Persuading voters with partisan TV news: a natural experiment using spatial reception data

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Abstract

We estimate the causal effect of partisan media on voters' choice by exploiting a natural experiment in which Sky News Australia – a conservative 24-hour news channel – became freely available to 8 million people. Using comprehensive national polling-station-level electoral data and variation in broadcast signal strength, we implement a difference-in-differences design comparing voting patterns before and after its 2018 free-to-air launch. We find that exposure to Sky News increased the conservative party's lead by 1.5 percentage points in the 2019 election. Compulsory voting allows us to identify the effect of partisan news in a context unaffected by voter turnout.

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1. Introduction

Like Fox News in the U.S., Sky News Australia is a 24-hour news channel owned by Rupert Murdoch that is widely accused of bias. Originally available only via subscription-based pay-television service, ratings at the time Murdoch acquired the channel in 2016 were low, with fewer than 12,000 nightly viewers nationally (Meade 2016). However, in September 2018 Sky News Australia started to broadcast as a free-to-air service to the WIN broadcast license area, reaching up to one third of the Australian population. We use the natural experiment provided by this change in accessibility to estimate the effect of free-to-air Sky News on the vote swing between the 2016 and 2019 national elections, when free-to-air broadcast still dominated television consumption in Australia (ACMA 2023). By assembling a unique dataset on all electoral polling places in Australia, and the share of the voting population receiving the Sky News broadcast signal, we perform a difference-in-differences analysis to measure the impact of partisan news on voting behavior. Compulsory voting makes Australia the ideal place to study how partisan news affects voters' ballot choices, largely avoiding confounding effects due to changes in turnout.

In recent decades the audience share of partisan news media has grown, especially among TV news audiences which is the focus of this paper (Muise *et al.* 2022). A growing literature suggests that partisan TV news influences electoral outcomes.[1] DellaVigna and Kaplan's (2007) pioneering study used variation in Fox News availability across cable networks to identify its effect on the 2000 U.S. presidential election, finding significant impacts. Martin and Yurukoglu (2017) identified several concerns about the cable network coverage data in DellaVigna and Kaplan (2007). As an alternative identification strategy, Martin and Yurukoglu

[1] This is part of a broader literature on the influence of TV media on behavior such as voting (Durante, Pinotti and Tesei 2019), divorces (Chong and La Ferrara 2009) or fertility choices (La Ferrara *et al.* 2008). See also Jensen and Oster (2009), Paluck (2009) and Green *et al.* (2020).

(2017) use channel position, which they show both predicts Fox News viewing and is independent of Republican vote share prior to Fox News' introduction. Their results suggest that an additional exposure of 2.5 minutes per week increases the Republican vote share by 0.3 percentage point in the 2008 presidential election. Ash *et al.* (2024) update and expand upon Martin and Yurukoglu's (2017) channel position approach. Their results support the conclusion that Fox News has shifted ideology over time, though they find no significant effect on the 2008 presidential election.[2] Related work has shown that increasing access to independent news in partisan dominated media landscapes can influence electoral outcomes. Using Italy's staggered digital TV rollout, Barone, D'Acunto, and Narciso (2015) show that expanded choice of non-Berlusconi controlled channels reduced his coalition's vote share in Piedmont's 2010 election. And Enikolopov, Petrova, and Zhuravskaya (2011) exploited geographical variation in TV signal strength in Russia and find that access to the country's only independent national TV channel reduced support for Putin's Unity party in the 1999 election. Geographical variation in signal strength has also been used to evaluate the effect of radio propaganda in interwar German elections (Adena et al. 2015) and in the 1936 U.S. presidential election (Wang 2021).[3]

Using a natural experiment in the context of Australia, we contribute to the literature on the effect of partisan TV news on electoral outcomes. We estimate a continuous treatment difference-in-differences model where identification rests on quasi-random variation in Sky News signal *within* electoral divisions (which are akin to congressional districts in the U.S.). This setting allows us to control for the time-invariant characteristics of polling places as well as time fixed effects. Electoral division fixed effects capture the average effect of local

[2] For reviews of the electoral effects of media see DellaVigna and Gentzkow (2010), Prat and Strömberg (2013), and Zhuravskaya, Petrova and Enikolopov (2020).
[3] Broadcast signal strength has been used to identify the effect of media on a range of other behavioral phenomena (Olken 2009; Chong and La Ferrara 2009; Yanagizawa-Drott 2014; Okuyama 2021).

candidates, including whether the incumbent is a member of the government or the opposition; local advertising; local electoral promises and other division-level factors like industry mix, population density and composition. We also introduce to this literature recent advances in continuous treatment difference-in-differences to test the key assumptions underlying our approach (de Chaisemartin and D'Haultfœuille 2024; Callaway, Goodman-Bacon and Sant'Anna 2024).

Australia's system of compulsory voting also allows us to shed new light on whether voters who choose to watch partisan news are persuaded to switch parties. Such evidence is difficult to garner from analysis of U.S. data since U.S. election outcomes are largely determined by who turns out to vote (Mayer 2008; Panagopoulos 2016; Hill 2017). Indeed, DellaVigna and Kaplan (2007, p1216) indicate that "the main effect of Fox News was to induce non-voters in Democratic districts to turn out and vote Republican" and Martin and Yurukoglu (2017) note that they cannot separate the effects of converting swing voters from those of increased partisan turnout. (ibid, appendix p80).[4] Enikolopov, Petrova and Zhuravskaya (2011) and Barone, D'Acunto, and Narciso (2015) also find a significant effect on turnout in Russia (62% turnout in 1999) and Piedmont, Italy (64% turnout in 2010).

Partisan news can influence elections by boosting voter turnout without persuading anyone to change their vote, simply by mobilizing existing supporters. The causal pathway between partisan news and voter turnout is uncontroversial, and fits with a range of established stylized facts. It is well established that audiences overwhelmingly choose to consume news media that already align with their pre-existing views, a phenomenon known as selective exposure (Iyengar and Hahn 2009; Durante and Knight 2012; Arceneaux and Johnson 2013; Martin and Yurukoglu 2017); selective exposure to partisan news fosters polarization

[4] Ash *et al.* (2024) do not discuss turnout.

(Arceneaux and Johnson 2013; Levendusky 2013); and polarization is associated with voter turnout (Kamm and Schram 2013).

The electoral impact of partisan TV news through vote switching is more complex. The extent that cross-cutting news changes minds is contested. The theory of motivated reasoning predicts that information that contradicts prior positions will be dismissed, discredited, or re-interpreted to align and even potentially strengthen existing beliefs (Kunda 1990). Partisan motivated reasoning is well documented (Bolsen, Druckman, and Cook 2014). However, a growing body of evidence suggests that exposure to cross-cutting news can in fact moderate views in an experimental setting (de Benedictis-Kessner *et al.* 2019; Broockman and Kella 2023). However, unlike experimental settings whereby exposure is controlled, or incidental exposure such as political advertising, viewers of Sky News are actively choosing to consume partisan content. Whether a meaningful share of center-left voters will watch conservative partisan news cannot be assumed, though some evidence suggests that individuals that are closer to the middle of the ideological spectrum, with weaker political conviction, are more likely to consume diverse sources (Mitchell *et al.* 2014; Jurkowitz *et al.* 2020). Whether a meaningful share of center-left voters both choose to watch and are persuaded by conservative TV news remains an open question.

Australia provides an ideal setting to assess whether partisan TV news can shift votes between parties. Near universal participation is the result of compulsory voting, automatic and compulsory voter enrolment, an absence of voter ID requirements, Saturday elections, and legislated time off to vote. Turnout in national elections is among the highest in the world – well over 90 percent since the 1920s. Non-voters consist mostly of those who could not vote because of illness, accidents, or absence from Australia on polling day (Bennett 2005; Twomey 2013; Australian Law Reform Commission 2014). These are all deemed ‘valid and sufficient reasons’ for failing to vote, unlike political opinions or beliefs, and together explain why only

a small fraction of non-voters end up paying the nominal fine (Commonwealth of Australia 2017). As a result, it has been argued that voter turnout is not a relevant measure of political participation in Australia (Passey & Lyons 2005, p71; Bean 2012; Crosby 2020). Correspondingly, invalid (or informal) voting is generally regarded "as the functional equivalent of non-voting" (Power and Garand 2007; Katz 2008; Hooghe et al. 2011; Hill and Rutledge-Prior 2016, p401).[5] As expected in this context, we find no effect of Sky News when estimating our model on informal vote shares or turnout.

We also contribute to the limited evidence on the effect of partisan TV news on electoral outcomes in parliamentary democracies, which are globally more common than presidential democracies (McManus and Ozkan 2018).[6] A key difference between parliamentary democracy is that the party with the parliamentary majority appoints the head of government and all cabinet positions from within their parliamentary ranks. As a consequence, the impact of partisan news may differ in a parliamentary democracy where specific local candidates and party play a relatively more important role in shaping voter preferences than the appeal of a single national candidate. It has been widely argued that presidential democracies are more conducive to polarization than parliamentary systems (Linz 1990).

We find that free-to-air Sky News broadcast caused the Liberal National Party (LNP) lead over the Australian Labor Party (ALP) to increase by 1.5 percentage points, which is consistent with the partisan direction of Sky News. This effect comprises a fall in support for ALP and an increase in support for the LNP. Statistical testing for homogeneous treatment and

[5] In Australia invalid ballots are called informal. These are ballots that cannot be counted due to incorrect marking, missing numbers, or being left blank.
[6] Both the Russian political system (the subject of Enikolopov, Petrova and Zhuravskaya 2011) and Italian region of Piedmont (the subject of Barone, D'Acunto, and Narciso 2015) share some features with parliamentary democracy, though both have directly elected presidents with the power to appoint cabinet heads from outside parliament.

parallel trends proposed by de Chaisemartin and D'Haultfœuille (2024) support the validity of our specification. Simulating the effects of Sky News suggest that in the absence of Sky News exposure, the LNP would have won one less electoral division and therefore held an outright parliamentary majority of one instead of two seats.

2. Institutional Context: Media Landscape and Electoral System

To identify the effect of partisan news media on voter behavior, we exploit variation in households' access to Sky News on free-to-air (FTA) television in the leadup to the 2019 national election. In brief, access depends on adequate signal strength from a terrestrial broadcast tower transmitting Sky News, or for residents of Western Australia, household eligibility for government subsidized satellite TV. In this section, we explain how channel mix varies by broadcast tower location and how Sky News came to be broadcast from towers serving license areas covering approximately one-third of the Australian population nine months before the 2019 election. Finally, we outline salient features of the Australian electoral system.

a. Australian Television News Markets

Until very recently, free-to-air broadcast has been the dominant form of television consumption in Australia. In 2018 and 2019, within our period of analysis, Australians consumed 3.4 times more FTA than pay television and more than twice as much FTA than video on demand (ACMA 2023). Only 27 percent of Australian adults watched any form of pay TV in each of the years 2017, 2018 and 2019 (ACMA 2022).[7] Take up rates of pay TV

[7] Low take up of pay TV (or subscription TV, STV) in Australia is attributed in part to its relatively late introduction, but also to legislation which prevented STV from licencing a wide range of major sporting events, which had been key in boosting subscription services in other regions of the world (Thurlow 2022).

were even lower outside state capitals (ACCAN 2022). In contrast, more than 99 percent of Australians have access to FTA TV via either terrestrial broadcast or government funded satellite TV, which provides digital infill for viewers in terrestrial blackspots and viewers in more remote areas (known as Viewer Access Satellite TV, VAST).

FTA TV provide households a mix of commercial channels that differ by location as well as channels provided by the Government owned but editorially independent Australian Broadcast Corporation (ABC).[8] Historically ABC broadcast channels included a mix of both news and entertainment programming. In 2010 ABC News-24 was launched, Australia's first FTA 24-hour news program which was the most widely consumed dedicated news channel in 2019, and the only 24-hour news channel besides Sky News. For households receiving terrestrial broadcast signals, the available FTA channel mix depends on the broadcasting tower, which is determined by the license area the tower is nominally intended to serve. From September 2018 Sky News was included in the channel mix for towers broadcasting the WIN television network.

The WIN broadcast license area covers a population of almost 8 million people, living across a diverse geography encompassing the entire state of Tasmania including its capital (Hobart, pop. 200,000); and the entire Australian Capital Territory including Canberra (pop. 395,000); and areas spanning remote communities to regional cities such as Newcastle (pop 322,000). License areas covered by WIN do not include the 5 largest metropolitan catchments of Sydney, Melbourne, Brisbane, Adelaide, and Perth. In practice, signal propagation does not conform perfectly to license area boundaries and several areas of metropolitan cities, including

[8] There were no other dedicated 24-hour news channels over the study period. Other channels are provided by Special Broadcasting Service (SBS) an independent non-government service founded to provide content in languages other than English, and National Indigenous Television.

central southern Sydney also receive a good signal from WIN towers (e.g., Matraville and Maroubra).

Households that do not receive reliable terrestrial TV reception, either due to distance from a transmitter or issues relating to local interference, can access a government funded Viewer Access Satellite Television (VAST). Only VAST viewers in the state of Western Australia had access to WIN and therefore Sky News Australia (Thurlow 2022, Table 11.1).

b. Sky News Australia

Sky News Australia – Australia's first commercial 24-hour news channel – was launched as a subscription-only pay-TV channel in 1996 as a joint venture between British BSkyB and Australian commercial networks (Seven and Nine). In December 2016 Sky News Australia[9] was acquired by News Corp Australia, a wholly owned subsidiary of News Corp (US). After the takeover Sky News Australia had no direct ties to its UK namesake. Ratings immediately after the Murdoch takeover remained low, reflecting the low overall take-up of subscription (pay) TV in Australia. For example, on election night in 2016, the Sky News Australia audience was barely 5 percent of the 2 million viewers who tuned in to ABC News, the most widely watched news content nationally (Bodey 2016; Meade 2016; Muller 2016). Additionally, in the period of analysis, Sky News Australia's social media presence was minimal, with its YouTube channel effectively dormant.[10]

[9] Sky News Australia parent company Australian News Channel.

[10] No videos were uploaded between February 2017 and April 2019 (Wilson 2020). In July 2019, 2 months after the national election, Sky News began expanding its social media presence, hiring a new digital editor and signing agreements with both YouTube and Facebook in August (Wilson 2020). Sky News Australia (2024) reports that its YouTube channel was launched in 2019 (Sky News Australia 2024).

Following the Murdoch takeover, Sky News shifted towards a conservative partisan stance.[11] Text analysis of a 3-day period found negative depiction of Labor (nominally left) at 7:1 as compared to the conservative party (Stapleton 2019). Media Bias Fact Check reports that Sky News Australia is "Right-Biased based on story selection and editorial positions that mostly favor the right" (Media Bias/Fact Check, n.d.). They also report Sky News broadcasts misinformation and the promotion of conspiracy theories. For example, claiming the 2020 U.S. presidential election was 'stolen' (Davies 2021). In 2021, Sky News was suspended from YouTube for spreading coronavirus misinformation (Pannett 2021).[12]

c. Expansion of Sky News Broadcast on the WIN Network.

In 2018 Sky News Australia signed an agreement with the WIN television network to broadcast on their FTA broadcast license area and partner channels (Mason 2018; Mediaweek 2018). In exchange for content, Sky News were to receive revenue share, access to WIN News localized content for use in both their FTA and subscription TV offerings;[13] and opportunities for cross-promotion subscription offerings (Samios 2017; Mason 2018).[14]

The specific pairing of Sky News and the WIN license area appears to have been effectively arbitrary. In fact, in 2017 Sky News launched an unsuccessful bid for control of (metropolitan) Network 10 with the intent of broadcasting over metropolitan markets (Kelly 2017; Mason 2018). Also serendipitous was the fact that WIN's decades old supply

[11] Young (2009) suggests that the initial incarnation of Sky News Australia was modelled on its British counterpart, widely viewed to be impartial.
[12] We acknowledge that Sky News' conservative stance may not be universally described as bias; our result that partisan media influences voters only require its rightward position relative to mainstream media, regardless of whether this is perceived as bias or balance.
[13] At the time WIN was the largest producer of regional commercial television news (Thurlow 2022).
[14] WIN television is a privately owned company majority owned by Bruce Gorden, there is no public annual report. Statements at the time emphasised access to content for regional viewers (Mediaweek 2018).

agreement[15] with Channel Nine broke down in 2016 following an unrelated legal dispute[16] leaving WIN struggling to fill airtime – in one license region even resorting to broadcasting rolling images of scenery and elevator music (Thurlow 2022, p404).[17] While the role of the content supply agreement breakdown in the decision to syndicate Sky News to WIN is somewhat speculative, it is noteworthy that in 2021 when WIN entered a renewed agreement with longstanding partner Channel Nine, Sky News was displaced from WIN (Meade 2021; Sky News 2021).[18]

Irrespective of its genesis, the partnership with WIN dramatically expanded the potential viewer base of Sky News to the tune of an additional 8 million Australians living in the WIN broadcast region.[19] Available evidence confirms the extent of the increase in viewers: 3.8 million people tuned in to Sky News via the WIN network in 2019[20] (Knox 2019). And, in the week prior to the 2019 election Sky News ratings on FTA were similar to and sometimes eclipsing the ABC (REGTAM 2019).[21]

[15] Content supply agreements are common in Australian regional FTA TV. Reforms from 1989 led to consolidation, resulting in three main regional FTA networks: WIN, Prime, and Southern Cross. Each network affiliated with a metropolitan counterpart, with WIN partnering with Nine. For more history of regional television, see Thurlow (2022) and Barnett (2023).

[16] WIN had sued Nine, claiming that Nine breached their affiliation agreement by providing licenced content on a new online catch-up service (9Now). Commentator suggested this litigation was itself a response to negotiations over revenue share on the renewed content agreement in 2015 (Samios 2020)

[17] WIN entered a contract supply agreement with Network 10 in 2017.

[18] However, soon after Sky News rebranded as Sky News Regional, and was launched on August 1 on competing regional network, Southern Cross.

[19] The introduction of Sky News on WIN did not change the channel position of ABC News-24 or other major TV stations.

[20] In TV ratings, reach is typically defined as the number of people who have watched a channel or a program for at least one minute over a given period (here, 27 January – 09 November 2019),

[21] We were not given permission to cite REGTAM data, however we refer the interested reader to weekly ratings freely available on the REGTAM website (https://www.regionaltam.com.au) and, in particular, to the election week ratings (https://www.regionaltam.com.au/upload/weekly-reports/RegTAM-20190512-E2RegFTARankSumCons.pdf, accessed on 8/12/2023).

d. The Australian electoral system and the 2019 National Election

Australia is a parliamentary democracy with a political system modelled on that of the UK. The party with the greatest representation in the legislature forms government and its leader the head of government (Prime Minister). National elections are conducted approximately once every three years.[22]

Voter turnout in Australia is high and stable: 91.93 percent in the 2016 national election and 92.48 percent in 2019 (AEC 2023b). High voter turnout is the consequence of several factors. Voting is compulsory for all eligible Australian citizens and non-compliance results in a nominal fine unless electors can justify having a 'valid and sufficient reason' for failing to vote. National elections are conducted by the Australian Electoral Commission (AEC), on whom the onus rests to ensure all citizens have the opportunity to vote. Elections are held on a Saturday and employers required by law to give workers time to vote (Commonwealth Electoral Act 1918, s345). Voter enrolment is compulsory and essentially uniform, there are no identification requirement, and voters can cast their ballot at one of more than 7,000 regular polling places on election day (one polling station for every 2,000 eligible voters, on average), mobile voting teams stationed at hospitals and prisons, via mail or at AEC operated Early Voting Centres in each electoral division.

Another distinctive feature of Australian Electoral system is ranked choice voting, known in Australia as preferential voting, which functions like an automatic run-off. Voters rank candidates in order of preference on their ballots. If no candidate secures more than 50 percent of first-preference votes, the candidate with the fewest votes is eliminated, and their votes are redistributed to the remaining candidates based on the second preferences indicated

[22] On a date determined by the Governor-General, on the request of the government of the day.

on the ballots. This process of elimination and redistribution continues until one candidate achieves a majority. Preferential voting has two consequences: the first is to reduce strategic voting and the second is that it has resulted in a legislature dominated by two major parties. The two parties are the ALP on the left, and the Liberal Party, on the right. The Liberal Party operate in a perennial alliance with another conservative party, the Nationals (formerly the Country Party), though in some electorates both the Nationals and the Liberal party field competing candidates. In the state of Queensland, the two conservative parties have formally merged. At the time of the 2019 election the LNP had been in government since 2013 and had 76 seats out of a legislature of 151 electoral divisions: an outright majority of just one seat.

Electoral divisions range in size from approximately 70,000 to 125,000 voters. Electoral boundaries are revised where required to ensure that each State and territory has representation in the lower house proportional to their population and that there are a similar number of electors in each electoral division for a given state or territory. Boundary revisions (known in Australia as redistributions) are undertaken by the stridently apolitical Australian Electoral Commission (AEC). The Parliament has no power to reject or amend an AEC redistribution (AEC 2014). Boundary changes are minimized but aim to maintain socially and economically integrated electoral divisions with shared community interests and strong transport and communication links (AEC 2022). Between the 2016 and 2019 national elections the number of electoral divisions increased from 150 to 151.[23] The boundaries of the 151 electoral divisions are indicated in Figure 1 with insets for each of the 8 capitals cities across Australia's States and territories.

[23] Victoria and the ACT each gained one electoral division while SA lost one electoral division.

3. Data

a. Election Outcome Data

Election result data for the House of Representatives for each polling place come from the AEC (2022). We include both regular polling places and early voting centers,[24] but exclude mobile polling stations, hospital polling stations and postal votes as the voting population at each of these polling places is likely to significantly change between elections. After merging the 2016 and 2019 data (see Appendix B.1), the data cover nearly 8,200 polling places, accounting for 11.7 million ballots or 93% of ordinary votes.

Our main outcome variable is the LNP (on the right) lead over the ALP (on the left) in first preference votes, expressed as a percentage of total votes.[25] This captures voters' relative preferences between the two major parties. Electoral lead accounts for the possibility that partisan news might shift first preference votes away from both ALP and LNP to independent candidates (or minor parties) at different rates, potentially widening the gap between the LNP and ALP. For completeness, we also report results for the effect of Sky News on LNP and ALP vote share directly.

Our second main outcome variable is the two-party preferred (TPP) vote share which also combines the relative flow of preference votes to LNP vs ALP. Recall that Australia uses preferential (ranked choice) voting, whereby voters rank candidates from most to least preferred. If no candidate secures over 50% of first-preference votes, the candidate with the fewest votes is eliminated, and their votes are redistributed based on second preferences marked on those ballots. This continues until two candidates remain. The TPP count at the

[24] Ballots can be cast at early voting centres by voters who cannot readily get to a polling place on election day.

[25] $Lead^{LNP} = \frac{\text{Votes_LNP}_{2019} - \text{Votes_ALP}_{2019}}{\text{Total_Votes}_{i2019}}$

electoral division level determines the election outcome, it also potentially captures subtle shifts in preferences between the major parties, taking into account any impact on preferencing third party candidates. Note that swings in the LNP lead over ALP in first preferences do not necessarily translate 1:1 to shifts in TPP, since the TPP gap also includes the preferences of voters who voted for an eliminated third-party candidate (or independent).

An important caveat to measuring TPP at the polling place level is that the elimination order applied in calculating TPP at each polling place follows the ranking of candidates established at the level of the electoral division in aggregate and this introduces some noise because these do not necessarily match preferences on ballots cast at specific polling places. To estimate the treatment effect on TPP, we use TPP data at polling places provided by the AEC. We exclude the 15 electoral divisions where the runoff was not between the ALP and the LNP for the analysis of TPP.[26]

b. Share of Voters with FTA Sky News Reception

Our treatment variable is the percentage of voters at each polling place with Sky News reception at their place of residence. We estimate this by combining three datasets: voter residential locations for each polling place; detailed geospatial models of broadcast signal strength across Australia; and building footprints data.

Signal strength data come from the Australian Communications and Media Authority (ACMA 2017a), an independent federal government agency. Signal strength is based on the Longley-Rice Propagation model incorporating power and direction of the broadcast signal at its source, distance to receivers, signal diffraction and reflection from topographic features like

[26] We also exclude the electoral division of Whitlam from the TPP estimates, due to an error in AEC data for the TPP measure for that electoral division.

mountains and hills, and other relevant environmental factors including atmospheric conditions and soil conductivity. The modelling used reflects the broadcast map as of December 2017 (ACMA 2018). The signal strength raster indicates 7 levels of signal strength, with a strength of 4 or above considered moderate-good reception (ACMA 2018). We identify Sky News signal based on tower callsigns licensed to WIN Television (ACMA 2012; ACMA 2017b). See Appendix B.2 for details regarding assembly of WIN signal data. Figure 1 illustrates access to Sky News, as determined by the transmission signal strength of all towers broadcasting Sky News on FTA TV across Australia. In Western Australia viewers can also access WIN via VAST. [27] Panel (c) of Figure 2 illustrates the signal strength raster for one specific area, the electoral division of Macarthur in New South Wales.

Voter residential locations come from the AEC (2019a), which reports the share of voters that cast their ballot at each polling place according to the Statistical Area Level 1 (SA1) in which they reside. AEC derive these data from electoral roll mark-off data. With an average population size of approximately 400 people, SA1 is generally the smallest unit for public release of census data. The catchment of the Eagle Vale polling place in the electoral division of Macarthur is depicted in Panel (a) of Figure 2.

To measure the share of voters at each polling place exposed to Sky News, we take the weighted average exposure across the SA1s that make up the polling place catchment, where the weights are the share of voters living in each SA1.

$$SkyShare_i = \sum_{s \in i} PPVoteShare_{is} \times SkyShare_s^{SA1} \qquad (1)$$

[27] Areas of regional WA that do not have Sky News indicated on Figure 2 reflect terrestrial towers broadcasting ABC but not WIN. E.g., the unshaded area northeast of Perth reflects areas serviced by the signal from Broadcast Australia Site off Dalwallinu.

where $s \in i$ denotes the set of all SA1s in the catchment of polling place i; $PPVoteShare_{is}$ is the share of voters at polling place i from SA1 s; and, $SkyShare_s^{SA1}$ denotes the share of the population in SA1 s that are exposed to Sky News. To estimate $SkyShare_s^{SA1}$ we intersect the signal strength raster with Microsoft's Global Building Footprints dataset (Microsoft 2024), which provides high-accuracy vectorized building locations derived from satellite imagery using deep neural networks. We first calculate the share of building footprint area that overlaps with Sky News signal within each Mesh Block,[28] multiply by the 2016 Mesh Block population,[29] aggregate Mesh Block populations to SA1 and take the ratio of treated population to total population.[30]

Measurement of the Sky News exposure by voters at each polling place is illustrated in Figure 2 for the electoral division of Macarthur. Panel (a) shows ED boundaries (dark line), SA1s (fine line), Mesh Blocks (very fine line), polling places (dots), and Eagle Vale polling place (cross). Panel (b) shows SA1s in Eagle Vale catchment. Panel (c) shows signal strength raster (shaded areas have good Sky News signal). Panel (d) shows Sky News exposure share for voters at PPs in Eagle Vale by SA1.

Our base dataset covers 8,192 polling places across 151 electoral divisions from the 2019 election. Since our identification strategy relies on variation within electoral divisions, it is notable that 110 electoral divisions show meaningful variation in Sky News coverage across

[28] Mesh Block is the smallest geographic area defined by the ABS and is designed where possible to contain between 30 and 60 dwellings. There are 368,286 Mesh Blocks covering the whole of Australia without gaps or overlaps.
[29] The Microsoft ML Building Footprints dataset is the most comprehensive footprint data available at the time of writing. However, buildings were absent in the case of 2,224 Mesh Blocks which the census shows had small but non-zero population, therefore we find that coverage of the building footprints captures 99.4% of the Australian population. In these cases, with missing data, we impute the population exposed to a given signal strength based on the area share of the Mesh Block multiplied by the 2016 population.
[30] There are 57,523 spatial SA1 regions covering the whole of Australia without gaps or overlaps.

their polling places.[31] The resulting dataset comprises 5,300 polling places. We present summary statistics for all variables in Table 1.

We have detailed broadcast signal data, but we cannot directly observe Sky News ratings at SA1, polling place or even electoral division level because small area TV ratings (viewership) data are not collected in Australia. However, available evidence confirms substantial viewership: 3.8 million people tuned in to Sky News via the WIN network in 2019 and Sky News ratings on free-to-air were comparable to those of ABC News in the week leading up to the 2019 election (see Section 2.c).

4. Empirical Approach

Our empirical strategy identifies the effect of access to Sky News, thereby exploiting plausibly exogenous variation in exposure attributable to signal strength and idiosyncratic licensing arrangements. This approach has the advantage of avoiding selection problems that would arise from purely relying on individual-level viewing decisions. We implement a continuous treatment difference-in-differences model, which we estimate in first differences as:

$$\Delta Y_i = \beta_0 + \beta_1 SkyNews\text{Share}_i + \omega_d + \varepsilon_i \qquad (2)$$

where ΔY_i is the change in election outcome between 2016 and 2019 at polling place i. As discussed previously, we consider the effect of FTA Sky News LNP lead over ALP in first preference votes, as well as raw LNP and ALP first preference vote shares and estimated two-party preferred (TPP) result at each polling place. Our main explanatory variable of interest,

[31] We include electoral divisions with at least a five percentage point difference in free-to-air Sky News exposure between their highest and lowest exposed polling places. Using a more inclusive threshold of 1 percent difference does not materially change our estimates. Estimates based on the full sample are provided in our robustness checks. See Appendix B.1 for a more detailed discussion of sample selection.

i.e., the continuous treatment variable, is $SkyNews\text{Share}_i$ which is the share of voters casting their ballot at polling place i who received FTA Sky News broadcast signal at their residence.

Since we model the change in electoral outcomes we abstract from any underlying relationships between location and long-run political preferences (essentially a feature of any difference-in-differences estimation). We include electoral division fixed effects (denoted by $\boldsymbol{\omega_d}$) so that identification is based on variation in Sky News coverage between polling places *within* each electoral division. Electoral division fixed effects capture the average effect of local candidates, including whether the incumbent is a member of the government or the opposition; local advertising; local electoral promises and other division-level factors like industry mix, population density and composition.[32] To account for polling places affected by redistributions, we include the full set of 2016-electoral-division × 2019-electoral-divison fixed effects.

Identification of treatment effect in a continuous treatment difference-in-differences setup differs from the binary treatment case and has been the subject of a fast-emerging literature (de Chaisemartin and D'Haultfœuille 2020, 2023, 2024; Callaway, Goodman-Bacon and Sant'Anna 2024; Roth, *et al.* 2023; de Chaisemartin *et al.* 2024a). Stated informally, identification in the case of continuous treatment does not rely purely on a control group purely comprising untreated individuals, but also a comparison between individuals with varying levels of treatment. In our context, the control group for observations with a specific level of exposure to Sky News are not restricted to untreated observations, but rather consist of all other observations with a different level of treatment. Callaway, Goodman-Bacon and Sant'Anna (2024) show that in the case of continuous treatment the treatment effect (in this case the

[32] While difference-in-differences does not require balance, the idiosyncratic mosaic of reception across outer suburban and rural areas which resulted from the syndication of Sky News to regional broadcaster WIN provides a more plausible context for identification than comparison with the inner-city electorates which have almost no Sky News reception. Correspondingly, the pre-treatment parallel trends test shows systematic divergence in the absence of electoral division fixed effects.

Average Causal Response) is identified under the assumption that there is no selection into the specific dose received, which they call the strong parallel trends assumption. This assumption breaks down in situations where individuals select their own level of treatment based on their expected personal response (such as the number of painkillers taken to treat a headache).

de Chaisemartin and D'Haultfœuille (2024) show that the strong parallel trends assumption articulated by Callaway, Goodman-Bacon and Sant'Anna (2024) is equivalent to a homogeneous slope assumption under a less onerous placebo testable parallel trends assumption. The specific form of parallel trends assumption with a non-binary treatment is that there is a real number such that:

$$E[\Delta Y(0)|D_2] = \mu_0 \quad (3)$$

where D_2 is the period 2 treatment dose and $\Delta Y(0)$ is the counterfactual change in Y under zero treatment. Equation (3) states that that counterfactual untreated trend is not systematically related to the level of treatment received. In other words, if no treatment had been given, those who received strong treatment would not have evolved in a systematically different way from those who received weak treatment. They note this condition can be readily placebo-tested based on a regression of pre-treatment trends on the not-yet-received individual specific dose (which is analogous to pre-treatment test for parallel trends in regular binary treatment difference-in-differences). de Chaisemartin and D'Haultfœuille (2024) also propose a non-parametric linearity test to validate the assumption of homogeneous slope based on Stute (1997). In our analysis below, we report both pre-treatment placebo test of the parallel trends test as well as the Stute test to support the validity of our empirical approach.

5. Results and Discussion

a. Main results

Our main outcome variable is the LNP's lead over the ALP as a percentage of total first preference votes. This metric captures relative party preferences while accounting for potential asymmetric shifts in voter support to independent candidates or minor parties. Given Sky News' partisan conservative stance, if the channel indeed affects voting behavior, we expect to see an increased LNP (conservative) margin in first preferences at polling places where a greater share of voters is exposed to Sky News. We report the treatment effect on constituent components of the first preference margin: the LNP (nominally right) and ALP (nominally left) first preference vote shares. Additionally, we report the treatment effect on estimated two-party preferred (TPP) outcome. The TPP is the share of votes for LNP candidate after the distribution of vote preferences from voters that who ranked 3rd party and independent candidates above either the ALP or LNP.

Table 2 presents our main results: estimates of the Sky News share coefficient from Equation 1 for each of our four dependent variables. Column 1 shows our baseline two-way fixed effects (TWFE) dose-response design, estimated using first differences with electoral division fixed effects. These electoral division fixed effects control for division-specific factors such as candidate quality, incumbency status, political advertising by all parties, local issues, and electoral commitments targeted at specific seats.

The estimates indicate that increased Sky News exposure raised the LNP's electoral margin by 1.485 percentage points (Column 1). This is consistent with a significant decrease of 0.755 percentage points in the ALP vote share and an increase of 0.733 percentage points in the LNP vote share, as shown in columns 3 and 4, respectively. Column 2 shows the estimated effect on the LNP's two-party preferred (TPP) vote share is an increase of 0.649 percentage

points. This is quite consistent with the estimated treatment effect on the total LNP electoral margin, despite the limitations of measuring TPP at the polling place level (discussed in Section 3).[33] There are several reasons why changes in first preferences may not fully reflect the changes in two party preferred votes. Allocation of preferences can give rise to discontinuities in TPP; e.g., evenly split three-way races can translate to a landslide result if second preferences on ballots for the eliminated candidate fall disproportionally to one of the two remaining candidates. Second, as noted, some noise is introduced estimating TPP at the polling place level where the order of candidates eliminated may differ from the electoral division.

b. Parallel Trends and Homogeneity

As discussed in Section 4, recent advances in continuous treatment difference-in-differences design show that identification requires that counterfactual untreated outcome trends are not systematically related to treatment intensity. de Chaisemartin and D'Haultfœuille (2024) show that this condition is equivalent to both (1) homogeneous slope assumption and (2) a parallel trends assumption. In support of these assumptions, we present the statistical tests suggested by de Chaisemartin and D'Haultfœuille (2024).

We conduct the non-parametric linearity test based on Stute (1997). For our main dependent variables LNP lead in first preference votes and TPP, we fail to reject the null hypothesis with p-values of 18% and 66%, respectively, supporting the assumption of homogeneous treatment effects. The null is rejected for ALP, one of the components of LNP lead, though the ALP results are otherwise in line with LNP lead as well as TPP results. Given that LNP lead and TPP—which are the primary focus of our analysis—and LNP (p-value of 57%) all pass the test, we interpret the results as a whole as supporting the validity of our

[33] Noting that a 1 percentage point shift in TPP (which is a share of total votes) is equivalent to a 2 percentage point increase in the LNP's TPP lead.

identification strategy.[34] We further validate our identification strategy by showing our results are robust when the continuous treatment is dichotomized (see Section 5.c, below).

In Table 3 we present the suggested parallel trends in the pre-analysis period. Here, the dependent variable relates to the change in electoral outcome at each polling place between the 2013 and 2016 elections. The 2016 election is a strong candidate for consideration of testing parallel trends because, as was the case in the 2019 election, the LNP were incumbent, and the government did not change. The explanatory variable of interest is the hypothetical share of the catchment of each 2016 polling station that would have had access to Sky News had Sky been broadcast at the time (it was not syndicated to FTA broadcast until 2018). The coefficients are all statistically insignificant and much lower in magnitude than our baseline estimates, with both TPP and ALP reflecting the opposite sign to the 2019 election; suggesting that no divergence in trends in vote swing was observable prior to the introduction of Sky News.

c. Robustness checks

Robustness checks for the results pertaining to LNP lead, ALP, LNP and TPP are presented in Table 4. We first consider addressing factors that give rise to patterns of heteroskedasticity in the vote outcome data, including spatial correlation and variation in the number of votes at each polling place. Examination of residuals suggests that the variance of the error term is larger for smaller polling places (Appendix Figure A1). In column (1) we present estimates with the largest possible sample (no data cleaning) therefore include both electoral divisions with negligible variation in Sky News as well as polling places recording fewer than 100 votes. We expect these to produce a smaller estimate owing to the inclusion of stayers and quasi-stayers,

[34] de Chaisemartin *et al.* (2024b) also consider a test based on Yatchew (1997) observing it to be somewhat less powerful. We also calculated these and they are entirely consistent with the Stute test results reported.

and this is marginally so, but the closeness of this result highlights that our result is robust to sample selection.

Also in consideration of heteroskedasticity, in column (2) we use weighted least squares where the weights are designed by following the approach proposed by Solon, Haider and Wooldridge (2015) to achieve precise estimates by correcting for heteroskedasticity. Considering spatial correlation, in column (3) we report estimates from a spatial correlation model based on Colella *et al.* (2019), with the distance threshold set at 10km.[35]

In column (4) we add a control for estimated hypothetical open space signal strength which reflects an estimate of the (hypothetical) signal strength in the absence of any geographic or topographic features such as mountains. Olken (2009) and Wang (2021) argue that controlling for opens space signal implies that identification comes from the residual variation in signal strength that reflects the idiosyncratic topographic factors along the signal transmission pathway. Details pertaining to the calculations of open space signal strength are reported in Appendix B.3. The coefficient estimate reported in row one, the treatment effect on the electoral margin in first preference vote, suggests Sky News reception over the period leading up to the election is associated with 2.048 percentage points increase in the electoral lead of the conservative LNP over the ALP. Row 2 to 4 present estimates of the effect of Sky News FTA broadcast on the LNP (1.048), ALP (-1.00) and TPP (0.724), respectively. Whether the addition of such a control in a difference-in-differences setting strengthens the identification strategy or not is debatable (see Caetano *et al.* 2022); it is reassuring to see that it does not meaningfully impact our results.[36]

[35] We considered alternative distances and results were materially unchanged.
[36] We also note that Enikolopov, Petrova and Zhuravskaya (2011) do not include OSSS on the basis that "Russia is characterized by high distances and relatively low variation in topography" (ibid, p3264) which broadly applies to Australia as well.

In columns 5-7 we consider variations in how we measure Sky News exposure. In column (5) we measure Sky News exposure by instead assuming that the population within a Mesh Block is distributed uniformly across each Mesh Block rather than the area share of building footprints coincident with the Sky News signal (see Section 3 for details on the construction of our Share of Sky coverage variable). In column (6), we consider an alternative definition of Sky News reception in which we extend treatment to include signal strength of 3 (described as 'variable' compared to 4 'good', which was used in the baseline). We expect this variation to weaken the effect of Sky News exposure since some households counted as having access to Sky News FTA will, in practice, have no reception. This is indeed what we see, though coefficients have similar albeit somewhat smaller magnitude and are still significant at the 10 percent level.

In column (7) we convert our continuous treatment variable (percentage of voters exposed to Sky News) to a binary treatment variable, which is 1 if more than 50% voters at a polling place are exposed to Sky News, and 0 otherwise. Although, this is expected to weaken the coefficient estimates, we offer this as an additional informal way to triangulate difficulties arising from the estimation of TWFE models with a continuous treatment variable, specifically illustrating that the estimated effect does not overtly reflect comparisons between level of treatment (and complements the Stute tests reported previously).

d. Informal votes and turnout

We have argued previously that Australia's electoral system provides an optimal setting for examining the effect of partisan news on vote choice, primarily due to its compulsory voting laws and extensive measures to facilitate voting access. These features result in consistently high voter turnout, exceeding 92 percent, minimizing concerns about partisan news influencing electoral outcomes by disproportionately mobilizing voters of one party over another. Indeed,

Australia has been used by political scientists precisely because non-participation is not an issue (e.g., Denemark 2002). Nonetheless, we examine two potential channels through which Sky News could affect participation: invalid (informal) votes and total turnout.

In the context of Australia's high turnout rate and compulsory voting, it has been widely argued that the relevant measure of political participation is the share of invalid votes (Power and Garand 2007; Hooghe et al. 2011; Hill and Rutledge-Prior 2016, p401). Hence, we extend our analysis to examine whether Sky News exposure affected another potential avenue of voter behavior: the rate of informal votes. Informal votes are ballots that fail to meet the AEC's criteria for validity, including incomplete ballots. These data are available at the polling place level. Results presented in Table 5 show that access to Sky News has no statistically significant effect on informal vote rates. This finding suggests that exposure to Sky News does not appear to impact voters' likelihood of casting invalid ballots, whether inadvertently or as a form of protest.

Estimating the effect on turnout presents a methodological challenge – turnout percentage is not a relevant metric at the polling place level because electors can choose which polling place to cast their ballot. However, we can examine the total number of votes cast at the SA1 level based on voters' residential addresses.[37] The result is presented in column 3 of Table 5. The coefficient on Sky News is small and statistically indistinguishable from zero, supporting a conclusion that exposure to Sky News has no effect on turnout.

e. Treatment Effect Heterogeneity

The potential treatment effect heterogeneity attributable to demographic factors is likely to be limited because pre-existing conservative partisan alignment is a strong predictor

[37] The AEC, however, does not provide enrolment numbers by SA1 for the 2016 and 2019 elections.

of consumption of partisan news. In other words, demographic attributes that are positively associated with viewership are likely negatively associated with amenability to change (or visa-versa). Like the proverbial choir, those more likely to watch Sky News may also be least likely to change their political persuasion as a result. To this end, Barone, D'Acunto, and Narciso (2015, p32) observe that mediating effects of demographics had not been observed in studies that look at the effect of biased exposures in the short run. And although our focus on variation within electoral divisions to identify the effect of Sky News on vote choice has several advantages, it is not well suited to revealing potentially subtle treatment effect heterogeneity due to the relatively homogenous population characteristics at this level of granularity.

Nonetheless we collated all available demographic data to assess possible treatment effect heterogeneity. Demographic attributes can never be directly linked to ballots in secret ballot process, so data do not exist to estimate separate models for various demographic sub-populations.[38] As a second-best alternative, we estimate a set of models augmented with treatment intensity interacted with the age and gender composition of electors (AEC 2019) and estimated division-level average demographic characteristics provided by the ABS (2019). We report results cautiously, noting that demographic measures, even in aggregated level, have a number of inherent limitations. Most importantly, the Census captures all people, including those who are not eligible to vote (e.g., non-citizens such as international students). Notwithstanding the limitations of estimating polling place demographics, we estimated separate models for our primary dependent variable, augmented Sky News interacted with population average shares that are: college educated; female, and aged between 19 and 29 and above 65, respectively. Results are provided Appendix Table A1. No evidence of

[38] There are no comprehensive exit polls in Australia. In an analogous continuous treatment difference-in-differences design looking at gender pay gap, Bailet *et al.* (2024) estimate separate models for sub populations.

heterogeneous treatment effect with respect to age, education or gender is observed. These results are reassuring in light of recent developments in the econometric literature showing that heterogeneous treatment effects may lead to biased estimates in continuous treatment difference-in-differences settings (de Chaisemartin and D'Haultfœuille 2020, 2023, 2024; Callaway, Goodman-Bacon and Sant'Anna 2024).

f. Simulations: The Impact on the 2019 Election

We simulate 2019 electoral results under two counterfactuals: one with no Sky News broadcast on free-to-air television, and another with Sky News available to all Australian households. We predict Electoral Division outcomes by applying our TPP coefficient estimate (Table 2, column 2) under scenarios where Sky News exposure is set to zero or one. Using the point estimate, we find that two electoral divisions would have flipped. Under the counterfactual scenario of no Sky News exposure, the ALP instead of the LNP would have won the electoral division of Bass. Under complete Sky News coverage, the LNP would have won Macquarie which the ALP won in the 2019 election. These are meaningful effects in an election in which the LNP obtained an outright parliamentary majority of only two seats. If exposure to Sky News for one third of the population only nine months prior to an election can flip one seat, it is not farfetched to think that longer or wider exposure could change an election outcome.

6. Conclusion

Australia is one of the world's most enduring parliamentary democracies, with a range of institutional features that result in one of the highest and most stable rates of voter turnout in the world. These characteristics, including compulsory voting and uniform voter registration, provide a unique opportunity to examine the influence of partisan news on voter behavior, largely unconfounded by variations in turnout. Our findings offer insights into the limits of

administrative and procedural safeguards against media influence in democratic systems, while shedding light on the mechanisms through which partisan media affects political preferences.

Our study benefits from comprehensive uniform national data, encompassing every state, electoral division, and polling station, providing a more finely grained geographical perspective than previous studies. We combine detailed data on the geographic distribution of the residential address of voters at each polling station across Australia with information about their exposure to Sky News based on broadcast signal data at a resolution of just 60-80 household and measured using the detailed data on building locations.

Based on this newly assembled data, we employ a two-way fixed effect (TWFE) dose response design, also known as a continuous treatment difference-in-differences approach. Our model incorporates electoral division fixed effects to account for factors such as candidate quality and incumbency. This approach ensures that our treatment effect is identified based on within-electoral-division variation in treatment. Our implementation reflects recent developments in the fast-emerging literature on identification of treatment effects in continuous treatment difference-in-differences setups, including a non-parametric test on the pre-treatment period to substantiate the assumption that treatment effects are mean-independent of dose.

We find that Sky News broadcast lead to a 1.5 percentage point increase in the electoral lead of the conservative Liberal National Party (LNP) over the center-left Australian Labor Party (ALP). This effect appears to stem from both an increase in LNP support and a decrease in ALP support. The result is confirmed for two-party-preferred vote share, which reflects preferences distributed via ranked choice voting. These findings are robust to variations in sample and methods addressing spatial heteroskedasticity and polling place size. We find no observable effect of Sky News exposure on the rate of informal votes. Simulations based on our estimated causal effect indicate that Sky News exposure may have changed the outcome in

one electorate, with the potential to affect two electorates under full saturation. Although it would have come close, it would not have changed which party formed government after the election. Nonetheless the result suggests partisan media has an electorally important impact even in a context with extensive institutional safeguards in place.

Past studies have emphasized the benefit of exposure to cross-cutting news media (e.g., exposure of Fox News viewers to CNN), our results suggest a more concerning possibility. A partisan news media that merely reinforces and amplifies existing beliefs is likely to contribute to polarization (bimodality). However, our findings indicate that partisan news can influence not only those already leaning towards its ideological stance but also a broader segment of the population. This suggests a more pervasive impact: partisan news may have the capacity to gradually shift the political outlook of the entire population over time, rather than simply reinforcing existing views, increasing turnout or exacerbating polarization.

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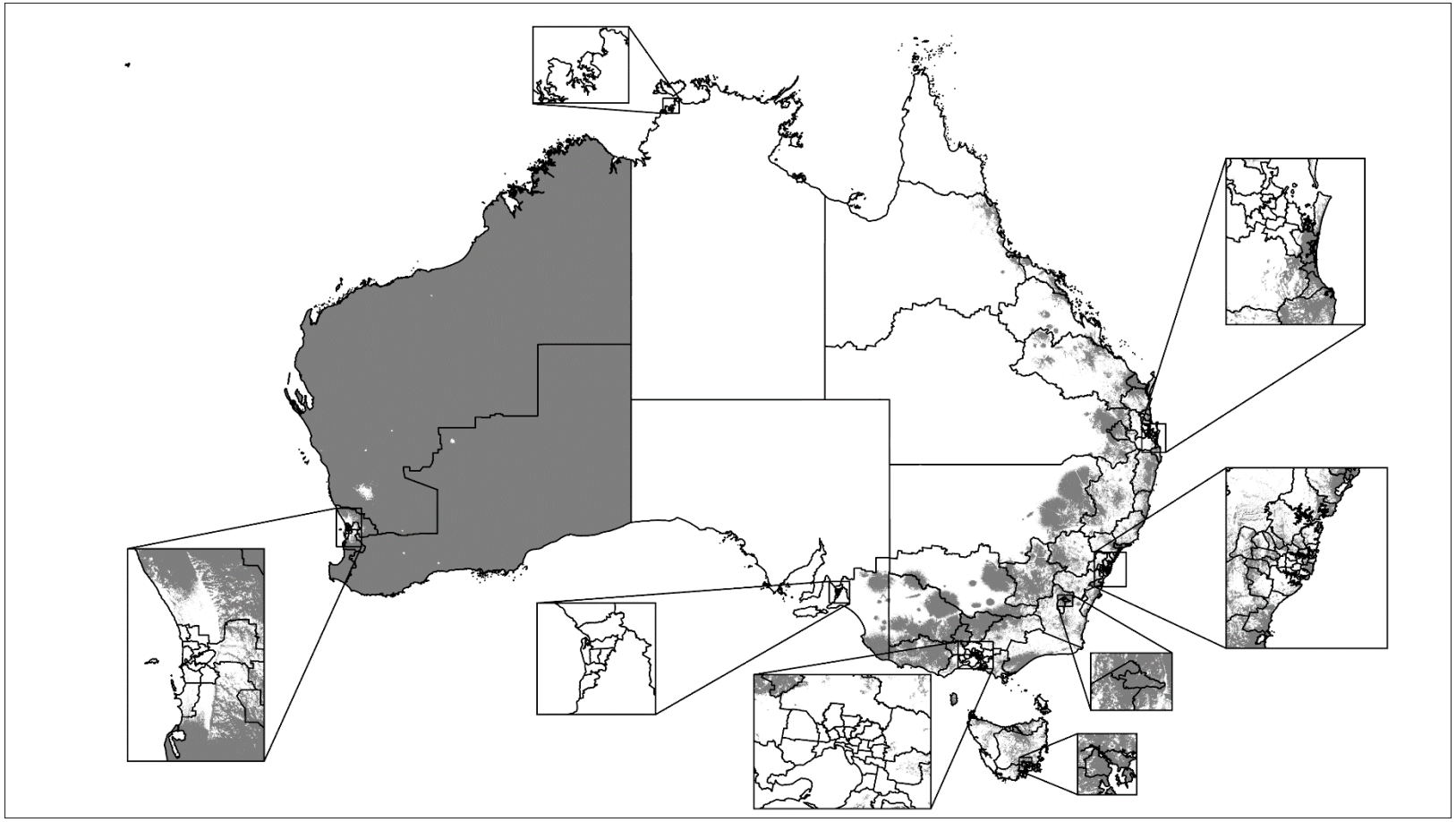
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Figures and Tables

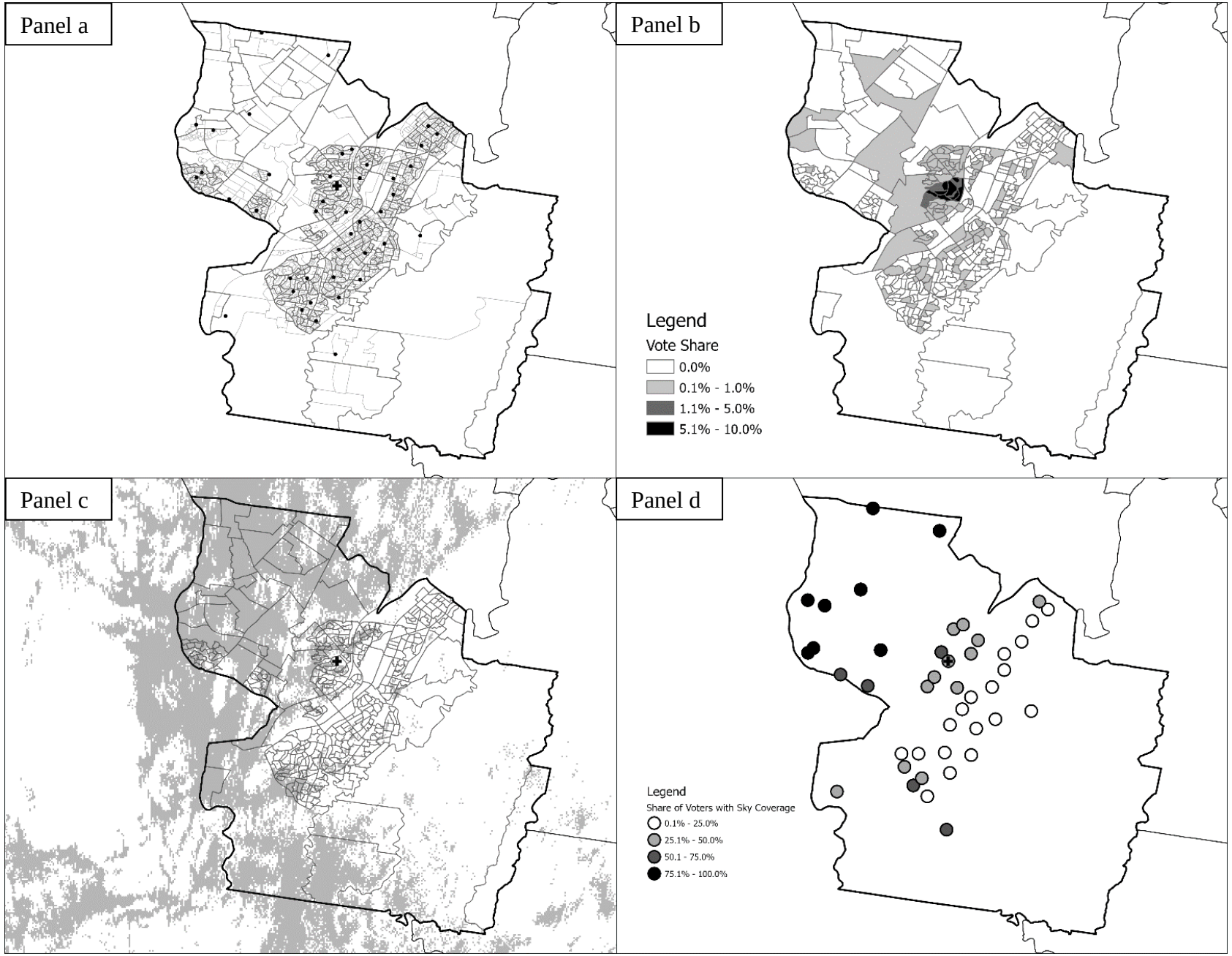
Figure 1. Australian Electoral Divisions and Sky News Reception.



Notes: Solid black lines show Electoral Divisions. Areas shaded in grey show free-to-air Sky News reception. Insets show all 8 State and territory capitals.

Sources: Tower broadcast data and electoral district boundaries were sourced from ACMA (2017a) and AEC (2019c), respectively. Details on the construction of Sky News Reception can be found in Section 3.

Figure 2. Measuring Sky News Exposure at each Polling Place: Example of Eagle Vale Polling Place in the Electoral Division of Macarthur.



Notes: Electoral Division of Macarthur. **Panel (a)** All relevant geography: ED boundaries (dark line); SA1 (fine line); Meshblock (very fine line); 32 polling places within the ED (dots); 'Eagle Vale' PP (cross **+**). **Panel (b)** SA1's which make up the catchment of Eagle Vale PP. **Panel (c)** signal strength raster, (shaded area indicates good Sky News signal). **Panel (d)** Sky News exposure share for voters at PP in Macarthur; Eagle Vale indicated by cross **+**.

Sky News exposure is the weighted average Sky News exposure share across the SA1's which make up the catchment of each polling place. Weights are calculated using the proportion of total **building footprints** in each SA1 that receives good Sky News FTA signal coverage.

Sources: see Section 3.

Table 1. Regression sample summary statistics

	count	mean	sd
Change in LNP lead over ALP (percentage points)	5,295	1.04	10.84
Change in first preference ALP vote share 2016-19	5,300	-2.01	5.96
Change in first preference LNP vote share 2016-19	5,295	-0.97	8.62
Change in Two Party Preferred LNP vote share	4,549	1.66	5.61
Share Sky News	5,300	0.61	0.39
Sky100percent	5,300	0.16	0.37
Sky0percent	5,300	0.10	0.30
Open Space Signal Strength	5,300	89.27	6.03
Total Votes in 2019	5,300	1470.17	2122.39

Notes: Each observation represents a polling station. Vote shares are expressed as percentages. Sky100percent and Sky0percent are indicator variables for polling stations with complete or no Sky News coverage, respectively. Signal strength is measured in dBm. The smaller sample for Two Party Preferred reflects the set of polling places which had both a Labor and Coalition candidate.

Table 2. Dependent variable: Change between 2016 and 2019 Election

	(1) LNP FP Lead	(2) TPP	(3) ALP	(4) LNP
Share Sky News	1.485***	0.649**	-0.755***	0.733**
	(0.519)	(0.328)	(0.286)	(0.330)
Observations	5,295	4,549	5,300	5,295

Notes: Each column represents a separate regression. The dependent variable in each regression is the change in the respective vote share between 2016 and 2019, measured in percentage points. Share Sky News ranges from 0 to 1. All models control for 2016x2019 electoral division fixed effects. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Parallel Trends: Dependent variable: Change between 2013 and 2016 Election

	(1) LNP FP Lead	(2) TPP	(3) ALP	(4) LNP
Share Sky News	0.389	-0.337	0.0492	0.438
	(0.481)	(0.310)	(0.263)	(0.325)
Observations	4880	4148	4880	4880

Notes: Each column represents a separate regression. The dependent variable in each regression is the change in the respective vote share between 2013 and 2016, measured in percentage points. All models control for 2016x2019 electoral division fixed effects. .Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4. Robustness Checks

	(1) All available Polling Places	(2) Weighted Least Squares	(3) Spatial Correlation Model	(4) Controlling for OSSS	(5) Area Weighted Sky Share	(6) Sky3to6	(7) Discretized
LNP FP Lead	1.436***	1.338***	1.485**	2.048***	1.606***	1.144*	0.898**
	(0.536)	(0.493)	(0.599)	(0.539)	(0.522)	(0.584)	(0.350)
TPP	0.589*	0.637**	0.649*	0.724**	0.712**	0.719*	0.415*
	(0.335)	(0.310)	(0.381)	(0.324)	(0.331)	(0.380)	(0.213)
ALP	-0.562**	-0.636**	-0.755**	-1.000***	-0.815***	-0.428	-0.495***
	(0.284)	(0.273)	(0.339)	(0.291)	(0.289)	(0.330)	(0.187)
LNP	0.876**	0.710**	0.733**	1.048***	0.794**	0.717**	0.404*
	(0.354)	(0.306)	(0.370)	(0.345)	(0.333)	(0.359)	(0.225)

Notes: Each table cell represents a separate regression featuring the coefficient estimate and standard error for the Share of Sky News. (1) Including tiny polling places and Electoral Divisions with little to no variation in the Share of Sky News. (2) Weighted least squares approach following Solon, Haider, and Wooldridge (2015) to correct for heteroskedasticity. (3) Spatial correlation model using a 10km distance threshold based on Colella et al. (2019). (4) Control added for hypothetical open space signal strength to isolate topographic influences, per Olken (2009) and Wang (2021). (5) Sky News exposure measured by land area of polling place catchment rather than structures. (6) Broader definition of Sky News reception to include weaker 'variable' signal strength (3 vs. baseline 4). (7) Continuous treatment variable converted to binary (1 if >50% voters exposed, 0 otherwise). All models control for 2016x2019 electoral division fixed effects. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Sky News Share, Informal Votes and Total Votes

	(1) Swing in informal votes 2016-19	(2) Swing in informal votes 2013-16 (Parallel trends)	(3) Swing in total votes by SA1 2016-19
Share Sky News	-0.0388	0.0385	-0.284
	(0.121)	(0.127)	(1.019)
Observations	5,300	4,880	30,356

Notes: Each column represents a separate regression. All models control for 2016x2019 electoral division fixed effects. Models (1) and (2) are run at the polling place level, model (3) is at the SA1 level, the finest level possible for turnout data (see Section 5.d). Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix A. Additional results

Figure A1. Heteroskedasticity - Residuals and polling place size

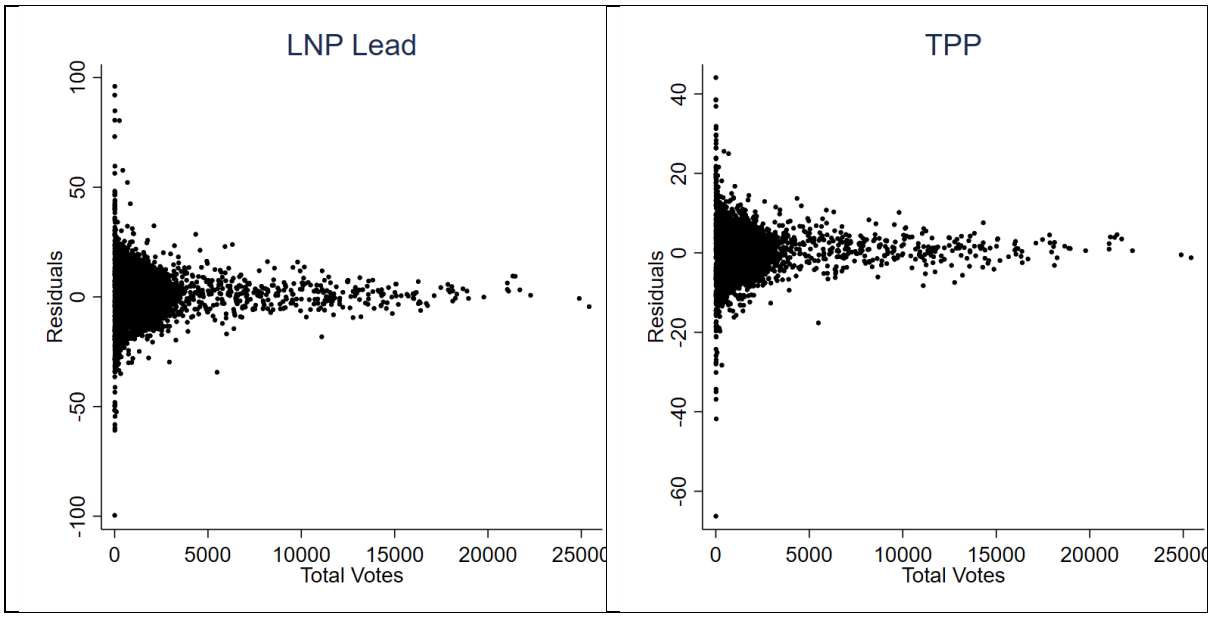


Table A1: Treatment Effect Heterogeneity Analysis.

	(1) LNP FP Lead	(2) TPP	(3) ALP	(4) LNP
Age 65plus (share)	0.147	-0.140	0.0288	0.177
	(0.364)	(0.219)	(0.229)	(0.188)
Age 18-29	0.0360	-0.191	-0.182	-0.145
	(0.507)	(0.317)	(0.302)	(0.295)
Female	0.262	0.138	-0.319	-0.0577
	(0.625)	(0.360)	(0.376)	(0.354)
Median income	-0.00235	-0.000398	0.00520**	0.00285
	(0.00421)	(0.00253)	(0.00255)	(0.00227)
Education Cert III +	11.84	-5.189	-20.74**	-8.886
	(14.11)	(8.701)	(8.207)	(8.351)
Observations	5,295	4,549	5,300	5,295

Notes: Each column represents a different regression. Each table cell presents the coefficient estimate and standard error for the Share of Sky News interacted with the variable indicated in the first column. All models control for 2016x2019 electoral division fixed effects. Robust standard errors in parentheses. * p < 0.10, ** p < 0.05, *** p < 0.01

Appendix B. Data Appendix

1. Polling Place Data

For the primary results, we use 2019 federal election data for the House of representatives at the polling place-level via the AEC Tally Room repository (AEC, 2019c). This includes data on Two party preferred by polling place as well as the series of First preferences by candidate by polling place for the 8 states and territories. We merge the election results with polling place location metadata from the AEC Tally Room. 547 Polling places with no votes recorded, mobile voting and polling places located in hospitals and prisons as indicated within the metadata are removed. The latter are removed due to the substantial variation in the covered populations between elections.

The primary data of interest contains both the polling place ID and various swing variables comparing the 2019 outcomes and the 2016 federal election and are the basis for the first differenced transformations in our difference-in-differences estimate (i.e., Equation 1). Polling stations are typically schools or government administrative buildings. The AEC measures are adjusted for any change in location using population weights based on the address of the voters on the electoral roll who vote at each polling place.

As described in the paper, some electoral boundaries were subject to minor redistributions, that is the boundary of an electoral division can move so that a specific polling place is shifted to a new electoral division. This does not directly impact the measure of swing. Moreover, all regressions include a full set of 2016-electoral-division x 2019-electoral-divison fixed effects such that any re-distributed sub-geography has its own fixed effect. For polling places that are new to 2019, 2016 electoral divisions are identified based on the electoral division of SA1s of the residential location of the voters casting their ballots there (i.e., the 2016 SA1 catchment).

From the 8,192 polling places with non-zero votes recorded, we further cleaned as follows. In 91 cases, polling outcomes in 2019 could not be reliably compared with results in 2016; either because one or the other party were not represented in one of either 2016 or 2019 (29 cases, in these cases raw AEC data typically report swing equal to the vote-share) or because the polling place was new in 2019 and the catchment included more than one 2016 electoral division so that we could not assign 2016-electoral-division x 2019-electoral-divison fixed effects (62 observations). Of the remaining 8,101 polling places reporting vote swing between 2016 and 2019, 1,710 are in electoral divisions with no within variation in Sky News Share and a further 772 have less than 5 percent variation between the polling place with the most exposure and the polling place with the least exposure. 319 are excluded as they have fewer than 100 votes. Leaving us with results data for a maximum of 5,300 polling places.

Polling place catchment data, published by the Australian Electoral Commission (AEC 2019a), report the share of voters that cast their ballot at each polling place according to the Statistical Area Level 1 (SA1) in which they reside. AEC derive these data from electoral roll mark-off data. With an average population size of approximately 400 people, SA1 is generally the smallest unit for public release of census data. This data is used to construct our primary treatment variable, Sky News Share which is described in detail within the main text. In addition, we use the polling place catchment data aggregated at SA1 to construct voter-weighted centroids for each polling place that are used to generate the spatial weights for our Spatial Correlation models in the Robustness Checks. Specifically, for each polling place, we calculate its centroid by taking a weighted average of the SA1 centroids within its catchment area, where each SA1 centroid is weighted by its number of voters.

2. WIN – Sky News Signal Data

Signal propagation data come directly from the Australian Communications and Media Authority (ACMA 2017a). We identify which towers broadcast WIN, and therefore Sky News, based on the callsigns licensed to WIN Television using ACMA records of listed broadcasters by region and State (ACMA 2012). These data were linked to Digital TV Planning data (ACMA 2017b) and in turn to the geocoded tower locations attached to the broadcast signal raster files (ACMA 2017a). The list of WIN callsigns is provided in table A1.

CALLSIGN	Service Area Licensee Callsign
WIN	Southern New South Wales TV1 WIN Television NSW Pty Ltd
AMN	Griffith And Mia TV1 WIN Television Griffith Pty Ltd
MDN	Griffith And Mia TV1 WIN Television Griffith Pty Ltd
MTN	Griffith And Mia TV1 WIN Television Griffith Pty Ltd
RTQ	Regional Queensland TV1 WIN Television Qld Pty Ltd
SDS	Mount Gambier/South East TV1 WIN Television Sa Pty Ltd
LRS	Riverland TV1 WIN Television Sa Pty Ltd
RDS	Riverland TV1 WIN Television Sa Pty Ltd
RTS	Riverland TV1 WIN Television Sa Pty Ltd
MGS	Mount Gambier/South East TV1 WIN Television Sa Pty Ltd
SES	Mount Gambier/South East TV1 WIN Television Sa Pty Ltd
TVT	Tasmania TV1 WIN Television Tas Pty Ltd
STV	Mildura/Sunraysia TV1 WIN Television Mildura Pty Ltd
VTV	Regional Victoria TV1 WIN Television Vic Pty Ltd
WOW	Remote And Regional WA TV1 WIN Television WA Pty Ltd
NRN	Northern Rivers Television Pty Ltd*

Notes: NRN is not listed as licensed to WIN in ACMA 2012; NRN was purchased by WIN in May 2017.

Tower locations in callsign data (ACMA 2017) were matched based on string with tower broadcast signal data (MySwitch 2018). In doing so, we treated tower entries with same

GPS coordinates as the same and remove "town / HP". Towers with broadcast data but no callsign data were dropped as these were found to be radio towers. We manually checked over 100 locations across regional and metropolitan Australia web search, mySwitch and personal communication with antenna repair professionals (Matraville, Sydney) and caravan parks in various locations.

3. Open Space Signal Strength

We use transmitter direction and power output from ACMA (2017) which provides the effective radiated power in Watts using an azimuth system with 1-degree increments. We then convert the power output P for azimuth i for every tower t to dBm using the following formula:

$$x_i^t = 10 \cdot \log_{10} P_i^t \cdot 1000$$

For each SA1 and tower combination, we calculate the azimuth orientation to the tower (i.e., if the tower was the middle of a compass, the polling place would be the degrees away from true North). We can then calculate the power output in dBm that the station would output to a centroid of the SA1 in free space, x^r that is in the i^{th} azimuth to tower t using the following formula:

$$x^r = x_i^t - 21.98 + 20 \cdot \log_{10} \frac{300000}{0.191} - 20 \cdot \log_{10} DistKM_{rt} \cdot 1000$$

Where 300,000 represents is the speed of light in km/s, and 0.191 is a typical frequency of Nine Network signals in GHZ and $DistKM_{rt}$ is the distance to SA1 r to tower t in kilometers. For each SA1, we select the tower with the strongest signal strength. We then calculate the weighted average signal strength for each polling place based on their distribution of registered voters in SA1.