Do Television and Radio Destroy Social Capital?
Evidence from Indonesian Villages

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ABSTRACT

In this paper, I investigate the impact of television and radio on participation in social groups, trust, and governance in Indonesian villages. To identify the impact of exposure to television (and radio), I exploit two sources of plausibly exogenous differences in over-the-air signal reception – one based on variation in signal strength driven by the mountains of East and Central Java, and a second based on the differential introduction across space and time of private television throughout Indonesia. Using both approaches, I find that increased media access, which is associated with more time spent watching television and listening to radio, is associated with substantially lower levels of participation in social organizations and with lower self-reported measures of trust. I find particularly strong effects on participation in local government activities, as well as on participation in informal savings groups. However, despite the impact on these measures of social capital, improved reception does not appear to affect village governance, at least as measured by discussions in village-level meetings and by corruption in a village-level road project.

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1. Introduction

Over the past several decades, economists and other social scientists have paid increasing attention to the phenomenon known as "social capital," the variety of social interactions, networks, and groups that link people in society together. Beyond describing the extent of these ties, there has been a vigorous debate as to whether social capital matters for everything from governance to growth to microfinance (Putnam 1993; Fukuyama 1995; Knack and Keefer 1997; DiPasquale and Glaeser 1999; Narayan and Pritchett 1999; Durlauf 2002; Sobel 2002; Guiso, Sapienza and Zingales 2004; Miguel, Gertler and Levine 2005; Karlan 2007).

Given the interest in social capital, concern has arisen about recent declines in various measures of social capital, particularly participation in organized social groups. Robert Putnam, in his book "Bowling Alone," highlighted this decline in the context of the United States, and suggested that the rise of television has played a major role (Putnam 2000). Empirically testing the link between television and social capital, however, is challenging. While there are many correlational studies on the relationship between television watching and various measures of social capital, establishing a causal relationship has proved far more difficult.[1,2]

In this paper, I examine the link between media exposure and two measures of social connectedness – participation in social groups and trust – using data from rural Indonesia. Rural Indonesia is a particularly attractive setting for studying this question, for several reasons. First, rural Indonesia has a rich social fabric – in the area that is the focus of this study, the typical village contains 179 groups of various types, or one for every 15 adults. Second, the setting

[1] Putnam, for example, acknowledges the paucity of causal evidence on this point, and to establish a casual link relies on only one study, based on the introduction of television in three isolated Canadian communities in the 1970s (Williams 1986; Putnam 2000).

[2] Several authors have recently used the diffusion of radio in the United States to study the impact of media on public finance (Stromberg 2004) and the diffusion of television in the United States to study its impact on voter participation and education (Gentzkow 2006; Gentzkow and Shapiro 2008). However, the relative scarcity of detailed data on social participation from the 1950s and earlier have meant similar exercises have not been conducted for participation in social groups.

provides two different sources of plausibly exogenous variation in television and radio access – one based on variation in signal strength driven by mountains, and a second based on the differential introduction across time and space of private television in Indonesia. The two empirical methodologies tell a very similar story: increased access to television (and radio) leads to lower levels of social capital.

The first identification strategy exploits the fact that the mountainous terrain of parts of East and Central Java generates plausibly exogenous variation in the ability of villagers in rural areas to receive television and radio signals. I first document that the variation in current television reception within rural districts in this part of Indonesia appears approximately balanced with respect to a variety of village characteristics, such as population, the share of households in agriculture, the number of schools in the village, and various social capital measure, all of which were collected several years prior to the introduction of private television. I then show, using detailed data I collected from over 600 villages in this area, that each additional television channel whose signal is strong enough to be received over-the-air is associated with villagers watching, on average, about 7 minutes of additional television per day. I also find that an additional channel of television reception is associated with respondents listening to an additional 7 minutes of radio each day, which likely reflects the high correlation between radio and television signals. Since I do not observe radio reception directly, and since even if observed it would likely be highly correlated with television reception, I consider the total effect of an additional channel of better TV reception to be the additional 14 minutes per day spent watching television and listening to radio, and do not attempt to separate television

from radio.[3] Overall, this represents about an 8% increase in time spent watching television and listening to radio for each additional television channel received.

I find that villages with better access to television and radio signals – and thus villages where villagers spend more time watching television and listening to radio – have lower levels of participation in a wide range of village activities. Reception of an extra channel of television is associated with a decline of about 7 percent in the total number of social groups in the village, and with the typical adult in the village participating in about 4 percent fewer types of social activities during a 3 month period. The effects are particularly strong among community self-improvement activities, neighborhood associations, school committees, and informal savings groups, and the effects are felt more strongly among wealthier households. These declines in social participation represent a net decline in social activity, rather than a shift from formal social groups to informal gatherings. Overall, the estimates imply that villagers participate in 0.28 percent fewer types of activities for every additional minute per day they spend watching television and listening to radio.

The second empirical approach finds similar results when I look over time at the impact of the introduction of private television throughout Indonesia.[4] Prior to 1993, outside of the capital, Indonesia had only a single television station, the government-owned TVRI. After 1993, private television stations began broadcasting, to the point where today there are 11 major

[3] Although I do not observe radio reception in the data, to investigate whether radio and television signals are positively correlated, I obtained data on the location of radio transmitters in Central Java province. Using the ITM model of electromagnetic signal propagation used in the working paper version of this paper (Hufford 2002; Olken 2006b), I can construct an average radio signal strength in the subdistrict, and compare it to the average television signal strength also calculated using the ITM model. Using this technique, I find that radio and television signal strength are indeed strongly positively correlated, even within districts, with correlation coefficients between 0.52 and 0.70 depending on the measure used and depending on whether I look only within districts or also include between-district variation.

[4] This panel-data approach is the approach more commonly used to estimate the impact of television in other settings (see, for example, Gentzkow 2006; DellaVigna and Kaplan 2007; Jensen and Oster 2007; Gentzkow and Shapiro 2008). I am grateful to an anonymous referee for suggesting using this approach in this context.

television stations broadcasting throughout the country. However, not all locations can receive all private stations. I therefore examine the change in average social participation levels between the time before private television began broadcasting (using data from 1990 and 1991) and after private television began broadcasting (using data from 2003), and examine the relationship between changes in participation and changes in the number of television channels a subdistrict could receive. This approach lets me control flexibly for any pre-period differences in the level of social capital that might be correlated with contemporary television reception. The data comes from the 1990 and 2003 PODES (census of villages) and from the 1991 and 2003 SUSENAS (national welfare survey) datasets.

The results from this approach show that each additional television channel introduced into a subdistrict resulted in 0.014 fewer types of social organizations in a typical village, and reduced the probability that an individual participates in any social organization over a 3-month period by 2.4 percentage points. These results, combined with the cross-sectional results from the much richer data available in the East and Central Java survey, tell a consistent story: improved access to television and radio reduced individual participation in social groups and, in aggregate, reduced both the number and the diversity of groups that exist within a village.

Having established this main result in both datasets, I then explore – using the more detailed data available in the East and Central Java survey – how television and radio access affects other forms of social capital. In particular, in addition to participation in social groups, another form of social capital that has been frequently discussed in the literature is trust (e.g., Knack and Keefer, 1997, La Porta et a. 1997). Since social networks can help enforce agreements among individuals, one might expect that 'trust,' which could reflect the probability of cooperation among agents in a network, might also decline as the strength of social networks

declines (Kandori 1992; Greif 1993; Mobius and Szeidl 2007). Using the data I collected from East and Central Java, I find that additional television and radio exposure is associated with substantially lower self-reported levels of trust. These results suggest that the effect of television and radio on social capital may be more than merely a mechanical effect operating through the budget constraint on time.

Finally, I explore a potential consequence of television's impact on social capital. A large part of the interest in social capital stems from the argument, advanced by Putnam (1993) among others, that lower levels of social capital translate into worse governance. In the East and Central Java data, I observe several measures of governance associated with a village-level road building program that took place in all 600 villages during the period the data was collected. The process for building and supervising these village roads was supposed to be participatory – construction was planned at open village meetings, and subsequent village meetings were held at which the construction team had to account for how they used funds. Enumerators attended these meetings, and consistent with the above results on participation in social groups, I show that areas with greater television reception had lower attendance at these village-level planning and monitoring meetings.

Despite the negative impact of better television reception on attendance at meetings, I find little evidence that this translated into worse outcomes for the road project. Even though it reduced attendance at meetings, greater television reception did not change the number of people at the road-building meetings who talked, the probability that a corruption-related problem was discussed at a meeting, or the probability that the meetings dedicated to project accountability voted to take any serious action, such as firing someone or calling for an outside audit, to resolve a problem. Moreover, better television reception was not associated with greater theft of funds

from the road project, as measured by the difference between the road's official cost and an engineer's ex-post estimate of what the road actually cost to build. Though television and radio broadcasts are largely national, and rarely if ever report on individual villages, it is of course possible that media exposure affects village level governance through channels other than social capital. Considerable caution should therefore be used in interpreting the results on governance as identifying the causal effect of social capital per se on governance. However, it is worth noting that the lack of a negative effect of decreased participation on governance is consistent with my experimental results in the same setting, which showed little impact of increased participation on governance (Olken 2007).

The remainder of the paper is organized as follows. Section 2 describes the setting and discusses the various data sets used in the paper. Section 3 discusses the empirical strategies, examines the relationship between television reception and village characteristics such as population, education rates, poverty, and pre-period measures of social capital, and shows that better signal strength does indeed lead to more time spent watching television and listening to radio. Section 4 presents the main results on the impact of television and radio on participation in social groups and trust. Section 5 discusses the impact of television reception on village governance, as measured through the monitoring process and final outcomes of a village-level road building project. Section 6 concludes.

2. Setting and Data

This study combines analysis from several distinct datasets. The primary focus of the study is a cross-sectional examination of 606 villages in Indonesia's East Java and Central Java provinces, in which I collected detailed data on social capital, governance, and media access. In addition, I also examine a subdistrict-level panel based on national data collected by the

Indonesian bureau of statistics (BPS). Section 2.1 describes the setting and data I collected in East and Central Java (which I hereafter refer to as the "Java survey"), and section 2.2 describes the BPS data I use for the national subdistrict-level panel.

2.1. The Java survey

Rural Java is one of the most densely populated rural areas in the world, with over 750 people per square kilometer.[5] Consistent with this high population density, districts (*kabupaten*) in Java contain almost one million people on average, but are relatively small geographically – a typical district contains only 1,100 square kilometers, equivalent to a square 33 km on each side. (A list of the various administrative units in Indonesia with their relative sizes is shown in Table 1.) Districts are broken into subdistricts (*kecamatan*), which are in turn broken into villages (*desa*), each of which contains an average of about 4,500 people. Villages are subsequently broken up into hamlets (*dusun*), blocks (*RW*), and neighborhoods (*RT*). All empirical specifications in the paper will include fixed effects at the district level, to control for the administrative, locational, and cultural differences that exist across the different parts of Indonesia.

The data from the Java survey represents the results of several surveys designed by the author and conducted between September 2003 and August 2004. The data were originally collected for a study of rural road projects (see Olken 2007). As a result, all villages in the study were selected because they were about to begin building a 1-3 km road project under the auspices of the Kecamatan Development Program (KDP), a project funded by the central government from a loan from the World Bank. In the remainder of this section I describe the subsets of the Java survey that I use to calculate the three main types of variables used in the

[5] Author's calculations using 2003 PODES dataset. This calculation includes only villages *(desa)*, and includes all agricultural land area as well as residential areas.

study – data on social organizations, data on television reception and use, and data on governance.

2.1.1. Social organizations

Indonesian villages have a complex network of social groups. As discussed in Alatas, Pritchett, and Wetterberg (2002) and Miguel, Gertler and Levine (2005), a typical Indonesian village includes a wide variety of social organizations, including religious study groups, neighborhood associations, rotating savings and credit associations (ROSCAs, known as *arisan* in Indonesian), and women's groups of various types. Many Indonesian villages also have a strong tradition of community-self help, or *gotong royong*, in which villagers work together to improve community infrastructure.

While many of the groups are formed independently by villagers, some are local chapters of larger organizations. Many of the Islamic study groups, for example, are loosely affiliated with the two national Islamic umbrella organizations, *Nahdlatul Ulama* (NU) and *Muhammadiyah*, though they essentially operate independently in each village. In addition, under the Soeharto regime, neighborhood associations (RTs and RWs) and the national women's organization (PKK) were formalized and encouraged by the central government. Since the end of the Soeharto regime in 1998 and the subsequent introduction of regional autonomy, these groups have been essentially left on their own, with relatively little subsequent support or encouragement from the central government.

To measure the prevalence and activity of these various types of social groups, I use two types of data: key informant surveys, which allow me to construct a list of all social organizations in the village, and household surveys, which allow me to measure the activities that a particular respondent participated in during the three months prior to the survey. In the key

informant surveys, the surveyor interviewed the head of the each hamlet in the village, and asked him for an exhaustive list of all groups, organizations, activities, meetings, or programs that exist in his hamlet. To ensure that the list was complete, the hamlet head was prompted with a list of 12 different categories of social groups, with each category containing a list of the four or five most common activities in that category.[6] I aggregate these data across all hamlets to obtain a complete picture of the all groups in the village. In the household surveys, the surveyor interviewed the respondent (a randomly selected adult member of the household), who was asked about all groups he or she participated in, assisted by the same set of prompting questions used in the key informant survey.

The first column of Table 2 presents some summary statistics from the Java survey. As shown in column (1) of Table 2, based on the key informant survey on average there are 179 total groups in each village. This works out to about 1 group for every 15 adults in the village. Using the more detailed data on the average number of attendees and frequency of meetings, I also compute the average number of times an adult in the village attended a meeting in the past three months. On average, each adult attended approximately 11 meetings over the three months prior to the survey, or about 1 meeting each week.

2.1.2. Television reception and use

Indonesia has 11 television channels that broadcast over the air. These channels include one government-run channel (TVRI), three major networks (RCTI, SCTV, and Indosiar), one all-news station (Metro TV), and six minor networks (ANTV, GLOBALTV, LATIVI, TV7,

[6] Hamlet heads typically know the activities in their hamlet in great detail. However, in hamlets with multiple blocks (RWs), hamlet heads may not know about neighborhood organizations in blocks other than the block where they live. Thus, if there are multiple blocks in the hamlet, the hamlet head was asked to list all neighborhood-level (RT) activities only for his block (RW). For all other organizations (i.e., any organization that contains members from multiple neighborhoods (RTs)), he was instructed to list all organizations in his hamlet. Accordingly, to calculate the total number of organizations in the hamlet, I multiply the number of organizations at the neighborhood (RT) level by the average number of blocks (RWs) per hamlet in the village.

TransTV, and TPI). All of the private channels (except Metro TV) have a range of entertainment programming, such as sitcoms, soap operas, movies, and religious programs, and in addition the government run channel and the major networks all have daily national news shows.

Data on the ability of households to receive each of these channels comes from the household survey. Each respondent was asked, for 9 of these different networks (all of the above except GLOBALTV and LATIVI), whether "as far as they know, this station could be received in this village clearly enough to watch." As shown in column (1) of Table 2, on average, households report being able to receive about 5 of these stations. Households report virtually universal coverage for two of the major networks (RCTI and Indosiar) and much lower coverage rates for the minor networks.

I average the number of channels received over all respondents in a subdistrict.[7] In constructing this average, I only use the data on television reception from those households that have televisions, excluding the 3 percent of households who also own a satellite dish, which yields an average of 20 data points on television reception for each of the 155 subdistricts in the sample. The correlation of these individual responses within a subdistrict is 0.70, which suggests that averaging over 20 households should produce a reasonable estimate of the number of channels received.

On average, 69 percent of sampled households report owning a television, and 71 percent report owning a radio; only 12 percent of households own neither. Overall, respondents reported spending an average of 123 minutes per day watching television and 55 minutes per day listening to radio.

[7] Averaging television reception at the village level, rather than the subdistrict level, produces very similar results. This is not surprising, given that television reception is highly correlated across villages in the same subdistrict. All standard errors are clustered by subdistrict to account for the geographic clustering of television reception.

In the working paper version of this paper (Olken 2006b), I used data obtained from the Indonesian Department of Information and Communications on the location and broadcasting power of all television transmitters in Java, combined with a model of electro magnetic signal propagation (Hufford 2002) and GIS data on the topography of East and Central Java, to predict television reception in each village as a function of the topography between the transmitters and each village in the data. I found a strong link between the model's predicted signal strength, actual television reception as reported by villagers, and the outcomes of interest in the paper, confirming that the variation in television reception I isolate is indeed coming from geographic features of East and Central Java.[8]

2.1.3. Governance

Two types of data on governance from the Java survey are used in the paper. The first measure of governance I examine is data from the open village meetings that were part of the road construction project. Enumerators attended four meetings in each village – one meeting where construction was planned, and three meetings (after 40%, 80%, and 100% of funds were spent) where those who implemented the project had to account for how they used project funds. The enumerator took attendance at the meeting and recorded all of the issues that were discussed at the meeting, as well as how each issue was resolved.

Second, I measure "missing expenditures" in each of the road projects that were built in the project. Specifically, after the road projects were completed, engineers dug core samples in each road to estimate the quantity of materials used, surveyed local suppliers to estimate prices, and interviewed villagers to determine the wages paid on the project. From these data, I construct

[8] In the working paper I show that the results in the paper are qualitatively robust to using the predicted signal strength as an instrument for television reception, controlling for the signal strength that would have been present in the absence of mountains. While this approach isolates precisely the variation in television reception due to mountains, the approach had relatively low statistical power (the F-statistic on the excluded instruments was only 2.96).

an independent estimate of the amount each project actually cost to build, and then compare this estimate with what the village reported it spent on the project on a line-item by line-item basis.[9] The measure of missing expenditures I examine is the difference in logs between what the village claimed the road cost to build and what the engineers estimated it actually cost to build,. I examine four versions of this measure: missing expenditures for the road project, missing expenditures for the road and ancillary projects (which includes accompanying projects such as culverts and retaining walls), missing prices (i.e., the difference in logs between the prices reported by the village and those found in the price survey, weighted by the reported shares of each commodity the village reports it uses), and missing quantities (i.e., the difference in logs between the quantities the village reports and those found in the engineering survey, weighted by the village's reported prices).

2.2. National data

In addition to the detailed cross-sectional data I collected in the Java survey, I also examine a national dataset, based on data collected by the Indonesian Central Bureau of Statistics (BPS). This data has been collected over time, which allows me to compare the same subdistricts before and after the impact of the introduction of television. Unfortunately, this data has only limited questions on social capital, unlike the more comprehensive data available from the Java survey, which is why I examine both data from both sources.

2.2.1. Data on social organizations

As with the Java survey, in the national data I examine questions on social capital from both key-informant surveys and individual household surveys. The key informant data come from the 1990 and 2003 Census of Villages (PODES) datasets, and are available for every

[9] Additional details about this measurement can be found in Olken (2007).

village in Indonesia.[10] The data is obtained from the head of each village, and includes questions on a wide variety of village characteristics. I focus on the variables on the existence of social organizations that are common to both waves: sports, arts, public service, and youth activities.[11] I restrict the sample to exclude major cities (*kotamadya)* such as Jakarta, Surabaya, and Medan, and drop the conflict-ridden provinces of Aceh, Maluku, East Timor, and Irian Jaya, where there are serious concerns about data quality in all Indonesian government surveys. The summary statistics on participation in these activities, shown in column (2) of Table 2, reveal an increase in the presence of these activities over time, with villages averaging 2.8 out of these 4 types of activities in 1990 and 3.3 out of these 4 types of activities in 2003.

The household survey data comes from the 1991 and 2003 National Welfare Survey (SUSENAS) socio-cultural module. The module was administered to 17,849 people in 1991 and to 155,832 people in 2003. The SUSENAS question on social capital asks if the respondent participated in any of a number of types of social organizations in the three months prior to the survey, though there is no data on the intensity of participation. I examine the types of social organizations that were asked about in both the 1991 and 2003 wave: religious organizations, sports groups, arts groups, youth groups, women's organizations, and mutual burial societies. In particular, I focus on a dummy variable for whether the respondent participated in any of these groups. The section also includes a question asking whether the respondent watched any television in the past week, but neither the 1991 nor 2003 waves ask about the number of hours of television the respondent watched.

[10] The PODES has been conducted in Indonesia every 3-4 years since 1976. I use the 1990 wave as this is the most recent wave available prior to the introduction of private television in 1993. I use the 2003 wave to match the Java survey. While intermediate waves (e.g., 1993, 1996, and 2000) exist and contain some social capital measures, I do not have any intermediate measurements of television reception, so I cannot make use of this additional data.

[11] Specifically, for each village, I add up the number of types of activities (sports, arts, public service, and youth) that exist in the village. I then take the average value of this index for all villages in the subdistrict.

2.2.2. Data on television reception

For the national sample, data on the number of channels received after the introduction of private television comes from the 2006 Census of Villages (PODES), which was the first round of the PODES to include questions on television reception. This survey asked each village head in Indonesia whether each of the 11 national stations could "be received in his village without using either a satellite antenna or cable television."[12] As shown in column 2 of Table 2, on average villages can receive about 6 of these 11 stations. In villages for which I have both television data from the Java survey and television data from PODES, the PODES data reports substantially higher rates of reception for each station. This may be due to the fact that the PODES survey asked merely whether the station could be received in the village, whereas the Java survey asked if the station could be received clearly enough to watch, which is a somewhat more restrictive standard.[13]

For the panel analysis, I take advantage of the fact that private television was introduced in Indonesia (outside of Jakarta, which as discussed above is dropped from the sample) beginning in 1993.[14] I therefore assume that all subdistricts had access to only one channel (TVRI, the government channel) in the period prior to the introduction of private television.[15]

[12] Unfortunately, since this question on media access was not asked in any of the prior PODES surveys, I cannot construct finer detail on the rollout of private television across Indonesia.

[13] In the villages where I have both datasets, the correlation between the television reception measures in the two datasets is 0.56. However, when I repeat the analysis from the Java survey using the PODES number of channels variable rather than the Java survey's number of channels variable, I find no statistically significant effects of the PODES number of channels variable on either the amount of time spent watching television or the number of social organizations in the village. This may reflect the fact that the question used in the Java survey more precisely captures the variation in television reception relevant for actual television watching decisions.

[14] Prior to 1988, the only television available in Indonesia was the state-controlled TVRI station. Private television in Indonesia began in 1988 in Jakarta and 1990 in Surabaya, when RCTI and SCTV (respectively) began broadcasting scrambled signals that could be watched only with specially-purchased decoders. Free over-the air private broadcasts began in 1990 in Jakarta, in 1991 in Bandung and Denpasar, and in 1993 in other locations. (Depinfokom 2004).

[15] In the analysis based on the 1991 SUSENAS (individual-level data), I limit the sample to those subdistricts where at least one individual reported watching any television in the previous week, so the assumption that there was 1 television station with reception in that area seems reasonable. Unfortunately, in the 1990 PODES, I have no

3. Empirical strategy: signal strength and media use

3.1. Determinants of signal strength

This paper uses television reception as an exogenous determinant of television watching. It is important to use an exogenous determinant of television watching – such as signal strength – to isolate the causal effect of media exposure because of potential reverse causality issues. For example, if the number of social groups was low for some other reason – say, the village head who organizes the social groups was incompetent – households might respond to the lack of available social activities by watching more television.

In the data from the Java survey, I focus on cross-sectional identification, using the fact that the mountains of East and Central Java create variation in television reception that is unrelated to other village characteristics. The key issue in doing this type of cross-sectional analysis is to ensure that television reception is, in fact, orthogonal to other village characteristics that might also affect social capital. In particular, the placement of TV stations, particularly for the minor networks, is determined primarily by the major cities of East and Central Java – in particular, Surabaya, Semarang, and the combined media market of Surakarta and Yogyakarta. This can be seen in Figure 1, which shows television reception in different geographic areas of East and Central Java (lighter shading indicates higher elevation, and larger circles indicate better television reception). As can be seen in the Figure, the largest circles, corresponding to the best television reception, are all in areas with direct lines of sight to Surabaya, Semarang, Surakarta, and Yogyakarta.

In all specifications, I therefore include district fixed effects, which captures 95% of the variation in the distance between the subdistrict and the closest of the three listed major cities

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information on whether television could be received in the village, so I assume that all villages can receive exactly 1 station.

above. (Districts borders are shown in black in Figure 1; subdistrict borders are shown in gray.) Not surprisingly, as shown in Table 2, removing district fixed effects also removes 75% of the variance from the number of channels variable. Including district fixed effects also removes most of the relatively subtle variation in economic or social structure across East and Central Java. In addition, in all specifications, I also include as control variables the distance to the nearest major city (*kotamadya),* as well as the distance and travel time to the nearest major town (defined as a district capital), to further capture locational differences within districts.

Once proximity to the television transmission sites has been removed, the major remaining determinant of television reception is geography. In particular, in some areas, mountains block television transmission, whereas in others they do not. This can be seen by looking at Figure 1, and noting that those villages whose 'line of sight' to a major city is blocked by a mountain have substantially less reception than nearby villages with a direct 'line of sight' to the city. As villages in mountainous areas may have different social structures from villages in low plains, I control for elevation, which may be correlated with reception, though doing so does not substantially affect the results.[16] I also control for dummies for whether the subdistrict faces north, east, or south (with west as the omitted category) and dummies for the subdistrict being coastal (as opposed to landlocked), in addition to the district fixed effects and measures of travel distance to nearby major towns and cities discussed above.

Table 3 examines whether, once district fixed effects are removed and elevation and other geographic characteristics are controlled for, the number of television channels appears unrelated to other, presumably exogenous, village characteristics. Specifically, I report the results of the following OLS regression using data from the Java survey:

[16]Controlling instead for a flexible spline of elevation to capture non-linear effects of elevation produces similar results.

$$NUMCHANNELS_{sd} = \alpha_d + X_{vsd}\delta_1 + \delta_2 GEOGRAPHY_{vsd} + \varepsilon_{vsd} \quad (1)$$

where *v* represents a village, *s* a subdistrict, and *d* represents a district. NUMCHANNELS is the average number of channels reported by all TV-owning households (except those who also own a satellite dish) surveyed in the subdistrict, α_d are district fixed effects, $GEOGRAPHY_{vsd}$ are the geographic variables described above (elevation, direction of slope, distance and travel time to nearest major town and distance to nearest major city, and coastal subdistrict dummy) , and X_{vsd} is a set of other village characteristics. Where possible, the X_{vsd} variables are calculated from the 1990 census of villages (PODES) – i.e., from before the introduction of private television. These characteristics include log adult population, the population share in agriculture, the number of schools in the village, the number of religious buildings (mosques, neighborhood prayer halls (mushollas), churches, etc) in the village, and dummies for whether there was any sports, arts, social welfare, or youth group in the village.[17] In addition, I include some variables which were only available in later datasets: the mean level of adult education in the village, ethnic and religious fragmentation (measured with a standard Herfindahl index), the log number of hamlets in the village, and the share of the population that is classified as poor (technically 'pre-prosperous' and 'prosperous group 1') by the national family planning association (BKKBN). Standard errors are adjusted for clustering at the subdistrict level.

The first column of Table 3 shows that, after controlling for district fixed effects, the number of channels received appears correlated with only three of the 24 variables considered: whether there was any social welfare group in the village in 1990, the log number of hamlets in the village, and whether the subdistrict is coastal. The negative correlation with the 'any social welfare group' dummy is a potential source of concern; however, of the 7 social capital variables

[17] All of these PODES 1990 variables are averaged at the subdistrict level to facilitate matching across time.

considered (number of mosques in the village, number of mushollas in the village, number of other religious buildings in village, and whether there is any sports, arts, social welfare, or youth group in the village) three have positive coefficients and four have negative coefficients, suggesting no clear overall relationship between these pre-period social capital measures and television reception. Overall, the p-value from a joint F-test of the seven social capital variables is 0.07; the p-value from a test of all 15 non-geographic variables is 0.20 and the p-value from a test of all 24 variables is 0.14.

Even these limited correlations are largely driven by a few outliers on the television reception variables. In column (2), I drop the highest and lowest subdistrict in terms of TV reception (after having removed district means) – i.e., I drop 2 subdistricts out of 155 in the sample.[18] When I drop these few outliers, the individual significance on all three of the previously statistically significant variables disappears. In this sample, the p-value from a joint F-test of the seven social capital variables is 0.31; the p-value from a test of all 15 non-geographic variables is 0.34 and a p-value from a test of all 24 variables is 0.18.

From these regressions, it appears that, for the East and Central Java villages, once I drop these two outlier subdistricts, the number of channels variable appears approximately balanced with respect to pre-period social capital variables and other village characteristics. In the results below, I therefore limit my attention to this restricted sample (i.e., the sample in which I drop the two outlier subdistricts), although I have verified that all of the results are similar in the full sample. I also include all 24 control variables as additional regressors in all subsequent

[18] These two subdistricts really are outliers -- the lowest subdistrict in terms of number of channels received is 3.5 standard deviations below the mean, whereas the second-lowest subdistrict is only 2.6 standard deviations below the mean. Similarly, the highest subdistrict is 3.9 standard deviations above the mean, whereas the next highest subdistrict is only 2.4 standard deviations above the mean.

specifications, although once again I have verified that doing so does not substantially alter the results.

In columns (3) and (4), I repeat the same regression, but this time on the nationwide sample of subdistricts from the 2003 PODES (key informant) and 2003 SUSENAS (household) datasets. In the PODES sample (column 3), I find significant relationships between many of the variables considered, including pre-period social capital variables, and contemporary television reception. Specifically, I find that having a youth group in 1990 was associated with receiving more channels in 2003, and that having more mosques in the village was associated with receiving fewer channels in 2003. Overall, the joint F-tests reveal that in the PODES sample, both the social capital variables, and all non-geographic variables taken together, are jointly significant predictors of television reception in 2003 ($p < 0.01$ in both cases).[19] The SUSENAS sample, which covers a much smaller set of subdistricts, appears more balanced ($p = 0.23$ for social capital variables and $p = 0.29$ for all non-geographic variables). Given these correlations, in the national sample I restrict attention to the panel analysis, in which I examine only changes in the level of social capital over time. The panel analysis will also include district × time fixed effects, to allow for differential time trends in different areas of Indonesia.

As a basis of comparison, in column (5) I repeat the same regression as in column (2), but this time with the log of the number of social groups in the village as the dependent variable. By comparing the coefficients from column (1)-(4) with the coefficients in column (5), one can compare the correlation between these variables and the dependent variable in the subsequent analysis – social capital – and the correlation between these variables and the independent

[19] Note that the difference between the results in columns (1)-(2) and the results in column (3) appears to be primarily due to the difference in sample rather than a difference in datasets. Specifically, if I restrict the regression in column (3) to the sample from the Java survey in column (1), a joint test of the social capital variables has a p-value of 0.85 and a joint test of all of the non-geographic variables has a p-value of 0.35.

variable in the subsequent analysis – television reception. The data is from the Java survey. The coefficients in column (5) reveal that most geographic variables are not major determinants of the level of social capital, though villages with less travel time to the nearest major town do have somewhat fewer social groups. Looking at the 1990 social capital variables, villages that had sports groups or arts groups in 1990 are more likely to have more social groups in 2003, suggesting that participation levels persist over time. Overall, these variables are highly significant predictors of the number of social groups in 2003 (p-value on social capital variables = 0.08, p-value on all non-geographic variables < 0.01), and in some cases, the coefficients are of the opposite sign of the coefficients in columns (1) and (2). The fact that these coefficients are of opposite sign emphasizes the importance of including these covariates as controls, limiting attention to the sample where these covariates are balanced with respect to television reception, and investigating the panel as well as the cross-section.

3.2. Impact on Media Use and Ownership

Having explored the determinants of reception, the next question is whether better television reception is, in fact, associated with more time spent watching TV and listening to radio. I focus on the total number of minutes spent watching TV and listening to radio, since villages that receive better television reception may also receive better radio reception.[20] Since this data is only available in the Java survey, I can only conduct this analysis using cross-sectional variation. I estimate the following OLS regression using data from the Java survey:

$$MINUTES_{hvsd} = \alpha_d + \beta\ NUMCHANNELS_{sd} + Y_{hvsd}\,\gamma + X_{vsd}\,\delta + \varepsilon_{hvsd} \qquad (2)$$

[20] Conceptually, one might imagine that television and radio might have very different effects on social participation, since radio can be listened to while in the midst of another activity whereas television is more demanding of a person's attention. Unfortunately, I do not have independent data on how many radio channels the households receive, so it is not possible with the data to separately identify their effects. Furthermore, as documented above, television and radio signals are highly correlated (see footnote 3), so even if I had detailed radio reception data disentangling radio from television empirically would be difficult.

where *h* represents a household, MINUTES is the number of minutes per day spent watching television and listening to radio, Y is a vector of household controls (gender, age, predicted per-capita expenditure, and whether the household has electricity), X is the vector of village controls used in Table 3 (including the geographic controls), and α_d are district fixed effects.[21] I estimate this regression via OLS at the household level, and adjust the standard errors for clustering at the subdistrict level.

The results are presented in column (1) of Table 4. They show that each additional television channel that people in the subdistrict can receive is associated with an extra 14 minutes per day spent watching television and listening to radio, about an 8 percent increase from the mean level. In columns (2) and (3), I re-estimate equation (2) separately for minutes per day spent watching TV and for minutes per day spent listening to radio. The results suggest each additional channel of television that can be received leads to an additional 7 minutes of television watching per day and an additional 7 minutes of radio listening per day.[22] As discussed above, the positive effect on radio is not surprising, given that radio and television signal reception are likely highly correlated. Since I cannot separately identify the impact of reception on television and radio, for the remainder of the paper, I therefore interpret the effect of television reception as the total effect of greater media exposure – i.e., the extra 14 minutes that a respondent spends each day watching television and listening to radio.

[21] Note that one of the household controls is per-capita expenditure. This is not actual expenditure (which was not measured), but rather predicted per-capita expenditure, where the prediction is based on the household's assets. (See Olken (2006a) for more details on predicting expenditure from assets in this context.) In the version of predicted per-capita expenditure I use in this paper, I do not include ownership of television, radio, or satellite dish in the expenditure prediction equation. Note also that for all household-level equations, the 'number of TV-channels' variable is an average of all households in the subdistrict *except* the household in question, to avoid mechanical biases that this might introduce.

[22] Note that the sample includes all households, including those that do not own televisions, because television ownership is potentially endogenous and also because many people who not own televisions watch television at friends' or relatives' houses and still may listen to radio. In practice, however, I find that the effect of additional channels on television watching comes almost entirely from those households that own a television (results not reported).

A natural question is whether better television reception leads to a change on the extensive margin of television ownership. In column (4), I estimate the same equation, where the dependent variable is whether the household owns a television. To simplify interpretation of coefficients with binary dependent variables in fixed effects regressions, throughout the paper I report results from linear probability models; results are qualitatively similar with Probit models. Column (4) shows no effect of television reception on television ownership, which suggests that the impact of more channels is only on the intensive margin of television watching, rather than the extensive margin of television ownership. Given that television ownership rates are already 70 percent, and that 97 percent of households already report watching at least some television on an average day, it is not surprising that the impact of additional channels is on the intensive rather than extensive margin.

4. Impacts on Social Capital

4.1. Evidence from the Java Survey

4.1.1. Participation in Social Groups

The first measure of social capital I examine in this paper is participation in social groups. This was the primary measure used by Putnam (1993), and it has in many ways become the canonical measure of social capital in the literature. As discussed above, in examining the Java survey I examine measures of participation in social groups that come both from the village-level key informant survey and from the individual level survey. I estimate the following cross-sectional equation via OLS:

$$LOGGROUPS_{vsd} = \alpha_d + \beta\ NUMCHANNELS_{sd} + X_{vsd}\,\delta + \varepsilon_{vsd} \qquad (3)$$

I estimate this regression in logs, controlling for the log adult population and log number of hamlets, to allow the baseline number of groups in the village to vary flexibly with the size and structure of the village.

Table 5 shows the results. In column (1), I present the results where the dependent variable is the log of the total number of social groups in the village, using data from the key-informant survey. The regression includes district fixed effects and the same set of village-level controls used in Table 3 above, and clusters standard errors by subdistrict. The results suggest that adding an extra channel of television – or about one standard deviation on the de-meaned television variable – is associated with 6.8 percent fewer groups existing in the village. Column (2) presents the results from re-estimating equation (3) where the dependent variable is the log of the total number of times each adult in the village attended a group meeting in the last 3 months, once again using aggregate data on participation in village groups from the key informant survey. The results show that each extra television channel is associated 11 percent lower attendance at meetings per person over a 3 month period.

Columns (3) and (4) present analogous variables from the household survey. Column (3) shows that each additional television channel is associated with respondents reporting participating in 4.0 percent fewer types of social groups. Column (4) shows that each additional channel is associated with participation in 2.8 percent fewer group meetings, although this result is less precisely estimated and not statistically significant.[23] Although the magnitude in column (4) is substantially smaller than the analogous magnitude in column (2), the mean of the

[23] Note that estimating this equation in logs implicitly drops the 6 percent of respondents who participate in zero activities. As an alternative, I have estimated columns (3) and (4) as quasi-MLE robust Poisson regressions, which produce coefficients with similar interpretation to log-dependent variable regressions but do not require dropping zeros (Wooldridge 1999). The quasi-MLE robust Poisson approach produces even stronger results than those reported in the table. Specifically, in the number of groups regression (as in column 3) the coefficient on number of television channels is -0.048 (p-value 0.007) and in the number of times participated regression (as in column 4) the coefficient on number of television channels of -0.050 (p-value 0.042).

dependent variable is higher, so the estimated reduction in levels (rather than in logs) is much more similar.

In results not reported in the table, I use the household data to test for heterogeneity in the response to additional channels by interacting the number of television channels received variable with the respondent's education, gender, age, and predicted per-capita household expenditure. The only statistically significant interaction I find is that wealthier respondents reduce the number of times they participate in social groups more in response to an increased number of television channels. One reason for this may be that these households are more likely to own televisions, and therefore have television watching behavior that is more responsive to the number of channels they receive.[24]

To gauge these magnitudes, it is useful to compare these estimates with the estimated impact of television reception on media usage reported in Table 4. To do so, in results not reported in the table, I re-estimate the regressions presented in Table 5 using instrumental variables, with the number of minutes spent watching television and listening to radio as the endogenous right-hand side variable and the number of channels received as the excluded instrument. The IV results suggest that each additional minute the average households spends watching television or listening to radio each day is associated with 0.44 percent fewer social groups existing in the village (standard error 0.22; p-value 0.041). At the individual level, the IV results suggest that each additional minute the respondent spends watching television or listening to radio each day is associated with that respondent participating in 0.28 percent fewer types of activities (standard error 0.17; p-value 0.096), and with that respondent attending 0.20 percent

[24] Indeed, the point estimates suggest that wealthier households spend more minutes per day watching television and listening to radio than poorer households in response to an increase in the number of channels, though this interaction is not statistically significant (results not reported.)

fewer social meetings each month (standard error 0.24; p-value 0.39).[25] The statistical significance of these IV-results is similar to the reduced form results shown in Table 5. These relative magnitudes need to be interpreted with caution, however, as there are other mechanisms through which television and radio exposure could affect participation in social groups besides the pure effect of fewer minutes spent watching television and listening to radio.[26]

To investigate whether there is a differential impact of media exposure on different types of groups and organizations, I re-estimate equation (3) using the key-informant data, splitting the dependent variable separately by non-religious and religious groups. On average religious groups make up only 21 percent of the number of groups in the village, but represent 41 percent of attendance at group meetings. This is because these religious groups, which tend to be various types of Koran and religious study groups, meet quite frequently. The results, presented in Table 6, show substantial, robust declines in both the number non-religious groups and the frequency of participation in such groups. In results not presented in the table, I further decompose these non-religious groups, and find that the largest single effect is coming from groups associated with local village government, which consists of volunteer labor for public goods maintenance (*gotong royong*), neighborhood associations, and school committees. Other types of groups also show declines; only health and women's groups to not seem to be affected. For religious groups, the evidence is more mixed, with the results showing smaller, and generally not statistically significant, declines.

[25] Since the total time budget does not change, it would be interesting to know what other activities are crowded out. Unfortunately, since the data do not contain complete time diaries, this question cannot be answered using this data.
[25] An interesting question is what else television watching and radio listening crowd out. Unfortunately, the household survey was not designed to answer this question, and does not include the types of detailed time diaries that would be necessary for this purpose. I regard this as an important direction for future work.
[26] For example, the results in Section 4.2 below show that additional television and radio exposure is associated with less trust in the village, which could in turn influence social participation. It is also possible that the content of the additional channels affects participation directly. Finally, there may be social multipliers, so that the aggregate effect of increased television exposure on group participation is larger than the effect of exposing a single individual to additional television.

Finally, as shown in the last two columns, there appears to be a decline in rotating savings and credit mechanisms (ROSCAs), a very common form of small scale savings mechanism in developing countries (Besley, Coate and Loury 1993). Many groups in Java involve a ROSCA as part of their regular meetings. Overall, the number of groups that include a ROSCA as part of their regular meetings declines by 14 percent with each additional television channel in the village, and participation in such groups declines by 17 percent with each additional channel. Moreover, in results not reported in the table, I find that the average amount contributed to a ROSCA at each meeting (conditional on a meeting taking place) does not change with additional channels, so the decline in ROSCA groups represents a net decline in total ROSCA contributions in the village. Since ROSCAs are a potentially important savings mechanism for villagers, this suggests that the decline in social capital may have productive costs as well.

Thus far, I have only examined participation in organized social groups. However, television and radio may be associated with substitution from participation in organized social groups to more informal gatherings at houses of friends. For example, one might imagine that people would gather at the home of a friend to watch television. To investigate this, I use data from the household survey, in which respondents were asked to report on social visits to and from friends and neighbors over the past week. In results not reported in the table, I find that, if anything, these reported social visits also seem to decrease in areas with better television reception, although the results are not statistically significant in all specifications.[27] This suggests

[27] Intriguingly, the declines are strongest when I examine social visits to households that do not own a television. One possible explanation is that, as the number of channels increase, those households who own televisions themselves increasingly prefer staying at home watching television rather than visiting their non-television owning neighbors.

that the reduction in participation in social organizations represents a net decline in social interactions, rather than merely a substitution from one form to another.

4.1.2. Trust

In addition to participation in social groups, the literature on social capital has also focused on a second measure of social capital – trust. Both theory and evidence from other settings suggests that participation in social groups and trust are related, as social networks of the form created by social groups provide a mechanism to enforce agreements among network members (Kandori 1992; Greif 1993; Karlan 2007; Mobius and Szeidl 2007).

Much of the empirical work on the impact of trust, such as Knack and Keefer (1997) and La Porta et al. (1997), measures trust through the trust question from the General Social Survey and World Values Survey, which asks: "Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?" Glaeser et al. (2000) and Karlan (2005) show that the answers to this self-reported trust question predict real economic activity; in particular, they are correlated with trustworthy play in the trust game and with repayment rates for microcredit.

I therefore examine whether increased media exposure affects answers to this self-reported trust question. In addition to asking the question for 'people in general,' the household survey also asked the same trust question about a variety of other groups, including people from the same neighborhood, from the same village, the government, the President of Indonesia, and so on. I define the TRUST variable as a dummy equal to 1 if the respondents say that they would generally trust a person, and 0 if they say that you can't be too careful in dealing with people. I then re-estimate equation (2), using the individual responses to the TRUST question as the dependent variable.

The results are presented in Table 7. The results show that increased media exposure is associated with declines of about 4 percentage points – or 16 percent from the mean level – in the percent of respondents responding affirmatively to the trust question. Interestingly, the responses appear across a wide range of questions about who is being trusted. The group which sees the smallest decline in being trusted is 'people who live in your neighborhood,' which declines by a statistically insignificant 1.2 percentage points, and the groups which see the largest effect are 'people who live in your village' and 'the village parliament,' which decline by 5.3 percentage points.

The fact that the two different measures of social capital I examine – trust and participation – both show similar effects provides confirmatory evidence for the effect of television and radio. Moreover, the fact that there is an effect on trust suggests that the impact of television and radio on social capital are not limited only to the mechanical effects of a time budget constraint – television and radio exposure appears to change attitudes as well.

4.2. Evidence from the national panel of subdistricts

The analysis presented above relied on cross-sectional analysis that related differential signal strength within rural districts to the level of media use and social capital. An alternative approach is to examine the change in the number of television channels people received over time, and examine the impact of this change on social capital. This section performs this analysis using a national panel of subdistricts, which allows me to compare changes in social capital between the period before the introduction of private television (1990 or 1991, depending on the dataset) and the period after the introduction of private television (2003) in many areas of the country.

Specifically, I estimate the following regression, using both subdistrict-level aggregate data from the key-informant based PODES surveys and individual-level data from the SUSENAS household surveys:

$$SOCIALCAPITAL_{sdti} = \alpha_{sd} + \alpha_{dt} + \beta\ NUMCHANNELS_{sdt} + X_{sdti}\ \delta + \varepsilon_{sdt} \quad (4)$$

In this equation, $SOCIALCAPITAL_{sdti}$ are the various social capital measures I examine (described in more detail below), *t* represents a wave of the survey, $NUMCHANNELS_{sdt}$ is the number of channels that can be received in subdistrict *s* (located in district *d*) in year *t*, α_{sd} is a subdistrict fixed effect, and α_{dt} is a district × survey wave fixed effect. For individual-level regressions, *i* represents an individual and X_{sdti} represent individual-level control variables, including age, gender, education, log per-capita household expenditure, and whether the household has electricity. There are two waves of the data, with the first wave (1990 for subdistrict-level data and 1991 for individual-level data) coming from the period when there was only 1 private television channel, and the second wave (2003) coming from the period after private television had been introduced. As discussed above, in the first period I set $NUMCHANNELS_{sdt}$ equal to 1, and in the second period I set $NUMCHANNELS_{sdt}$ equal to the average number of channels that the village heads in that subdistrict reported being able to receive in 2006. Note that by including district × survey wave fixed effects (α_{dt}), I allow flexibly for changes in the social capital environment over time in different parts of Indonesia.[28] This specification is therefore the panel equivalent of equation (3), and is identified off of subdistrict-by-subdistrict changes in television reception looking within districts of Indonesia.

The results are presented in Table 8. In column (1), the dependent variable is the average number of types of organizations present in villages in the subdistrict using data from the

[28] For example, district × time fixed effects would absorb all the variation in industrialization used by Gertler, Levine, and Miguel (2006).

PODES. As discussed above, the PODES contains data on the presence of four types of social organizations -- sports, arts, public service, and youth activities – so the dependent variable, the average number of types of groups among villages in the subdistrict, ranges from 0 to 4. The estimate in column (1) shows that each additional channel that can be received in a subdistrict is associated with a reduction in 0.014 in the number of types of organizations present in the village. While this effect may seem small in magnitude, it is worth remembering that the variables in the PODES captures only whether each of these four types of organizations exists, and has no information about the intensity of participation, so these small changes in the number of types of organizations that exist may mask much larger changes in participation rates.

In column (2), I repeat the same specification using individual-level data. In this specification, the dependent variable is a dummy variable for whether the individual participated in any of 6 types of social activities (religious organizations, sports groups, arts groups, youth groups, women's organizations, and mutual burial societies) over the previous three month period. The impact of improved television reception is negative and quite large in magnitude: each additional channel of television reception reduces the percentage of respondents participating in social activities by 2.5 percentage points, or about 5% of the mean level of the dependent variable. In results not reported in the table, I have also examined the impacts one-by-one for individual types of groups. The point estimates on these individual group regressions are not generally individually significant, but they suggest that most of the reduction comes from declines in religious groups (the point estimate is a 1.3 percentage point reduction in participation per additional television channel) and mutual burial societies (the point estimate is a 1.2 percentage point reduction in participation per additional television channel.)

5. Impacts on Governance: Evidence from the Java Survey

The previous sections showed a clear relationship between exposure to television and radio and social capital, whether measured by participation in social groups or as measured by trust. This section explores another part of the social capital equation – the suggestion by Putnam (1993) and others that lower social capital is associated with worse governance. In particular, I focus on governance surrounding the road projects that were being built in the villages at the time the data from the Java survey was collected.[29] I examine three measures of governance in the projects – attendance at village level meetings that planned and monitored construction, the quality of discussion at those meetings, and ultimately the percentage of funds used in the project that could not be accounted for by an independent engineering team. For each of these measures, I examine whether or not increased television reception, which we have seen is associated with lower levels of social capital in the village, is associated with worse outcomes.

An important question, of course, is the validity of the implicit exclusion restriction that television and radio reception affects governance *only* through the channel of its effects on social capital. At higher levels of government, this is unlikely to be the case, as the media may have a direct effect on governance beyond the effect on social capital discussed here. For example, increasing the population's access to news reports may provide incentives for politicians to change their behavior (e.g., Stromberg 2004). For the level of governance examined here – village level road construction projects – this direct effect is unlikely to be present, as television and radio news reports are largely national in scope and extremely unlikely to cover village events. Nevertheless, it is possible television may have other effects on governance besides those through the social capital channels. As a result, while the reduced form estimates of the impact of

[29] Another natural variable to examine would be voter turnout, as in Gentzkow (2006). However, turnout in Indonesia is so high (in part as a holdover from the Soeharto era, when voting was effectively compulsory) that there is almost no variation in this variable. In fact, in the Java survey 99% of respondents reported voting in the most recent national parliamentary elections.

television and radio media exposure on governance are well identified, interpreting the results in this section as identifying the causal effect of social capital on governance is more speculative.

As discussed above, survey enumerators attended four meetings in each village associated with the road project – one meeting at which the road project was planned, and three meetings at which the village had to approve of how the project officials had spent the funds on the road project. These meetings were open to the public, and attendance at these meetings was observed directly by the project enumerator, who circulated an attendance list and noted who on the list spoke during the meeting.[30] To estimate the impact of media exposure on attendance at the meetings, I re-estimate a version of equation (3), where each observation is a village meeting. I include dummies for which type of meeting it was, interacted with the experimental treatments discussed above.

The results are presented in Table 9. The results suggest that each additional television channel is associated with a decline of about 3 percent in the number of people attending a meeting. This 3 percent estimate is identical to the participation effect estimated from the household surveys (e.g., column 4 of Table 5). I classify all those who attend as either 'insiders' (members of the village government, the project implementation team, or other types of informal leaders in the village) or 'outsiders' (everyone else). Somewhat surprisingly, the lower attendance associated with media exposure appears more pronounced among insiders than among outsiders. One possible explanation, consistent with the earlier findings, is that there are simply fewer 'insiders' in total in villages with greater media exposure, as some people spend

[30] As described in Olken (2007), experiments were conducted in which additional invitations to these meetings were distributed in some villages, and in other villages anonymous comment forms were distributed along with these villages. These treatments were randomly assigned within subdistricts, so their presence will be orthogonal to the number of television channels received and other pre-determined village characteristics. Nevertheless, in Table 9 I control for dummies for the experimental treatments interacted with which type of meeting it was, and in Tables 9 and 10 I control for dummies for the different treatment groups. I also control for whether a subdistrict was randomly assigned to receive external audits of the road project.

more time watching television and listening to radio instead of becoming deeply involved in village government.

Second, I investigate whether television and radio have an effect on the quality of the discussion at the meetings. In column (4), I show that even though there are fewer people attending the meetings, there is no statistically significant reduction in the number of people who talk at the meetings. In columns (5), (6), and (7), I further examine alternative measures of the quality of the discussion at the meetings. Column (5) examines the number of problems or issues that were discussed at the accountability meetings.[31] The point estimate suggests that villages with more media exposure have slightly more discussion at meetings, with more problems or issues being raised, although this effect is not statistically significant. Column (6) focuses on whether any corruption-related problems were discussed, and finds no effect of media exposure.[32] Similarly, column (7) finds that there is no effect on the probability of a serious response being taken to resolve a problem at a meeting.[33] Overall, these results suggest that while television and radio exposure affected the quantity of participation in the meetings, it did not measurably affect the quality of discussion at the meetings.

The third measure of governance I examine is 'missing expenditures' from the road project. As discussed in Section 2.1.3 above, 'missing expenditures' is the difference in logs between what the village claimed the road cost to build and what an independent team of engineers estimated it cost to build. The coefficients are therefore interpretable as percentage

[31] A "problem" was defined as the topic of any substantial discussion other than the routine business of the meeting; the median problem reported in the data was discussed for 7 minutes.
[32] The enumerator recorded each problem or issue that was discussed at the meeting, and coded whether the problem was potentially corruption-related or not.
[33] "Serious response" is defined as agreeing to replace a supplier or village office, agreeing that money should be returned, agreeing for an internal village investigation, asking for help from district project officials, or requesting an external audit. Although the probability of these actions being taken is low overall, Olken (2007) reports that the experimental intervention of introducing anonymous comment forms led to a statistically significant increase in these actions being taken.

point changes in the share of expenditures that could not be accounted for by the independent engineering estimate.

The results from estimating equation (3) with missing expenditures as the dependent variable are presented in Table 10. As in Table 9, in addition to district fixed effects and a set of village level controls, this specification also includes dummy variables for the experimental treatments (audits, invitations, and comment forms). I examine four versions of the missing expenditure variable – missing expenditures in the road project, missing expenditures in the road project and the ancillary projects that accompanied it (including culverts, retaining walls, etc), the discrepancy in prices in the road project (i.e. the difference between the unit prices reported by the village and the unit prices the surveyors found in their independent price survey), and the discrepancy in quantities in the road project (i.e. the difference between the quantity of materials reported by the village and those measured by the engineers).

The results in Table 10 show that if anything, having more television channels (and hence lower social capital) is associated with *less* corruption, rather than more as Putnam (and others) might have predicted. In particular, in three of the four specifications, the coefficient is actually negative and statistically significant.[34] The lack of a relationship between participation and corruption is consistent with the experimental evidence presented in Olken (2007), which showed, in the same setting, that increasing participation in the monitoring meetings through an experimental intervention had no statistically significant impact on missing expenditures from the road project. The lack of a detrimental effect of television exposure on corruption suggests that the other potential channels through which social capital could affect governance – such as a

[34] Note, though, that the statistical significance of these results is not robust to alternative sample definitions – i.e., not dropping outliers, or dropping the top and bottom 2.5% of districts in terms of television reception. Nevertheless, in all these other samples, the point estimates remain negative.

broader decline in social interactions where the project might be discussed – do not on net lead to an increase in corruption, at least as measured by the village road project.

6. Conclusion

This paper examines the link between exposure to television and radio and social capital. To do so, I exploit two sources of plausibly exogenous variation in the number of television (and radio) channels households can receive. One methodology uses the fact that the topographical features of rural Java mean that some villages receive many channels, whereas nearby villages, whose direct 'line of sight' to major cities is blocked by mountains, receive fewer channels. The second methodology examines the differential introduction of private television in Indonesia between the early 1990s, when the only television station was the government-run TVRI, and the mid 2000s, when there were as many as 11 television stations broadcasting across the country.

These two methodologies tell a very consistent story: increased access to television signals led to reduced participation in social groups. Using the Java data, I show that each additional channel of television reception is associated with 14 additional minutes per day spent watching television and listening to the radio. This translates into participation in substantially fewer social groups: each additional channel of television reception is associated with 7 percent fewer social groups existing in the village, and with each adult in the village participating in about 4 percent fewer types of groups over the a three month period. The results that detail the impact of the introduction of private television tell a similar story: each additional channel of television that can be received in a village is associated with fewer types of social organizations existing in villages and lower rates of participation in those organizations. The Java data also reveal that greater television reception is associated with lower levels of participation in village development meetings, and with lower levels of self-reported trust.

I then examine the relationship between television and radio exposure and governance of a village road-building program using the data from rural Java. Despite finding a negative impact of better television on attendance at village meetings about the road project, I find no impact on what happens at the meetings. I also find no relationship at all between television reception and 'missing expenditures' in the road project. Together, these results suggest that to the extent that television reception leads to plausibly exogenous variation in social capital, this does not translate into worse governance outcomes, at least as measured here.

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Table 1: Organizational Structure of Indonesia

Name in English	Name in Indonesian	Average Population Per Geographic Unit in East Java and Central Java Provinces	Number of units in sampled villages
Province	Propinsi	32,500,000	2
District	Kabupaten	986,000	30
Subdistrict	Kecamatan	53,900	155
Village	Desa	4,380	606
Hamlet	Dusun	1,100	2,417
Block	Rukun Warga (RW)	624	4,255
Neighborhood	Rukun Tangga (RT)	162	16,375

Notes: To compute average population for province, district, and subdistrict, I use data from the 2003 PODES, restricted to East and Central Java. For district and subdistrict population, I exclude major cities. To compute average population for village, hamlet, block, and neighborhood, I use data collected from the village head in each village I surveyed.

Table 2: Summary Statistics

Java survey		National sample	
Television reception:			
Average number of TV channels 2003	5.067	Average number of TV channels in 2005	6.122
(out of 9 possible stations on the survey)	(2.028)	(out of 11 possible stations on the survey)	(4.256)
Average number of TV channels 2003	0	Average number of TV channels in 2005	0
(after removing district FE)	(1.059)	(after removing district FE)	(1.737)
Social capital variables			
Number of Social Groups	178.963	Number of types of organizations in village	2.802
	(135.324)	in 1990 (ranges from 0-4)	(0.725)
Attendance at Group Meetings Per Adult	10.852	Number of types of organizations in village	3.246
in last 3 months (from key informant data)	(11.112)	in 2003 (ranges from 0-4)	(0.597)
TV and radio ownership in 2003:			
TV ownership	0.694		
	(0.460)		
Radio ownership	0.713		
	(0.452)		
Number subdistricts	155	Number subdistricts	2661

Notes: Means of variable listed shown. Standard deviations in parentheses.

Table 3: Determinants of Number of TV Channels

	Number of television channels				Log groups in 2003
	Java survey		National panel sample		Java survey
	(1)	(2)	(3)	(4)	(5)
Geographic variables					
Elevation (thousands of meters)	0.010	-0.034	0.000**	0.064*	0.016
	(0.039)	(0.030)	(0.000)	(0.034)	(0.010)
Travel distance to nearest major town (km)	-0.004	-0.011	-0.002***	-0.002***	0.001
	(0.008)	(0.007)	(0.000)	(0.001)	(0.003)
Travel time to nearest major town (hours)	-0.064	-0.059	-0.145**	-0.169	-0.091*
	(0.108)	(0.111)	(0.063)	(0.111)	(0.052)
Travel distance to nearest major city (km)	0.005	-0.002	-0.006***	-0.011***	-0.003
	(0.009)	(0.009)	(0.001)	(0.003)	(0.003)
Coastal subdistrict dummy	0.540*	0.213	-0.002	-0.213	0.148
	(0.324)	(0.264)	(0.104)	(0.223)	(0.111)
North-facing subdistrict dummy	0.220	0.220	0.398***	0.448	-0.070
	(0.281)	(0.255)	(0.146)	(0.298)	(0.121)
East-facing subdistrict dummy	0.220	0.040	0.416***	0.329	-0.081
	(0.381)	(0.294)	(0.143)	(0.308)	(0.106)
South-facing subdistrict dummy	-0.301	-0.075	0.221*	0.228	-0.027
	(0.330)	(0.271)	(0.134)	(0.288)	(0.094)
Social capital variables (1990 census of villages)					
Number of mosques in village	0.010	0.070	-0.143***	-0.165***	0.016
	(0.161)	(0.134)	(0.035)	(0.063)	(0.034)
Number of mushollas in village	0.021	0.016	-0.002	0.032	0.004
	(0.025)	(0.024)	(0.010)	(0.023)	(0.007)
Number of other religious buildings in village	-0.446	-0.132	-0.024	0.041	-0.019
	(0.274)	(0.219)	(0.084)	(0.249)	(0.098)
Any sports group in village	-1.396	-1.564	-0.057	-0.091	0.694*
	(1.203)	(1.205)	(0.054)	(0.111)	(0.364)
Any arts group in village	-0.072	0.138	-0.033	-0.124	0.252**
	(0.418)	(0.398)	(0.083)	(0.195)	(0.111)
Any social welfare group in village	-0.655*	-0.518	0.093	0.003	0.009
	(0.370)	(0.343)	(0.125)	(0.256)	(0.096)
Any youth group in village	2.890	2.803	0.226*	0.128	-0.334
	(3.095)	(3.028)	(0.128)	(0.306)	(1.195)
Other variables (1990 census of villages)					
Log adult population	0.746	0.529	0.392**	0.107	0.241
	(0.573)	(0.505)	(0.167)	(0.397)	(0.163)
Population share in agriculture	0.086	-0.085	-0.044	-0.769	-0.124
	(0.944)	(0.828)	(0.329)	(0.638)	(0.315)
Number of schools in village	-0.130	-0.125	0.040	0.061	0.050
	(0.133)	(0.127)	(0.032)	(0.061)	(0.039)
Village characteristics (2000 population census)					
Mean adult education	-0.056	-0.064	-0.081	-0.237**	0.049**
	(0.043)	(0.043)	(0.052)	(0.117)	(0.020)
Ethnic fragmentation	-0.702	-0.757	-0.688	-0.764	0.713**
	(0.644)	(0.648)	(0.564)	(1.054)	(0.327)
Religious fragmentation	-0.652	0.713	-1.315*	2.206	0.541
	(1.146)	(0.565)	(0.676)	(1.912)	(0.348)
Village characteristics (2003 data)					
Log number of hamlets	-0.272**	-0.078	0.220*	0.568**	0.589***
	(0.136)	(0.100)	(0.132)	(0.275)	(0.052)
Share poor	0.068	0.130	0.459	0.250	-0.039
	(0.236)	(0.224)	(0.296)	(0.704)	(0.099)
District fixed effects	YES	YES	YES	YES	YES
Sample	Java survey	Java survey, drop high/low subdistricts	PODES sample	SUSENAS sample	Java survey, drop high/low subdistricts
Observations	592	584	2205	668	584
R-squared	0.77	0.82	0.86	0.88	0.63
Joint P-value -- social capital variables	0.07	0.31	<0.01	0.23	0.08
Joint P-value -- all non-geographic variables	0.20	0.34	<0.01	0.29	<0.01
Joint -value -- all listed variables	0.14	0.18	<0.01	<0.01	<0.01
Mean dep. var.	5.07	5.06	6.58	6.44	4.94

Notes: Each observation in columns (1), (2), and (5) is a village; each observation in columns (3) and (4) is a subdistrict. Robust standard errors in parentheses, adjusted for clustering at subdistrict level. Dependent variable in columns (1) – (4) is the average number of television channels households in the subdistrict can receive; dependent variable in column (5) is the log number of social groups in the village. All 1990 variables, as well as distance to nearest city, coastal dummy, and aspect dummies, are calculated as the average value for all villages in the subdistrict. All specifications include district fixed effects. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Media Usage and Ownership

	(1)	(2)	(3)	(4)
	Individual-level data (Java survey)			
	Total minutes per day	TV minutes per day	Radio minutes per day	Own TV
Number of TV channels	14.243***	6.948***	6.997***	-0.007
	(2.956)	(1.827)	(1.881)	(0.008)
Observations	4213	4250	4222	4266
R-squared	0.18	0.16	0.10	0.17
Mean dep. var.	180.15	124.54	55.82	0.70

Notes: Each observation is a household. Robust standard errors in parentheses, adjusted for clustering at subdistrict level. The dependent variable for each column is listed in the column heading. All specifications include district fixed effects, the geographic variables and other village characteristics from Table 3, the respondent's gender, education, age, predicted per-capita household expenditure, and a dummy for whether the household has electricity.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Participation in Social Groups – cross sectional data

	(1)	(2)	(3)	(4)
	Village-level data (Java survey)		Individual-level data (Java survey)	
	Log number of groups in village	Log attendance per adult at group meetings in past three months	Log number types of groups participated in during last 3 months	Log number times participated in last 3 months
Number of TV channels	-0.068**	-0.111**	-0.040*	-0.028
	(0.026)	(0.045)	(0.021)	(0.032)
Observations	584	556	4006	3981
R-squared	0.64	0.49	0.32	0.24
Mean dep. var.	4.94	1.97	1.32	2.85

Notes: In columns (1) and (2), each observation is a village; in columns (3) and (4), each observation is an individual. Robust standard errors in parentheses, adjusted for clustering at subdistrict level. The dependent variable for each column is listed in the column heading. All specifications include district fixed effects and the geographic variables and other village characteristics from Table 3.

Table 6: Impact on Different Types of Groups

	(1)	(2)	(3)	(4)	(5)	(6)
	Non-Religious Groups		Religious Groups		Groups with ROSCAs	
	Log Number Groups	Log Attendance	Log Number Groups	Log Attendance	Log Number Groups	Log Attendance
Number of TV channels	-0.077***	-0.174***	-0.033	0.019	-0.136***	-0.165***
	(0.027)	(0.051)	(0.043)	(0.050)	(0.040)	(0.049)
Observations	584	554	578	514	557	532
R-squared	0.62	0.49	0.65	0.47	0.54	0.44
Mean dep. var.	4.71	1.28	3.12	1.12	2.21	0.75

Notes: See Notes to Table 4.

Table 7: Trust

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	People in general	People who live in your neighborhood	People who live in your village	The Government	The President of Indonesia	The village head	The village parliament
Number of TV channels	-0.036***	-0.012	-0.053***	-0.036**	-0.033**	-0.040**	-0.053***
	(0.010)	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)	(0.018)
Observations	4157	4236	4187	3730	3523	4104	3979
R-squared	0.28	0.17	0.24	0.19	0.19	0.17	0.20
Mean dep. var.	0.25	0.71	0.52	0.55	0.53	0.71	0.69

Notes: See Notes to Table 4. The trust question asked is the same as that in the GSS and the World Values Survey: "In your opinion, can […] be trusted, or do you have to be careful in dealing with them?" where […] is the group of people listed in the column heading. The dependent variable is a dummy variable that takes 1 if the response was that they could be trusted, and 0 if you have to be careful in dealing with them.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Participation in social groups – subdistrict panel, national sample

	(1)	(2)
	Village-level data (PODES)	Individual-level data (SUSENAS)
	Number of types of organizations in village	Participate in any organization in last 3 months
Number of TV channels	-0.014**	-0.024**
	(0.006)	(0.010)
Observations	5274	55234
Mean dep. var.	3.03	0.54

Notes: In column (1), the unit of observation is a subdistrict in a particular wave of the survey, where subdistrict variables represent the average value of the variable for all villages in the subdistrict. In column (2), the unit of observation is an individual respondent. All regressions include district × wave fixed effects and subdistrict fixed effects. Robust standard errors in parentheses, adjusted for clustering at subdistrict level.

Table 9: Attendance and discussion at village development meetings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Log attendance at meeting	Log attendance of 'insiders' at meeting	Log attendance of 'outsiders' at meeting	Log number of people who talk at meeting	Number of problems discussed	Any corruption-related problem	Any serious action taken
Number of TV channels	-0.030**	-0.047**	-0.009	0.002	0.019	-0.009	0.000
	(0.015)	(0.020)	(0.032)	(0.020)	(0.059)	(0.008)	(0.003)
Observations	2273	2266	2124	2200	1702	1702	1702
Mean dep. var.	0.26	0.19	0.26	0.22	0.37	0.15	0.15
	3.75	2.77	2.71	2.07	1.18	0.06	0.02

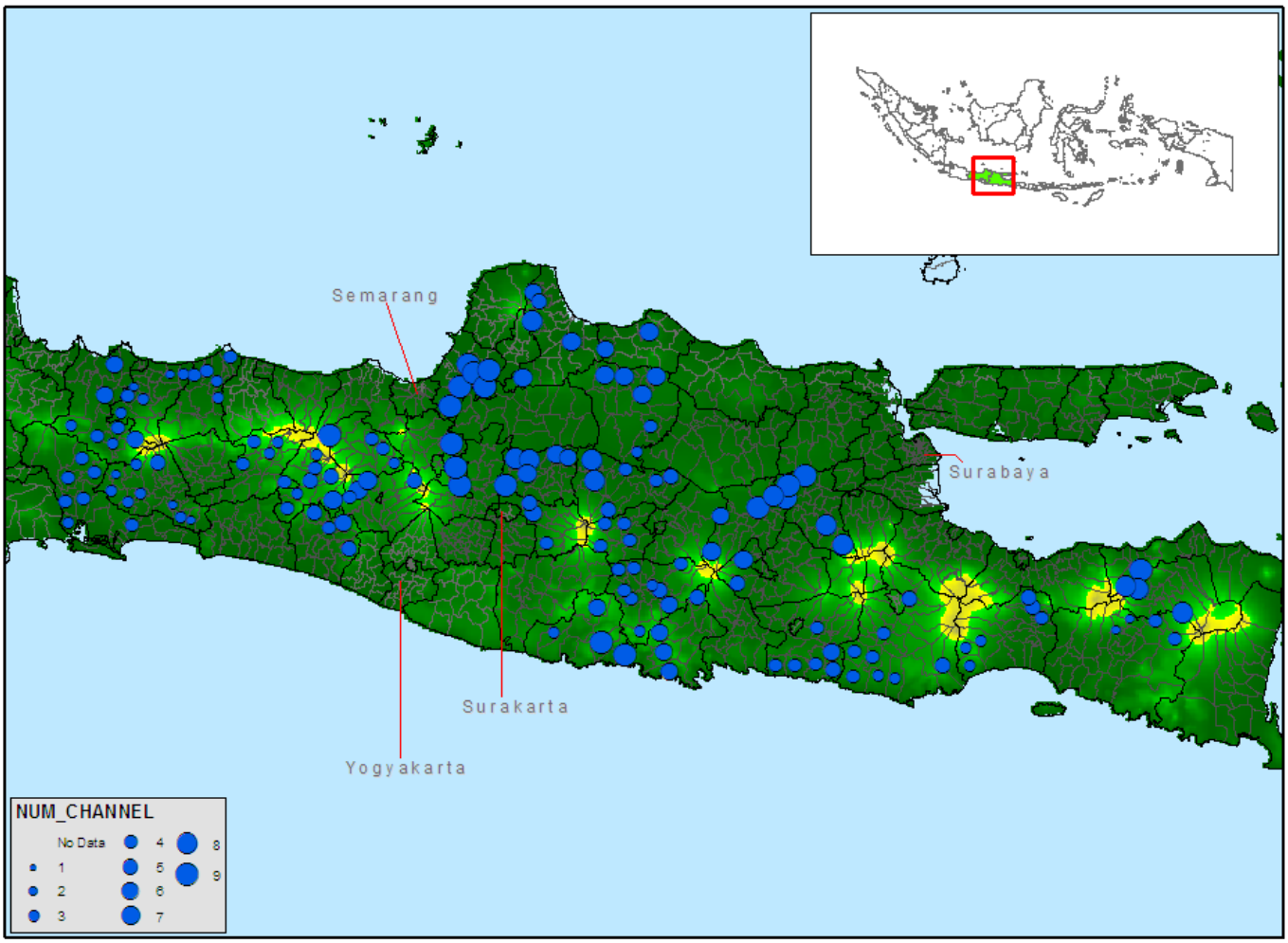
Notes: Each observation represents one meeting. Columns (1) – (4) include both the planning meeting and the three accountability meetings; columns (5) – (7) include only the accountability meetings. The dependent variable for each column is listed in the column heading. All regressions are estimated with linear probability models with kabupaten fixed effects, as well as fixed effects for meeting type interacted with experimental treatment. Robust standard errors in parentheses, adjusted for clustering at subdistrict level. All specifications include district fixed effects and the geographic variables and other village characteristics from Table 3.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Impact on 'Missing Expenditures'

	(1)	(2)	(3)	(4)
	Missing Expenditures in Road Project	Missing Expenditures in Road and Ancillary Projects	Discrepancy in Prices in Road Project	Discrepancy in Quantities in Road Project
Number of TV channels	-0.033*	-0.042**	-0.030***	0.003
	(0.019)	(0.019)	(0.010)	(0.021)
Observations	460	517	476	460
R-squared	0.35	0.29	0.30	0.32
Mean dep. var.	0.24	0.25	-0.01	0.24

Notes: See Notes to Table 9.

Figure 1: Television reception and elevation in East and Central Java



Notes: Background colors indicate elevation, where dark green represents sea level and yellow indicates mountainous areas. Each blue circle represents one subdistrict (kecamatan), where larger circles indicate more TV channels and smaller circles indicate fewer channels. Circles are only shown in the subdistricts included in the sample. Dark black lines indicate district (kabupaten) borders; faint gray lines indicate subdistrict (kecamatan) borders. Note that all regressions in the paper include fixed effects for each district (kabupaten).