

The impact of state television on voter turnout

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Abstract

In an influential study, Matthew Gentzkow (2006) found that the introduction of TV in the US caused a major drop in voter turnout. In contrast, the current analysis shows that public broadcasting TV can increase political participation. Detailed data on the rollout of television in Norway in the 1960s and 1970s are combined with municipality-level data on voter turnout over a period of four decades. The date of access to TV signals was mostly a side effect of geography, a feature that is used to identify causal effects. Additional analyses exploit individual-level panel data from three successive Election Studies. The new TV medium instantly became a major source of political information. It triggered political interest and caused a modest, but statistically significant increase in voter turnout.

Keywords: Television, Media, Voter turnout

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1 Introduction

How the media affect voter participation is important for several reasons. One is the effect on citizens' control of government. Lack of information on government performance may lower political participation, allowing an incumbent government to serve its own private interests rather than the population at large.¹ Low voter turnout may bias party representation, with important implications for policy decisions.² Politicians may also discriminate against citizens living in particular areas with limited access to media and information.³

In an important study, Gentzkow suggested that access to television was the cause of a major drop in voter turnout in US Congressional elections.⁴ Since the 1950s, about half of the decline in voter turnout may have been caused by the introduction of television. At least part of the explanation appears to be that television has caused voters to switch from newspapers and radio to commercial television, which appears to have resulted in a decline in political knowledge. TV might have exerted a positive influence on voter turnout if U.S. television had it offered better coverage of news stories and political events.⁵ If television improved its coverage of news stories and political events, it could have a positive effect on democratic participation.⁶

The current paper explores this hypothesis using data tracing the introduction of public broadcasting TV in Norway. Where the regulatory philosophy of the U.S. favored privately owned, for-profit broadcasting companies, most European countries established independent, state-owned broadcasting agencies. These institutions were established with the stated intent to inform the electorate, thereby improving citizens' ability to influence election outcomes.

¹ See e.g., (Besley & Burgess, 2002; Stromberg, 2004; Gentzkow, 2006; Bruns & Himmler, 2011).

² See e.g., (Hansford & Gomez, 2010).

³ See e.g., (Stromberg, 2004; Snyder & Stromberg 2010; Stromberg 2015).

⁴ See (Gentzkow, 2006).

⁵ See (Gentzkow 2006:941). Gentzkow's (2006) result has been challenged in some subsequent studies. Prior (2006) finds that access to television in the U.S. did improve informants' knowledge of the local incumbents. A study by DellaVigna & Kaplan (2007) suggests that the introduction of the Fox News TV channel had a positive impact on voter turnout. However, Campante & Hojman (2013) report results that are consistent with Gentzkow (2006).

⁶ See (Newton 1999; Curran et al. 2009; Soroka et al. 2013). A related stream of papers suggests that access to new media leads voters to change their view of parties, politicians and political issues (Adena et. al, 2015; DellaVigna & Doyle, 2008; Enikolopov et al., 2011; Gerber et. al, 2009). DellaVigna and Gentzkow (2010) provide a review of these studies.

Empirical research appears to confirm that access to information can increase voter participation.⁷ In fact, TV might reach wider audiences than radio and newspapers when it combines entertainment and easy-to-follow information. The nonselective nature of TV may also generate a “trap effect”, where viewers acquire political information without seeking it.⁸ This paper's key hypothesis is therefore that exposure to TV news and political programming aroused political interest and stimulated electoral participation.

A number of empirical studies have used survey data to examine the electoral impact of television.⁹ Studies based on self-reported indicators of media use are susceptible to a number of methodological problems, including omitted variable bias and reverse causality.¹⁰ Other studies compare countries with different media systems, suggesting that systems with public service broadcasting have electorates that are better informed and display higher rates of voter participation than the market-oriented systems.¹¹ These designs may suffer from related problems, not least because media regulations and institutions result from political choices, which also can affect voter behavior.

This paper exploits an empirical approach pioneered by Besley and Burgess, Stromberg, and Gentzkow.¹² Their idea is to estimate the political effects of mass media by comparing voter behavior before and after their introduction.¹³ This design has allowed us to learn about the causal effects of media on political behavior, including consequences for voter behavior and for the policies implemented by political elites. The Norwegian case offers an opportunity to assess the effects of the state-owned broadcaster. The timing of access to television signals was a side-effect geography, which facilitates the estimation of causal effects.

As the paper shows, a significant proportion of the public broadcaster's schedule was devoted to serious programming, including news and current affairs. When television signals became

⁷ See e.g., (Lassen, 2005; Barabas & Jerit, 2009).

⁸ See (Schoenbach & Lauf, 2002).

⁹ See e.g., (Newton, 1999; Jenssen, 2008).

¹⁰ See e.g., (Barabas & Jerit, 2009: 74).

¹¹ See e.g., (Curran et al., 2009; Soroka et al., 2013).

¹² See (Besley & Burgess, 2002; Stromberg, 2004; and Gentzkow, 2006).

¹³ For a comprehensive review, see (Stromberg, 2015). 2

available, TV penetration increased rapidly, and people turned from radio to the new medium. Newspaper consumption remained high, however. Analyses of three consecutive Election Surveys indicate that television induced a significant increase in several types of political activity, and, importantly, a modest increase in voter turnout.

The first part of the paper outlines the development of TV and presents descriptive statistics on television penetration, the amount of TV programming, and levels of media consumption. It provides evidence in support of the identification assumption, and presents estimates on the impact of television on voter turnout. The second part of the paper uses survey data to explore how television influenced media consumption and a set of indicators of political behavior.

2 The emergence and expansion of television in Norway

The pros and cons of television were debated passionately in the 1950s before Norway introduced television. The situation in the United States was used as an argument against television with opponents pointing in horror to 'American conditions'.¹⁴ Nevertheless, while the Norwegian parliament wanted to avoid what they saw as the stupefying effects of commercial television, parliament - despite serious reservations¹⁵ - approved the introduction of television in 1957: Norway was one of the last European countries to do so.¹⁶ The public broadcaster - the Norwegian Broadcasting Corporation (NRK) - was tasked with developing a national television channel. Inspired by the BBC, the Norwegian model was meant to inform the public and motivate involvement in political issues. At a time when most newspapers were affiliated to a political party, information coming from the state broadcaster was supposed to be independent and impartial. In the 1960s and '70s, NRK had only the one channel and programs were usually broadcast between 6 p.m. and 11 p.m. The program schedule,

¹⁴ In the parliamentary debate leading to the introduction of television, Labor Party representative Haakon Johnsen argued that television had led to a society where "*even the smallest children watch TV for hours on end ... and entire areas lie in darkness in the evenings as families watch television hour after hour.*" See (Dahl & Bastiansen, 1999:165). (Norwegian: "*små barn, fra de aller minste, sitter i timevis og glaner inn i fjernsynsapparater ... hele bydeler ligger mørke om kveldene, familiene sitter time etter time og ser på fjernsyn.*")

¹⁵ Twenty-four of the 150 members of parliament voted against the introduction of TV on a permanent basis.

¹⁶ See e.g., (Dahl & Bastiansen, 1999:165-189).

as mentioned, had a 'serious' profile. More than half was devoted to news, documentaries, and cultural programs.¹⁷ News and current affairs had a large budget. Many sports and entertainment programs were also given priority during the period. From the mid-1980s, international providers had begun offering commercial television channels via cable and satellite. The national telecommunications agency allowed cable companies to distribute Swedish television. It was not until 1992 that the first Norwegian commercial television company - TV2 - was given the green light to broadcast programs to the nation.

2.1 The construction of transmitters and relay stations

A television network consists of master transmitters that receive signals from the program line network, and relay stations (frequency converters) that make the signals available to areas not reached by the main transmitter (shadow zones). To access signals, a receiver needs to be relatively close to the transmitter (depending on signal strength and antenna capacity); direct sight transmission path is usually required. Given Norway's challenging geography and dispersed settlement patterns, it was always going to be difficult to reach every household in every corner of the country.¹⁸ With the exception of the region round Oslo in the southeast, Norway is sparsely populated. The main cities are mostly located along a coastline of more than 2,500 kilometers. Much of the inland and many areas along the coast are dominated by high mountains.

When the *Storting* allowed the introduction of television in 1957, it approved a master plan for the development of a nationwide network of transmitters.¹⁹ The government telecommunications agency²⁰ drafted and implemented the plan. According to the master plan,

¹⁷ See (Høst, 1979).

¹⁸ Both investment and operating costs were initially financed by the government, but license fees, paid by all owners of television sets, gradually covered most of the costs. There was a separate fee for owners of radio receivers.

¹⁹ The master plan is available from the digital library of the National Library of Norway. See Arbeidsutvalget for fjernsyn, NRK. 1956. *Fjernsyn i Norge. Utredning om de tekniske og Økonomiske forutsetninger og retningslinjer.* (presented to the Board of Norsk Rikskringkasting, 23. August 1956.) The location of the master transmitters was chosen to minimize interference between transmitters. Positions and direction also had to comply with an agreement aimed at minimizing interference with signals in neighboring countries.

²⁰ The agency was named *Telegrafverket*, but from 1969 *Televerket*.

television signals would become available in the Oslo area from 1960, followed by the cities on the south and west coasts. Television did not arrive in Northern Norway until the late 1960s and early '70s, with rural communities in the valleys and mountains having to wait even longer.

Radio lines connected the different mountaintop transmitters. The same locations had previously been used as transmission chains for the telephone network. In large parts of the country, the main transmitter did not provide satisfactory TV reception. Networks of relay stations (frequency converters) were built to bring signals to scattered settlements in mountainous areas. The first relay stations were strategically positioned to serve the greatest number of households. Although people in one municipality might receive television signals relatively early, topography could prevent their distribution to people in large parts of a neighboring municipality. The cost of constructing senders was often very high relative to the populations served.²¹ A large and complex TV transmitter network was completed in the early 1990s, with 48 main transmitters and more than 2,900 local relay stations.

I have obtained information on the exact location and startup date of all these senders in each of Norway's 454 municipalities.²² I take the official opening of television in 1960 as the first year.²³ The current operator of the ground-based television network - *Norkring* - has fed these historical data into a state-of-the-art simulation program that displays the reach of signals depending on signal strength from sender, geographical distance, and topography. Annual maps display the location of main transmitters and relay stations, and yield a very detailed picture of the geographical coverage of TV signals.²⁴ TV coverage has been defined as

²¹ For example, the northern city of *Tromsø* with 30.000 inhabitants (1960) required 37 relay stations. A small city on the west coast - *Voss* - needed 33 relay stations before every household in a population of 13,000 received the signal. It took ten relay stations to cover the population of 589 in 1960 in a mountainous municipality like *Bykle*. Despite their location in southern Norway, TV signals were still not available to all households even as late as 1972. Small townships like *Bykle* were the last to get a full complement of senders.

²² To facilitate over-time comparison, I use the 1978-87 municipality structure as the unit of analysis (454 municipalities).

²³ The number of television licenses in 1959 was a mere 6,492 but it rose rapidly in the following years: 48,572 licenses by 1960; 107,088 in 1961; 204,018 in 1962; 292,404 in 1963; 406,403 in 1964 and 793,350 in 1969 (Høst, 1974).

²⁴ I greatly appreciate the assistance of Kristian Hugo Strøm and Harald Hansen of *Norkring*. *Norkring* is currently responsible for operating the ground based digital TV network. Their annually updated coverage maps for the period 1960-73 have been of enormous help in the production of this paper. I am also thankful for the assistance of Truls Langeeggen (telecommunications expert at *Televerket*, retired) for making data on

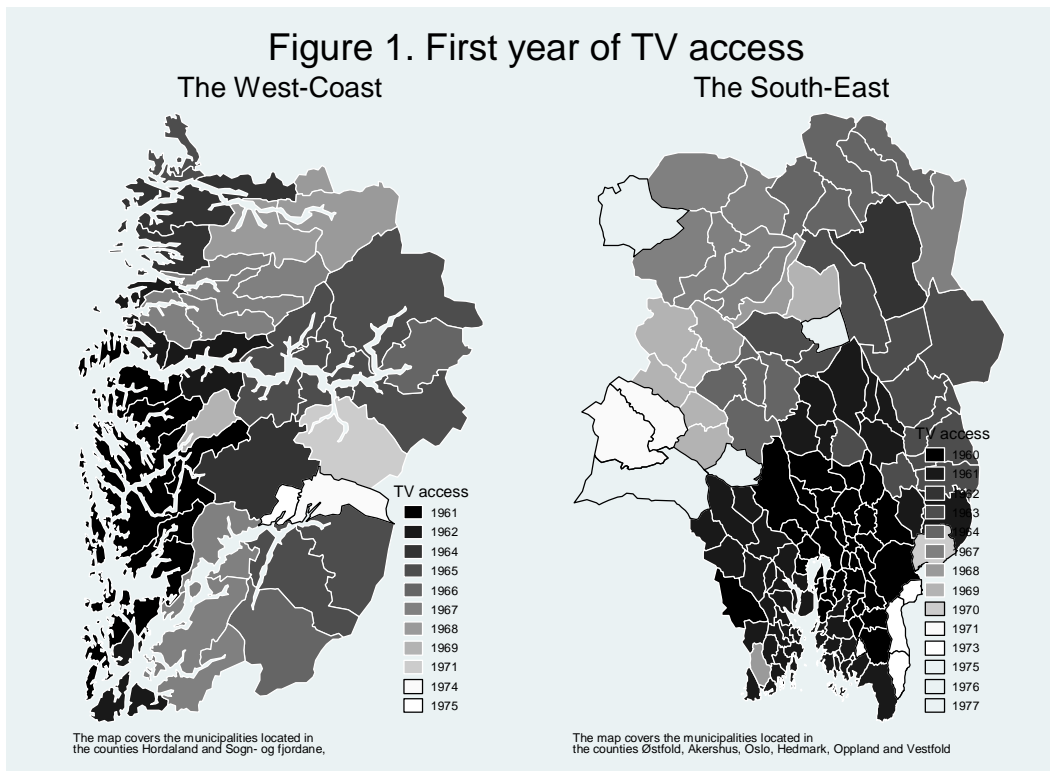
the signal strength required to receive signals of sufficient strength using an ordinary outdoor antenna.

The timing of television access has been coded by the year when part or all the population in a municipality could receive signals. Local and national elections are always held in September, and I therefore assume that television will have been available if the relevant main transmitter or relay stations had started operating earlier than 1 August of the election year.

The maps displayed in Figure 1 indicate the first year of TV signal reception in the municipalities. During the first years, main transmitters came on line in the greater Oslo area in the southeast and one transmitter in Bergen on the west coast. Because of the mountainous terrain of the west coast, the first senders could only cover a limited area, mainly coastal areas. Municipalities along the fjords and in the interior received TV access later, sometimes decade later. Figure 1 shows differences in access between the west coast and the south-east region where TV signals covered a much wider geographical area with multiple municipalities. Many of the smaller (rural) municipalities in the region, gained access to TV signals at the same time as the central municipalities with larger populations.²⁵

senders' location and start-up dates available.

²⁵ For comparison with the U.S., see (Gentzkow 2006: 943).



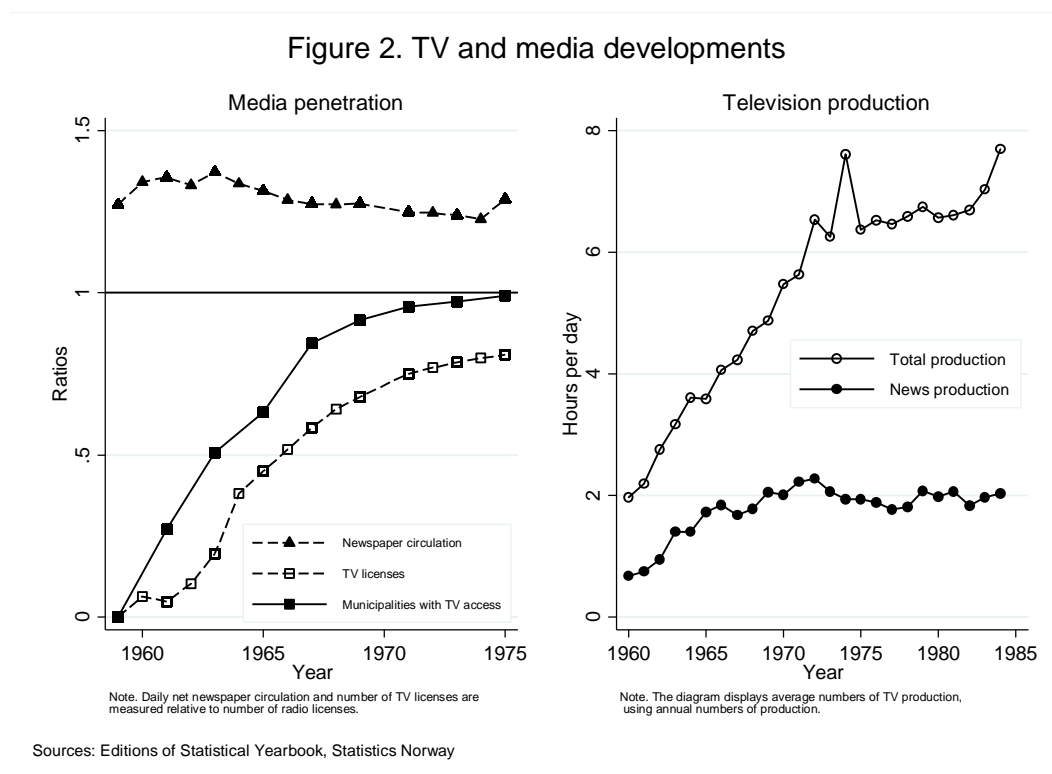
2.2 TV and media consumption

Figure 2 yields further information on the spread of television. The left-hand diagram shows developments in media penetration. The proportion of municipalities with TV access reached a level of 50 percent by 1965. The second phase started in 1966 and lasted until 1988 when complete TV coverage was attained.²⁶ Newspaper circulation remained at a high level throughout the period.

The right-hand diagram displays television production. TV broadcasting was initially limited to a couple of hours of a day, and expanded gradually to an average of seven hours in the mid-1970s. News productions increased to about two hours per day in the late 1960s, and leveled off thereafter. At that stage, about 70 percent of the population watched television on weekdays and the average viewer saw 70-90 minutes per day. The evening news (*Dagsrevyen*) was the most

²⁶ Statistics Norway also estimates that 100 percent of the population could watch TV in 1988 (Statistical Yearbook 1989, table 107).

popular program, watched by more than half of those with access to TV.²⁷



3. Voter participation 1947-1987

In the Norwegian system, local and national elections are held on fixed dates every fourth year, with local (to the municipal councils) national elections (to parliament, i.e. the *Storting*) alternating every second year. National elections are conducted in 19 county districts. The municipalities are nested within each of the counties, each municipality constituting one election district. The election statistics collected at the municipal level include data on voter turnout at local and national elections. Voters are automatically registered on the election roll by the Population Registry, and turnout is defined relative to number of eligible inhabitants in each municipality.²⁸ The analyses are based on data for each election year in the period 1947-87. Figure 3 shows voter turnout in local and national

²⁷ For documentation, see the historical statistics of Statistics Norway available at: <http://www.ssb.no/a/histstat/aarbok/ht-070110-296.html>

²⁸ In 1946, the voting age was lowered to 21 years, in 1967 to 20, and in 1978 to 18 years.

elections measured at the municipal level.

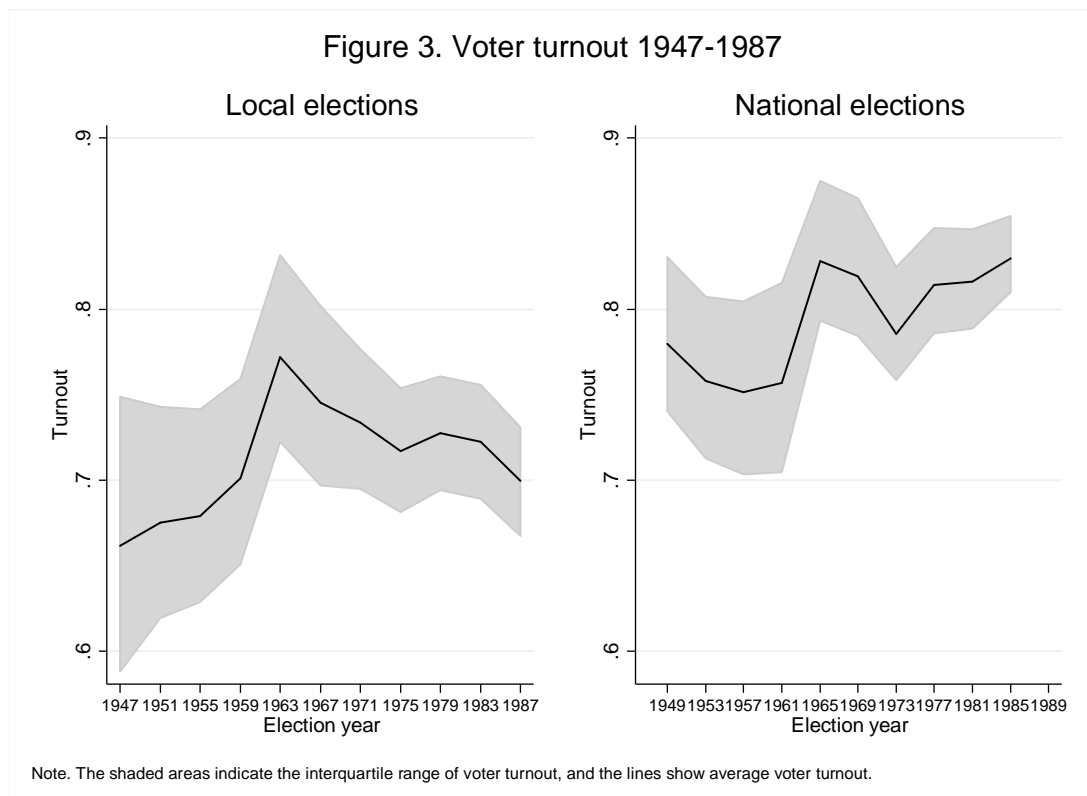


Figure 3 shows that voter turnout is consistently lower in local than national elections. TV broadcasts started in 1960, and the 1963 and 1965 elections are commonly seen as the first television elections. That levels of voter turnout peaked in these elections is widely attributed to the so-called King's Bay incident.²⁹ The high turnout levels in the 1963 local elections were probably triggered by the sharp parliamentary debate, which ended with a vote of no confidence. The non-socialist party bloc demonstrated that it was a credible challenger to the previously dominant Labor Party, which had held a majority in the national parliament since

²⁹ The King's Bay incident (so named after the King's Bay mining company) refers to a mining accident on Svalbard in the autumn of 1962 in which 21 people lost their lives. The immediate cause was an explosion in the mine. An investigation revealed serious violations of the safety regulations. The non-socialist parties in the *Storting* called for a vote of no confidence in the governing Labor Party. The proposal was adopted by 76 votes to 74, and the Labor government resigned. A government of four non-socialist parties was appointed in August 1963, becoming the first non-socialist government after World War II. Without the support of a parliamentary majority, the new government remained in power for four weeks only. Nevertheless, it demonstrated that the non-socialist party bloc was a credible alternative to the previously dominant Labor Party. For an early analysis of the 1963 and 1965 elections, see (Valen & Torsvik, 1967).

1945. These events were extensively covered on national television.

Voter turnout in national elections is somewhat higher in the 1970s and 1980s than prior to the introduction of TV.³⁰ From the mid-1960s, a decline set in local voter turnout relative to the national elections. Another important pattern in Figure 1 is the convergence in turnout rates across municipalities. The variations in levels of turnout declined considerably over the 40-year period plotted, and the reductions were somewhat larger in the local elections.

3 Empirical strategy

In the baseline model displayed below, I regress levels of voter turnout against a dummy intervention variable. TV_{it} equals 0 before television signals could be received in municipality i in year t , and 1 when the signals could be received. $Turnout_{it}$ is defined as the share of the eligible population who cast their votes in municipality i in election year t . The baseline specification is estimated separately for voter turnout in local and national elections. Notation for types of elections is suppressed in the formalization below.

$$\ln\left(\frac{Turnout_{it}}{1 - Turnout_{it}}\right) = \alpha TV_{it} + \mathbf{X}_{it}\boldsymbol{\varphi} + \vartheta_i + \tau_t + \omega_{it}$$

I estimate a regression model using a logistic transformation of the response variable, and which takes the fractional character of the response variable into account.³¹ The baseline model specification employs fixed effects for municipalities (ϑ_i) and election years (τ_t), and a random error component (ω_{it}). The key hypothesis is that television has positive effects on voter turnout ($\alpha > 0$). Some existing studies suggest that national media can work to crowd out information on local politics causing a drop in local voter turnout. The models are therefore

³⁰ Levels of voter turnout were somewhat lower in the 1973 national elections, partly also in the 1975 local elections. This has been interpreted as a by-product of the 1972 referendum on Norwegian membership in the European Union. A significant proportion of the electorate may have abstained as result of cross pressure between their stance on the European Union (Norway voted no) and their primary party identification. For further documentation, see (Narud & Valen, 2006).

³¹ See (Papke & Wooldridge, 1996; Baum, 2008). 10

estimated separately for local and national elections.³²

The specification implies that television caused a one-time "jump" in voter participation. I also estimate models that allow TV to have a more gradual influence on voter participation.³³

Television exposure increased gradually over time (Figure 2), suggesting that those who received TV relatively late would be subject to a larger television shock. I therefore define an alternative treatment variable as $P_t \cdot TV_{it}$, where P_t represents the amount of television production.

I assume that voter turnout in municipalities obtaining TV access in a particular year would have followed the same trend as voter turnout in municipalities adopting television at a later point in time, had television not been available. I relax the parallel trends assumption by estimating models with county-year fixed effects. In this specification, the assumption of parallel trends applies within counties only. In supplementary analyses, I also estimate models with a linear, municipality-specific time trend.

The models also include a vector of time-varying controls, population size (log), share of eligible voters in the population, share of eligible women voters in the electorate, share of population living in sparsely populated areas and share of population aged 15 or more with higher education. The Online Appendix A presents the relevant descriptive statistics.

3.1 Pre-treatment trends in electoral behavior

The main idea of the current paper is that the arrival of television in the different municipalities was a side effect of geography, and can therefore be analyzed as a natural experiment. In this context, three features of television uptake are important:

- Norwegian television was developed according to a national plan shaped by technical limitations and cost constraints. The aim was to provide TV signals to the entire

³² See e.g., (Gentzkow, 2006; Althaus & Trautman, 2008; Cancela & Geys, 2016).

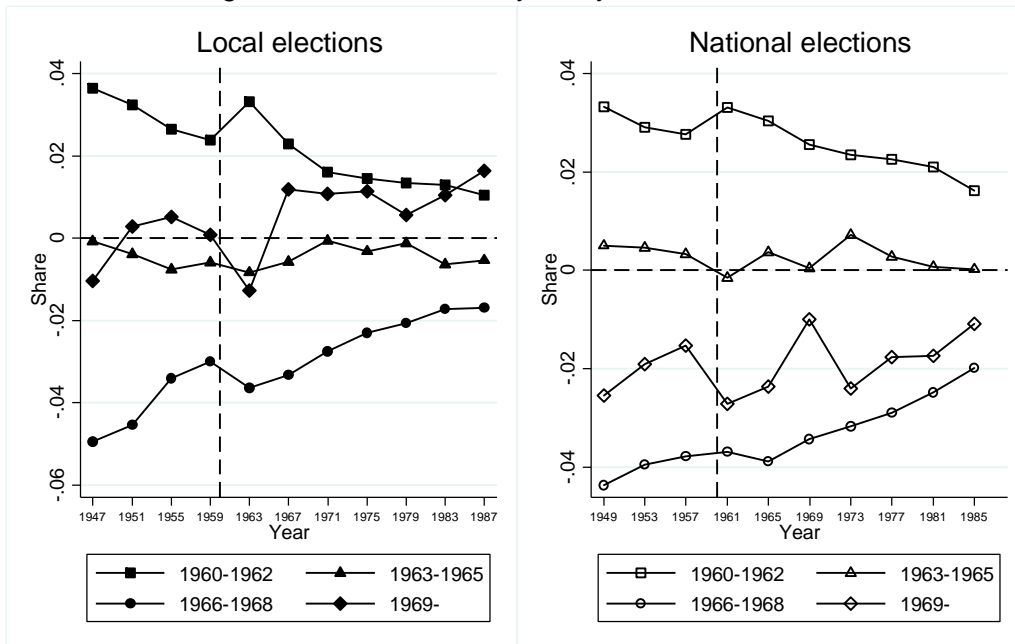
³³ For a similar approach, see Gentzkow (2006:948). 11

population within a defined period. Commercial objectives were not a major concern.

- In some cases, a main transmitter offered television access over a wide geographical area, covering various types of urban settlements and rural communities. It was often hard to foresee whether a main transmitter would provide adequate signal strength in a particular area. In other cases, a network of local relay stations was required to receive the signals with sufficient quality.
- The costs of providing access to television in a particular municipality increased as the number of required local senders grew. Municipalities covering a large area, often separated by high mountains, required a large network of senders. Such areas received TV access later.

The identifying assumption is that trends in voter turnout would have been the same across municipalities in the absence of television access, conditional on the relevant controls. One way of addressing the parallel trends assumption is to explore trends in voter turnout before television was introduced. I have classified municipalities into four groups depending on the first access to signals. The first wave received access to TV signals in the periods 1960-62 and 1963-65, and the second wave in the period 1966-68 and in 1969 and later. In Figure 4, I display average voter turnout measured as deviations from the election-specific national averages.

Figure 4. Voter turnout by first year of TV access



Note. Voter turnout has been measured as deviations from the annual means. The first municipalities received access to TV signals in 1960.

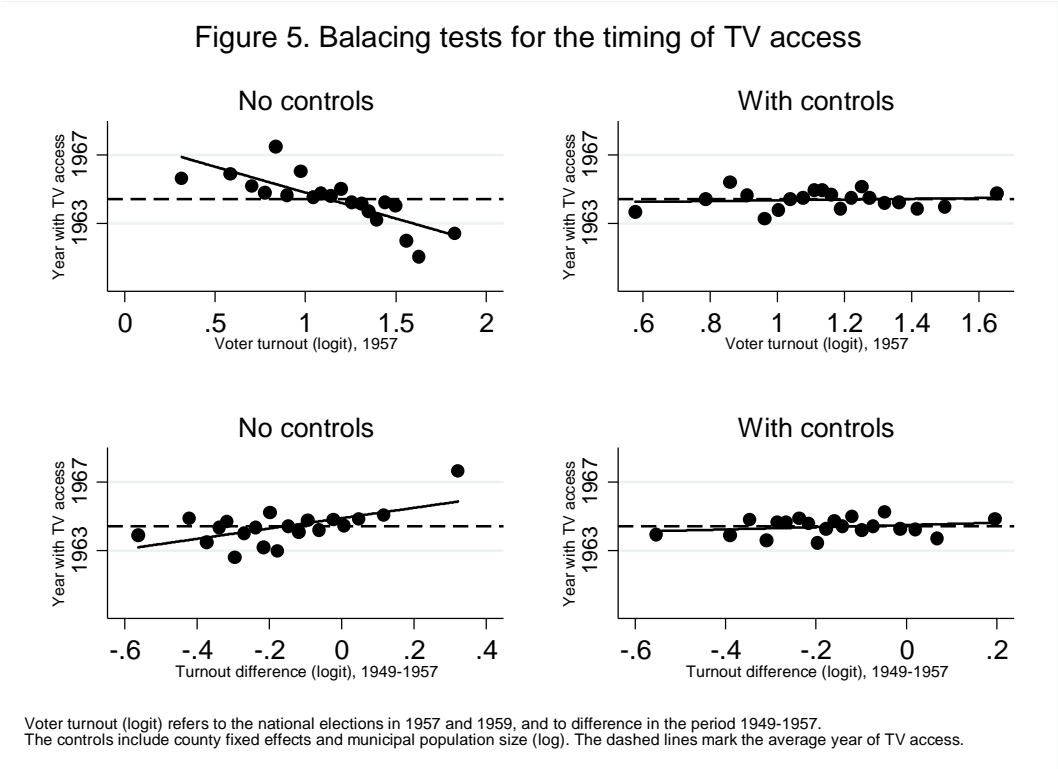
According to Figure 4, the timing of television access correlates with levels and trends in voter turnout before and after 1960. Municipalities with early access (1960-63) had relatively high turnout rates in the beginning of the period. The latecomers (1964 and later) had lower turnout rates. Relative turnout rates among those who received TV early fell dramatically, while it increased in areas that received television later.

The timing of television access was heavily influenced by two factors, both of which also correlate with voter turnout. One was the development of the main transmitter network starting in the southeast and finishing in the north, and the subsequent regional timing of TV signal delivery. This development correlates with political mobilization, which came relatively early in the urban areas in the south and later in peripheral inland areas and in the north.

The regional timing of TV access can be measured by including fixed effects for the municipalities located within 19 county regions. The other factor was the relatively early construction of relay stations in the major population centers within each of the counties. Voting participation was

also higher in the urban municipalities.

The counterfactual assumption can be examined by looking at partial correlations between the timing of TV access and conditions in the elections before television was introduced in 1960. In Figure 5, I display (binned) scatter plots showing the relationship between voter turnout before TV signals were available in 1960 and the year television signals became available. The upper-left diagram shows that latecomers had relatively low levels of turnout in the 1957 national elections (as in Figure 2). The upper-right diagram in Figure 5 is a partial plot employing the two controls described above, municipal population size (log) and county-fixed effects. The partial correlation is very close to zero, suggesting that levels of voter turnout in 1957 are unrelated to the first year of access to TV. In the lower part of Figure 5, I examine the relationship between pre-treatment trends in voter turnout and the year when television was first available. The lower-right diagram shows that the two controls eliminate the positive, bivariate correlation between pre-trends and the timing of TV access. Hence, the partial scatter plots are consistent with the assumption the timing of TV access is as good as random.



4 Empirical results

The current section displays the main effects of TV on levels of voter turnout in local and national elections. All regressions in this section are based on municipality-level data.

4.1 The effect of TV on voter turnout

In Table 1, I present separate analyses for turnout in local and national elections. The tables display the marginal effects of TV, that is, the effect of television on levels of voter turnout given averages on the other exogenous variables.

All TV-estimates are positive and significant for local voter turnout. Access to TV appears to increase voter turnout by about 1.1-1.4 percentage points. The baseline estimate (1) is very similar to those using municipality-specific trends (2) and county-year fixed effects (3). The final model (4) speaks directly to the identifying assumption, and excludes all controls except county and year fixed effects.³⁴ Even this model specification yields a comparable TV-estimate.

Television appears to have positive effects on voter turnout in national elections as well. The estimates suggest that TV increases voter turnout about 0.2-1.4 percentage points. The estimates are significant, except in the model with county-year fixed effects (3). Assuming parallel trends assumption within counties only appears to be too demanding since the counties correspond to the election districts in the national elections. In Online Appendix B, I present corresponding estimates using a linear model.

The estimates in Table 1 run counter to the hypothesis that television generated a larger turnout increase the national elections. A formal test suggests that the difference in parameter

³⁴ See (Altonij et. al., 2011).

estimates is not statistically significant.³⁵ Political interest is to some extent generic. If information on national politics triggers political interest and participation, it is likely to have spillover effects on turnout in the local elections. Additionally, local welfare services are subjected to central government regulations, and local governments rely on sizable central grants. Since local government is an integral part of the welfare state, many voters fail to distinguish the responsibilities of the different levels of government. Though TV provided information mostly on national politics, it stimulated both national and local participation.

Table 1. Television and voter turnout

		(1)	(2)	(3)	(4)
Local elections	TV(=1)	0.0142***	0.0134***	0.0129***	0.0113*
		(0.004)	(0.004)	(0.004)	(0.006)
	Observations	4991	4991	4991	4991
National elections		0.0077***	0.0084***	0.0015	0.0143***
		(0.002)	(0.002)	(0.002)	(0.003)
	Observations	4540	4540	4540	4540
	Control variables	YES	YES	YES	NO
	Municipality FE	YES	YES	YES	NO
	County FE	NO	NO	NO	YES
	Election year FE	YES	YES	YES	YES
	Mun.spec.trend	NO	YES	NO	NO
	County-year FE	NO	NO	YES	NO

Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Notes. The response variables are voter turnout in local and national elections. The models are fractional logistic regression models, and the estimates displayed are (marginal) effects of the TV dummy on rates of voter turnout. The standard errors are robust standard errors clustered at the municipality level. The control variables are the size of the electorate relative to the population, share of women in the electorate, share of population living in sparsely populated areas, and share of population with higher education.

In Table 2, I estimate television effects using hours of television production given access to TV-signals as an intervention variable. Using the baseline model specification, the estimates suggest that 2 hours of TV news production (corresponding to the level of TV production in the 1970s and 1980s, cf. Figure 2) generates an increase of 0.0148 in the local elections, and 0.0080 in the national elections. Similarly, 7 hours of total TV production (i.e. the peak level

³⁵ The Chi Squared test statistic is 1.51 (DF=1), yielding a significance probability of 0.22.

of TV production in the period) causes turnout increases of 0.0189 and 0.0105 in local and national elections respectively. These estimates correspond quite closely to those presented in Table 1.

Table 2. Television production and voter turnout

	(1) Local	(2) Local	(3) National	(4) National
TV news production*(TV=1)	0.0074** (0.003)		0.0040** (0.001)	
TV total production*(TV=1)		0.0027** (0.001)		0.0015* (0.001)
Observations	4,991	4,991	4,540	4,540
Control variables	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES
Mun.s.trend	NO	NO	NO	NO

Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Notes. The response variables are voter turnout in local and national elections. The models are fractional logistic regression models, and the estimates displayed are (marginal) effects of the hours of television production on rates of voter turnout. The standard errors are robust standard errors clustered at the municipality level. The control variables are the size of the electorate relative to the population, share of women in the electorate, share of population living in sparsely populated areas, and share of population with higher education. 'Local' refers to estimates for voter turnout in local elections; 'National' refers to turnout in the national elections.

The persuasion effect: The persuasion rate shows³⁶ "...the percentage of receivers that change the behavior among those that receive a message and are not already persuaded." In the current context, the rate adjusts the regression estimates in Table 1 for the share of non-participants and television owners in the electorate. Let $Turnout_{TV} - Turnout_0$ represent the difference in voter turnout in the treatment group and the control group, and the relevant the estimates are presented in Table 1. The population share receiving the television broadcasts can be measured by the share of households with at TV license ($License_{TV}$), assuming that people did not buy a license unless signals could be received ($License_0 = 0$). The non-voting share of the electorate if there was no exposure to ($1 - Turnout_0$) is measured by voter turnout in the last elections before TV became available. We can write the persuasion rate (PR) as:³⁷

³⁶ See (DellaVigna & Kaplan, 2008).

³⁷ See (DellaVigna & Gentzkow, 2010: 645).

$$PR = 100 \frac{Turnout_{TV} - Turnout_0}{License_{TV} - License_0} \frac{1}{1 - Turnout_0}$$

Figure 2 shows that television penetration increased rapidly, and reaching 80% in 1975, ($License_{TV} - License_0 = 0.809$). The share of non-participating voters ($1 - Turnout_0$) is measured by turnout in the 1957 national election (76,3%) and the 1959 local election (67,9%). These numbers show that about (PR=) 5.5% of the abstainers was induced to cast their voters in the local elections, and (PR=) 4.0% in the national elections, indicating modest differences between the two types of elections. Gentzkow found that TV caused a drop in voter turnout of 2 percentage points per decade, corresponding to a persuasion rate of 4.3%. Gentzkow and Shapiro estimated the impact of newspaper entry and exit on voter turnout to 0.8 percentage points, and a corresponding persuasion rate of 5.1%.³⁸ These numbers are arguably comparable to those presented here, and suggest that media exposure has modest persuasion effects on voter turnout.³⁹

4.2 Robustness tests

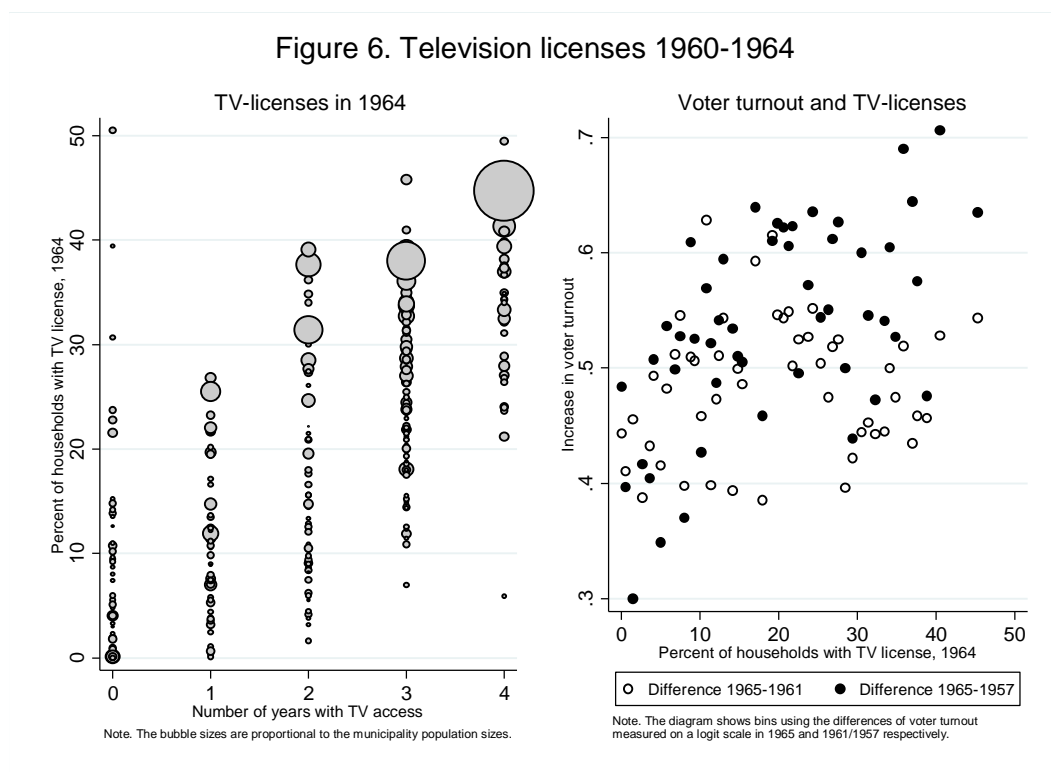
TV access, TV ownership and voter turnout: The analyses assume that television ownership spread rapidly once signals were available, and it proposes a causal mechanism where exposure to the television medium spurred additional citizens to cast their vote. In Figure 6, I exploit municipality-level data on the share of households with television licenses from 1964. The left-hand diagram displays the relationship between number of years with access to TV signals in the municipality and television ownership. The plot indicates that television spread rapidly, even in the first years with relatively limited programming. Note that the more populous municipalities (indicated by the larger "bubbles") saw higher levels of TV penetration. The right-hand diagram in Figure 6 plots TV penetration against increases in national voter participation. The plot indicates a positive correlation between increases in TV licenses and increases in voter participation. Online Appendix C provides additional evidence on the relationship between television ownership and voter turnout up to the 1965 national election.⁴⁰

³⁸ See Gentzkow (2006) and Gentzkow and Shapiro (2009).

³⁹ DellaVigna and Gentzkow (2010, Table 1) present a broad review of persuasion effects.

⁴⁰ Some municipalities had a surprisingly high ratio of licenses to households, mostly because people in the

Figure 6. Television licenses 1960-1964



The assumption of conditional independence: A main argument is that the timing of television access was quasi-random, given controls for population size and county fixed effects. Online Appendix D displays supplementary tests related to this assumption (cf. Figure 6). The response variable is number of years with access to TV signals, and I test whether levels and trends in voter turnout before 1960 are related to the timing of TV access. As in Figure 4, these pre-treatment trends are highly correlated with the timing of TV access when the controls are not included in the regressions (models (1), (3) and (5)). When I control for population size and county fixed effects (models (2), (4) and (6)), both the F-tests and tests on individual parameters indicate no significant effects.

The first year of TV access could either be a year with a local election, a national election, or a year without elections. About 51.1% of the 454 municipalities received the first access to TV in year prior to a national election or in the national election year, and the others in years before a local election or in the year with a local election. About 53.3% gained TV-access in the

eastern part of the country could watch Swedish television (although they had to pay the Norwegian license fee when they bought the TV). Moreover, people sometimes bought TV sets before they could receive signals of satisfactory quality. Some mounted an antenna without having a receiver simply to impress the neighbors!

election years, and the others in off-election years. These numbers are consistent with the assumption that television availability was as good as randomly assigned.⁴¹

Estimating TV lead- and lag-effects: The causal interpretation assumes that TV intervention occurred before we observe a shift in voter turnout. In Online Appendix E, I estimate turnout regressions using "lead" TV-dummies indicating election years before TV signals were available, a dummy variable representing the first TV election, and additional dummies capturing lagged TV-effects. I present these pre- and post-treatment estimates for the baseline logit-model and a corresponding linear model. The analysis includes data for both national and local elections, assuming that potential effects are similar in the two types of election. In the logistic specification, the pre-treatment effects do not differ significantly from zero (i.e. no 'Placebo effect'); the contemporaneous effect is positive and significant, and the lagged TV-effects are even larger and positive. The linear specification yields a less clear-cut case in favor of the causality interpretation. The analysis of lead- and lag effects suggests that the logistic specification captures TV-effects more appropriately.

Estimating models with first differences: Bertrand et. al (2004) show that the standard errors of estimates can be undervalued in situations with positive serial correlation. Using Wooldridge's (2002) suggested test for serial correlation in panel data, I reject the hypothesis of zero first order autocorrelation.⁴² This suggests that the models could alternatively be estimated with first differences. Importantly, the justification for the logistic model is that television has a relatively larger (positive) effects on turnout at low levels, and smaller effects when levels of turnout are high. This assumption can be tested in a model based on first differences.

Let $\Delta Turnout_{i,t} = Turnout_{i,t} - Turnout_{i,t-4}$, and define voter mobilization as $M_{i,t} = \frac{\Delta Turnout_{i,t}}{1 - Turnout_{i,t-4}}$. The regression analyses presented in Online Appendix F indicate that the TV

⁴¹ As result of a central government reform in the 1960s, the number of Norwegian local governments fell from 750 to 454. About 530 municipalities were merged into 209 larger polities, while 245 units remained intact. Most consolidations were implemented in 1964 and 1965, and the municipality structure was quite stable thereafter. The reform was initiated and planned by central government, and the municipalities had little say in the decisions. Survey data from 1965 suggest that 50 percent approved of the reform, 29 percent disapproved, and 20 percent were not interested. A concern is that the restructuring of municipalities influenced voter participation. The correlation between the timing of TV access and being affected by the reform is close to zero.

⁴² The Wooldridge test statistics for serial correlation under the null hypothesis are $F(1, 453) = 84.337$; $\text{Prob} > F = 0.00$ for local elections, and $F(1, 453) = 233.360$, $\text{Prob} > F = 0.00$ for national elections.

estimates are positive as in Table 1. The estimates are more precise when voter mobilization ($M_{i,t}$) is used as response variable, as compared to models using the first difference ($\Delta Turnout_{i,t}$) as response variable.

5 Analyses based on National Election Surveys

The National Election Surveys cover three elections - 1965, 1969, and 1973. About half the municipalities had access to television signals by 1965 (cf. Figure 1). The surveys include municipality identification, which means that the data can be merged with data on year of access to TV signals.⁴³ Importantly, all respondents in the 1965 sample were interviewed again in the 1969 and 1973 surveys, and we can test whether individuals changed their political behavior following the introduction of television. The survey data therefore offer a unique opportunity to test a set of related hypotheses. Note that data were collected during years of national elections, and that some of the results have less relevance for the local elections. Online Appendix G presents descriptive statistics on the survey data.

Similar to the municipality-level analysis, $TV_{i,t}$ is a dummy variable indicating whether television signals were available in municipality i before the election campaign in year t ($t=1965, 1969$ and 1973). Let $Q_{j,i,t}$ be a relevant political outcome (media consumption, political interest, knowledge or participation) of person j in municipality i in election year t . The response variables are coded in the zero-one interval. I estimate linear models using the following specification:

$$Q_{j,i,t} = \beta TV_{i,t} + \gamma_j + \vartheta_i + \tau_t + \varepsilon_{j,i,t}$$

The regression model comprises fixed effects for respondents (γ_j), municipalities (ϑ_i) and election years (τ_t). Municipality fixed effects are included as some respondents moved to a

⁴³ The data used in the current analysis are based on the National Election Surveys of 1965, 1969, and 1973. The quality of the Election Surveys has been meticulously documented in a report by Waldahl et. al. (1974). The report shows that the response rates are very high, and representativeness is generally satisfactory. The data were obtained from Statistics Norway (SSB), and prepared and made available by the Norwegian Center for Research Data (NSD). The Institute of Social Research (ISF) was responsible for the original study and Statistics Norway collected the data. Neither ISF, SSB, nor NSD are responsible for the analyses/interpretations of the data presented here.

new municipality. As an alternative, I use individual-level controls (respondent's age, gender, income- and education level) instead of respondent fixed effects.

5.1 The impact of TV on media consumption

In the U.S. case, it appears that television induced people to take less interest in newspapers and radio.⁴⁴ The substitution away from media with more politically relevant information is one mechanism that relates television consumption to political participation. Since the estimates presented in Tables 1 and 2 indicate that TV did raise voter participation, we would not expect to see a similar shift in the Norwegian case. Stromberg's study from 2004 suggested that the introduction of radio in the US raised voter turnout, while the evidence regarding the impact of newspapers is more mixed.⁴⁵ The survey dataset include information on three types of media usage:

- *TV consumption:* The election surveys included a question on the NRK's coverage of election campaigns: "*We would like to know how people gain information on the election. Did you have opportunity to follow election broadcasts in radio or television?*" Television was coded 1 if the respondent followed programs on TV, or on radio and TV, and 0 if he/she did not follow any election programs.
- *Radio consumption:* The same question was used to measure whether respondents listened to radio programs covering the election campaigns. Radio was coded 1 if the respondent stated radio, or radio and TV, and if he/she did not follow any election programs.
- *Newspaper consumption:* The Election Surveys included the following question: "*Which newspapers do you subscribe to or read on a regular basis?*" They could name up to five newspapers.⁴⁶

⁴⁴ See (Gentzkow, 2006).

⁴⁵ See e.g., (Stromberg, 2004; Gerber et. al., 2009; Gentzkow et.al., 2009; Schneider and Stromberg, 2010; Baekgaard et.al., 2014)

⁴⁶ The respondents could mention four newspapers in the 1965 Election Survey.

These TV estimates on media consumption are presented in Table 3. Access to television signals had a large, positive effect on the probability of following the election campaigns on television. When TV was available, nearly half the population followed the election campaign on television. Importantly, the regressions indicate that TV had a comparable negative effect on the probability of listening to radio coverage of the national elections.⁴⁷ This means that people switched from radio to television programs, with TV rapidly becoming the main source of information on national politics.⁴⁸ However, the estimates in Table 4 indicate that access to TV did not affect newspaper circulation significantly. The local press had (and still has) a strong position in Norway, and local newspapers were (and still are) the main source of information on local politics.⁴⁹ This might indicate that television did not crowd out information relevant to participation in local politics.⁵⁰

⁴⁷ Other survey data suggest a reduction in average radio consumption from 20 hours per week in 1953/54 to about 13 hours in 1973, see (Høst 1979: table 11).

⁴⁸ For additional documentation, see (Høst, 1979).

⁴⁹ For example, the 1969 National Election Survey asked respondents to state their main sources of information on national and local politics. About 67.6 percent said TV was their primary source of information on "national politics and decisions affecting the entire country," while 43.2 percent said newspapers were their main information source. Only 8.9 percent said TV was their most important source of information on "local politics and decisions regarding their local community," while 78.3 percent said newspapers were their main source of information.

⁵⁰ The issue of crowding out of local information has been addressed in (Gentzkow, 2006; Althaus & Trautman, 2008).

Table 3. Television access and media consumption

	(1) TV consumption	(2)	(3) Radio consumption	(4)	(5) Newspaper consumption	(6)
TV(=1)	0.415*** (0.138)	0.466*** (0.097)	-0.290** (0.139)	-0.300* (0.162)	-0.107 (0.090)	-0.113 (0.090)
Observations	2,777	3,918	2,777	3,918	2769	3,918
Respondents	948	1856	948	1856	948	1856
Municipalities	79	79	79	79	78	78
R-squared	0.555	0.167	0.542	0.655	0.649	0.201
Control variables	NO	YES	NO	YES	NO	YES
Respondent FE	YES	NO	YES	NO	YES	NO
Municipality FE	YES	YES	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES	YES	YES

Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Notes. The response variables are dummy variables for watching the election campaigns on TV, following the election campaigns on radio, and number of newspaper subscriptions. The models are linear probability models (1-4) and linear regression models (5-6). Models (1), (3) and (5) include respondent fixed effects, while models (2), (4) and (6) include municipality fixed-effects and a set of individual-level controls (gender, age, income and education level). The standard errors are robust standard errors clustered at the municipality level.

5.2 The impact of TV on political interest and knowledge

It has also been argued that television dilutes social capital and reduces social interaction, possibly decreasing citizens' involvement in political discussions with family and friends.⁵¹

Since television appears to have increased voter turnout, one might wonder whether these mechanisms are absent in the current setting. The surveys can be used to explore how the arrival of television affected political interest, knowledge of political affairs, and participation in face-to-face political discussions:

- *Political interest:* Political interest is measured by a standard survey question read: "Would you say that you in general are very interested in politics, somewhat interested, modestly interested or not interested?" The answers were coded on an ordinal scale from 1 (very interested), 0.67 (somewhat interested), 0.33 (modestly interested) and 0 (not interested). Identical formulations were applied in the 1965, 1969, and 1973 Election Surveys.

⁵¹ See e.g., (Putnam 2000; Olken 2009).

- *Interest in election outcome:* The respondents were asked: "Would you say that you personally care which parties win or lose the election this fall, or do you think that it does not matter?" The respondents stated whether they were highly interested (=1), moderately interested (=0.5), or did not care (=0). This question was included in the 1965 and 1969 surveys.
- *Political knowledge:* Knowledge of political issues was also measured by similar questions in the three surveys. The respondents were shown a picture of the national party leaders and asked to provide their names and party affiliations. In 1965 and 1969, respondents were asked to provide the names of 7 politicians, and in 1973 eleven politicians. For each respondent, knowledge was measured as the share of respondents providing the right names of the persons and parties.

The estimates presented in Table 4 show that television caused a modest (and marginally significant) increase in general political interest, and gave a major boost to voter interest in the election outcome. The analyses also indicate a substantial increase in political knowledge, as measured by names of party leaders. Given the visual nature of television, it is perhaps not surprising that respondents' knowledge of party leaders improved substantially. The estimates using models with respondent-fixed effects are very similar to those using municipality-fixed effects. These results lend some confidence to the interpretation that television did mobilize new voters to the polls by providing relevant information and by triggering political interest.⁵²

⁵² See e.g., (Stromback & Shehata 2010).

Table 4. Television access and political interest

	(1)	(2)	(3)	(4)	(5)	(6)
	Political interest		Interest in election outcome		Political knowledge	
TV(=1)	0.035 (0.025)	0.049* (0.027)	0.156*** (0.043)	0.134*** (0.038)	0.179*** (0.062)	0.211*** (0.041)
Observations	2826	4,040	1,852	2,892	2,839	4,059
Respondents	948	948	947	947	948	948
Municipalities	79	79	64	64	80	80
R-squared	0.686	0.139	0.713	0.146	0.617	0.146
Control variables	NO	YES	NO	YES	NO	YES
Respondent FE	YES	NO	YES	NO	YES	NO
Municipality FE	YES	YES	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES	YES	YES

Significance levels: *** p<0.01, ** p<0.05, * p<0.1

Notes. The response variables are indicators of political interest, interest in the election outcome and political knowledge. The models are linear regression models. Models (1), (3) and (5) include respondent fixed effects, while models (2), (4) and (6) include municipality fixed-effects and a set of individual-level controls (gender, age, income and education level). The standard errors are robust standard errors clustered at the municipality level.

5.3 The impact of TV on political behavior

The surveys facilitate further analysis of engagement in political discussions and voter turnout in the national elections.

- *Political discussions*: Respondents to the 1965 survey were asked about the frequency of political discussions in the family or at work. For each of the two questions, the responses were coded 1 (often), 0.5 (occasionally), and 0 (never), and the index is the average of the two variables. A slightly different wording was used in the 1969 and 1973 surveys where respondents were asked to say how often they discussed politics in the family or with acquaintances outside the family. The responses were coded 1 (daily), 0.67 (twice a week), 0.33 (more rarely) and 0 (never).
- *Voter turnout*: Data on voter turnout are available for the 1961, 1965, 1969 and 1973 surveys. The individual responses were checked against the data in the population register, and corrected when necessary. Yet the survey data show a considerably higher rate of voter turnout than the official records.⁵³ One reason may be that mobile

⁵³ The Table below shows rates of voter turnout as measured by the Election Surveys (3), and corresponding turnout rates as measured by register data.

respondents are more likely to drop out of the survey; they also display lower rates of participation. Another reason is that data collection was initiated by an introductory letter sent to all respondents before the election telling them to expect a call from an interviewer after the election. The letter itself might have stimulated participation.⁵⁴ The dataset is therefore limited by relatively little variation in voter turnout.

In Table 5, the estimates in columns (1) and (2) are positive, suggesting that television had a positive, yet modest, impact on partaking in political discussions. The estimates for voter turnout are comparable to those presented in Table 1 for the national elections; yet, the estimates are less precise. That notwithstanding, it seems fair to conclude that TV had a positive influence on political interest, politically relevant knowledge and political participation.

Voter turnout as measured by National Election Surveys and the official election statistics.

Percent. (N: Number of respondents in the Election Surveys)

	1961	1965	1969	1973
Election surveys:	82,2%	92.4%	92.1%	87.2%
(N)	(1356)	(1751)	(1580)	(2383)
Register data:	79.1%	85.4%	87.2%	80.2%

⁵⁴ See (Waldahl et al., 1974)

Table 5. Television access and political behavior

	(1)	(2)	(3)	(4)
	Political discussions		Voter turnout	
TV(=1)	0.034 (0.039)	0.044* (0.023)	0.015 (0.025)	0.018 (0.022)
Observations	2,772	3,898	3,613	5,266
Respondents	948	948	948	948
Municipalities	79	79	79	79
R-squared	0.607	0.173	0.456	0.039
Control variables	NO	YES	NO	YES
Respondent FE	YES	NO	YES	NO
Municipality FE	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Notes. The response variables are the indicator of partaking in political discussions and the dummy variable measuring participation in the national elections. The models are linear regression models (1-2) and linear probability models (3-4). Models (1), (3) and (5) include respondent fixed effects, while models (2), (4) and (6) include municipality fixed-effects and a set of individual-level controls (gender, age, income and education level). The standard errors are robust standard errors clustered at the municipality level.

6 Conclusions

The introduction of a state television service in 1960 caused a rapid increase in TV penetration in Norway. People switched from listening to the radio to watching television. Large segments of the electorate began to follow television coverage of the election campaigns, increasing citizen engagement in political life. The evidence indicates that television caused a moderate increase in political interest and people participated more in face-to-face political interaction. TV also led some voters to become better informed about national politicians. Television brought about a modest increase in voter turnout, suggesting that TV can be used to stimulate political participation. If for-profit television has a negative effect on voter turnout, the problem appears to be with content, not the medium as such.⁵⁵

It has been suggested that national television crowds out information on local politics.⁵⁶ As in other countries, Norwegian TV was a national broadcaster that put the national party leaders on show. News coverage and political debates addressed national issues during the local election

⁵⁵ See e.g., (Aarts & Semetko, 2003; Prior, 2005; Gentzkow, 2006; Curran et al., 2009).

⁵⁶ See e.g. (Gentzkow, 2006; Althaus & Trautman, 2008) 28

campaigns. All the same, in the Norwegian case, TV caused an increase even in local voter turnout. Better media coverage of national politics might have had positive spillover effects on participation in local elections.

The TV effects are positive, yet relatively small. TV was the second broadcast medium, which might explain why its effects were weaker than radio's.⁵⁷ The positive effects might have resulted from the state broadcaster's monopoly. The population was to some extent forced to watch serious programs. The limited supply meant that those with a preference for sports and entertainment also received a dose of news and information. The trap effect meant that all viewers received a minimum helping of "hard news".

The current media environment differs radically from the situation in the 1960s and 1970s. Internet has improved availability of news, leading to a substantial shift from news provided by traditional mass media to information gleaned from the internet. Media surveys⁵⁸ show that Norwegians currently spend 2.2 hours per day watching TV and 1.7 hours a day listening to the radio. About 3.7 hours are consumed in front of the home PC and internet.⁵⁹

Importantly, while 84 percent of Norwegians read at least one newspaper daily in the early 1990s, the current percentage is 49. Newspaper consumption currently accounts for 0.3 hours per day (2014). Following global media trends, newspaper circulation has declined, and media companies have been cutting staff levels, including journalists. Several media have also pruned in-depth news coverage, offering instead more entertainment and "soft news." Public service broadcasting could therefore play an important role in providing high quality news coverage as a public good, possibly stimulating an interest in politics and a thirst for political knowledge, thereby exerting a positive influence on voter participation.

⁵⁷ See (Stromberg 2004).

⁵⁸ The source is the Norwegian Media Barometer provided by Statistics Norway, see <http://www.ssb.no/en/kultur-og-fritid/statistikker/medie/aar/2015-04-14>

⁵⁹ The TV channels of the state broadcaster NRK retain a relatively high market share of about 35% (2014), well ahead of its main for-profit rival, TV2.

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Appendix

Appendix A. Descriptive statistics for municipality-level data

	(1)	(2)	(3)	(4)	(5)
	N	Mean	Sd.dev.	Min	Max
Election year	9,548	1,967	12.11	1,947	1,987
Population size	9,534	8,235	24,884	244	488,377
Eligible voters, % of population	9,531	66.96	5.342	13.59	90.87
Eligible women voters, % of electorate	9,531	49.21	1.975	37.66	58.18
Share of population aged 15 year or more, with higher education	9,534	2.897	2.963	0	26.45
TV-access (TV=1)	9,534	0.576	0.494	0	1
TV licenses per household, 31.12 1964	9,471	12.99	12.93	0	50.49
Share of population in sparsely populated areas	9,534	0.642	0.300	0	1
TV news production, hours per day if TV=1	9,534	1.137	1.001	0	2.315
TV total production, hours per day if TV=1	9,534	3.479	3.184	0	8.047
Voter turnout, national elections	4,540	0.794	0.0662	0.148	0.929
Voter turnout, local elections	4,993	0.712	0.0807	0.268	0.940

Notes: Sd.dev.: Standard deviation.

Appendix B. TV-estimates with a linear probability model.

	(1)	(2)	(3)	(4)
	Local	Local	National	National
TV(=1)	0.012***	0.011*	0.009***	0.016***
	(0.003)	(0.005)	(0.002)	(0.003)
Observations	4,991	4,993	4,540	4,540
Control variables	YES	YES	YES	YES
Municipality FE	YES	NO	YES	NO
County FE	NO	YES	NO	YES
Election year FE	YES	YES	YES	YES

Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Notes. The response variables are voter turnout in local and national elections. The models are linear regression models. The standard errors are robust standard errors clustered at the municipality level. The control variables are the size of the electorate relative to the population, share of women in the electorate, share of population living in sparsely populated areas, and share of population with higher education. 'Local' refers to estimates for voter turnout in local elections; 'National' refers to turnout in the national elections.

Appendix C. TV-licenses and voter turnout in the 1965 national election

	(1)	(2)	(3)
Share with TV licenses	0.0353 (0.020)	0.0734*** (0.014)	0.0431*** (0.011)
Observations	451	451	451
Control variables	YES	YES	YES
Turnout 1957	NO	YES	YES
Turnout 1961	NO	NO	YES
County FE	YES	YES	YES
Election year FE	YES	YES	YES

Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Notes. The response variable is voter turnout in the 1965 national election. The models are fractional logistic regression models, and the estimates displayed are (marginal) effects of the of television licenses per household measured in December 31., 1964. The control variables are the size of the electorate relative to the population, share of women in the electorate, share of population living in sparsely populated areas, and share of population with higher education. Model (1) includes no controls for prior voter turnout, model (2) includes control for voter turnout in the 1961 national election, and model (3) take in voter turnout in the 1957 national election. The standard errors are robust standard errors clustered at the municipality level.

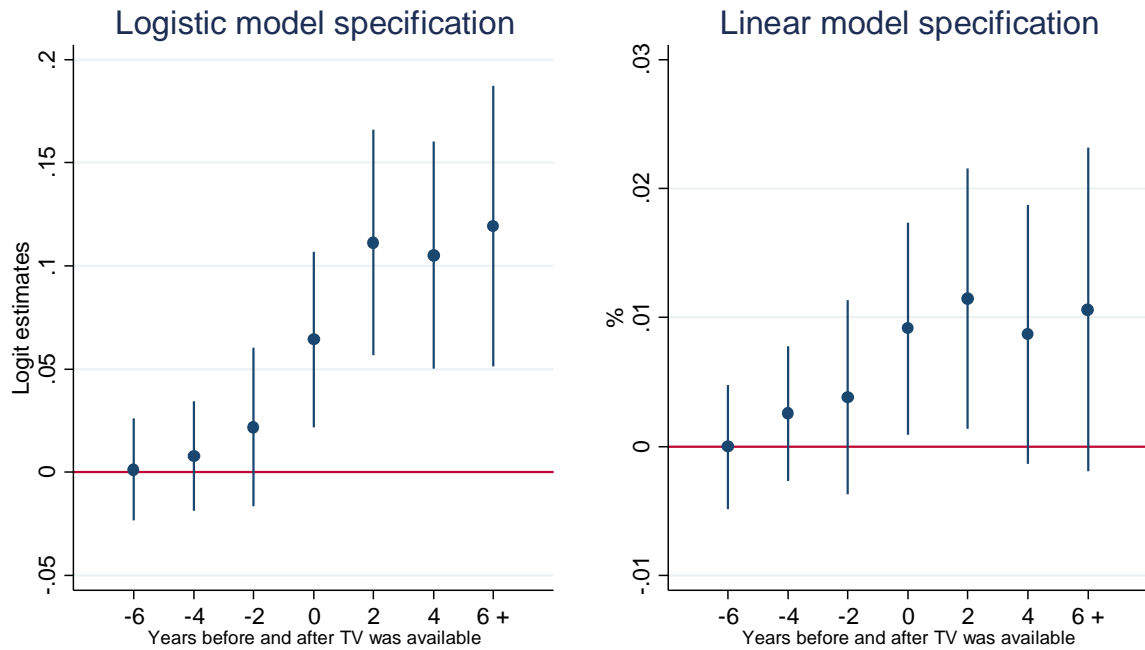
Appendix D. Balancing tests.

	(1)	(2)	(3)
Voter turnout (logit) in local elections, 1959	-0.915 (1.159)	-0.324 (1.163)	-0.359 (1.169)
Voter turnout (logit) in national elections, 1957	4.653*** (1.234)	-0.173 (1.287)	-0.141 (1.314)
Difference in voter turnout (logit) in local elections, 1947-1959	1.237 (0.876)	0.804 (0.863)	0.846 (0.853)
Difference in voter turnout (logit) in local elections, 1949-1957	-5.372*** (1.363)	-2.493 (1.337)	-2.791* (1.336)
Observations	453	453	453
R-squared	0.097	0.342	0.348
Population FE	NO	YES	YES
County FE	NO	YES	YES
Covariates	NO	NO	YES
F(Trends)	12.54	1.213	1.469
P(Trends) > F	1.12e-09	0.304	0.211
F(Covariates)	-	-	1.214
P(Covariates) > F	-	-	0.304

Significance levels: *** p<0.001, ** p<0.01, * p<0.05

Notes. The response variable is number of years with access to television during the 1960-1987 period. The table shows estimates for levels and trends in voter turnout prior to the introduction of television in 1960. Model (1) comprises no controls, (2) includes controls for county fixed effects and population size (log), and (3) also takes in a set of additional controls (the size of the electorate relative to the population, share of women in the electorate, share of population living in sparsely populated areas, and share of population with higher education). The F(Trends) is a simultaneous test of the effects of levels and trends in voter turnout prior to 1960 being significantly different from zero. The F(Covariates) is a corresponding simultaneous test of the covariates (except population size) being significantly different from zero. The standard errors are robust standard errors.

Appendix E. The impact of TV-leads and -lags on voter turnout



Notes. Leads and lags have been coded as dummy variables indicating election years when TV was first available as well as election years before and after the arrival of television. 6+ indicates a dummy variable for all elections starting in the 6th year and after. Both diagrams are estimated with the baseline model with fixed effects for municipalities and years. The graphs show parameter estimates and corresponding 95% confidence intervals indicating the effects on voter turnout in local and national elections.

Appendix G. First difference estimates

	(1)	(2)	(3)	(4)	(5)	(6)
	Local	Local	Local	National	National	National
	Logistic	Linear	M	Logistic	Linear	M
$\Delta TV(=1)$	0.0354	0.0043	0.0374**	0.0186	0.0035	0.0163*
	(0.019)	(0.004)	(0.013)	(0.011)	(0.002)	(0.008)
Observations	4,536	4,536	4,536	4,086	4,086	4,086
R-squared	0.352	0.317	0.333	0.584	0.520	0.546
Control variables	YES	YES	YES	YES	YES	YES
Election year FE	YES	YES	YES	YES	YES	YES

Significance levels: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Notes. The response variables are voter turnout in local and national elections. Models (1) and (4) are linear models using the logistic transformation of voter turnout, and estimated with first differences. Models (2) and (5) are standard linear probability models, estimated with first difference models. Models (3) and (6) employ the mobilization indicator (M) as response variable (see main text). The first differences are defined by four-year lags, corresponding to the election periods. The control variables are the same as in the baseline model. 'Local' refers to estimates for voter turnout in local elections; 'National' refers to turnout in the national elections. The standard errors are robust standard errors clustered at the municipality level.

Appendix G. Summary statistics for Election Surveys. Averages.

	1961	1965	1969	1973	Total
TV(=1)	0.47	0.82	1.00	1.00	0.82
TV consumption	-	0.55	0.60	0.80	0.66
Radio consumption	-	0.31	0.13	0.06	0.18
Newspaper subscriptions	-	1.56	1.73	1.79	1.68
Political interest	-	0.34	0.43	0.43	0.36
Interest in election outcome	-	0.66	0.50	-	0.58
Political knowledge	-	0.68	0.70	0.64	0.68
Political discussions	-	0.44	0.56	0.55	0.51
Voter turnout	0.86	0.94	0.92	0.92	0.91
Gender	0.51	0.51	0.52	0.54	0.52
Age	43	47	47	50	47
Education	0.43	0.43	0.51	0.50	0.47
Income	29	29	42	42	34
Individual-level panel (=1)	0.58	0.58	0.60	0.78	0.63
(Number of respondents)	(1623)	(1623)	(1589)	(1223)	(6058)

Notes. TV(=1) is the dummy variable indicating whether television signals could be received in the municipality. TV consumption, Radio consumption, Newspaper subscriptions, Political interest, Interest in the election outcome, Political discussions and Voter turnout are documented in the main text. Education is a dummy variable equal 0 if the respondent had primary schooling (i.e. 7 years), and 1 if the respondent had additional education. Respondents' annual (gross) income levels were coded as the mid-points of the intervals applied in the surveys, i.e. 15.000 NOK, 30.000 NOK, 50.000 NOK or 70.000 NOK.