**Model Choices in Observational Media Effects Research:
A Systematic Review and Validation of Effects**

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Abstract

Media effects research has produced mixed findings about the size and direction of the relationship between media consumption and public attitudes (e.g., Bartels, 1993). We investigate the extent to which model choices contribute to these inconsistent findings. Taking a comparative approach, we first review the use of different models in contemporary studies and their main findings. In order to extend and validate this review, we consider the implications for national election studies attempting to measure media effects in election campaigns and recreate these models with the British Election Study 2005-10 panel data. We compare the direction and size of effects of media content *on attitude change* across: between-subjects, within-elections models, in which the effects of individual-level variance in media exposure and content are assessed; within-subjects, within-elections models, which compare the effects of variance in media content for the same individual; and within-subjects, between-elections models that allow us to analyze the links between media content and exposure with attitude change over time. Our review shows some notable differences between models in terms of significance of effects (but not effect sizes). We corroborate this finding in the British campaign analysis. We conclude that to check the robustness of claims of media effects in observational data, where possible researchers should examine different model choices when evaluating media effects.

Keywords : media exposure, media effects, within-subjects models, between-subjects models, between-elections models

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For decades, researchers viewed the media as having a minimal effect on opinion and behavior (e.g., Klapper, 1960). Although more recent work has revised those conclusions the empirical record is still remarkably mixed, ranging from claims of “minimal effects” to “massive effects” (Barabas et al., 2015; Mondak, 1995; Zaller, 1996) to an apparent return to “minimal effects” (Bennett & Iyengar, 2008). With such heterogeneity in mind, Bartels described the body of research on media effects as “one of the most notable embarrassments of modern social science” (Bartels, 1993, p. 267), a state of affairs he attributed primarily to a combination of measurement error and the absence of longitudinal research designs capable of detecting media effects (see also Mondak, 1995). Zaller (2002) later raised an additional problem of research designs: the lack of attention to sample size, and in particular the power of different sample sizes to pick up even medium to large media effects on shifts in voting preferences. Research on media effects in observational studies since then has responded to these seminal critiques in paying close attention to improving measures of exposure (e.g., Dilliplane 2014; Jerit et al. 2013) and to estimating exposure to media content as well as media usage (e.g., Slater 2013, Stevens et al. 2011), but less so to the consequences of different design choices for observational data.

In this paper, we first revisit the validity of Bartels’ and Zaller’s claims with regard to contemporary research, through a survey of statistical methods and substantive results in the published literature on media effects in leading political science and communication journals between 2011 and 2015.² This research has generally been focused on the US case but we draw on a range of country specific and cross-national studies which are increasing in number, with

² Citation counts suggest that media effects researchers have focused more on Bartels’ criticisms: according to Google Scholar the citation numbers for these two articles were 890 versus 89 at the time of writing (November 2017).

implications for research on media effects regardless of the country . We then examine these statistical methods in original analysis of the British general elections of 2005 and 2010 in order to validate and extend the findings of our review. In both the review and the validation, we assess the extent to which the statistical significance, as well as the size and direction of “media effects” are contingent on the methods employed. Examination of media effects are often relies on election studies and a range of designs -- post-election surveys (for example, the mainstay of the Australian Election Study); panel designs (such as the pre-post-election survey deployed in some New Zealand Election Studies and the British Election Study) or repeated cross-sections (e.g. NZES and BES). Therefore, our analysis using BES will be instructive for researchers using other election studies to study media effects. Further, the BES analysis can also be instructive as New Zealand and Australia can be characterized as “Liberal” media systems like Britain (Hallin and Mancini 2004).

Our focus is on media effects research using observational data -- cross-sectional surveys and survey panels -- for two reasons. First, despite their often-noted limitations, these types of data continue to represent the majority of published work on media and are particularly important in studies of media effects in election campaigns. Despite the recognized weaknesses of cross-sectional data, its greatest strength lies in the potential for studying people who have been exposed to real-world treatments (i.e., it captures people as they naturally encounter political information). It therefore behooves scholars to leverage the unique strengths of observational data to understand media effects. Second, Bartels’ and Zaller’s critiques of media effects research were directed at such observational studies. Given the development of new practices that purport to address their concerns, we need to take a step back and systematically evaluate the choices media effects researchers make.

In the years following Bartels’ critique, the scholarly community has developed new practices for estimating media effects with observational (non-experimental) data. These have generally focused

on three areas: 1) better measures of exposure (e.g., Dilliplane et al. 2013; Prior 2009); 2) capturing variation in both media content and exposure by linking the two (e.g., Slater 2013); and 3) using methods that account for omitted variable bias or selection bias (e.g., within subject designs, Barabas and Jerit 2008). The object of this paper is not to focus on measurement, which has been done elsewhere (e.g., Dilliplane et al. 2013), but rather on a comparison of models. In other words, we are interested mainly in how observational data has been used, whether it is linked to media content and how omitted variable bias has been accounted for, and whether this all leads to different conclusions about the presence and direction of media effects.

We focus on three common methods used to examine media effects in observational studies: between-subjects models that utilize variation in media exposure and media coverage across respondents; within-subjects models that utilize variation in media coverage for the same individual during one election; and within-subjects models that utilize variation in media coverage and possibly exposure for the same individual across elections. The results of the review of published research show a degree of similarity in effect sizes but some differences in the likelihood of finding statistical significance, which in part can be ascribed to variation in the number of observations these models are based on. Our review of published research also reveals that the US dominates studies of media effects. Over half the articles reported data from the US and only slightly more than 10% of studies used cross-national data.

There are limitations to our review of the published research -- such as direct comparisons of modeling choices across the same data -- that lead us to extend and validate it using data on the British elections of 2005 and 2010 combined with media content. This analysis shows more clearly how systematic differences in media effects based on different research methods might arise: results based on within-elections models -- both within and between subjects -- are substantively different from results based on between-elections models. We conclude that while media effects research may have moved on in paying close attention to issues of measurement, there is still a relative lack of focus on the consequences of different methods that tap into different micro

processes underlying media effects. We recommend using more than one approach where possible, especially if the analyst is interested in disentangling the effects of exposure and of content.

The Mechanisms of Media Effects

Most extant research has relied on one of three observational methods for identifying media effects: between-subjects models, in which the effects of individual-level variance in media exposure and media content are assessed; within-subjects models, which compare the effects of variance in media content for the same individual; and between-elections models using, for example, panel surveys, that allow us to measure attitudinal change over time. The challenge in these methods is to reflect both variation in exposure patterns (measured at the individual level and usually based on self-reports) and variation in media content or “the message” (sometimes explicitly captured by linking media content to measures of exposure). Each method relies on different sources of variation, which in turn tap into somewhat different micro-processes of media effects.

i. Between subjects, within-election models

Between-subjects models have long been a staple of the cross-sectional study of media effects. The comparison in this method is between respondents with varying levels of media usage for particular outlets -- the source of variation generally derives from differences in reported exposure to general types of media (newspapers, radio, television, Internet) or to specific outlets (e.g., *Guardian*, *The Sun* in the UK, *TV One* or *TV3* in New Zealand). In addition, there is variation between individuals in the media content they are exposed to: individuals who report reading *Guardian* are exposed to different content than individuals reporting reading *The Sun*. As our review of published studies shows, however, linkage studies which combine self-reported exposure with actual media content still represent only about half of the media effects studies (with the other half not including any media content). Furthermore, there are problems inherent to between-subjects models. First, media usage is not randomly distributed. This implies that high and low

media users (even of the same outlet) are likely to be different on factors, often unobserved, other than media usage (on this point see Levendusky, 2011; Soroka *et al.*, 2013). If relevant variables are omitted in the empirical analysis, the purported relationship between media exposure and the dependent variable is likely to be biased (Morgan & Winship, 2007; Pearl, 2009). In recent years, matching techniques -- attempts to replicate randomized experiments by selecting subgroups of “treatment” and “control” with similar distributions on covariates -- have been applied to overcome this omitted variable bias (e.g., Ho *et al.*, 2007). However, matching algorithms are far from a quick fix to identify media effects since one can only match on observables and not on unmeasured covariates (Levendusky, 2011; Soroka *et al.*, 2013). That is, “while matching methods rely on a weaker functional form than regression models, matching cannot correct for an incorrect specification” (Keele & Minozzi, 2013, p. 3). Second, as Zaller (1992) demonstrates, in high intensity contexts such as election campaigns media coverage tends to be relatively high, meaning that there is less variation in content across outlets or exposure, resulting in less variation across individuals, which may lower the possibility of discerning media effects (see also Mondak, 1995).

ii. Within-subjects, within-elections models

Within-subjects models seek to overcome omitted variable bias by comparing the same survey respondent to him or herself, an approach also known as “within-survey, within-subjects” models (see for example Barabas & Jerit, 2009). Because variation is examined “within” a subject across measures, unobserved factors correlated with (self-reported) media exposure are held constant. Barabas and Jerit (2009) draw upon nationally representative cross-sectional surveys that ask respondents multiple questions about different aspects of a political event (e.g., a battery of questions about proposals outlined in the President’s State of the Union address). The critical variation is thus in media content (rather than in content and media exposure in the case of between individual comparisons). For example, if the amount of media coverage varies across topics (e.g. proposals in the president’s address) differences in the outcome measures (e.g., knowledge about the proposals) can be attributed to the variation in media coverage. Similarly, Banducci, Giebler

and Kritzinger (2016) link variation in the amount and tone of coverage of different parties to knowledge of the different parties' issue positions for that same individual. The within-subjects comparison approach retains the strengths of observational studies (examining people learning in the actual world), while improving the ability to make causal inferences about media influence by disentangling between content and exposure. Multiple observations for the same respondents, i.e., “stacked data”, also have the advantage of increasing the number of observations per respondent. When paired with media content, within-subjects models are a very powerful method of estimating media effects using observational data.

iii. Within-subjects, panel design

Instead of making a within-subjects comparison across similar questions at the same moment in time (i.e., in the same survey), panel methods examine responses to the same question within subjects at different moments in time where media coverage varies between observations (Ladd & Lenz, 2009; Levendusky, 2011). Differences in outcome measures between observations at T and $T + I$ are likely due to an intervening factor such as media content or change in media exposure for a particular individual. As in within-subjects, within-elections models, individual-level characteristics that are unobserved but potentially correlated with (self-reported) media exposure are held constant. The additional advantage with this model is that one can compare change over time within the same individual and potentially disentangle separate effects of content and exposure.³

iv. Summary: Designs and the micro-processes behind “media effects”

In general, a “media effect” occurs when exposure to media content is accompanied by a change in attitude or behavior that, in the estimate of the analyst, is not attributable to a third factor.

³ More generally, panel data also have other advantages (e.g., decomposing variation into a between-subjects and a within-subjects component), but there can be problems of non-random panel attrition (Bartels, 1999; Frankel & Hillygus, 2013), and they can require more advanced statistical techniques, such as corrections to standard errors in order to account for the longitudinal nature of the data.

Experimental methods, which are high on internal validity, are better than observational studies at controlling exposure to messages and observing the response. In observational studies, the probability of being exposed to a message is based both on the intensity of the message (an attribute of the media coverage and content) and news consumption behavior (an attribute of individuals) (see in particular Zaller, 1996). Minimally, in order to demonstrate a media effect one needs to show that, after controlling for other potential confounding factors, those with more exposure to a message have different attitudes than those with less exposure. Thus media effects research pays attention to variation at both the individual level of news consumption and in news media content. Each of the three observational research methods is based on a different mix of exposure and content, and each type of use is discussed in the literature as a “media effect,” yet the micro-processes underlying them and their ability to identify media effects in different contexts vary.

Between-subjects, within-elections effects largely stem from variation in media consumption behavior in terms of days, hours, or types of media consumed, and across individuals. Controlling for variation in an individual’s characteristics, “media effects” in this comparison are presumed to be caused by variation in coverage by different outlets or by the level of exposure. Within-subject, within-elections effects stem from variation in content across issues in the same outlet that is consumed by the same individual. The comparison is not between individuals but of the individual with him or herself. Thus, the trade-off in terms of detecting media effects is that variation in media exposure is enhanced, but the attributes of the individual—habitual news reception in Zaller’s (1992) terms—do not vary: what this model picks up is the influence of variation in media content rather than individuals. Within-subjects, between-elections effects stem from differences in media consumption within an individual but add the dimension of time. The focus is now on comparing media at two (or more) points in time and their relationship with the (change in) attitudes and behaviors of an individual at two (or more) points in time. In this comparison, we are still comparing two relatively high intensity media events – elections -- but there could be

additional variation in media exposure within individuals because different elections vary, for example, in competitiveness and the issues that are top of the agenda. This could hold more promise of identifying media effects if there is variation in the political content of media reports across elections for the same individual, or if exposure for the individual varies between the two elections.

Media Effects in the Literature

In order to gain initial perspective on contemporary research methods and findings regarding media effects, we analyze recent published research for 1) the use of different kinds of research methods, and 2) findings of effects of different sizes and statistical significance. This comparison could yield three possible outcomes: 1) all methods produce similar results; 2) methods produce results that imply relationships of a similar size but that differ in terms of statistical significance; and 3) methods produce results that differ in terms of size and statistical significance.

We collected all articles that were published in leading political science and communication journals between 2011 and 2015, based on the top ten journals as reported by Google Scholar.⁴ We searched for “media”, “media” and “politics”, or “media” and “political” in the abstract to identify potentially relevant articles, and within those articles we searched for the pertinent analyses. This provided us with a total of 73 model outcomes in 18 articles of relevance for our purposes in that they directly addressed media effects on public opinion, political attitudes, or knowledge with

⁴ This is not a meta-analysis, which would look at published and unpublished work over a wider range of journals and possibly a greater time period; our intention here is simply to get a systematic idea of the methods that are being used in contemporary media effects research and whether they appear to provide different results. The journals we used were: American Journal of Political Science, American Political Science Review, Journal of Politics, Journal of Common Market Studies, Comparative Political Studies, Journal of European Public Policy, West European Politics, British Journal of Political Science, Annual Review of Political Science and Political Analysis for Political Science (<http://bit.ly/2jsB57K>) and New Media & Society, Journal of Communication, Public Relations Review, Journal of Computer-Mediated Communication, Journal of Pragmatics, Journalism, International Journal of Communication, Public Opinion Quarterly, Communication Research, and Media, Culture & Society for Communication (<http://bit.ly/1MaD3zG>).

observational, large-N data (see Appendix for the list of papers).⁵ We coded the models containing these outcomes on a number of features, but most importantly the kind of method design they employed (see Table 1).⁶ Of the models coded for analysis, 54 of 73 outcomes (74%) relied on a between-subjects comparison, versus within-subjects comparison (over time or at one time point).⁷ We also observe that roughly one-half of the models about media effects did not include any measure of media content (36/73 = 49%), despite Zaller's (1996, p. 18) warning of the necessity of knowing "the content of the mass communication to which individuals are exposed" in order to be able to observe media effects (which are so-called linkage studies)

Although we do not report it in Table 1, the analysis of media effects articles also shows that a majority of studies are conducted in a single country with only a very small minority of papers making cross-country models even though there is reason to believe that media systems matter when it comes to media effects (Barabas *et al.* 2015, Schoonvelde, 2014).

To determine if such methodological choices are in any way related to the model outcomes, we first calculated for each the average d effect size statistic, as calculated by $2 * t / \sqrt{df}$.⁸ This is a measure of the substantive size of the reported effect with larger effect sizes denoting larger substantive effects.

⁵ We exclude papers that report the results from experimental designs from this analysis. A majority of these experiments took place in the lab with only a handful occurring out in the real world in the form of a field experiment or a quasi-experimental design. Since our emphasis in this paper is on a comparison of three research designs (between-subjects, within-elections, within-subjects, within-elections, and between-subjects, between-elections) in detecting large scale media effects, we choose to focus on observational studies alone. In order to be able to compare results with those of our UK analysis, we also exclude studies that have behavioral or emotional rather than cognitive dependent variables. The effect sizes in the observational studies we report are about half as large as the average effect size ($d = 0.21$) in the experimental results that we also collected.

⁶ NB: we only analyzed one within-subjects design (Banducci *et al.* 2015) with no time component. Because of that, we grouped it with the within-subjects over time models. Over Time models refer to panel, time-series or rolling cross-sectional designs in this analysis.

⁸ That is, the reported t -statistic multiplied by two, divided by the square root of the degrees of freedom of the model.

Model	Media Content	Number of Models	Average Effect Size	Proportion of Significant Results
between-subjects	no	29	0.12	0.41
within-subjects	no	8	0.12	0.62
between-subjects	yes	25	0.08	0.36
within-subjects	yes	11	0.12	0.63

Table 1: Breakdown of Media Effects Models & Outcomes

We find that -- on average -- within-subjects models report larger effect sizes ($d = 0.12$) than between-subjects models ($d = 0.10$). We also find that -- across designs -- the presence of media content is associated with smaller average effect sizes ($d = 0.09$ versus $d = 0.12$). These differences are mostly driven by between-subjects models that include media content, which report the smallest average effect size ($d = 0.08$).⁹ It is interesting to note that models that do not include media content -- and by definition cannot distinguish between the effects of media exposure and media content -- report the average largest effect size.

So model choices appear to relate (modestly) to the reported *size* of relationships. What of statistical significance? For this outcome, the results are more pronounced: in 63 percent of cases, within-subjects models reported significant coefficients, compared to 38 percent of between-subjects models. Of models with measures incorporating media content 44 percent of outcomes reported significant results compared to 46 percent of outcomes without media content.

These results imply that we are likely to have found ourselves to be in a scenario in which -- in the published literature on media effects -- model choices may have had some effect on both effect

⁹ Since we considered knowledge, attitudes and evaluations as outcomes we have also broken down our effect sizes for each of these outcomes separately. Because we did not find any systematic differences across outcomes we decided to take them together in the presentation of our results.

sizes and significance of media effects. At least when it comes to effect sizes these outcomes correlate with the presence of media content in the model. In particular, we find that within-subjects models -- which in the current analysis include both within-subjects models at one point in time and over time -- are more likely than between-subjects models to detect media effects. This raises the question whether these differences are indeed driven by model choices per se or by the different individuals and contexts on which these different models were estimated. To tease out these two competing explanations, we need to make a comparison of models, keeping their context and -- most importantly -- the individuals on which they are based the same. To such a comparison we turn next in our analysis of media effects in the UK elections.

There are no New Zealand or Australian studies in our review as they did not match our criteria. However, in New Zealand, where patterns of reported exposure have been examined there tends to be partisan alignment, with Three News viewers less supportive of the National party and newspaper readers more supportive of the National party (see Denmark 1998 p. 91; Atkinson 2004, p 64; Banducci & Vowles 2002, 224). However, there have been some changes in terms of significance of these effects over time, for example TV News 3 exposure had a positive and significant effect on vote for Labour in 1999 but a positive and insignificant effect in 1996 and a significant and negative effect in 2002 (Atkinson 2002, p 64). In Australia, there are partisan divides across elite (broadsheets and public broadcasting) and tabloid media with those using elite media more likely to vote left (Young 2010). Both in terms of the partisan divide across outlets and the inconsistent results, these patterns of media effects in New Zealand and Australia are comparable to Britain and elsewhere: appropriate models are necessary to rule out any bias in the results due to individuals selecting news outlets which tend to be consistent with their own preferences.

Media Effects in British Elections: The Effects of Visibility and Tone on Party Evaluations

We now proceed to extend our analysis of methods in published media effects articles with a comparison of models estimated on data from the British general elections of 2005 and 2010. The role of the media in British elections is particularly relevant, both in terms of existing surveys and media content, making it a useful case for evaluating the three models, as there is widespread recognition of media effects in British elections.¹⁰ British consumption of news media is high: about nine in ten people (89%) reported using television as their main source of information on political issues during the 2005 general election campaign and more than half (54%) said they read their local newspaper for the same purpose (Deacon et al. 2005, p. 31), with similar numbers saying that they watched some television about news and current affairs each week (90%), or read a daily newspaper (58%) in the 2010 election. Most national newspapers in Britain are partisan and take a clear and explicit party line in their editorials and their reporting of daily news (Newton and Brynin 2001), albeit the strong pro-Conservative bias of many newspapers in the 1980s dissipated without being replaced by equivalent sentiment towards (New) Labour (Bartle 2005), or towards subsequent Conservative-led and Conservative governments.

This analysis of the British elections is intended to extend and validate the findings from our survey of the published literature. We think that the case study is a better specified comparison here since all three models are based on the British context over two elections, essentially controlling for unobserved factors related to audience and context that may have influenced our analysis of published results.

¹⁰ This could be disputed on the grounds that the press in Britain is partisan, readers select outlets that accord with their partisan predispositions, and what one observes is therefore selection effects rather than media effects. However, recent studies, for example Stevens et al. (2011) suggest that this account is simplistic and that there are short-term media effects on partisans in British elections. Research on partisan media in the US also suggests effects that are not just an artefact of self-selection (Dilliplane 2014; Smith and Searles 2014).

We are again interested in whether model choices affect both the size and the significance of reported media effects. As with our survey of the media effects literature, we compare the results of a between-subjects model within a cross-sectional survey, a within-subjects model that is also within-survey, and a within-subjects model, between-surveys (panel data). Our UK analysis is in two ways more restrictive than our analysis of the published results. First, since we have access to media content in both the 2005 and 2010 elections we include this in all our models. Second, since for both the 2005 and 2010 elections we have at our disposal pre-campaign and post-campaign survey results we focus on change in party evaluations rather than post-campaign levels alone, which represents a more stronger test of causal influence than a purely cross-sectional model.

This comparison of methods in the UK could yield three possible outcomes: 1) all methods produce similar results; 2) they produce results that imply relationships of a similar size but that differ in terms of statistical significance; and 3) methods produce results that differ in terms of size and statistical significance. The analysis of published results suggests that scenario 3 is the most likely outcome.

For the independent variables in this analysis, we concentrate on two salient and commonly examined aspects of media exposure: the amount of coverage of a candidate or party (visibility) -- widespread media effects are less likely when the probability of exposure is low (Zaller, 1996) -- and its tone (e.g., Althaus & Kim, 2006; Stevens et al., 2011) -- more negative coverage is likely to diminish evaluations of candidates or parties. We analyzed whether the relative visibility and tone of coverage of the three major UK parties at the time--Labour, the Conservatives, and the Liberal Democrats -- in national newspapers in Britain shifts voters' evaluations of those parties using each of the three models.

These comparisons require that there was change in party evaluations during these campaigns that could be attributable to media reports. Figure 1 shows that in 2005 there was a greater change in evaluations than in 2010 but that there was change in both campaigns, though in

2010 this was mainly for Labour. In 2005, the ratings for Labour increased by 38% (from 3.43 to 4.73)—a change of 1.3 points on a 10 point scale. Conservative evaluations improved by 27%, and Liberal Democrat evaluations 28% (from 4.07 to 5.19). All three changes are of an order that if media effects were a significant cause of these shifts they should be picked up with the kinds of sample sizes that are standard in surveys such as the BES (but see Zaller 2002). These shifts in evaluations of the parties indicate what could be considered the maximum potential net impact of media coverage on party evaluations in the campaign.

Figure 1: Campaign Effects in the 2005 and 2010 Elections

Data & Measurement

A comparison of the three models requires measures of the visibility and tone of media coverage of Labour, the Conservatives and the Liberal Democrats at two or more points in time and repeated individual-level measures of media consumption and party favorability ratings at two or more points within and between-elections. The data we use that satisfy these requirements come from two sources. Individual-level survey responses are taken from the 2005–2010 BES panel dataset (Clarke *et al.*, 2010), which has repeated measures of the thermometer ratings of Labour, Conservative and Liberal Democrat parties, of newspaper usage at each election, and also of key control variables at each election. The media content variables we use were gathered by a team of

coders in the Communications Department at Loughborough University, which analyzed election coverage in 2005 and 2010 from ten daily national newspapers also asked about in the BES (see Stevens *et al.*, 2011; Stevens & Karp, 2012). This team coded all articles about the election in newspapers from the front page, the first two pages of the domestic news section, the first two pages of any specialist section assigned to the coverage of the campaign, and the pages containing and facing a newspaper's leader editorials for the duration of the campaign. Using the Loughborough content analysis, we operationalize party visibility by the number of stories in which at least one party actor appeared. Tone refers to the number of stories in which party actors were featured promoting their policies minus the number of articles in which actors were featured defending their own policies from attack. In the analysis that follows we divide the tone and visibility variables by 20 so that a positive one-unit change denotes a 20-article increase (see the Appendix for the distribution of visibility and tone scores for all newspapers).

Our main dependent variable is constructed from ten-point feeling thermometers about the three parties, ranging from 0 (strongly dislike) to 9 (strongly like). These feeling thermometers were administered before and after the campaign in 2005 and 2010, which allows us to construct within-election and between-election models. Crucially, the thermometer items were administered for each party separately which allows us to make within-subjects models.

In the between-subjects model we also control for a number of demographic variables that previous research tells us influence vote choice in Britain (e.g., Clarke et al. 2009). *Education* is measured by two dummy variables, which denote low education and medium education groups (high education individuals form the excluded category). *Gender* is measured by a dummy variable with 0 denoting female and 1 denoting male. *Labour party identification*, *Conservative party identification* and *Liberal Democrat party identification* are dummy variables for individuals who identified with Labour, the Conservatives and the Liberal Democrats respectively in 2005 or 2010. To control for income effects on vote choice we include a measure of *Income* on a 4-point income scale with 1 denoting the lowest income group and 4 the highest income group. *Race* is a dummy

variable for which 1 denotes white respondents. In order to make sure that the models were estimated on the same respondents we selected only those respondents with data on all variables in the models.

Between-Subjects, Within-Elections Model	
	Change in Party Evaluations
Visibility	-0.046 ^{**} (0.018)
Tone	-0.120 ^{**} (0.049)
CONSTANT	0.740 ^{***} (0.270)
<i>Observations</i>	3,312
<i>R-squared</i>	0.011
<i>Adjusted R-squared</i>	0.008
<i>Residual standard error</i>	1.600 (df = 3301)
<i>F statistic</i>	3.600 ^{***} (df = 10; 3301)
<i>Notes:</i>	Standardized coefficients, standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10

Table 2: Between-Subjects, Within-Elections Models: Content and Exposure

Analysis

i. Between-subjects, within-elections models

To investigate potential media effects on change in voter attitudes using between-subjects models, we first regress change in party evaluations across the campaign (that is, we subtract pre-campaign-evaluations from post-campaign evaluations) on the media content variables and control variables. We then stack the data so that each row denotes a change in party evaluations (summing to a total of 6 rows per respondent: Labour 2005 and 2010, Conservatives 2005 and 2010, and

Liberal Democrats 2005 and 2010), and we control for partisan identification, gender, race and income. Table 2 contains the results of an OLS regression model.¹¹

The results point in the same direction for tone and visibility: we find evidence that -- across parties -- an increase in a party’s visibility is associated with a decrease in the change in party evaluations across the campaign (as evidenced by the significant negative coefficient for *visibility*). Furthermore, more negative reporting about a party is associated with a decrease in the change in party evaluations across a campaign (as evidenced by the significant negative coefficient for *tone*).

To capture the size of these effects, we simulate their first differences varying *visibility (tone)* from its lowest to its highest values, and keeping all other (categorical) covariates at their modal values (Choirat *et al.*, 2015; Imai *et al.*, 2008). The results of these *first differences* simulations are shown in Figure 2. The results point in a similar direction: overall, the estimated effects for *visibility* and *tone* are estimated to be different from zero. What is more, their substantive size varies between 0 and 0.5 on a 10-point scale, which would have us conclude that media effects on changes in party evaluations in the British elections of 2005 and 2010 were limited and modest in size.

¹¹ To keep the regression output clear and concise we did not include parameter estimates for the control variables in the table. The model displays the results of the regression of the change in party evaluations on party visibility, party tone, party identification, medium education dummy, low education dummy, gender, income and race. All regression tables were constructed using the Stargazer package in R (Hlavac 2013).

Figure 2: First Differences, Between-Subjects, Within-Elections Models

However, we should keep in mind that these results are not conclusive. After all, tone and visibility are not randomly distributed among media outlets and readers are not randomly distributed among outlets, so problems of selection and omitted variable bias, still a drawback of between-subjects models more generally, may affect these results as well.

ii. Within-elections, within-subjects models

Within-subjects models seek to overcome omitted variable bias by comparing the same survey respondent to him or herself. By doing so both observed and unobserved stable differences between respondents accounted for by design. We are able to conduct such a within-subjects analysis because of two features of the data. First, we have multiple observations of changes in party evaluations—summing to a maximum of 6—for each respondent, both in 2005 and 2010, for Labour, the Conservatives and the Liberal Democrats. And second, we also have *visibility* and *tone* scores for each of those parties within the same newspaper. In essence, these different scores on newspaper content serve as “within-subject” treatment variables for readers of that newspaper. To prepare for a within-subjects analysis we again stacked the BES data so that each row denotes a single observation of changes in party evaluations. These observations sum to a maximum of six for each individual: Labour 2005 and 2010; Conservatives 2005 and 2010; and Liberal Democrats in 2005 and 2010. We then estimate an OLS model, but this time we include fixed effects for individual respondents to account for stable between-individual variation. The results are presented in Table 3.

Substantively, the results are similar to the between-subjects, within-elections model: for a particular individual and newspaper, an increase in a party’s visibility is associated with a decrease in the change in party evaluations across the campaign (as evidenced by the significant negative coefficient for *visibility*). What is more, as a party receives more negative reporting this associated

with a decrease in the change in party evaluations across the campaign (as evidenced by the significant negative coefficient for *tone*).

Change in Party Evaluations	
Visibility	-0.050** (0.019)
Tone	-0.110* (0.049)
Observations	3,312
R-squared	0.240
Adjusted R-squared	0.094
Residual standard error	1.500 (df = 2758)
F statistic	1.600*** (df = 553; 2758)
Notes:	Standardized coefficients, standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table 3: Within-Subjects, Within-Elections Models: Content

We again simulate the size of these media effects by means of an analysis of first differences (Choirat *et al.*, 2015; Imai *et al.*, 2008). The results of our simulations are displayed in Figure 3. In terms of their size, these effects are similar to the between-subjects, within-elections results: for a particular individual, as a party's visibility increases from lowest to highest point this is associated with a decrease in evaluative change of about 0.40 point; as the tone of newspaper articles about that party is moved from most positive to most negative, this is associated with a decrease in evaluative change of about 0.35 point.

Figure 3: First Differences, Within-Subjects, Within-Elections Models

We want to emphasize that the between-subjects within-elections, and the within-subjects, within elections models are estimated on the same individuals and with the same dependent variable. Substantively, we conclude that content matters most since the results of the between-subjects, within elections (content + exposure) and the within-subjects, within elections (content) are very similar. But what if we compare media effects across campaigns? That is, what if we take into account changes in the environment between the 2005 and 2010 elections? To this question we turn in the next section.

iii. Within-subjects, between-elections models

With repeated observations for each individual in both 2005 and 2010 it is also possible for us to make models of the media effects of *visibility* and *tone* across elections. In particular, repeated observations allow us to compare the effects of media content changes from one election to the next (for a similar design, see Ladd & Lenz 2015). We construct a difference-in-differences design, modeling the differences in the changes in party evaluations in 2005 and 2010 as a function of the differences in the *tone* and *visibility* scores in both elections. This model gives us some leverage on whether changes in exposure to the same party influence change in party evaluations for a particular individual. We thus keep constant both party characteristics and stable individual characteristics and observe the effect of changes the campaign media environment.

In order to make between-elections models, we first subtract for all news-reading respondents their change in party evaluations in 2005 from their change in party evaluations in 2010. A positive

score denotes that the change in party evaluations in the 2010 campaign was larger than the change in party evaluations in the 2005 elections, and a negative score denotes the opposite pattern. For the *tone* and *visibility* variables we do the same: we subtract *visibility (tone)* in 2005 from *visibility (tone)* in 2010. We then again stack the data, such that we end up with the following information per individual: difference in the change in campaign evaluations (between 2005 and 2010) for Labour, for the Conservatives and one for the Liberal Democrats, as well as change in *visibility* and *tone* across both campaigns. We then estimate an OLS regression models for our dependent variable on the *visibility* and *tone* variables, including fixed effects for individual respondents. The results of this regression are reported in Table 4.

Difference in Change in Party Evaluations	
Visibility	0.230 ^{***} (0.042)
Tone	-0.092 (0.060)
Observations	1,656
R-squared	0.380
Adjusted R-squared	0.067
Residual standard error	1.800 (df = 1102)
F statistic	1.200 ^{**} (df = 554; 1102)
Notes:	Standardized coefficients, standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

Table 4: Within-Subjects, Between-Elections Models: Content and Exposure

This time, our results point in the opposite direction than those of the between-subjects, within-elections, and the within-subjects, within-elections models: we find evidence that a positive change

in *visibility* across campaigns *increases* the difference in the change in party evaluations for a particular individual. That is, as the number of articles about a party increases between 2005 and 2010, this is associated with an positive increase in the change of party evaluations. Furthermore, we find no evidence for a significant effect of tone.

We again simulate the change in the probabilities of observing positive campaign effects and negative campaign effects varying *visibility (tone)*.¹² The results are reported in Figure 4. Interestingly enough, the estimated effect of visibility on the change in the change in party evaluations is estimated to be about 4 times the size (2) than the estimated effect sizes of our between-elections models.

Figure 4: First Differences, Within-Subjects, Between-Elections Models

Whereas the between-subjects, within-elections models and the within-subjects, within-elections models (mostly) indicated a negative effect of visibility on change in party evaluations, our analysis based on a within-subjects, between-elections model points us in the opposite direction: increasing party visibility increases the change in party evaluations, and tone is not found to have any effect, qualifying our results of the within-elections models.

¹² The lowest value (-1) for *visibility* and *tone* -1 now denotes a situation where visibility (tone) is larger (more positive) in 2005 than in 2010, whereas the highest value (+1) denotes a situation where visibility (tone) is larger (more positive) in 2010 than in 2005.

iv. Tying the Three Models Together

We presented a framework comparing three different models of examining media effects, using between-and within-subjects models, could produce three possible outcomes: 1) similar results, 2) results that are similar in size but differ in terms of statistical significance, and 3) results that differ in terms of statistical significance and size. Our analysis of published results led us to expect that the third outcome was most likely.

Our analysis of the UK elections also shows that we find ourselves in the third scenario: across models the effect sizes vary and differ in terms of statistical significance and direction. With these results in mind, if we had examined media effects using a within-subjects, within-elections model alone we might have written a story about powerful British media and pervasive media effects in British elections with both media visibility and media tone having an effect on change in party evaluations. It is not that such a conclusion would be incorrect so much as it would be incomplete, as evidenced by the substantively different results the within-subjects, between-elections model generates.

Substantively, we have shown that the press appear to have affected voters' party evaluations in two British elections. Yet we would be mistaken to speak of clearly defined "media effects" that point in one particular direction. Instead, the media effects we observed appear to a degree to be model-dependent, in line with our analysis of media effects in published results. However, in many respects our British data offer a better comparison since we are controlling for (some) unobserved factors that we introduced when comparing across designs and contexts. Furthermore, the results from 3 models are all based on the same survey respondents, whereas our analysis of the published literature is of course based on various groups of respondents. Nevertheless, the results of this validation exercise point us in the same overall direction: substantive conclusions about media effects appear in part to be driven by modeling choices.

Conclusion

Bartels' (1993) seminal article on media effects has received more attention for the points it made about problems of measurement than of modeling choices. While Bartels was particularly concerned that research be conducted using data that enable the discernment of effects that are likely to develop over long periods of time, we have argued that an additional and perhaps more pressing issue in contemporary media effects research is the heterogeneity of models coupled with the homogeneity of interpretation of findings as indicative of generalizable media effects. Our analysis of published results in leading political science and communication journals from 2011-15 showed that between-subjects cross-sectional models continue to be most favored; it also showed that both the size of the effects and the conclusions about their significance are model-dependent: within-subjects models -- on average -- are more likely than between-subjects models to report significant effect which are also somewhat larger in size. We confirm these findings in our analysis of the UK elections: size and significance of media effects correlate with model selection.

None of the analyzed articles evaluate more than one model to gauge the robustness. Yet some studies present opportunities for doing so. For example, Goldman (2012) looks at the relationship between media exposure and changes in within-subject white racial prejudice in the 2008 presidential election using a fixed effects model applied to NAES panel data. With regards to his fixed effects model he notes that (p. 669): "constant effects of individual characteristics (whether observable, or unobservable) cannot produce spurious associations. This represents a huge improvement over most observational studies, which rely on potentially contaminated between-person variance." In contrast, we would argue that rather than presenting just a fixed effects (or within-subjects models for that matter) model, a comparison of results with, for example, a between-subjects model would have been enlightening. If the results of both designs indeed point in the same direction this would strengthen the substantive conclusion that "exposure to Obama caused the largest reductions in prejudice among McCain supporters, Republicans, and

conservatives” (p.663). If, however, both designs lead to different substantive conclusions this would shed light on the robustness of the substantive findings in the paper, especially if the number of observations were to remain unchanged. Furthermore, it would allow us to disentangle whether it is media *content* or *exposure* that matters more.

More broadly, what do we learn from our analysis with respect to media effects? First, in the introduction we depicted the empirical record with regard to media effects as ranging from “minimal effects” to “massive effects” (Barabas *et al.*, 2015). Our analysis illustrates that one possible source of this heterogeneity, raised most prominently by Zaller (2002), is to be found in the variety of models combined with variation in the number of observations that have been used to disentangle these media effects. After all, even though all models had some form of change in party evaluations as a dependent variable, when it came to the role of media content they pointed to different substantive conclusions,. In essence, presenting these models side-by-side serves as a robustness check for each separately. Second, this research illustrates the contextual nature of media effects. Rather than thinking of media effects as an on-off phenomenon we think of them as partly conditional on model features and their implied comparisons. Effect sizes, significance levels and causal arrows may not transcend beyond their local context, and as such it seems fruitful both theoretically and empirically that the field of media effects research moves beyond the “minimal effects” versus “massive effects” paradigms.

While, with our original analysis, we have demonstrated these differences in Britain they are instructive for other national election studies where similar data collection efforts are used such as New Zealand or being developed such as in Australia. Given that the New Zealand Election Study uses a pre-post design and has an across election panel this within-subjects design (see www.nzes.org for description) our findings are particularly relevant. As the Australian Election Study collects its first between-elections panel data in 2016-19 this will also present opportunities

to look at Australian media effects with the different designs that we have employed, and thus to establish the robustness of different “media effects.”

In general, we urge researchers to be precise in defining what is the media effect that they expect to find and with what type of design they intend to analyze it. For many authors, testing for media effects involves the examination of treatment effects with secondary data, as in this paper.

Different models may lead to different conclusions, as a result of different micro-processes being tested, the implied treatment (e.g., *content* or *exposure*), statistical power, or a combination of these. Where possible, before concluding that there were or were not “media effects” researchers should subject their findings to additional tests with alternative models, for example combining within-subjects, between-subjects, or panel designs, in order to identify and explain variation in effects and their sources. Such checks on the robustness of findings are now commonplace within other areas of political science research (Plümper & Neumayer, 2012). In the absence of appropriate data for additional tests, our results suggest that researchers should, nevertheless, be more cautious about over-generalizing the implications of their findings.

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Appendix

newspaper	Labour vis	Labour tone	Cons vis	Cons tone	Libdem vis	Libdem tone
daily mail / scottish daily mail	91	25	45	-17	22	-5
daily telegraph	133	42	99	-4	53	-8
express	53	26	45	-16	8	-5
financial times	98	42	61	0	18	-5
guardian	115	47	75	-1	46	8
independent	100	22	60	2	38	-3
(scottish) mirror/daily record	97	15	66	14	31	0
the sun	64	26	36	-3	14	1
times	70	21	56	2	26	-4

Table: Tone and visibility in 2005 newspapers

newspaper	Labour vis	Labour tone	Cons vis	Cons tone	Libdem vis	Libdem tone
daily mail / scottish daily mail	70	4	75	-1	63	6
daily telegraph	100	5	92	8	64	3
express	77	4	73	6	50	10
financial times	58	6	52	17	35	4
guardian	79	3	66	18	46	9
independent	73	8	66	16	46	5
(Scottish) mirror/daily record	89	0	90	10	50	0
the sun	78	4	75	5	56	9
times	82	3	73	11	52	0

Table: Tone and visibility in 2010 newspapers

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