Friends that Matter: How Social Influence Affects Selection in Social Media

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Abstract

We consider the difficult but important question of social influence in the context of media consumption. The correlation between social contact and information consumption means that social influence may be driving media consumption online. Yet, influence in this context is severely confounded with homophily—a set of similar interests, preferences, and habits that simultaneously give rise to both friendship and information consumption, making the causal effect of social influence particularly difficult to identify. We address this theoretical question with an original experiment that overcomes the methodological problem of cleanly dissociating social influence from homophily. We deploy a proprietary Facebook application that instruments social influence based on how often a participant communicates with each of her friends, classifying each as a strong or weak tie. Our platform then randomly assigns the participants' weak- and strong-tie friends to ostensibly share content with the participant in an experimentally controlled replica of her Facebook news feed, then records her reading behavior. Our design allows us to quantify the effect of social influence exerted by strong versus weak ties in a way that is completely independent of the content shared, and hence independent of common interests arising from homophily. Our results show that tie strength exerts a large effect on consumption behavior, suggesting that as Americans shift from following a limited set news outlets to casually browsing social media, their friends and acquaintances shape not only media exposure but also media attention.

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Every model of mass opinion acknowledges the importance of exposure to arguments made in the public sphere, yet few account for *social influence* when characterizing how these opinions diffuse through society. Early work emphasizing the role of opinion leaders in transmitting views from the media elite[s] to the public at large via interpersonal discussion (e.g., Katz and Lazarsfeld 1955; Converse 1962), was supplanted by work emphasizing the role of the mass media that assumed relatively uniform exposure to media content across society (e.g., Zaller 1991, 1992). Today however, the role of social influence is potentially more important in the formulation of mass opinion than ever. Technology—email and social media in particular—make it trivial to share, endorse, or otherwise signal the importance of opinions and ideas expressed in mass media with one's social contacts and peers.[2]

The question of how social influence drives attention to elite opinion online is difficult to quantify. The problem stems from homophily (Lazarsfeld and Merton 1954)—the tendency for individuals to maintain social ties with others similar to themselves—which makes it difficult to identify whether one individual influenced another or whether they merely both have similar interests and/or habits. Because close individuals tend to frequent the same information sources, it is difficult to isolate the effect of exposure to information in a single medium (Adar et al. 2009). Of course, similar individuals are more likely to form social ties, and the more similar a pair of individuals' interests, the more they tend to interact (Granovetter 1973; McPherson et al. 2001), a propensity that extends to the domain of attending to news (Knobloch-Westerwick and Hastall 2006). This creates a difficult problem when attempting to measure the effect of social influence—individuals may be more likely to attend to content that strong ties recommends merely because the pair are interested in the same content. To isolate the effect of social influence on attention, we would need to randomly vary social influence while holding constant the underlying information content.

As part of a novel experiment, we created an experimentally controlled exact copy of

[2]As of 2011, Facebook was among the top sources of referral traffic to the web's top traditional websites (data from Nielsen's Netview database, see Pew 2011); Twitter was a significant source as well. By 2012, 42 percent of Americans reported learning something about the 2012 campaign on Facebook, according to Pew (2012).

the Facebook interface, which communicates with the Facebook OpenGraph API, gathering information about how often an individual communicates with friends and appears in a photograph with friends in order to compute a measure of tie strength for each social contact. The application then randomly assigns strong- and weak-ties to recommend content, embeds this content in an exact replica of the user's current news feed, then collects data on the items that individuals selected as a measure of attention. In what follows, we review the literature on choice and social influence, explain our design in detail, and present our results. The evidence we present shows that social influence affects how consumers decide to allocate attention and consume content, privileging information shared by socially close friends at the expense of socially distant (and often heterogeneous) contacts, which provides strong support to the social influence hypothesis.

A Heuristic Basis for Social Influence in Allocating Media Attention

We expect that individuals choose content to consume not merely based on their own projections of what a story might be about based its title, but use multiple indicators, including social cues related to the person who shared the content. When choosing a media item from a set of headlines, consumers generally seek to maximize utility by employing cue-based heuristic processing (Kahneman 2003; Tversky and Kahneman 1974) rather than pursuing a cognitively-taxing optimization strategy, especially when considering criteria on more than one dimension (e.g., professional relevance and the ability to hold a conversation about current events, see Messing and Westwood 2012). Heuristic processing is also especially when we lack unambiguous information about the costs and benefits of each outcome (Conlisk 1996; Simon 1972), which is certainly the case when trying to anticipate whether we will like or benefit from reading/viewing a news item.

The heuristic cues that people utilize in conventional media have been identified as

source (most often operationalized as the media outlet's "brand," rather than the story's by-line/author, see Althaus and Tewksbury 2002; Iyengar and Hahn 2009; Sundar et al. 2007), story placement, the presence of a photograph, and other editorial cues (Graber 1988) to help them judge the relevance, credibility and importance of a news story. In social media there is no editor and the only traditional cues from current models of news consumption are story title and source (though source often appears unobtrusivly and in a small font). In fact, in social media the notion of what constitutes a "source" becomes even more ambiguous—for some viewers, it might be the person who shared and/or recommended the information, the initial author of the content, or the media "brand" itself, (e.g., Metzger 2007).

Social media open new avenues for social influence in media consumption becasue social media prominently attach social endorsements to content. These include aggregates of social behavior (e.g., the number or proportion of people who read, endorse, and/or comment on content), and personally shared media content that comes from one's network of social contacts. Messing and Westwood (2012) present experimental evidence showing that behavioral aggregates have a strong effect on attention and serve to crowd-out partisan selectivity based on source labels (e.g., aggregate cues override the tendency for Republicans to select Fox News articles over those from the New York Times). Of course, personally shared content conveys a very different type of social cue. Individuals interpret sharing content as a recommendation to attend to it.[3] And of course individuals often rely on the preferences of others to predict personal relevance and utility (Sundar and Nass 2001).

The personal relationship between the sharer and the viewer of content affects how an individual viewer responds to personal recommendations. An individual is more likely to trust others who she has a close relationship with, and to assume that she agrees with their decisions (Chaiken 1987). Furthermore, socially close peers are more likely to have similar preferences (e.g., McPherson et al. 2001). And, the relationship the sharer has with her

[3]Though, an individual may share content that she believes in or to which she objects and/or finds ridiculous, but it is quite unlikely that she would share content she considers to be unimportant and inconsequential.

contacts probably gives her insight into her contacts' preferences. The viewer also knows that the sharer's reputation is on the line when she shares an article, and so is unlikely to send something she considers worthless—individuals generally seek to cultivate and avoid threats to social bonds, no matter how small the the threat (Scheff 2000). The reader might also see value in attending to that her strong ties recommend in case it comes up in a future conversation. All this means that we should see greater social influence when the relationship is characterized by a strong tie than a weak tie. Hence, we manipulate tie strength to examine social influence in our design, which describe in detail below.

Design and Methods

We crafted an experimental platform designed to isolate and measure the impact of social influence when selecting social media news content. The platform first instruments social influence based on behavioral measures of tie strength between participants and their social contacts. Because we create this index based on participants' actual historical interactions with their friends on Facebook (attained with participants' permission via Facebook's application programming interface (API)), we avoid problems with self-reported measures of tie strength such as informant inaccuracy (Bernard et al. 1984) and a tendency to remember well-connected individuals (Marin 2004). Next, our platform presented participants with an experimentally controlled copy of the Facebook news feed. Participants saw content from their actual Facebook news feed (again made possible by utilizing Facebook's API), along with randomly assigned current news stories that we inserted in random order. Each story appeared to have been shared by a strong or weak-tie friend from each participant's actual social network. We randomly assigned strong- and weak-tie friends to recommend each of these articles, effectively manipulating the relationship between the content's recommender and viewer.

Participants were recruited from various courses at a West Coast research university.

They were asked to use our proprietary Facebook application for a study on social media. After granting permission, participants waited for a few seconds while we collected their friend list and previous six months worth of wall posts, newsfeed items, comments, and photo tags. The application them summed the interactions between the participant and the participant's friends (posts on each other's walls, co-occurrence in tagged photographs, comments on each other's posts) to yield a measure of tie strength. Two highly connected friends and two less well-connected friends were then randomly drawn, and assigned to "recommend" news stories that would appear in the participant's newsfeed.

Participants were then shown their current news feed, with the addition of eight news stories embedded at randomly selected points. The order in which these stories were inserted was randomized. External links were disabled to prevent distraction. The eight stories were randomly assigned a highly connected friend recommender (2 stories), a less well-connected friend recommender (2 stories), and to a state in which either the New York Times or Fox News logo was displayed instead of an actual friend (4 stories). News stories were sourced from CNN, the New York Times, and the Wall Street Journal on a variety of topics including politics, international news, sports, and entertainment. Figure 1 presents a screenshot showing the screen layout for the experimental application, which retains the look and feel of the Facebook news feed.[4] All references to the story's source from within the article were removed from the articles so as not to confound the source manipulation. Participants could click on a story to read the full story in a window that opened within the experimental web page. A click on a story constitutes our dependent measure, though it is important to note that participants could read the story's summary which was embedded in the news feed. After the experiment, we issued a survey to respondents asking about relevant socio-demographics and inquiring about the people who ostensibly recommended each story in their news feed. Participants were fully debriefed at the conclusion of the survey.

[4]Though some might find it unusual that a headline such as "super rich see federal taxes drop dramatically" could be from FoxNews.com, in fact Fox News featured this headline with a link to the AP story in their blog, see http://www.foxnews.com/on-air/fox-news-sunday/blog/2011/04/17/fox-news-sunday-snippets-april-17-2011.

Figure 1: Web application replicating Facebook newsfeed with strong- and weak- tie friend randomly assigned to recommend articles.

A total of 183 students participated in the study, 34 of whom were removed from the analysis because they guessed the manipulation.[5] Participants comprised a relatively diverse set of individuals, with 75 identifying as White, 16 as Black, 9 as Hispanic, 27 as Asian, 21 identified as being of another racial/ethnic group, and 1 did not list any such identification. Females were over-represented, with 90 Females to 59 males. The sample skewed politically left, with 64 identifying as Democrats, 19 as Republicans, 24 as Independents or Other, and 42 not providing any political affiliation.

As a manipulation check, we asked respondents how often they interact and how interested they are in the opinions of each friend we classified as a strong tie or a weak tie (and displayed in the experiment). In response to the question "how often do you interact (online or offline) with [friend in question]," on a scale where 1 is never and 7 is daily, participants reported significantly higher overall interaction with those we classified as strong

[5]To alert us as to when deception was detected, we asked participants "Sometimes it is surprising what our friends like. How surprised were you at the news stories your friends recommended?" Those responding "No way! My friends would have never recommended those stories" were removed from the analysis.

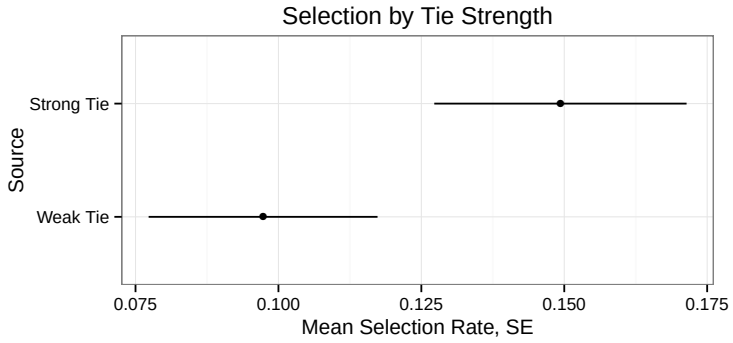


Figure 2: Participants were significantly more likely to select articles recommend from strong tie friends than weak tie friends.

tie friends ($M = 4.71$), than weak-tie friends ($M = 1.86$, $t(148) = -22.679$, $p < 0.001$, paired two-sided).[6] Likewise, participants stated significantly higher interest in friends who we classified as strong ties. On a scale from 1 (not very interested) to 5 (very interested), participants reported significantly higher interest in their strong ties ($M = 3.39$) than weak ties ($M = 1.94$, $t(148) = -14.961$, $p < 0.001$, paired two-sided).

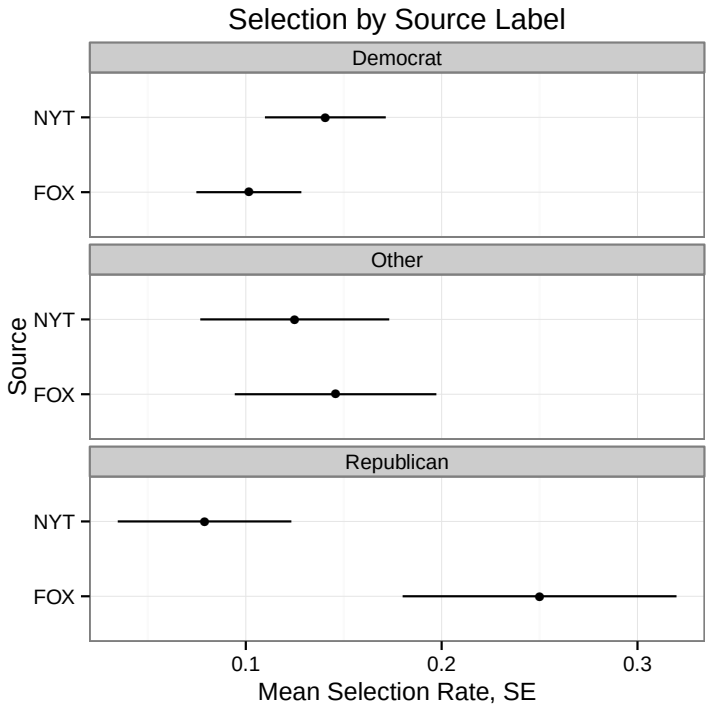
Results

Tie strength between the viewer and the person who recommended the article has a large effect on consumption. Figure 2 shows that recommendations from strong ties ($M = 0.151$) were 50 percent more likely to prompt participants to select an article than recommendations from weak ties ($M = 0.097$).[7] A paired, two-sided t-test comparing each respondent's probability of selecting content recommended by strong versus weak ties reveals that this difference is significant ($t(148) = -2.344$, $p = 0.02$, paired two-sided).

[6] We first take the mean rating for each participants' strong tie friends and weak tie friends, then compute the global means to avoid violating the independence assumption.

[7] All error bars are standard errors. We take the proportion of articles selected per respondent for strong- and weak-tie recommenders to avoid exaggerating our confidence in these estimates by artificially inflating N. Articles displaying a news organization logo were often selected irrespective of source, consistent with a novelty effect (see appendix for details).

Figure 3: Selection by Source-Ideology Agreement



Because news source was also randomly assigned to each article, we can examine the selective exposure hypothesis in the context of social media—that republicans and democrats are more likely to select content with sources perceived as friendly to their ideological viewpoints. Figure 3 shows that Republicans in particular were more likely to select articles their friends recommended if the FoxNews.com ($M = 0.26$) domain appeared in friends' recommendations compared to the NYTimes.com domain ($M = 0.08$, $t(18) = 2.111$, $p = 0.049$, paired two-sided).

We also found some tendencies for people to select content recommended by others with a similar ethnic background. Of course, homophily should be expected to govern the absolute number of articles recommended from friends of various ethnic backgrounds that each participant encountered, so we compare the selection rate—the number of articles selected divided by the number of articles that each ethnic group recommended. Respondents identifying as Black selected at a lower rate articles recommended by contacts they identified as White (none) compared to contacts they identified as fellow in-group members (Black, $\mu = .10$, $t(15) = 2.18$, $p = .05$). Similarly, respondents identifying as Asian selected at a lower rate articles recommended by contacts they identified as Black (none) compared to fellow in group contacts (Asian, $\mu = .18$, $t(19) = 2.53$, $p = .02$). There was no significant pattern among Whites. Of course, we did not manipulate ethnicity and so cannot make a causal claim about its impact on selectivity and leave this for future research.

Discussion

This work provides a direct causal examination of how the strength of the relationship between an individual and a social contact who shares content drives attention, *independent of common interests or other sources of similarity/homophily*, and hence speaks to a broad literature on social influence and selective exposure. Participants were 50 percent (15 percentage points) more likely to attend to media recommended by a strong tie, independent of these confounds. Unlike previous findings examining the impact of behavioral aggregates on selectivity (e.g., Messing and Westwood 2012), personal recommendations did not crowd-out partisan selectivity—we found evidence of selectivity among self-identified Republicans in our sample. Finally, among minority participants, we found evidence of a tendency to act on personal recommendations from individuals of a similar ethnic background, independent of content. We did not manipulate ethnicity so this should not be interpreted as a causal effect (e.g., individuals may form stronger ties with those of the same ethnicity, so tie strength may be driving this effect).

The magnitude of the effect of tie strength on selectivity suggests that social influence is a strong determinate of attention to traditional media items on social networking websites like Facebook. Hence, our findings also have implications for the literature on exposure to ideological viewpoints that cut across ideological boundaries. In particular, our findings suggest that people embedded in social networks characterized by strong but heterogenous ties should be most likely to attend to attitude-inconsistent content. However, exposure to novel content that viewers would not otherwise encounter tends to come from weak ties (Bakshy et al. 2012). Work contacts have been proposed as a likely channel for cross-cutting discourse (Mutz and Mondak 2006), which suggests that individuals with strong but heterogenous work ties should be most likely to attend to cross-cutting viewpoints they encounter in social media.

The role social influence plays in allocating media attention suggests that the rise of social media should have notable implications for how we understand aggregate-level media effects. To the extent that media's agenda is distorted by interpersonal information flows (as in the days before the broadcast era of political communication, see two-step flow models Katz and Lazarsfeld 1955; Katz 1957) and selective consumption (see Klapper 1960; Sears and Freedman 1967; Iyengar et al. 2008; Iyengar and Hahn 2009; Stroud 2010; Messing and Westwood 2012), mass media effects on social media consumers will be more the exception than the rule (Bennett and Iyengar 2008). Indeed, scholars are finding weaker aggregate media effects, such as agenda-setting (Shehata and Stromback 2013). Our findings provide further evidence for those who contend that agendas in the context of social media should be considered highly interpersonal, resembling something more akin to the two-step flow model of political communication, rather than mass media effects or priming (see also Messing and Westwood 2012; Mutz and Young 2011).

There are several limitations to this research. Our sample comprised of college students and had disproportionate allocations of liberals and Whites. Furthermore, we do not examine the effects relative to individuals' substantive preferences for a particular type of content. Of

course, a study that attempts to match the relevant dimensions of content to the participants' preferences that are relevant at the time of the study would be a challenge in and of itself, and we leave that for future research. Nonetheless, our findings suggest that social influence is indeed a powerful force driving news consumption and serves to privilege information shared by socially close friends at the expense of heterogeneous contacts.

Future work should examine how social attributes of recommenders aside from their relationship with the viewer affect attention and selectivity. Such attributes, including common group membership, attraction, social status, perceived expertise, might affect selectivity, message processing, and and/or change the frames through which people interpret such content. Our work also suggests the need to investigate how the structure of ties in social media drive media exposure and attention. The structure of strong and weak ties to partisans should have a substantial effect on the amount of political news and cross-cutting media exposure in particular that one encounters in social media.

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1 Appendix I: Survey Questions

Sometimes it is surprising what our friends like. How surprised were you at the news stories your friends recommended?

1. Not at all, I know my friends!
2. Somewhat surprised, especially for people I don't keep in touch with that often.
3. I was surprised, even by some of the stories my good friends recommended.
4. I was very surprised, I guess I don't know my friends as well as I thought.
5. No way! My friends would have never recommended those stories.

Did you think that your friends didn't actually recommend those stories (i.e., there was a problem with our system)? If so, please let us know:

1. Yes, the problem was: _____
2. No

Are you registered to vote?

1. Yes
2. No

Are you registered as a

1. Democrat
2. Republican
3. Independent
4. Other

Do you consider yourself to be closer to the Democratic Party or Republican Party?

1. Democratic Party

2. Republican Party
3. Neither

What year were you born?

What is your race?

1. White/Caucasian
2. African American
3. Hispanic
4. Asian
5. Native American
6. Pacific Islander
7. Other

What is your gender?

1. Male
2. Female

How many hours per week do you spend online using social media (Facebook, Twitter, etc.)? (Enter a number from 0-40)

Are you a native English speaker?

1. Yes
2. No

What is your class standing?

1. Freshman

2. Sophomore
3. Junior
4. Senior
5. Co-term
6. Graduate degree (e.g., MA, JD, MBA, Ph.D.)

What is your major or most likely major?

Do you consider yourself to be

1. Very conservative
2. Conservative
3. Moderate
4. Liberal
5. Very liberal
6. Don't know/ None of the above

For the following, describe the extent to which you agree or disagree with each of the following statements:
{very strong disagreement - very strong agreement, 9 point}

- I would prefer complex to simple problems.
- I like to have the responsibility of handling a situation that requires a lot of thinking.
- Thinking is not my idea of fun.
- I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.
- I try to anticipate and avoid situations where there is likely a chance I will have to think in depth about something.
- I find satisfaction in deliberating hard and for long hours.

- I only think as hard as I have to.
- I prefer to think about small, daily projects to long-term ones.
- I like tasks that require little thought once I've learned them.
- The idea of relying on thought to make my way to the top appeals to me.
- I really enjoy a task that involves coming up with new solutions to problems.
- Learning new ways to think doesn't excite me very much.
- I prefer my life to be filled with puzzles that I must solve.
- The notion of thinking abstractly is appealing to me.
- I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.
- I feel relief rather than satisfaction after completing a task that required a lot of mental effort.
- It's enough for me that something gets the job done; I don't care how or why it works.
- I usually end up deliberating about issues even when they do not affect me personally.

Please answer the following questions about: ${e://Field/f1}

How often do you interact (online or offline) with ${e://Field/f1}?

1. Never
2. Less than Once a Month
3. Once a Month
4. 2-3 Times a Month
5. Once a Week
6. 2-3 Times a Week
7. Daily

How interested are you in ${e://Field/f1}'s views and opinions

1. (1) Very interested
2. (2)
3. (3)
4. (4)
5. (5) Not very interested

Is ${e://Field/f1}

1. Male
2. Female
3. Don't know

Is ${e://Field/f1}

1. A Republican
2. A Democrat
3. A member of another party
4. Not interested in politics
5. Don't know

Is ${e://Field/f1}

1. White/Caucasian
2. African American
3. Hispanic
4. Asian
5. Native American

6. Pacific Islander
7. Other
8. Don't know

Is ${e://Field/f1}

1. About the same age as you
2. More than 10 years older
3. More than 10 years younger
4. Don't know

Which of the following stories did you see in your news feed?

1. Ivory Coast warlord cites heavy toll
2. Pentagon inquiry clears McChrystal of wrongdoing
3. Documents show US funding Syrian opposition
4. 2012 presidential candidates' friend' social media
5. Killer storms moved too swiftly for many in NC
6. Super rich see federal taxes drop dramatically
7. Celtics beat Knicks 87-85 on Allen's 3-pointer
8. Toyota resumes production at all Japan plants
9. Paul leads Hornets past Lakers in stunning opener
10. Obama to hold meeting on immigration reform
11. Film fans head for 'Rio,' shrug over new 'Scream'
12. Raul Castro votes for new Communist Party leaders
13. Action comedy 'Gallants' named HK best film

14. Nigerian leader wins presidential poll amid riots
15. Duke lacrosse accuser indicted on murder charge

Which of the following stories did your *friends recommend*?

1. Ivory Coast warlord cites heavy toll
2. Pentagon inquiry clears McChrystal of wrongdoing
3. Documents show US funding Syrian opposition
4. 2012 presidential candidates' friend' social media
5. Killer storms moved too swiftly for many in NC
6. Super rich see federal taxes drop dramatically
7. Celtics beat Knicks 87-85 on Allen's 3-pointer
8. Toyota resumes production at all Japan plants
9. Paul leads Hornets past Lakers in stunning opener
10. Obama to hold meeting on immigration reform
11. Film fans head for 'Rio,' shrug over new 'Scream'
12. Raul Castro votes for new Communist Party leaders
13. Action comedy 'Gallants' named HK best film
14. Nigerian leader wins presidential poll amid riots
15. Duke lacrosse accuser indicted on murder charge

2 Appendix II: Additional Diagnostics

In the experiment we presented eight stories, randomly assigned a highly connected friend recommender (2 stories), a less well-connected friend recommender (2 stories), or to a state in which either the New York Times or Fox News logo was displayed instead of an actual friend (4 stories). Analyzing all four conditions simultaneously shows that not only were articles from strong ties more likely to be selected than articles from weak ties, but articles

Table 1: Multi-level logistic regression of selection on recommendation

(Intercept)	-3.361^{***}
	(0.304)
Strong Tie	0.684^{*}
	(0.297)
FOX	0.625^{*}
	(0.299)
NYT	0.851^{**}
	(0.293)
Log-likelihood	−422.899
Deviance	845.798
AIC	857.798
BIC	888.497
N Observations	1232
N Participants	154

that displayed a media logo were also more likely to be selected. Table 1 presents estimates for each effect based on a multi-level logistic regression model of selection, which includes a random intercept for each participant and each story.

Although it would be tempting to conclude from this table that emphasizing the brand of conventional news sources has a positive effect on selectivity comparable to encountering a recommendation from a strong tie friend, perhaps due to perceived credibility, this interpretation is problematic. Items in newsfeed do not appear this way on Facebook,[8] which means this anomalous presentation in the context of an interface otherwise identical to Facebook could very well have caused a substantial novelty effect for these items. Because we have little evidence one way or another, and because the effect of strong versus weak ties is robust, we focus on this effect in this article and leave to future research the relative impact of personal recommendations versus media brands.

Further consistent with a novelty effect is the absence of partisan selectivity among the media-branded articles. When we look at a plot of partisan selectivity in response to media brand when a friend shares it compared to when it appears in one's newsfeeds as an anomalous branded item (Figure 4), we see a complete absence of partisan selectivity, especially among Republicans (for whom selective exposure has been consistently documented to be higher).

[8] If a user installs certain Facebook applications from media outlets, she can encounter content resembling these items. However, this is not default Facebook behavior.

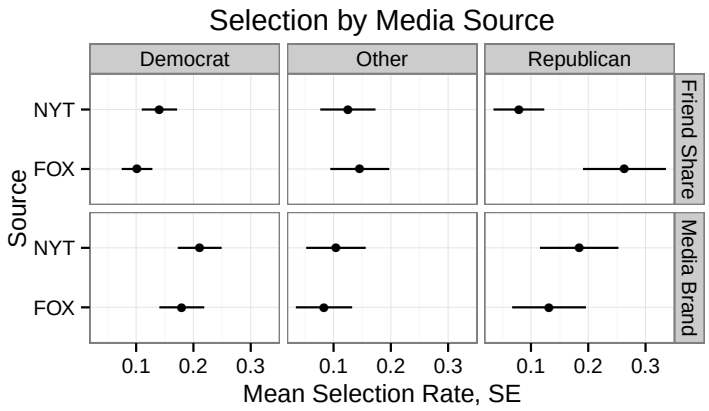

Figure 4: Selection by party Identification and news source reveals partisan selectivity for ecologically valid friend shares but not for media-branded items, consistent with a novelty effect.