

Intermedia Reliance and Sustainability of Emergent Media: A Large-Scale Analysis of American News Outlets’ External Linking Behaviors

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Although concerns over the sustainability of news outlets online have prevailed for the past decade, niche media—with partisan news outlets as a notable example—have been gaining more influence on public discourse. This study suggests information outsourcing via hyperlinks to other outlets as a sociotechnical factor that explains how online emergent media sustain themselves during the contemporary “period of disruption.” Using computational data collected from 89 U.S.-based news outlets, we applied a gravity model to analyze relationships between pairs of outlets and produced a novel spatial network visualization. We found that emergent media rely more heavily on legacy media as they become institutionalized. Further, we find that “antagonistic” linking across ideology is exclusively a conservative phenomenon. We argue that these patterns have been provided by the new technological affordances that have transformed journalism.

Keywords: media ecology, journalism, hyperlinks, gravity model, network visualization

The diversification of media technologies has contributed to a seemingly never-ending supply of information and a high-choice environment that encourages the development of niche media, which assume the relatively unique informational role of a news outlet that narrows the audience it attracts (Nelson-Field & Riebe, 2011; Stroud, 2011). As part of the rise of niche media, partisan reporting has become a fairly common feature of the digital media and news environment (Stroud, 2011). In fact, many newer media entities have emerged that publicly embrace an ideological orientation that thematizes and motivates their reporting (Stroud, 2011). Partisanship acts as a criterion used in selecting news sources from the vast array

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of options available to consumers (Stroud, 2011), and audiences increasingly expect reporting to be consistent with their own views (Iyengar & Hahn, 2009).

The news industry has also faced many challenges in recent decades as technological developments prompt change. The Internet, social media, and smartphones have enabled the rise of citizen journalists and a breakdown of the traditional gatekeeping that existed previously in news publication (Splichal & Dahlgren, 2016). The economic stability of news media has been undermined by decreases in revenue streams as more people get their news from social media, where users often consume news without visiting news sites (Splichal & Dahlgren, 2016). Although some individual news outlets (e.g., *The New York Times*, *The Wall Street Journal*) have seen increases in circulation, circulation and revenue across the news industry overall have declined (Barthel, 2017). All of this instability has contributed to concerns over the sustainability of individual media outlets, particularly niche media with smaller audiences. Amid a changing paradigm of journalism in the 21st century (Elliott, 2009), it is not certain that any new outlet will emerge and survive by mimicking legacy media's organizational forms and goals. We seek to clarify how niche media, particularly partisan outlets, sustain themselves as they compete in an increasingly complex media environment. Through a computational media ecology approach to intermedia hyperlinks, we provide findings that emergent online media survive, in part, by relying on each other as well as more institutionally entrenched media outlets for information sourcing, and also analyze their reliance on different news organizations for sustaining themselves. We also find evidence that online partisan media, as niche media, rely more heavily on other outlets than nonpartisan media do. However, our spatial network visualization shows that the reliance pattern is asymmetric between liberal and conservative media, in the sense that liberal media rely on liberal or neutral institutionally entrenched media, whereas conservative media rely nearly exclusively on liberal media. We characterize conservative media's reliance on liberal media as antagonistic symbiosis because both media outlets benefit from this relationship.

Background

Media Ecology: Institutionalization and Organizational Diversity

Media sociology perspectives often construe the contemporary transformation of the news ecosystem through the narrative of "organizational adaptation to the disruptive technologies" (Lowrey, 2012, p. 225). In this view, new types of organizations emerge as a response to information technologies and the socioeconomic environment, and then gradually find their stable organizational forms in relation to other agents within the news ecology. This "institutionalization" process is strongly governed by a logic that drives organizations to adapt to the ecological environment; first, as the niche approach (Dimmick, 2002) suggests, companies have incentives to optimize their organizational forms for revenue streams—or, in the context of journalism, popularity among news audiences. Second, as organizational institutionalists emphasize, organizations seek to gain legitimacy in an institutional environment, which is often separate from economic optimization (DiMaggio & Powell, 1991; Meyer & Rowan, 1977). The institutionalization path an organization adopts largely decides (news) organizations' bureaucratic form, such as routinized practices and conventions (Lowrey, Parrot, & Meade, 2011). Although institutional perspectives among media sociologists often assume the pursuit of legitimacy is dominant (Lowrey, 2012), this again presumes strong

inertia—the persistence of existing form and function—enough to override momentum toward optimization (Hannan & Freeman, 1984).

Media sociologists often find that the institutionalization of news media is a normal path to broader success, as opposed to continuing to optimize its forms and practices for niches—areas in which an organization outcompetes all other local competitors (Hannan & Freeman, 1977).¹ According to this pattern, emergent media outlets tend to start their operations by assuming an instrumental orientation, assessing exogenous factors in the media environment and strategically responding to perceived challenges (Lowrey, 2012). As media outlets mature, they trend toward an institutional orientation, which emphasizes factors endogenous to the established media ecology in an effort to achieve legitimacy, stability, and a broader audience (Dimmick, 2002; Dimmick & Rothenbuhler, 1984; Lowrey, 2012).

However, organizational forms are not merely a reflection of market force or institutional legitimacy; inflow of data scientists to new organizations changes work ethics and how the profession of journalism is defined (Tandoc & Vos, 2016). As news production becomes much less costly, to the extent that small-scale unique news targeting is economically efficient, the organization of the production process and the division of labor within the news ecology also changes (Picard, 2014). The observation that the environmental forces and organizational forms are interdependent implies two premises. These are pivotal to our analysis of institutional characteristics of organizations that locate them within a news ecosystem relative to other news outlets. First, it is hard to capture media evolution as a directional process from a “preorganizational form” to an “institutionalized form” (Lowrey, 2006) that adapts to the environment that is considered external. Rather, economic drive, orientation toward legitimacy, bureaucracy level, and the strength of inertia constitute distinctive dimensions that describe different characteristics of news organizations. Thus, rather than distinguishing the new form and the old form up front, as in earlier studies, we propose to map different news organizations onto a continuum of the distinctive (but interdependent) dimensions that describe “novelty” of news organizations. This conforms to our “new reality” where the distinction between the roles of new media and legacy media is somewhat blurred (Deuze & Witschge, 2018; Tandoc & Jenkins, 2017).

Second, it is hasty to expect that diversifying news organizations will converge *in a new equilibrium*, following the ecological principle that organizational forms are “isomorphic” to the environment (DiMaggio & Powell, 1983; Hannan & Freeman, 1977). In addition to news blogs, recent intermedia agenda setting literature shows that nontraditional news organizations, such as news aggregators, fact-checkers, and even “fake news” websites, have just as strong agenda-setting power as legacy media, particularly for specific issues (Guo & Vargo, 2018), which expands and redefines the news ecology. Recent organizational ecology turns their attention to how diversity is sustained in the ecology, which was the original motivation of Hannan and Freeman (1977)—“why are there so many kinds of organizations?” (p. 956). For example, Beckert (2010) argued that the typical mechanisms that lead to institutional isomorphism can also lead to

¹ This definition, commonly used in ecological studies, has a slightly different significance from “niche” as in “niche media.” Whereas the former refers to the local demand that a company has dominance over, the latter also implies local demand is relatively small. We use the term to capture the magnitude of demand only when we discuss “niche media.”

divergence, rather than convergence, in institutional changes. In the field of journalism studies, Anderson (2016) called for a rhizomatic turn for the study of media ecology urging colleagues to focus on how the hybridization of different kinds of news agents provide momentum that promote the continual transformation of the news ecosystem. One important force that can sustain the diversity of organizations is symbiosis between them, which is common as a form of information outsourcing in the online economy. In this study, we investigate the relationship between the symbiosis among (broadly defined) news organizations and their diverse forms.

Information Outsourcing and Sustainability of the Online-Borne Niche

The ever-changing sociotechnical media environment creates opportunities for the emergence of new species that target a relatively unique subset of a broader audience (what we understand as “niche media”) in the media ecosystem. In particular, the Internet has lowered the bar of entry and transaction costs for reaching a broad audience, which makes the “long-tail” profitable (Anderson, 2006) and may help to foster the emergence of niche media outlets (Flaxman, Goel, & Rao, 2016). However, this divergent momentum does not always last. Though the production of niche news has drawn attention as a strategy facilitated by the Internet (Picard, 2006), online niche media outlets have not been as financially successful as expected (Cook & Sirkkunen, 2013). This lack of profitability suggests that strategically targeting niche interests alone does not generate enough resources for niche online media to sustain themselves in the long term.

The symbiotic perspective allows us to extend our inquiry about the sustainability of diverse media species in precarious times to intermedia reliance, rather than competition (Weber & Monge, 2017). Unlike the traditional competition approach of the niche analysis of media, which posits that different populations compete for a common resource, the symbiotic approach views intermedia reliance as an important mechanism by which differences among news outlets are preserved as they evolve (Weber, 2012). According to the symbiotic approach, there can exist a beneficial reliance between different species (e.g., emerging media vs. legacy media) and similar species (e.g., blog vs. blog; legacy media vs. legacy media). Further, this reliance can be mutually beneficial (Monge, Heiss, & Margolin, 2008), but also antagonistic in the sense that one species can benefit from harming another species, but not to a fatal degree (Baumard, 2010). In this article, we focus on reliance in terms of information outsourcing, as we will elaborate on in the next section.

Hyperlinks as a Signifier of Interreliance

Hyperlinks in online news provide unique information about interdependent relationships between media outlets and a variety of other actors, and symbiosis in journalism more generally. Hyperlinks allow news organizations to rely on a broad network for gathering and distributing information (Weber & Monge, 2017), and lean on existing media’s legitimacy and credibility or new entrants’ resources with regard to new technologies (Weber, 2012). Furthermore, economists argue that outsourcing information via hyperlinking allows niche businesses to focus on their specialized areas (Dellarocas, Katona, & Rand, 2013; Jeon & Nasr, 2016; Vafoopoulos, 2012). In the context of the present study, these theories imply that information outsourcing via hyperlinks allows emergent niche news organizations, with presumably weaker reporting infrastructure, to sustain their business model by targeting a narrower audience.

Journalism studies of hyperlinking practices have generally found patterns of linking behaviors among different types of outlets to vary by levels of institutionalization (Coddington, 2012, 2014; Cui & Liu, 2017; Larsson, 2013; Stroobant, 2018). For example, whereas legacy media prefer to link to their own news stories to contextualize a given news topic, emergent outlets, such as bloggers, adopt external links to benefit from other outlets' information and credibility, or to (re)interpret previous reporting of other outlets (Coddington, 2012; Cui & Liu, 2017). However, a recent longitudinal study implicated resources spent on hyperlinking as a potential cause of stagnating linking behavior in Swedish online journalism (Karlsson, Clerwall, & Örnebring, 2015). Indeed, recent reports show that media organizations' optimization to the online reporting environment through seemingly low-cost practices like hyperlinking actually require more resources that only financially successful media can afford (Rashidian, Brown, Hansen, Bell, & Albright, 2019). This implies that it is not certain whether less institutionalized organizations hyperlink more. Thus, we pose the following research question:

RQ1: Is the organizational novelty of news outlets associated with the degree to which they link to external sources in their online news texts?

Unlike the institutionalization/normalization approach, the symbiosis approach also attends to the source of outsourced information and the interplay of the borrowing and indirect sharing of information (Weber, 2012; Weber & Monge, 2017). In our context, this implies that if a symbiotic relationship indeed sustains niche media, our analysis should also take into account the nature of the media outlet from which information is sourced. Emergent niche media outlets can cut costs by relying on more institutionalized outlets, who have built more robust reporting infrastructures over time. Moreover, they may gain visibility by piggybacking on legacy media's stories. In this regard, hyperlinking to legacy media can be interpreted as a form of symbiosis that may help emergent media survive.

RQ2: Do news organizations link more to other media outlets with a lower level of organizational novelty?

Partisan News as Niche Media

Unlike the normalization path that media evolution studies might suggest for news outlets generally, contemporary partisan news outlets, as niche media, seem to be retaining their more extreme orientation in terms of the content they produce. In the current political climate, this decision likely narrows their audience of active readers. That is, as partisan news outlets' content becomes more ideologically specialized (i.e., extreme), the audience segment they resonate with narrows. Like niche media generally, by differentiating themselves from other outlets—in this case, according to ideology—partisan news outlets forgo the profits that might come from appealing to a broader general audience.

Considering the above, we complicate our running theoretical hypothesis that interreliance among news outlets helps niche media sustain themselves by proposing the following research question in relation to partisan media as niche:

RQ3: Do partisan media rely more heavily on other news outlets via linking?

In addition to baseline market competition, partisanship implies an adversarial relationship among multiple opinion blocks. As such, for emergent partisan media, relying on other outlets for information sourcing also reflects on their ideological brand. Consequently, though reliance through hyperlinking is symbiotic, we posit that, in line with the concept of the "conflict frame" (Coddington, 2012, 2014), news hyperlinking can be either mutualistic or antagonistic. With antagonism, media outlets involved derive some benefit from an antagonistic relationship. For example, an emergent partisan media outlet may link to a more established media outlet and question the source's credibility or trustworthiness; conservative media have attracted audiences dissatisfied with the "liberal bias" of legacy media (Pfau, Houston, & Semmler, 2007). Notably, even with antagonistic reliance, the relied-on media outlet is still positioned as authoritative by nature of being recognized as an adversary worth mentioning. This brings us to the final research question:

RQ4: Do (conservative) partisan media rely on media outlets with the opposite ideology more often than they rely on nonpartisan media?

Methods

Data/Sample

Two data sets were used in this study: one contains hyperlinks embedded in news stories scraped from online news outlets; the second contains meta-information about each news outlet. To collect the first set of data, we developed a piece of software that collects and extracts hyperlinks from news stories. The software works in three steps: First, it extracts URLs from Media Cloud, an open API, to a database that archives online news stories from 25,000 media sources/organizations by monitoring RSS feeds.² Because Media Cloud only provides metadata about news stories due to copyright restrictions, our software is designed to open all the URLs collected from Media Cloud, and download news stories as its second step. Lastly, the software detects all hyperlinks embedded in the downloaded news stories.

In all, we collected 442,757 news stories published by 89 news outlets for approximately eight weeks, from November 25, 2018, to January 26, 2019. During this time, events occurred that would attract significant media coverage from all sides of the political spectrum. They include (but are not limited to) the following:

- A "Brexit" agreement is reached by the European Union.
- France's "Yellow Vest" movement becomes widespread and violent.
- Special Counsel Robert Mueller implicates President Donald Trump on campaign fraud.
- The U.S. government experiences the longest ever shutdown.

The news outlets were selected from a recent report from the Berkman Klein Center, which lists 106 most influential online news outlets during the 2016 U.S. presidential election (Faris et al., 2017). Some of the websites were not active during our data-collection period, and thus our analyses focus on the 89 outlets that were active.

² Media Cloud was developed and is maintained by a collaboration between the MIT Center for Civic Media and the Harvard Berkman Klein Center for Internet & Society.

Measurement for Reliance

We operationalize reliance in our study by the average number of hyperlinks to another news outlet within a single news story. In other words, we added up the number of hyperlinks from an outlet, i , to another outlet, j , and divided the sum by the total number of news stories published by the news outlet, i . This approach departs from the majority of previous network analyses in communication literature in two ways. First, the reliance score measures “degree” of relationship rather than assuming a binary measure of whether a relationship is present. The binary relationship assumption that is a common simplification in network analysis loses much of the information contained in the network data, particularly when the focus is “strength of relationship” (Opsahl, Agneessens, & Skvoretz, 2010). Second, the reliance measure is also normalized by the number of articles each news organization publishes. Studies about tie strength on communication networks often count the total number of interactions, like commenting on Facebook posts (Bakshy, Rosenn, Marlow, & Adamic, 2012). However, this approach is less sensible when the total amount of information an individual produces is independent of how the individual forms relationships with others.

Measurement for Organizational Characteristics

As discussed, there is indeterminacy in the interdependence among organizational characteristics that mark the “novelty” of news organizations—pursuit of popularity, pursuit of legitimacy, level of bureaucracy, and level of inertia. We operationalized the four dimensions, respectively, as online popularity, recognition by the profession, degree of bureaucratic form, and age. All the dimensions except age and popularity were binary measures (yes/no). Adapted from Lowrey et al. (2011), degree of bureaucratic form consisted of two subdimensions: (1) division of labor and (2) formalization. Division of labor refers to whether or not an organization’s staff has specialized roles. Formalization refers to whether or not an outlet’s website lists terms of use/service, legal policies (e.g., privacy, copyright), and advertising policies.

Age refers to how long the outlets have been in continuous operation. When we could not find a reputable source for a founding year listed for an outlet, we used the earliest year for which the Internet Archive’s Wayback Machine captured a snapshot to determine “founding year.” We used age as a proxy of inertia, assuming that legacy media with a longer history experience relatively more pressure to conform to the organizational structure inherited in American journalism (Lawrence, Winn, & Jennings, 2001). Recognition by the profession concerns whether or not outlets have ever received a Pulitzer Prize and/or a Peabody Award. The premise of this measure for pursuit of legitimacy is that such recognition is likely to be an outcome of pursuing ethics and norms of reporting that have been traditionally recognized in American journalism (Lowrey, 2012). Popularity was operationalized as an outlet’s U.S. Alexa ranking, which is “a measurement of how a website ranks in a particular country relative to other sites over the past month” (Alexa Internet, n.d.). Again, we use popularity as a proxy that measures news organizations’ pursuit of wide popularity, as opposed to narrow appeal (blog-like instrumental orientation; Lowrey et al., 2011).

Measurement for Partisanship

The level of partisanship was drawn from a recent report related to the 2016 U.S. presidential election by the Berkman Klein Center (Faris et al., 2017). They categorized Clinton retweeters and Trump

retweeters first, and then measured the proportion of retweets of each news organization's story from each retweeter group. Projecting this proportion on the range from -1 (liberal) to 1 (conservative), they calculated the partisanship score. We used the absolute value of the partisanship score as a measurement of strength of partisanship, and used the sign of the partisanship measure as an indicator of whether a news outlet is conservative leaning or liberal leaning.

Interaction Terms

We also constructed interaction terms. First, the opposite partisanship variable is a binary variable, which is equal to one when a pair of news organizations has the opposite partisanship. We assumed that "cross-cutting" reliance, where a media outlet links to another with the opposite partisanship, represents antagonistic reliance. We also constructed interaction terms between the conservative dummy variable and the four institutionalization measures as well as the partisanship strength measure.

Gravity Model

We conducted a series of inferential analyses to determine a possible relationship among organizational characteristics, partisanship, and reliance. The dependent variable is the reliance measure between every pair of a hyperlink sender and receiver depending on a research question to test. To capture the impact of characteristics of both hyperlink senders and receivers on their relationship, we constructed all the possible pairs of news organizations. Then, we included measures for both a hyperlink sender and a receiver as independent variables. This specification is similar to the gravity model that is often used to explain international trade data (Feenstra, 2015) or migration (Sgrignoli, Metulini, Schiavo, & Riccaboni, 2015). As in Newton's universal law of gravitation, gravity models assume the (directional) strength of an edge is determined by characteristics of both nodes (link sender and link receiver) that are connected by the edge. Whereas a common analysis of network data often only contains topological positions of each node as its explanatory variables, the gravity model specification allows for attributing a phenomenon of interest to directly observable variables.

In addition, we adopted a tobit regression model to statistically describe a news organization's choice of reliance (Tobin, 1958). The tobit model was adopted because there were many zero reliance cases in the data. These cases should not be considered missing data when news stories from the news organizations are observed, because no hyperlink is their choice rather than a lack of data. The tobit model allows for independent variables to explain both the level of a dependent variable and whether the dependent variable has a nonzero value by specifying a model as follows: $y_{ij} = \max\{0, x_{ij}\beta + \epsilon_{ij}\}$. That is, a news organization chooses positive reliance only if doing so gives better utility than none. We estimated the models using maximum likelihood estimation (MLE) assuming the normal error term.

Spatial Network Visualization

To supplement the inferential analysis with a more qualitative account, we also present a visualization of the interorganization reliance network. We add this approach because (a) the interaction terms that theory implies (e.g., opposite partisanship between a pair of news outlets vs. being conservative

× the opposite partisanship) generates a high correlation among dummy variables, which makes the statistical inference weak, and (b) there are a relatively small number of conservative and extremely partisan media in our data, which makes generalizing statistical inference that bunches different types of news outlets less convincing. To make the visualization more interpretable in our context, we adopt a unique approach that maps nodes (i.e., news outlets) onto an ideology–institutionalization-level space while the links represent the reliance. The location of the nodes in the visualization represent the types of “species” we are interested in the context of our study. Combining this spatial information with the width of links (i.e., intermedia reliance), we could efficiently summarize the associations among relationships between nodes and each node’s meta-information of our interest without reducing them into statistical estimates.

Results

Varying Institutional Orientation Across Different Types of News Outlets

To demonstrate emergent news organizations’ institutionalization level and their heterogeneity, Figure 1 presents a visualization of the institutionalization level based on four dimensions (age, bureaucracy, popularity, recognition), depending on the level of partisanship of each news organization. Eighty-nine news outlets in our data sets are heuristically categorized into four types as a visual aid; following Vargo and Guo’s (2017) categorization scheme, we merged “NYT and Post,” “News agencies,” and “Traditional media” as traditional group, and “Online partisan media” and “Emerging media” as online type. Then, we split the first group into magazines (nondaily publications), national (broadcasting network, news agencies + *The New York Times* and *The Washington Post*³), and regional type (all others). Although this categorization does not directly speak to our take on organizational “novelty” of news organizations, we expect that it helps readers see how the measures are correlated (or not) with the common-sensical categorization of news outlets.

It generally shows two patterns: First, although we generally see more variation in recognition by the profession and age in the left end of the partisan spectrum, the variation gets smaller at both ends of the partisan spectrum. This observation seems to indicate that these two measures of organizational characteristics effectively capture the legacy-ness of traditional media outlets, thus cementing their position in the ecosystem as a “keystone species” that play a crucial role in the sustainability of this system (Paine, 1995). Thus, recently emerged (relative to the legacy news organizations) partisan news organizations are grouped at lower scores.

³ *The New York Times* and *The Washington Post* have been consistently recognized as agenda setters in the media ecosystem in multiple intermedia agenda setting studies (see Vargo & Guo, 2017, pp. 1033–1034).

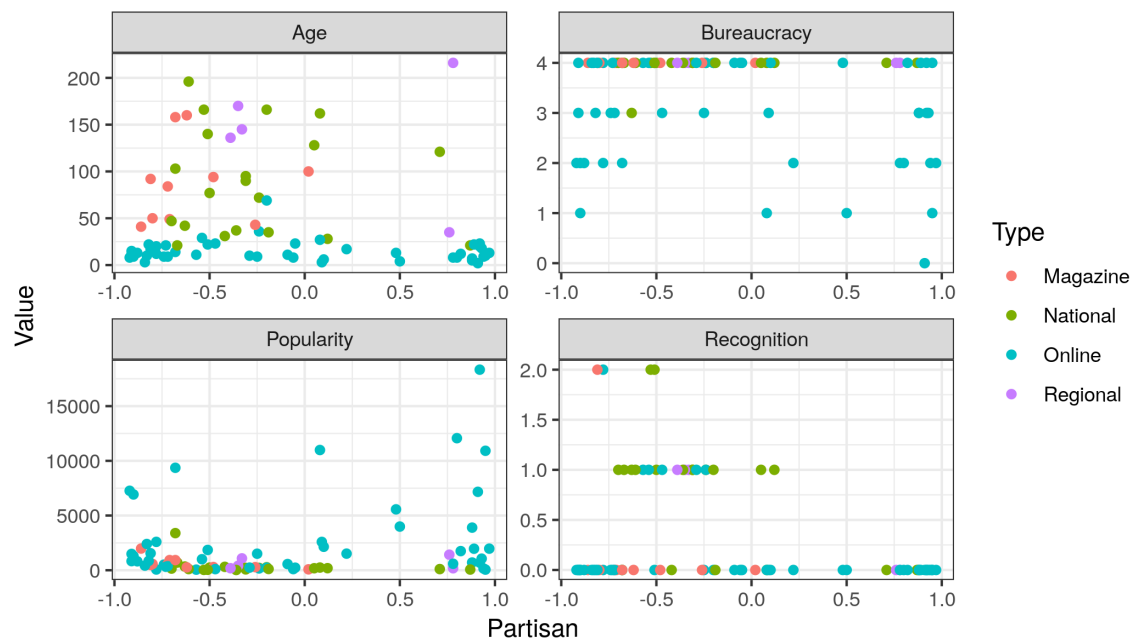


Figure 1. Different institutionalization-level variables plotted against partisanship scores.

On the other hand, more variation is observed in two other measures at political extremes: degree of bureaucratic form and popularity. At both ends of political extremes, the level of bureaucracy is evenly distributed from zero to four, and the ranking ranges from the very top to 27,532, particularly for more right-leaning organizations. The varying degree of bureaucratic form at the extremes confirms our speculation that partisan websites are adopting different levels of an institutional orientation. Further, the levels of attention they achieved from different strategies also vary.

Hyperlinking Behavior Among Various News Outlets

To describe how different types of news outlets are relying on others and being relied on, we calculated each outlet's summed reliance scores toward all others (out-degree), and summed reliance scores from all others (in-degree). Table 1 presents the results. Out-degree (how much a news website relies on others) shows that emerging news organizations (e.g., fact-checking news websites, news curation services, ideologically driven news websites) are most engaged in reliance on others. For example, an online partisan website, Real Clear Politics, is ranked at the second (in-degree: 18.22); a polling aggregation website, FiveThirtyEight, at the third (in-degree: 8.74); a fact-checking site, FactCheck.org, is ranked at the seventh (in-degree: 4.97). A limited number of legacy media, such as *The Atlantic* and ABC News, are ranked high (16th and 20th respectively).

Table 1. Rankings of Out-Degree and In-Degree.

Ranking	Out-degree		In-degree	
	Outlet	Degree	Outlet	Degree
1	MSNBC	20.41	Fox News	49.77
2	Real Clear Politics	18.22	NBC News	21.90
3	FiveThirtyEight	8.74	<i>TIME</i>	18.47
4	RedState	8.39	<i>The New York Times</i>	15.70
5	<i>The Week</i>	7.71	<i>The Washington Post</i>	10.00
6	<i>New Republic</i>	6.29	Townhall	7.29
7	FactCheck.org	4.97	CNN	5.94
8	Vox	3.77	ABC News	4.11
9	Townhall	3.67	Politico	3.95
10	The Intercept	3.08	<i>The Wall Street Journal</i>	3.13
11	Daily Kos	2.64	RedState	2.99
12	ThinkProgress	2.63	<i>Guardian U.S.</i>	2.93
13	Media Matters	2.61	FiveThirtyEight	2.34
14	AlterNet	2.49	Reuters	2.28
15	<i>The Atlantic</i>	2.46	CNBC	1.96
16	Salon	2.41	The Hill	1.92
17	Slate Magazine	2.26	Vox	1.77
18	<i>Mother Jones</i>	2.09	Bloomberg	1.75
19	ABC News	2.04	<i>USA Today</i>	1.66
20	<i>Vanity Fair</i>	1.85	<i>Los Angeles Times</i>	1.55

As expected, many online-borne media with a marked partisan orientation, such as RedState, Townhall, Daily Kos, and ThinkProgress, frequently rely on other outlets. In the rankings for top link receivers (in-degree column), on the other hand, we see some liberal online media, but a few conservative online media are still high ranked (e.g., Townhall and RedState). These observations are generally consistent with the idea that emergent media at a narrower niche have greater incentive to rely on more established media with greater reporting infrastructure.

Inferential Tests for Institutionalization and Reliance

To test our research questions about how news organizations' novelty and partisanship are associated with reliance on others, we ran multiple tobit regression models, with the results summarized in Table 2. We standardized age and popularity because wide variation in those variables make it hard to interpret the estimated coefficients. Further, popularity, measured by Alexa ranking, was reverse coded so that greater numbers mean a higher level of institutionalization, as in other variables.

Table 2. Tobit Model Results for Negative Reliance.

	Model 1	Model 2	Model 3	Model 4	Model 5
Sender					
Bureaucratic (From)	0.0575*** (0.0084)	0.0604*** (0.0086)	0.0646*** (0.0089)	0.0646*** (0.0089)	0.0646*** (0.0089)
Recognition (From)	0.0247 (0.0132)	0.0267* (0.0133)	0.0218 (0.0138)	0.0217 (0.0138)	0.0217 (0.0138)
Age (From)	-0.0348*** (0.0078)	-0.0336*** (0.0078)	-0.0351*** (0.0078)	-0.0350*** (0.0078)	-0.0350*** (0.0078)
Popularity (From)	0.0845*** (0.0202)	0.0852*** (0.0204)	0.0862*** (0.0226)	0.0864*** (0.0228)	0.0864*** (0.0228)
Partisan (From)		0.0399 (0.0254)	0.1551*** (0.0352)	0.1548*** (0.0353)	0.1544*** (0.0353)
Conservative (From)			0.1143*** (0.0329)	0.1372*** (0.0333)	0.1083** (0.0382)
Partisan × Cons			-0.2283*** (0.0479)	-0.2293*** (0.0478)	-0.2282*** (0.0478)
Opposite × Cons					0.0515 (0.342)
Receiver					
Bureaucratic (To)	0.0714*** (0.0104)	0.0714*** (0.0104)	0.0717*** (0.0104)	0.0699*** (0.0104)	0.0681*** (0.0105)
Recognition (To)	0.0485*** (0.0128)	0.0485*** (0.0128)	0.0487*** (0.0128)	0.0445*** (0.0128)	0.0396** (0.0133)
Age (To)	0.0357*** (0.0073)	0.0357*** (0.0073)	0.0357*** (0.0073)	0.0366*** (0.0073)	0.0374*** (0.0073)
Popularity (To)	0.6695*** (0.1342)	0.6716*** (0.1343)	0.6665*** (0.1342)	0.6665*** (0.1342)	0.6291*** (0.1356)
Mutual Opposite				-0.0574*** (0.0150)	-0.0756*** (0.0194)
Pseudo R^2	0.1471	0.1474	0.1504	0.1523	0.1526
N	7,921	7,921	7,921	7,921	7,921

Note. . $p < .1$, * $p < .05$. ** $p < .01$. *** $p < .001$. Pseudo R^2 is McFadden's.

In RQ1, we asked how the hyperlink senders' novelty is associated with their reliance on other media outlets. The results are mixed; age is negatively associated with reliance in all models (e.g., -0.0348 $p < .001$ in Model 1; -0.0336, $p < .001$ in Model 2). However, the level of bureaucracy has a positive impact on reliance (e.g., 0.0575, $p < .001$ in Model 1; 0.0604, $p < .001$ in Model 2). Additionally, popularity of senders was also positively associated with reliance (e.g., 0.0845, $p < .001$ in Model 1; 0.0852, $p < .001$ in

Model 2). However, recognition—as measured by awards reception, which reflects the reputations of news outlets as perceived by the larger industry in terms of news quality—had only a marginal impact on reliance.

Research Question 2 asks whether the novelty of link receivers is also an important determinant of reliance. We found strong evidence that link receivers' novelty is an even stronger determinant of reliance. For example, in Model 1, all novelty measures of link receivers had statistically significant positive effects on reliance (bureaucratic: 0.0714; recognition: 0.0484; age: 0.0357; popularity: 0.6695, all p s < .001), and the estimated coefficients are robust across different model specifications. Further, the coefficients are all greater than their link senders' counter parts, which means that link receivers' "legacy-ness" is a stronger determinant of links between a pair of news outlets than senders' novelty.

For RQ3, which asked about media outlets' partisanship, and its impact on reliance, we added variables that are related to partisanship, generating Models 2 and 3. We found differential effects of partisanship between liberal and conservative outlets. When only link senders' partisanship strength was included (Model 2), it did not show a statistically significant effect (0.0399, $p > .10$). However, when conservative and liberal media are differentiated (Model 3), we found that more partisan media tend to hyperlink more (0.1551, $p < .001$), in support of the notion that partisan outlets, as niche media, rely on others to sustain their business by outsourcing. The estimated coefficients for being conservative (0.1143, $p < .001$) and the interaction term between being conservative and partisan strength (-0.2283 , $p < .001$) imply that the association between partisanship and reliance is positive only for liberal media because when a link sender is liberal (i.e., conservative = 0), the estimated impact of partisanship on reliance is 0.1551, whereas when it is conservative (i.e., conservative = 1), the estimated impact is $0.1551 - 0.2283 = -0.0732$. In other words, conservative outlets rely more heavily on other sources, but the association between their strength of partisanship and reliance is weaker than it is for liberal media.

It was not clear that partisan media rely more on outlets with the opposite ideology in the inferential model (RQ4). In Model 4, we added the variable that represents whether link sender and receiver have the opposite partisanship, which showed negative impacts (-0.0574 , $p < .001$). This is somewhat a natural result that follows homophily (McPherson, Smith-Lovin, & Cook, 2001). However, this does not necessarily disprove the idea that partisan media link to outlets with the opposite ideology relative to more ideologically neutral outlets. In addition, including the interaction term between link senders' conservative orientation and receivers' opposite ideology in the model to test whether conservative media use more cross-cutting hyperlinks (Model 5) did not turn out to be significantly associated with reliance score (-0.0515 , $p > .10$). However, this might follow from the fact that (a) the multiple dummy variables, and their interaction terms generate large correlations, and that (b) the relatively small number of strongly partisan and/or conservative media in our data set may hinder the statistical inference. Thus, in the next subsection, we supplement the inferential analysis with the network visualization mapped onto ideology–institutionalization space.

Visualization of Reliance on Partisanship–Institutionalization-Level Space

In Figures 2 and 3, we map the news outlets in our data set onto the two-dimensional space that is spanned by partisanship level (x -axis) and some measures of novelty (y -axis). We chose popularity (Figure 2) and age (Figure 3) because recognition and bureaucracy are discrete with only three levels. In

addition to the node-locating strategy, we differentiated the colors of the edges based on the partisanship score of link senders (red: conservative/yellow: neutral/blue: liberal). One visible pattern from Figure 2 is that, whereas liberal and neutral media are tightly connected with interreliance (i.e., the dense network on the left and the middle), conservative media on the right are only very sparsely connected with each other. Notable exceptions are Daily Mail and Breitbart, receiving hyperlinks from other far-right media, which are the most popular among them. On the other hand, the conservative partisan media's hyperlinks are mostly directed toward liberal media (i.e., the dense red edges toward the upper left direction), most notably *The New York Times*, CNN, and *The Washington Post*, which are the most popular among liberal media.

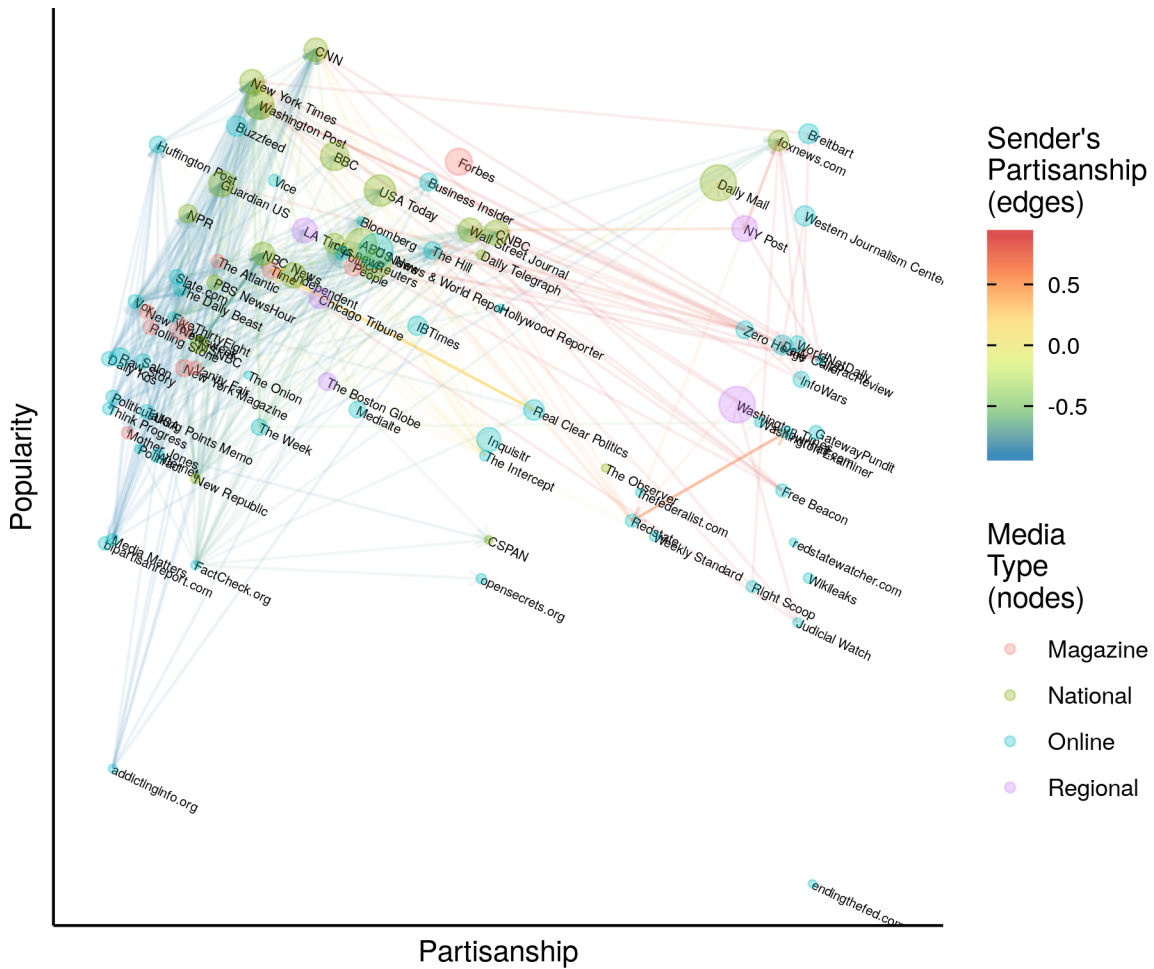


Figure 2. Interoutlet reliance mapped onto partisanship (x-axis) to popularity (y-axis) space.

Another visualization on the partisanship–age space (see Figure 3) shows a very similar pattern. Here, it becomes clearer that conservative outlet *The Washington Times* with a longer history also receives hyperlinks from far-right news outlet Judicial Watch. And most of the hyperlinks from the far-right media (i.e., the red edges) are toward liberal or neutral media, with longer history, on the top-left side.

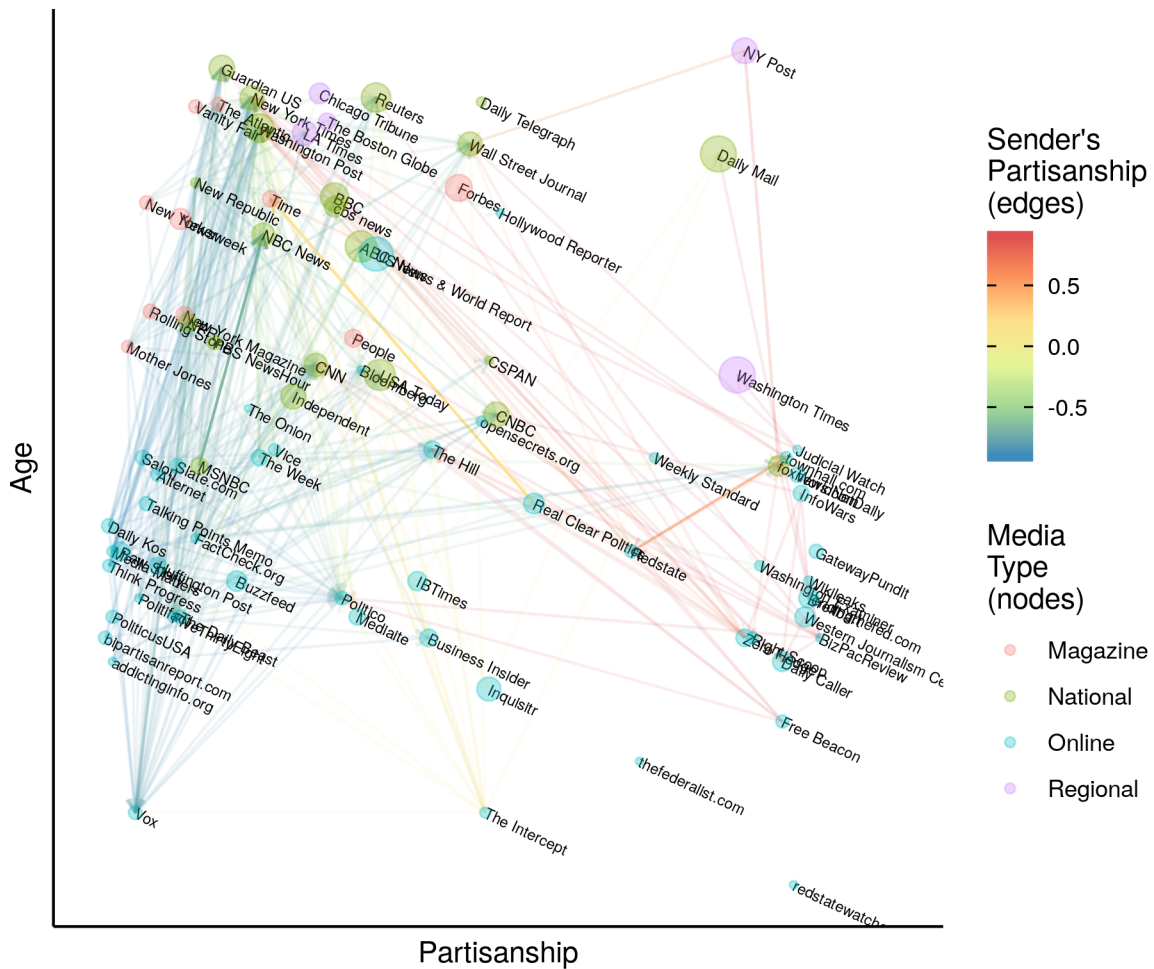


Figure 3. Interoutlet reliance mapped onto partisanship (x-axis) to age (y-axis) space.

These results from the visualization are partially consistent with the notion that partisan media more frequently rely on outlets with the opposite ideology. However, this is an asymmetric phenomenon in the sense that this antagonistic reliance strategy is only being adopted by conservative outlets. The results present an interesting contrast: whereas partisanship is a stronger drive toward overall reliance for liberal outlets, partisanship-driven antagonistic reliance is a conservative phenomenon. This could be a result of the fact that news outlets deemed left-leaning tend to be more popular and have a longer life span than

outlets deemed right-leaning in our data set. Thus, as emergent conservative media's survival strategy, adversarial reliance on liberal legacy media may be their adaptively rational choice.

Discussion

This study investigated how relying on other news organizations via hyperlinks functions as an adaptation strategy for emergent media. Extending the media ecology literature, we hypothesized that news outlets' organizational novelty has a reciprocal relationship with their reliance on other media outlets. The mixed result for RQ1 from the inferential analysis based on the gravity model reflects the multidimensionality of the novelty measures. We found that, although link senders' bureaucracy and popularity levels had a positive impact on reliance (i.e., linking behavior), age had a negative impact. That is, the older an outlet is, the less they rely on other outlets. This finding seems related to the multidimensionality of the evolutionary process; although news organizations tend to produce their own reporting as they successfully sustain themselves in the market, different news organizations adopt different strategies in how they mimic traditional media. As Karlsson and colleagues (2015) pointed out, finding relevant external online resources and linking them with their own news reporting is a costly practice for media organizations, requiring journalists to change their everyday reporting practices and mindsets as professionals (De Maeyer, 2012). Thus, the results seem to indicate that reliance on other media is an outcome of strategic choice as a news organization strengthens and adapts their organizational resources to the online environment. Further, this result provides a potential answer to Karlsson and associates' (2015) hesitation to associate news outlets' institutionalization level and hyperlinking behaviors: Emergent media are more likely to link to others, as "native online species," yet only when they choose or are able to draw on their resources for such a strategy.

The result that hyperlink receivers' novelty is robustly associated with the number of in-links toward them (RQ2) suggests that the role of legacy media is crucial for the adaptation of emergent media. Legacy media seem to remain firmly at the center of news discourse by their role as the producers of information. In other words, if legacy media stopped reporting, then many emergent media would lose a crucial source of information to sustain their news production. Even though legacy media, in general, have suffered financially in recent years, they may be partially maintaining their dominance and relevance through emergent media's hyperlinking behaviors.

As to our question of whether partisan media, as a niche species, rely more on legacy media (RQ3), we found a surprising result that partisanship and overall reliance were positively associated only for liberal news outlets, although conservative media rely more heavily on other outlets overall. From an ecological perspective, this may be because the denser competition on the liberal side makes partisan liberal media retain a narrower target, which leads them to outsource information as a sustainability strategy. Combined with our earlier finding that news organizations with higher bureaucracy level use external hyperlinks more frequently, we might interpret this result as evidence that as liberal partisan media are building organizational infrastructure, they adopt information outsourcing as a strategic choice to help sustain themselves as niche media. If this logic indeed holds, for liberal media, evolving toward conventional routines of news production and editorial process may have a different meaning to partisan media. This suggests that, for liberal media, gaining self-sufficiency in news reporting infrastructure may not be the main motivation for developing conventional routines in news production and editorial processes, since they tend to rely more heavily on

hyperlinked information sourcing. This transformative adaptation strategy may be a new “niche” they found to identify themselves as a new species. This evolutionary path seems halfway between networked journalism—“organizations as loosely integrated units of individuals working together” (Deuze & Witschge, 2018, p. 173)—and traditional perspectives on journalism as a coherent entity that shares the routinized norms of journalism. Building an organization (and therefore mimicking institutional norms) is important to emergent partisan media, but only insofar as they use it to adopt “mutated” journalism practices. In their “speciation” process (Lowrey & Sherrill, 2019), emergent media seem to follow the organizational routines as a means of coping with uncertainty enough to be able to apply a transformed practice of journalism.

The surprising result that partisanship increases reliance only on the liberal side becomes more sensible when our finding about the next research question, whether partisan media rely more heavily on other outlets antagonistically (RQ4), is also considered. As opposed to the patterns from the overall reliance, our visualization showed that antagonistic reliance is asymmetrically a conservative phenomenon. Notably, this hyperlinking pattern of news organizations somewhat contrasts Benkler, Faris, Roberts, and Zuckerman’s (2017) finding that conservative media have formed “an internally coherent, relatively insulated knowledge community, reinforcing the shared worldview of readers and shielding them from journalism that challenged it” (para. 4). We found that conservative partisan media are not entirely insulated from liberal media outlets that might challenge their perspectives. In fact, we found that conservative media are robustly connected with legacy liberal media, whereas they are barely connected with each other in terms of linking behavior. Taken together with the previous result, because strong partisanship renders a news outlet niche, it may make a new outlet more inclined to rely on others to sustain themselves. However, such reliance does not have to be antagonistic. At the same time, this finding implies that the conservative partisan media may invoke antagonistic discourse through the framing power of hyperlinks (Coddington, 2012, 2014). This type of journalism is reminiscent of partisan American journalism around the turn of the 20th century, when most newspapers were affiliated with political parties and engaged in partisan debates (Schudson, 2001). Conversely, when the mainstream media links to fringe websites, these websites take on an agenda-setting role that penetrates the core of the broader media ecosystem (Phillips, 2018), moving them from the periphery to the mainstream.

The emergence of antagonistic reliance on the part of right-wing media also suggests a supply-side/ecological ground of media polarization online. Benkler and colleagues (2017) suggested the asymmetry between conservative and liberal audiences’ attention to traditional and hyperpartisan media was evidence that media polarization online is caused by cultural and political factors, rather than technology. However, we found that the historical short supply of prominent right-wing media in the broader U.S. media ecosystem that Benkler et al. pointed out is crystallized through conservative media’s partisan reporting. This occurs when news outlets produce their content by charging ideologically dissimilar media, and highlights how hyperlinking is a technological affordance that facilitates information outsourcing as a viable sustaining strategy for emergent media. This explanation sheds light on a longer term process in which technological affordances and the historical development of the media ecosystem are intertwined to result in the transformation of journalism practices.

Limitations

The limitations of this study range from issues regarding academia's shifting definition of partisan media and the omission of the direct measure of antagonistic reliance. We chose to operationalize antagonistic reliance heuristically as an ideologically cross-cutting hyperlink because (a) we could not find stable measures for the sentiment of specific hyperlinks separate from the sentiment of an entire news story that can scale up, and (b) it is reasonable to assume that cross-cutting hyperlinks are significantly more likely to be antagonistic than like-minded hyperlinks. Despite this, as computational analysis becomes more advanced, future research may pursue this as a measure of understanding the dynamics of the current media ecosystem that is becoming more fractured and partisan.

Another limitation of this study is that it was not a longitudinal analysis that spanned many election cycles/years. Future studies should pursue an analysis of these ecosystems across a longer period—and how outlets react to and report on significant political and social events, and how these streams of information frame and shape the lived realities of audiences. Despite these limitations, we believe that this study sheds light on important aspects of the contemporary media ecosystem, and hope other researchers will build on these findings in the future.

Conclusion

By introducing methodological innovations—the gravity model and the spatial projection of an interorganization network—that relate online news outlets' information outsourcing with their institutional characteristics, we have suggested that information sourcing via hyperlinks is an important technological affordance that sustains emergent partisan media at the core of the media ecosystem. In this, we found that the overall patterns of external hyperlinks among news organizations consistently show that how a news organization relies on other media depends on the location of the organizations within the media ecosystem and the relationship with the link receivers. Emergent media rely on others, but such a strategy seems to demand resources. Liberal partisan media, as niche media, are more likely to rely on other media outlets for resources, but using politically cross-cutting links was an asymmetrically conservative phenomenon. We suggest this asymmetry has resulted from the historical short supply of prominent right-wing media in the broader media ecosystem. These results imply a complex relationship between (a) the media environment that serves as resources and technological affordances (environmental approach), (b) institutional organizations of news media (meso-level approach), and (c) the symbiotic relationships among organizations (network approach) to give rise to the emergence and sustainability of new media species (rhizomatic approach). Our analysis demonstrates that relying on other media outlets' reporting via hyperlinks is, in some cases, antagonistic, affected by the path-dependent partisan landscape of American media. The resurrection of partisan reporting that is based on partisan contentions and debunking (Bennett & Iyengar, 2008), which characterized Western journalism a century ago, appears to be facilitated by this sociotechnical complexity.

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