Received: 21 April 2023 | Revised: 14 September 2024 | Accepted: 4 October 2024

DOI: 10.1002/sej.1519

RESEARCH ARTICLE

SMS | Strategic Entrepreneurship Journal

WILEY

Shifts in national entrepreneurial culture: The promise of linguistic cultural artifacts and machine learning analysis

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Funding information
Spanish State Research Agency (AEI) of the Ministry of Science, Innovation, and Universities, Grant/Award Number: PID2020-117248GB-100

[Correction added on 2 December 2024, after first online publication: Text and figures have been updated for accuracy in this version.]

Abstract

Research Summary: We develop a dynamic view of national entrepreneurial culture by examining the linguistic evolution of media-produced cultural artifacts—entrepreneurship-related newspaper articles. Applying machine learning to 690,088 articles from 103 newspapers across the United States between 1996 and 2016, we identify a growing positivity bias toward entrepreneurship at the national level evidenced by rising emotional tone and declining analytical thinking. This bias varies by topic, with "entrepreneurial aspirations and journeys" driving the trend. Our analyses also suggest this bias may encourage the creation of new ventures but limit venture growth potential. We highlight theoretical and methodological contributions to research on national entrepreneurial culture and identify promising avenues for future research.

Christina Kyprianou and Siddharth Vedula contributed equally to this study.

Managerial Summary: We examine how a country's cultural attitudes toward entrepreneurship change over time by studying relevant newspaper articles. We also consider if any changes in such attitudes may have implications for the quantity and quality of a country's new ventures. After analyzing 690,088 articles from 103 newspapers across the United States between 1996 and 2016, we find a growing positivity bias toward entrepreneurship evidenced by increasing rates of positive tone and decreasing rates of analytical thinking. This bias is largest when media articles discuss entrepreneurial aspirations and journeys. Our analyses also suggest this bias may facilitate the creation of new ventures but limit their growth potential. These findings have implications for understanding and measuring national entrepreneurial culture, and create opportunities for future research.

KEYWORDS
big data, cognition, emotion, entrepreneurship, LIWC, machine learning, national culture, topic modeling

"Language is the road map of a culture. It tells you where its people come from and where they are going"—Rita Mae Brown

1 | INTRODUCTION

The entrepreneurial culture of places and its impact on economic activity has been a long-standing topic of scholarly inquiry (Davidsson, 1995; Hayton & Cacciotti, 2013; Liñán & Fernandez-Serrano, 2014). The shared values, norms, and belief systems within a community tend to influence how individuals perceive and engage in entrepreneurship as well as their willingness to participate in entrepreneurial ventures (Autio et al., 2013; Bogatyreva et al., 2019; Calza et al., 2020; Cardon et al., 2011; Mitchell et al., 2002). As a result, the entrepreneurial culture of a nation, reflected in its collective attitudes toward entrepreneurship, often provides explanatory power beyond formal institutions and economic variables, such as regulations, immigration policies, or education systems (Frederking, 2004; Krueger et al., 2013).

Much of the extant research has focused on how culture shapes internal, embodied attitudes and behaviors toward entrepreneurship—what Bourdieu calls the "long-lasting dispositions of the mind and body" (Bourdieu, 1986, p. 17). For instance, culture provides lenses through which people think and feel about entrepreneurial opportunities, their abilities to pursue them, and the support they receive from society, government, and regulations (Aldrich & Yang, 2012; Bogatyreva et al., 2019; Cacciotti & Hayton, 2017; Calza et al., 2020; Díez-Martín et al., 2016; Hayton et al., 2002; Hopp & Stephan, 2012; Krueger et al., 2013; Wyrwich et al., 2016). However, culture is also reflected in its material and symbolic expressions, or cultural artifacts, which provide tangible evidence of a society's entrepreneurial attitudes (Berglund et al., 2020; Berglund & Glaser, 2022; Bourdieu, 1986; Carlile et al., 2013; De clercq & Voronov, 2009). Cultural artifacts represent the "objectified state" of culture, and are equally important in understanding how the social world operates (Bourdieu, 1986, p. 17).

The media play a critical role in constructing cultural artifacts such as news stories (Bourdieu, 1986; Glynn & Lounsbury, 2005; Peterson & Anand, 2004). Entrepreneurship-related news stories enable collective sensemaking of entrepreneurship by mirroring and influencing related collective cognitive and affective processes (Anderson & Warren, 2011; Cardon et al., 2011; Hindle & Klyver, 2007; Laguía & Moriano, 2021; Radu & Redien-Collot, 2008). For instance, media reports on entrepreneurial failure events may reflect "broad community views on failure" (Cardon et al., 2011, p. 83) while media stories about successful entrepreneurs may shape entrepreneurial identity (Anderson & Warren, 2011) and strengthen preexisting attitudes toward entrepreneurship (Hindle & Klyver, 2007). In this way, a nation's body of entrepreneurship-related news stories can be viewed as a national cultural artifact, whose systematic analysis reveals a nation's cultural attitudes toward entrepreneurship. Importantly, longitudinal analysis of these artifacts can generate insights into how national entrepreneurial culture evolves over time. Based on these insights, our study asks: *How can national entrepreneurial culture and its evolution be studied through media-produced cultural artifacts? What implications might the evolution of these artifacts have for national entrepreneurial activity?*

We adopt a linguistic lens to answer these questions. Language serves as both a defining characteristic of textual artifacts and a medium for expressing cognition and emotion (Achtenhagen & Welter, 2007; Cardon et al., 2011; Mantere et al., 2013; Motoki et al., 2022). Importantly, linguistic approaches are particularly useful for uncovering otherwise difficult-to-capture cognitive and affective dynamics in large volumes of data (Boyd & Schwartz, 2021; Hannigan et al., 2019; Jordan & Pennebaker, 2017; Macanovic, 2022; McAllister et al., 2024; Min & Park, 2019; Tausczik & Pennebaker, 2010), at collective levels of analysis and across cultural contexts (e.g., Bail, 2014; Sharifan, 2009), including within the field of entrepreneurship (Cardon et al., 2011; Hang & van Weezel, 2007; von Bloh et al., 2020). Together, these insights suggest that the emotional and cognitive linguistic markers of a country's entrepreneurship-related media stories can explicate latent cognitive and emotional processes underlying the formation and change of national cultural attitudes toward entrepreneurship.

Our interest in studying the entrepreneurial culture of a nation through media-produced artifacts required a dataset representative of a country's media coverage of entrepreneurship-related news. We therefore constructed a dataset of 690,088 articles published about entrepreneurship-related topics in 103 regional and national newspapers across the United States between 1996 and 2016. Using machine learning, specifically natural language processing, we analyzed the linguistic content (i.e., topics) and style of media-produced artifacts, focusing on validated linguistic measures of emotion (emotional tone) and cognition (analytical thinking). Finally, we correlated these linguistic measures with established indicators of entrepreneurial activity from the Startup Cartography Project (Andrews et al., 2022; Guzman & Stern, 2020) and the Global Entrepreneurship Monitor (Global Entrepreneurship Monitor, n.d.) to explore their implications.

Our findings generate three key insights. First, they point to an increasingly positive cultural bias toward entrepreneurship in the United States, as evidenced by a rise in emotional tone coupled with a decline in analytical thinking over the observation period. Second, our examination of the relationship between news topics—which represent underlying cognitive frames (DiMaggio et al., 2013; Goffman, 1974)—and linguistic style shows that this bias is not homogeneous across all cultural representations of entrepreneurship. Instead, specific topics such as those about entrepreneurial aspirations and journeys drive the identified trends. Third, this bias is strongly correlated with the creation of more ventures (i.e., higher entrepreneurial quantity), but also with ventures that have lower growth potential (i.e., lower entrepreneurial quality) (Andrews et al., 2022; Guzman & Stern, 2020).

Through this work, we offer theoretical, empirical, and methodological contributions to the study of national entrepreneurial culture. Theoretically, we enrich the literature by focusing on the objectified aspects of culture. By conceptualizing media stories as a tangible pathway through which culture is enacted (Carlile et al., 2013; Vogus et al., 2010; Weick, 1979), we develop a complementary perspective to the extant literature that has primarily focused on the embodied aspects of culture. In doing so, we also advance understanding of the media's role in shaping the social construction of entrepreneurship (Achtenhagen & Welter, 2007; Downing, 2005; Fletcher, 2006; Kennedy, 2008; Rindova et al., 2006; Suárez et al., 2021).

Empirically, a key contribution lies in the strong relationships we observe between our patterns and established indicators of entrepreneurial activity (startup quantity, startup quality, total entrepreneurial activity). These relationships suggest that an increasingly positive cultural bias toward entrepreneurship may inspire more people to start new ventures, but may also downplay the importance of the entrepreneurial skills and capabilities necessary for building scalable, high-growth ventures (Anderson & Warren, 2011; Barton & Muñoz, 2023; Blanco-Gracia, 2018; Eberhart et al., 2022; Hunt, 2015; Johansson, 2009; Shane, 2009; Suárez et al., 2021). Although these relationships are correlational, our study paves the way for further exploration of the positive and negative impact that glorifying entrepreneurship in the media may have on different aspects of national entrepreneurial activity. Moreover, these strong correlations highlight the possibility of using entrepreneurship-relevant cultural artifacts to develop new measurements of cultural attitudes toward entrepreneurship. Since cultural attitudes and beliefs tend to evolve slowly, detecting changes in them in a shorter period can be challenging. Thus, new measurements of cultural attitudes, such as the emotions expressed in media coverage, may serve as a more precise instrument with "greater predictive power" (Kaiser & Oswald, 2022, p. 3) than more conventional measures of culture.

Methodologically, we demonstrate how a machine learning approach can be used to capture national attitudes toward entrepreneurship by leveraging publicly available texts and modern methods for extracting insights from big data (von Bloh et al., 2020). While traditional methods, such as national surveys of entrepreneurs and experts, are undeniably valuable, our method offers a less intrusive, less costly, and more replicable approach to studying the evolution of national entrepreneurial culture. Our approach can also be applied across national contexts, languages, and other cultural artifacts with linguistic characteristics such as social media data. Doing so can help develop a more comprehensive, nuanced, and dynamic view of national entrepreneurial culture.

2 | THEORETICAL BACKGROUND: NATIONAL CULTURE, ENTREPRENEURSHIP, AND THE MEDIA

It is well established that "culture is a multidimensional phenomenon" with significant implications for economic activity, including entrepreneurship (Liñán & Fernandez-Serrano, 2014, p. 3). The multidimensionality of culture explains the diversity of approaches to capturing it as well as its varied consequences. For instance, numerous studies have utilized Hofstede's dimensions of national culture—power distance, uncertainty avoidance, individualism, and masculinity (Hofstede, 1984)—to predict the rate at which individuals act on their entrepreneurial intentions (Bogatyreva et al., 2019); distinguish more innovative from less innovative nations (Prim et al., 2017; Shane, 1993); explain differences between entrepreneurs and managers within the same nation; and identify shared values among entrepreneurs from different nations (Holt, 1997; McGrath et al., 1992). Another path to studying national entrepreneurial culture is rooted in the idea that a nation's values are reflected in its policies and institutions (Liñán & Fernandez-Serrano, 2014; Pinillos & Reyes, 2011). In turn, entrepreneurship-related policies, formal institutions, and infrastructure investments are considered cultural indicators of entrepreneurial activity (Acs & Szerb, 2007; Aidis et al., 2008; Bowen & De Clercq, 2008; van Stel et al., 2007).

But arguably, the most prevalent approach to capturing national entrepreneurial culture involves studying its "embodied state," which Bourdieu defines as the "long-lasting dispositions of the mind and body" (Bourdieu, 1986, p. 17). A prime example of this approach, and perhaps the most comprehensive initiative of this kind, is the Global Entrepreneurship Monitor's (GEM) Adult Population Survey and National Expert Survey, conducted annually across more than 100 countries since 1999. These surveys measure public and expert attitudes toward entrepreneurship through indicators such as the 'perceived opportunities rate' and the 'fear of failure rate' (Global Entrepreneurship Monitor, n.d.). Other initiatives, such as the Panel Study of Entrepreneurial Dynamics, have focused on the activities of individuals starting new ventures (Curtin & Reynolds, 2009; Hopp & Stephan, 2012), while the World Values Survey has examined cultural attitudes based on the attempts or intentions of respondents to start a business (Haerpfer et al., 2022).

Classic sociological perspectives, however, have long argued that culture is not only embodied but also "objectified in material objects and media such as writings, paintings, monuments, instruments, etc. [and] is transmissible in its materiality" (Bourdieu, 1986, p. 19). Material objects, as Bourdieu (1986) indicates, are physical artifacts of culture. These artifacts are related but separate from underlying beliefs because they reveal how culture is practiced (Berglund & Glaser, 2022; Swidler, 2001). In other words, cultural artifacts involve cultural practices through which latent attitudes become observable (Giorgi et al., 2015). Importantly, these artifacts can influence dispositions and beliefs and be appropriated as cultural resources (Bourdieu, 1986). One type of cultural artifact is media stories, which provide a window into the underlying cognitive and emotional processes of collective sensemaking by reflecting societal norms, perceptions, and ideologies (Herman & Chomsky, 2010; Metzler et al., 2022; Wirth & Schramm, 2005). For instance, the topics and tone of media coverage on climate change are considered reflections of societal attitudes toward the issue (Boykoff & Boykoff, 2004; McAllister et al., 2021, 2024; O'Neill, 2020).

In entrepreneurship, media stories are important cultural artifacts because they mold the meanings associated with entrepreneurship itself. As Achtenhagen and Welter note, "the content and language [of media stories]… allows us to identify and understand the images transported through media, which in turn influence the role of entrepreneurs and their identity, thus determining the extent and nature of entrepreneurship" (Achtenhagen & Welter, 2007, p. 197). The media also help audiences navigate the ambiguity surrounding novel entrepreneurial efforts by "building a shared mental map of associations that make up a new category or concept" (Kennedy, 2008, p. 272). By transmitting meaning as well as information and ideas about entrepreneurship, the media can shape collective attitudes toward entrepreneurship (Weiss et al., 2023). For example, variations in the content and tone of media coverage about entrepreneurs can reflect regional differences in attitudes toward entrepreneurial failure (Cardon et al., 2011).

Beyond merely reflecting prevailing cultural attitudes, the media also contribute to shaping them (Rao, 2010; Real, 1980; Reese Jr et al., 2001). This influence is especially evident in how media coverage affects the cognitive and affective processes of key stakeholders—such as investors, analysts, and the general public—during key entrepreneurial events like venture fundraising, earnings announcements, and IPOs (Petkova et al., 2012; Pfarrer et al., 2010; Pollock et al., 2008; Schultz et al., 2014; Zavyalova et al., 2012).

Together, these insights suggest that media-produced artifacts related to entrepreneurship provide an important pathway for observing the enactment of cultural attitudes toward entrepreneurship. This pathway is related to, but distinct from the underlying attitudes and dispositions that are typically examined by entrepreneurship scholars (Carlile et al., 2013). One key advantage of studying culture through media-produced artifacts is that these artifacts exist independently of any research intervention, and thus facilitate the natural observation of cultural attitudes as they evolve over time. As Cook (2020) argues, such analysis can also explicate the unconscious processes that perpetuate or change collective attitudes toward entrepreneurship in a particular place.

Two characteristics of media-produced artifacts that are especially informative of a country's entrepreneurial culture are emotion and cognition. At a collective level, both emotion and cognition can enable or constrain a country's entrepreneurial activity (Crnogaj & Bradač Hojnik, 2016; Goss, 2005; Spigel, 2017; Valdez & Richardson, 2013). For instance, a society's feelings of shame about entrepreneurial failure tend to dampen entrepreneurial intentions, and business growth efforts (Begley & Tan, 2001; Doern & Goss, 2014; Goss, 2005), while a more positive emotional climate may encourage the risk taking needed for entrepreneurship (Cardon et al., 2012; Simon, 1997). Similarly, collective cognition, such as shared knowledge about a topic, can explain group behaviors (Simon, 1997) including those related to entrepreneurship within teams (Bryant, 2014; West, 2007), and more broadly, within society (Crnogaj & Bradač Hojnik, 2016; Valdez & Richardson, 2013). Differences in cognitive structures among entrepreneurs from different countries—such as variations in mental maps of arrangements, willingness, and ability—have also explained cross-country differences in entrepreneurial decision making (Mitchell et al., 2002). Thus, the emotional and cognitive characteristics of media-produced artifacts related to entrepreneurship can provide key insights into a nation's entrepreneurial culture.

3 | RESEARCH METHODS

3.1 | Data sources

To examine how national entrepreneurial culture is reflected in the media, we first constructed a longitudinal, country-level dataset comprised of news media articles about entrepreneurship. We chose to collect newspaper articles published in the United States in English to control for alternative explanations that could be attributed to differences in languages and in types of written content (e.g., newspaper, magazine, and social media content). Importantly, our focus on news media is consistent with prior studies relying on news articles to examine macro-collective processes of cognition and emotion related to entrepreneurship (Croidieu & Kim, 2018; Hiatt & Carlos, 2019). Finally, by focusing on news articles in the United States, we develop a proof-of-concept for our methodological approach, which can be utilized and adapted to develop indicators of entrepreneurial culture in other national or regional settings, and through other types of texts.

We collected news articles from the LexisNexis database using the following search parameters: "entrepreneur*" OR "home-based business*" OR "small business*" OR "new business*" OR startup* OR "new business venture*" OR "nascent business venture*" OR "nascent venture*" OR "new firm*" OR "nascent firm*." Our search was limited to the 21-year period between 1996 and 2016 due to data availability in the LexisNexis database, and because this period covered several economic expansion and contraction cycles, including the dot-com bubble in the early 2000s and the Great Recession between 2007 and 2009. Our final sample consisted of 690,088 articles from 103 newspapers (100 regional newspapers, and 3 national outlets). A summary of our data can be found in Table 1, and the distribution of the news articles in our sample across the United States is portrayed in Figure 1.

In conceptualizing media stories related to entrepreneurship as cultural artifacts, we assume that the emotional and cognitive characteristics of such artifacts can unveil shared cultural attitudes toward entrepreneurship. Emotion and cognition reflected in the media are typically captured by certain linguistic markers, including positive and negative emotions as well as specific emotions such as joy, shame, and fear (Cardon et al., 2011; Min & Park, 2019; Nandwani & Verma, 2021; Rozado et al., 2022; von Bloh et al., 2020). We focus on the frequency of positive and negative emotions because the emergence of collective emotions is thought to depend on their valance as well as the frequency with which they are expressed (Lawler et al., 2014; Salmela, 2012; Schweitzer & Garcia, 2010). Regarding collective cognition, prior research typically captures the rate at which the adult population perceives good entrepreneurial opportunities and intends to pursue them (Justo et al., 2008). To complement prior approaches with a broader understanding of collective cognition and to capture a substantially different aspect of national culture, we focus on analytical thinking—a linguistic marker that represents the extent to which something is discussed in a logical, evidence-based, and structured manner (Jordan & Pennebaker, 2017; Tausczik & Pennebaker, 2010). This aspect of collective cognition is particularly useful in understanding how a society processes and evaluates information vis-à-vis entrepreneurship. The added advantage of emotional tone and analytical thinking is their generalizability across levels of analysis and contexts (Jordan & Pennebaker, 2017; Monzani et al., 2021; Pennebaker et al., 2015; Tausczik & Pennebaker, 2010). Our unit of analysis for all our models is at the news article level.

3.2 | Dependent variables

3.2.1 | Emotional tone

To measure the frequency of positive and negative emotion in the news media articles in our dataset, we use Linguistic Inquiry and Word Count (LIWC v2015)—a psycholinguistic method for quantifying emotion and cognition manifested in language (Pennebaker et al., 2015; Tausczik & Pennebaker, 2010). LIWC's summary variable *emotional tone*, measures the relative frequency of both positive and negative emotion words in a text based on the frequency

TABLE 1 Summary of data sources.

Newspaper name	Number of articles	% oftotal sample	% of total sample (cumulative)	Emotional tone (Average value)	Analytical thinking (Average value)	City	State	National (1) vs. regional (0) newspaper	Newspaper format
The New York Times	41,986	6.08%	6.08%	47.23	91.58	New York City	NY	1	Broadsheet
The Mercury News	36,238	5.25%	11.34%	50.15	92.50	San Jose	CA	0	Broadsheet
The Washington Post	35,900	5.20%	16.54%	49.79	91.34	Washington	DC	1	Broadsheet
The East Bay Times	20,891	3.03%	19.56%	52.66	91.65	Walnut Creek	CA	0	Broadsheet
The Charleston Gazette Mall	18,530	2.69%	22.25%	51.41	91.53	Charleston	WV	0	Broadsheet
Tampa Bay Times	18,336	2.66%	24.91%	51.99	91.12	St. Petersburg	FL	0	Broadsheet
Chicago Daily Herald	18,329	2.66%	27.56%	59.98	91.63	Arlington Heights	IL	0	Broadsheet
St Louis Post Dispatch	17,581	2.55%	30.11%	51.65	92.00	St. Louis	MO	0	Broadsheet
Pittsburgh Post-Gazette	16,577	2.40%	32.51%	51.53	91.30	Pittsburgh	PA	0	Broadsheet
Atlanta Journal and Constitution	16,412	2.38%	34.89%	51.76	91.50	Dunwoody	GA	0	Broadsheet
Tulsa World Oklahoma	13,713	1.99%	36.88%	55.61	91.43	Tulsa	OK	0	Broadsheet
Deseret Morning News	13,643	1.98%	38.86%	52.65	90.86	Salt Lake City	UT	0	Broadsheet
St Paul Pioneer Press Minnesota	13,307	1.93%	40.78%	51.92	91.47	St. Paul	MN	0	Broadsheet
The Daily Oklahoman	12,995	1.88%	42.67%	58.62	91.64	Oklahoma City	OK	0	Broadsheet
The Tampa Tribune	12,440	1.80%	44.47%	53.78	92.17	Tampa	FL	0	Broadsheet

(Continues)

TABLE 1 (Continued)

Newspaper name	Number of articles	% oftotal sample	% of total sample (cumulative)	Emotional tone (Average value)	Analytical thinking (Average value)	City	State	National (1) vs. regional (0) newspaper	Newspaper format
The Philadelphia Inquirer	12,219	1.77%	46.24%	48.97	92.53	Philadelphia	PA	0	Broadsheet
Dayton Daily News	11,818	1.71%	47.95%	56.09	91.76	Dayton	OH	0	Broadsheet
Bangor Daily News	11,816	1.71%	49.66%	57.41	92.76	Bangor	ME	0	Broadsheet
Star Tribune	11,317	1.64%	51.30%	52.66	91.61	Minneapolis	MN	0	Broadsheet
Richmond Times Dispatch	11,253	1.63%	52.94%	54.84	91.59	Richmond	VA	0	Broadsheet
The Austin American Statesman	10,505	1.52%	54.46%	51.19	92.29	Austin	TX	0	Broadsheet
The Denver Post	10,142	1.47%	55.93%	51.60	91.85	Denver	CO	0	Broadsheet
Telegram and Gazette	9733	1.41%	57.34%	54.93	92.96	Worcester	MA	0	Broadsheet
Sarasota Herald Tribune	9570	1.39%	58.72%	54.94	92.51	Sarasota	FL	0	Broadsheet
South Bend Tribune	9002	1.30%	60.03%	54.01	92.03	South Bend	IN	0	Broadsheet
The Spokesman Review	8930	1.29%	61.32%	53.06	92.10	Spokane	WA	0	Broadsheet
Daily News New York	8741	1.27%	62.59%	47.58	91.92	New York City	NY	0	Tabloid
The Bismarck Tribune	8631	1.25%	63.84%	53.83	92.30	Bismarck	ND	0	Broadsheet
The Florida Times Union	8397	1.22%	65.06%	54.25	92.02	Jacksonville	FL	0	Broadsheet
The Augusta Chronicle	8383	1.21%	66.27%	50.26	91.30	Augusta	GA	0	Broadsheet
The Palm Beach Post	8369	1.21%	67.48%	50.93	91.58	West Palm Beach	FL	0	Broadsheet

TABLE 1 (Continued)

Newspaper name	Number of articles	% oftotal sample	% of total sample (cumulative)	Emotional tone (Average value)	Analytical thinking (Average value)	City	State	National (1) vs. regional (0) newspaper	Newspaper format
Telegraph Herald	8334	1.21%	68.69%	52.71	91.64	Dubuque	IA	0	Broadsheet
Crains Detroit Business	8017	1.16%	69.85%	57.06	92.84	Detroit	MI	0	Business focused
The Salt Lake Tribune	7766	1.13%	70.98%	52.83	91.82	Salt Lake City	UT	0	Broadsheet
Wisconsin State Journal	7722	1.12%	72.10%	55.67	92.12	Madison	WI	0	Broadsheet
USA Today	7309	1.06%	73.16%	49.06	90.30	McLean	VA	1	Broadsheet
Lowell Sun	6763	0.98%	74.14%	57.82	92.50	Lowell	MA	0	Broadsheet
The Journal Record	6539	0.95%	75.09%	60.89	92.96	Oklahoma City	OK	0	Tabloid
Crains New York Business	6354	0.92%	76.01%	51.53	93.61	New York City	NY	0	Business focused
Portland Press Herald	6127	0.89%	76.89%	55.56	91.34	Portland	KY	0	Broadsheet
The Patriot Ledger	6003	0.87%	77.76%	50.59	91.95	Quincy	MA	0	Broadsheet
The New York Post	5971	0.87%	78.63%	44.17	90.68	New York City	NY	0	Tabloid
Crains Chicago Business	5525	0.80%	79.43%	51.65	91.59	Chicago	IL	0	Business focused
Pittsburgh Tribune Review	5428	0.79%	80.22%	53.01	92.30	Pittsburgh	PA	0	Broadsheet
LNP	5367	0.78%	80.99%	56.86	91.99	Lancaster	PA	0	Broadsheet
The Capital	5227	0.76%	81.75%	53.64	91.92	Annapolis	MD	0	Broadsheet
Crains Cleveland Business	5067	0.73%	82.49%	56.37	92.77	Cleveland	OH	0	Business focused
The Daily News of Los Angeles	4790	0.69%	83.18%	51.77	90.95	Woodland Hills	CA	0	Broadsheet

(Continues)

TABLE 1 (Continued)

Newspaper name	Number of articles	% oftotal sample	% of total sample (cumulative)	Emotional tone (Average value)	Analytical thinking (Average value)	City	State	National (1) vs. regional (0) newspaper	Newspaper format
The State Journal Register	4659	0.68%	83.85%	53.65	91.77	Springfield	IL	0	Broadsheet
The Pantagraph	4569	0.66%	84.52%	55.06	91.54	Bloomington	IL	0	Broadsheet
Topeka Capital Journal	4535	0.66%	85.17%	55.04	92.03	Topeka	KS	0	Broadsheet
Las Cruces Sun-News	4482	0.65%	85.82%	58.38	88.68	Las Cruces	NM	0	Broadsheet
The Santa Fe New Mexican	4276	0.62%	86.44%	52.83	91.80	Santa Fe	NM	0	Broadsheet
Long Island Business News	4042	0.59%	87.03%	56.67	92.25	Long Island City	NY	0	Business focused
Monterey County Herald	3946	0.57%	87.60%	51.43	91.70	Monterey	CA	0	Broadsheet
Chico Enterprise Record	3879	0.56%	88.16%	58.51	93.05	Chico	CA	0	Broadsheet
The Myrtle Beach Sun News	3873	0.56%	88.72%	55.06	91.30	Myrtle Beach	SC	0	Broadsheet
Star News	3769	0.55%	89.27%	52.90	91.21	Wilmington	NC	0	Broadsheet
Daily Camera	3662	0.53%	89.80%	60.13	90.25	Boulder	CO	0	Broadsheet
The Indianapolis Business Journal	3374	0.49%	90.29%	56.69	91.01	Indianapolis	IN	0	Business focused
San Gabriel Valley Tribune	3286	0.48%	90.77%	53.96	90.55	Monrovia	CA	0	Broadsheet
Inland Valley Daily Bulletin	3252	0.47%	91.24%	55.03	90.45	Rancho Cucamonga	CA	0	Broadsheet
The York Dispatch	3183	0.46%	91.70%	51.58	92.42	York	PA	0	Broadsheet
New Orleans City Business	3010	0.44%	92.13%	55.22	93.50	Metairie	LA	0	Business focused

TABLE 1 (Continued)

Newspaper name	Number of articles	% oftotal sample	% of total sample (cumulative)	Emotional tone (Average value)	Analytical thinking (Average value)	City	State	National (1) vs. regional (0) newspaper	Newspaper format
The Idaho Business Review	2695	0.39%	92.53%	57.28	91.70	Boise	ID	0	Business focused
The Berkshire Eagle	2668	0.39%	92.91%	59.54	92.11	Pittsfield	NY	0	Broadsheet
Finance and Commerce	2623	0.38%	93.29%	58.75	93.80	Minneapolis	MN	0	Broadsheet
Lincoln Journal Star	2623	0.38%	93.67%	57.99	91.33	Lincoln	NE	0	Broadsheet
The Philadelphia Daily News	2406	0.35%	94.02%	48.52	88.64	Philadelphia	PA	0	Tabloid
Marin Independent Journal	2365	0.34%	94.36%	54.52	92.61	San Rafael	CA	0	Broadsheet
Sentinel and Enterprise	2224	0.32%	94.69%	58.31	89.86	Fitchburg	MA	0	Broadsheet
The Wyoming Tribune Eagle	2171	0.31%	95.00%	57.28	90.05	Cheyenne	WY	0	Broadsheet
San Bernardino Sun	2148	0.31%	95.31%	52.65	90.53	San Bernardino	CA	0	Broadsheet
Intelligencer Journal	2140	0.31%	95.62%	54.23	91.07	Lancaster	PA	0	Broadsheet
The Ledger Lakeland	2075	0.30%	95.92%	52.71	91.21	Lakeland	FL	0	Broadsheet
Brattleboro Reformer	1947	0.28%	96.20%	60.15	92.37	Brattleboro	WI	0	Broadsheet
Eureka Times Standard	1680	0.24%	96.45%	63.80	89.06	Eureka	CA	0	Broadsheet
Idaho Falls Post Register	1655	0.24%	96.69%	55.76	90.34	Idaho Falls	ID	0	Broadsheet
Colorado Springs Business Journal	1623	0.24%	96.92%	61.41	90.49	Colorado Springs	CO	0	Business focused

(Continues)

TABLE 1 (Continued)

Newspaper name	Number of articles	% oftotal sample	% of total sample (cumulative)	Emotional tone (Average value)	Analytical thinking (Average value)	City	State	National (1) vs. regional (0) newspaper	Newspaper format
The Lebanon Daily News	1495	0.22%	97.14%	59.97	92.03	Lebanon	PA	0	Broadsheet
Vallejo Times Herald	1478	0.21%	97.35%	55.60	88.59	Vallejo	CA	0	Broadsheet
The Orange County Register	1474	0.21%	97.57%	54.08	89.59	Anaheim	CA	0	Broadsheet
The Chronicle of Higher Education	1459	0.21%	97.78%	52.40	92.02	Washington	DC	0	Broadsheet
The Hartford Courant	1436	0.21%	97.99%	54.70	91.99	Hartford	CT	0	Broadsheet
New York Observer	1387	0.20%	98.19%	49.19	87.94	New York City	NY	0	Broadsheet
Pasadena Star News	1363	0.20%	98.39%	50.96	92.05	Pasadena	CA	0	Broadsheet
Daily Journal of Commerce	1292	0.19%	98.57%	59.82	91.88	Portland	OR	0	Business focused
Farmington Daily Times	1193	0.17%	98.75%	59.07	90.89	Farmington	NM	0	Broadsheet
Silver City Sun News	1124	0.16%	98.91%	60.86	91.32	Silver City	NM	0	Broadsheet
The Evening Sun	1088	0.16%	99.07%	58.58	90.18	Hanover	PA	0	Broadsheet
Maryland Gazette	1071	0.16%	99.22%	54.98	92.14	Annapolis	MD	0	Broadsheet
The Daily Record of Rochester	842	0.12%	99.34%	59.78	94.37	Rochester	NY	0	Business focused
Long Beach Press Telegram	790	0.11%	99.46%	50.31	91.49	Long Beach	CA	0	Broadsheet
The Alamogordo Daily News	725	0.11%	99.56%	53.71	89.52	Alamogordo	NM	0	Broadsheet

TABLE 1 (Continued)

Newspaper name	Number of articles	% oftotal sample	% of total sample (cumulative)	Emotional tone (Average value)	Analytical thinking (Average value)	City	State	National (1) vs. regional (0) newspaper	Newspaper format
Oroville Mercury Register	622	0.09%	99.65%	59.49	90.29	Oroville	CA	0	Broadsheet
Fort Wayne News Sentinel	596	0.09%	99.74%	52.34	95.40	Fort Wayne	IN	0	Broadsheet
The Daily Reporter	574	0.08%	99.82%	54.64	90.85	Coldwater	MI	0	Broadsheet
Arizona Capitol Times	479	0.07%	99.89%	55.26	90.34	Phoenix	AZ	0	Tabloid
The Baltimore Sun	345	0.05%	99.94%	54.14	91.57	Baltimore	MD	0	Broadsheet
The Morning Call	177	0.03%	99.97%	57.24	93.00	Allentown	PA	0	Broadsheet
City Business North Shore Report	106	0.02%	99.98%	56.15	90.30	Mandeville	LA	0	Business focused
The State Journal Register	91	0.01%	100.00%	59.81	86.64	Springfield	IL	0	Business focused
The Patriot Ledger	28	0.00%	100.00%	56.21	85.15	Quincy	MA	0	Broadsheet

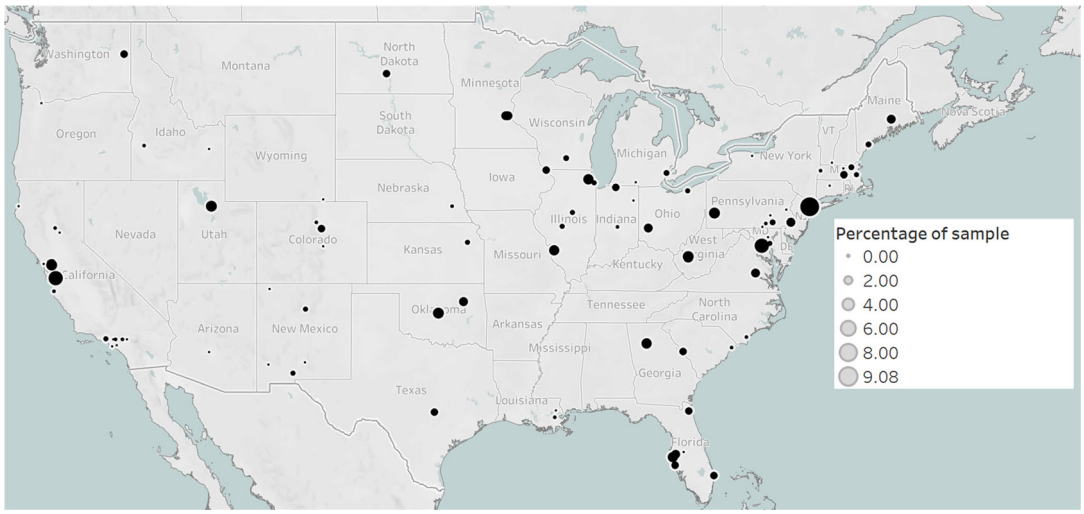


FIGURE 1 Distribution of news articles in the data sample.

of words associated with positive emotion such as "love, nice, sweet" and those associated with negative emotion such as "hurt, ugly, nasty" (Pennebaker et al., 2015, p. 3). The measure has a theoretical range from 0 to 100. Scores below 50 suggest a more negative emotional tone, while those above 50 suggest a more positive emotional tone (Pennebaker et al., 2015).

3.2.2 | Analytical thinking

To measure the frequency of *analytical thinking*, we utilize the corresponding summary variable in LIWC that measures "several categories of function words" (Pennebaker, 2024) such as "nouns, articles, and prepositions" (Jordan & Pennebaker, 2017, p. 313). Analytical thinking involves breaking down complex concepts into simpler parts and understanding their relationships (Jordan et al., 2019). A more frequent use of articles and prepositions indicates a more logical and structured approach to organizing information that reflects systematic and logical cognitive processes (Boyd & Pennebaker, 2015; Pennebaker et al., 2014). Like emotional tone, this variable also has a theoretical range from 0 (low) to 100 (high).

3.3 | Independent variable

3.3.1 | Time trend

Given our interest in the evolution of national entrepreneurial culture, our primary independent variable is an indicator of calendar time. Since each article in our dataset has a day, month, and year stamp, we calculate a *time trend* variable by using each article's publication year, and subtracting it from the smallest year in our sample (i.e., 1996). Thus, the time trend variable is a continuous variable with a value from 0 (for articles published in 1996) to 20 (for articles published in 2016). In sensitivity analyses, we also create a more granular version of this time trend measure using the calendar month organized chronologically (given 12 months and 21 years of data, this variable had a value from 1 to 252).

3.4 | Control variables

We control for six variables at the news article level. We control for the overall *word count* (*logged*) of each article, and the number of *words per sentence* (*logged*) in each article. We include a newspaper fixed effect by adding a *newspaper dummy* variable. In this manner, we account for the variance of any time-invariant media source characteristic such as newspaper type (e.g., broadsheet vs. businesss-focused vs. tabloid) and its geographic location (e.g., the city/region that it is based in). Unobservable and potentially time-invariant characteristics of the newspaper (e.g., its organizational culture or political orientation) are also captured by these effects. In addition, we include calendar time fixed effects by controlling for the *month* and *year* in which each article is published to account for seasonal variations in entrepreneurship news coverage (e.g., due to specific current events) distinct from the overall time trend.

Finally, we identify and control for the *main topic* of each article. Conceptually, the main topic of a given article can be thought of as the dominant cognitive frame related to entrepreneurship and manifested in that article (DiMaggio et al., 2013; Kaplan & Vakili, 2015). To identify the main topics in our entire sample, we use Latent Dirichlet Allocation (LDA), a popular topic modeling algorithm for discovering themes in a large and unstructured collection of documents (Blei, 2012; Griffiths & Steyvers, 2004; Hannigan et al., 2019; McAllister et al., 2024). Table 2 shows the top 20 "bag of words" associated with each of the 21 topics derived from our sample using topic modeling.[1] Note that in a topic model, the same "bag of words" obtained from the entire text corpus is associated with every topic, but the relative probability that each word is associated with a given topic differs. We label each topic (see column header of Table 2) based on our interpretation of these words and our reading of articles that have the highest identified probability of being associated with each topic (see Appendix A, Table A1 for representative articles from each main topic).

In Table 3, we provide a yearly view of the percentage of articles associated with each topic. The table is also color shaded to identify "hot spots" in dark red color (i.e., years where particular topics were trending). We observe that articles about local economic development (7.1%), local real estate projects (6.6%), technology entrepreneurship (6.5%), employee healthcare (6.3%), and entrepreneurial aspirations and journeys (6.2%) occur most frequently in the sample. Not surprisingly, technology entrepreneurship and venture financing are "hot topics" in the period 1999 to 2001—the IPO bubble. Articles about entrepreneurs in politics also wax and wane, likely following national election cycles. Figure 2 shows how topics trend over time in our sample. Over the 21-year study period, we observe that articles about organizational relationships and culture, culinary innovations, entrepreneurs in politics, local entrepreneurship events, and medical innovation are the five topics that trend most upward (i.e., the slope fit for the % of articles in the sample for each year with that main topic is positive and has the largest magnitude). On the other hand, articles about executive appointments, local economic development, local real estate projects, entrepreneurial aspirations and journeys, and aviation innovation become less common over time in our sample. Additional technical details on how we implemented the LDA algorithm, and calculated the main topic for each news article, can be found in the Appendix B.

4 | ANALYSIS AND RESULTS

4.1 | Evolution of national entrepreneurial culture

We ran our analysis at the news article level and used a multivariate regression model to predict our outcomes of interest in *STATA v17*. Since we had several news articles from each newspaper, we clustered our standard errors at the newspaper level. In sensitivity analyses, we also used a Tobit regression model since our dependent variables were theoretically bounded between 1 and 100, and found robust results.

Table 4 shows the descriptive statistics and pairwise correlations of the time-varying variables in our model, as well as the categorical variable capturing the main topic of each article. All pairwise correlations were significant at

TABLE 2 Topics and most common words (top 20) associated with each topic.

	Entrepreneurship education	Entrepreneurial fraud	Entrepreneurial aspirations and journeys	Medical innovation	Aviation innovation	Entrepreneurs in politics	Clean energy innovation	Organizational relationships and culture	Executive appointments	Small business borrowing	Entrepreneurs abroad
1	school	law	peopl	research	new	republican	energi	busi	presid	percent	american
2	univers	case	want	medic	million	state	state	job	manag	bank	countri
3	student	court	know	use	contract	democrat	industri	work	offic	rate	peopl
4	educ	file	work	technolog	servic	hous	plant	small	servic	loan	world
5	colleg	rule	think	health	oper	presid	product	peopl	inc	million	mani
6	high	report	back	hospit	offici	campaign	power	make	busi	report	govern
7	state	attorney	make	develop	travel	vote	water	need	compani	sale	nation
8	program	charg	got	care	state	senat	manufactur	want	director	month	america
9	graduat	legal	that	new	airport	elect	use	help	execut	price	unit
10	degre	feder	good	drug	feder	polit	compani	employe	vice	increas	black
11	work	offic	start	system	air	parti	electr	owner	firm	quarter	war
12	class	state	didnt	test	plan	support	gas	start	base	billion	immigr
13	award	polic	realli	patient	base	obama	oil	think	associ	market	live
14	teacher	regul	old	product	atlanta	candid	china	good	name	credit	way
15	communiti	secur	home	work	busi	bill	car	mani	market	economi	chang
16	experi	investig	famili	innov	utah	bush	new	employ	new	financi	right
17	children	protect	hes	univers	agenc	issu	produc	creat	group	growth	cultur
18	learn	claim	live	center	week	govern	farm	oklahoma	bank	expect	becom
19	age	offici	way	doctor	depart	governor	cost	find	sale	averag	today
20	public	lawyer	tri	make	airlin	legisl	natur	success	corp	share	foreign

TABLE 2 (Continued)

	Local entrepreneurship events	Entrepreneurs in the arts	Technology entrepreneurship	Local economic development	Local Real estate projects	Employee healthcare	Venture financing	Culinary innovation and entrepreneurship	Business networking and training	Volunteering by and for small businesses
1	art	show	compani	citi	build	tax	compani	food	busi	program
2	center	book	internet	counti	store	state	million	restaur	meet	help
3	free	new	comput	develop	new	health	invest	open	call	servic
4	church	music	servic	council	open	insur	fund	bar	center	provid
5	call	play	use	communiti	street	pay	capit	new	chamber	organ
6	inform	ms	onlin	plan	shop	cost	firm	wine	inform	need
7	park	film	site	district	retail	plan	ventur	make	week	women
8	librari	york	custom	resid	space	care	investor	coffe	club	communiti
9	event	movi	web	board	squar	bill	market	serv	member	busi
10	meet	stori	technolog	town	hous	increas	stock	market	counti	offer
11	museum	star	softwar	area	downtown	incom	deal	beer	event	support
12	santa	design	network	project	area	cut	money	custom	commerc	assist
13	communiti	first	phone	mayor	home	worker	new	local	group	mail
14	open	magazin	new	public	park	percent	share	sell	network	inform
15	group	world	user	new	citi	budget	execut	place	road	home
16	children	tv	market	member	owner	benefit	start	fresh	small	call
17	road	make	system	need	busi	small	base	includ	free	famili
18	age	name	offer	econom	locat	employ	partner	offer	west	center
19	class	artist	product	propos	center	propos	billion	made	chico	volunt
20	club	publish	data	properti	plan	feder	rais	good	present	group

TABLE 3 Main topic distribution in sample.

Rank	Main topic	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average	Slope of linear fit	21-year change based on slope of linear fit
1	Local economic development	7.0%	7.9%	8.3%	8.5%	7.2%	7.6%	8.5%	8.5%	7.8%	8.2%	7.3%	7.7%	6.0%	6.0%	6.1%	6.6%	5.5%	5.6%	5.7%	6.1%	6.0%	7.1%	−0.1%	−2.7%
2	Local real estate projects	6.5%	7.2%	7.3%	7.4%	7.3%	7.8%	7.6%	7.9%	7.9%	8.0%	6.9%	7.2%	6.0%	5.3%	4.4%	5.4%	5.1%	5.6%	6.1%	5.7%	6.4%	6.6%	−0.1%	−2.3%
3	Technology entrepreneurship	6.0%	6.0%	6.8%	9.1%	9.9%	6.8%	5.1%	4.7%	4.7%	4.9%	5.0%	5.2%	4.9%	5.9%	7.0%	7.2%	7.5%	8.1%	8.1%	7.9%	6.3%	6.5%	0.0%	0.6%
4	Employee healthcare	7.4%	6.5%	5.3%	5.2%	4.6%	4.5%	5.2%	6.8%	6.7%	5.6%	6.0%	6.7%	5.6%	9.1%	8.5%	6.8%	6.8%	9.2%	6.2%	5.3%	4.8%	6.3%	0.1%	1.3%
5	Entrepreneurial aspirations and journeys	6.7%	6.7%	6.5%	6.8%	6.7%	6.7%	6.8%	6.5%	6.3%	7.1%	6.6%	7.2%	6.7%	6.4%	5.2%	5.5%	4.8%	5.2%	5.2%	5.4%	5.2%	6.2%	−0.1%	−1.9%
6	Entrepreneurs in politics	8.8%	3.8%	5.4%	3.7%	5.9%	4.3%	5.9%	4.7%	7.0%	3.5%	5.3%	3.4%	7.2%	6.8%	11.7%	6.6%	9.8%	4.4%	6.2%	5.2%	7.0%	6.0%	0.1%	1.9%
7	Small business borrowing	4.8%	5.2%	5.4%	4.5%	3.8%	5.2%	4.6%	4.7%	4.5%	4.2%	3.9%	3.9%	7.9%	9.6%	8.5%	7.5%	6.2%	5.7%	4.6%	4.4%	3.7%	5.4%	0.1%	1.3%
8	Entrepreneurship in the arts	5.0%	5.4%	5.4%	5.7%	4.9%	5.2%	5.1%	4.7%	5.9%	6.2%	5.5%	5.7%	5.1%	4.7%	4.2%	4.4%	4.9%	5.5%	6.0%	6.9%	6.1%	5.4%	0.0%	0.4%
9	Executive appointments	6.5%	6.7%	6.7%	6.4%	6.3%	7.0%	6.4%	6.3%	5.8%	6.0%	5.5%	5.4%	4.9%	4.3%	3.8%	3.8%	3.6%	3.4%	3.1%	2.7%	3.1%	5.1%	−0.2%	−4.6%
10	Organizational relationships and culture	4.2%	4.3%	3.8%	3.4%	3.6%	4.1%	4.1%	4.7%	5.1%	4.7%	4.4%	5.0%	4.8%	5.2%	4.8%	5.8%	6.4%	5.5%	6.0%	5.9%	6.0%	4.9%	0.1%	2.5%
11	Entrepreneurial fraud	6.4%	6.0%	4.7%	4.5%	4.3%	4.1%	4.9%	5.0%	4.8%	5.1%	4.5%	4.3%	4.3%	4.0%	3.7%	4.2%	4.5%	4.9%	4.6%	4.9%	5.0%	4.7%	0.0%	−0.8%
12	Venture financing	3.7%	3.9%	4.4%	5.7%	8.1%	5.9%	5.1%	4.0%	3.6%	3.7%	3.7%	3.6%	2.9%	2.6%	2.6%	4.4%	5.0%	5.3%	5.3%	4.6%	4.1%	4.4%	0.0%	−0.8%
13	Entrepreneurs abroad	4.9%	5.3%	4.5%	4.4%	4.5%	4.5%	4.3%	4.2%	3.8%	3.7%	4.7%	3.9%	3.7%	3.5%	3.7%	4.5%	4.4%	4.6%	4.7%	5.0%	4.7%	4.4%	0.0%	0.0%
14	Culinary innovation and entrepreneurship	3.3%	3.6%	3.5%	3.3%	3.2%	3.7%	3.8%	4.3%	4.1%	4.4%	4.5%	4.8%	4.6%	4.2%	4.0%	4.6%	4.3%	5.1%	5.7%	6.0%	6.3%	4.3%	0.1%	2.5%
15	Entrepreneurship education	3.3%	3.4%	4.2%	4.0%	4.3%	3.9%	4.1%	3.9%	4.2%	4.3%	4.6%	4.3%	4.5%	3.9%	3.9%	4.3%	4.5%	4.5%	4.5%	4.9%	5.5%	4.2%	0.1%	1.3%

TABLE 3 (Continued)

Rank	Main topic	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Average	Slope of linear fit	21-year change based on slope of linear fit
16	Clean energy innovation	3.9%	4.5%	4.0%	3.7%	3.5%	4.1%	3.3%	3.8%	3.0%	3.7%	3.8%	4.5%	5.3%	5.4%	5.0%	4.6%	3.9%	3.5%	3.9%	4.1%	4.0%	4.1%	0.0%	0.4%
17	Business networking and training	3.1%	3.3%	4.2%	3.8%	3.4%	3.9%	4.1%	4.1%	3.7%	4.3%	5.5%	4.8%	4.7%	4.0%	3.3%	3.5%	2.9%	3.0%	2.8%	2.6%	3.3%	3.7%	0.0%	−0.6%
18	Aviation innovation	3.8%	4.9%	3.3%	3.5%	2.9%	4.3%	3.4%	3.7%	3.7%	4.1%	3.7%	3.6%	2.9%	2.1%	3.3%	2.5%	2.5%	3.0%	2.8%	2.8%	2.8%	3.3%	−0.1%	−1.5%
19	Medical innovation	1.5%	1.9%	2.1%	2.6%	2.0%	2.6%	2.6%	2.8%	2.9%	3.0%	3.0%	3.0%	2.5%	2.5%	2.4%	2.8%	2.8%	2.8%	3.3%	3.6%	3.8%	2.7%	0.1%	1.5%
20	Local entrepreneurship events	1.4%	1.5%	1.6%	1.5%	1.4%	1.8%	2.8%	2.4%	2.4%	2.9%	3.1%	3.3%	3.3%	2.8%	2.2%	2.9%	2.4%	2.8%	2.9%	3.4%	3.2%	2.5%	0.1%	1.9%
21	Volunteering by and for small businesses	1.9%	2.1%	2.4%	2.3%	2.2%	2.1%	2.4%	2.4%	2.1%	2.3%	2.3%	2.6%	2.2%	1.9%	1.6%	2.1%	2.1%	2.3%	2.1%	2.3%	2.7%	2.2%	0.0%	0.0%

Note: Topics are sorted from most to least common, and cells are highlighted in different colors to indicate different levels of media coverage of a topic (white, yellow, orange, red). White cells indicate low media coverage whereas darker cells indicate higher media coverage of a topic. Dark red cells indicate the most prevalent topics during the study's observation period.

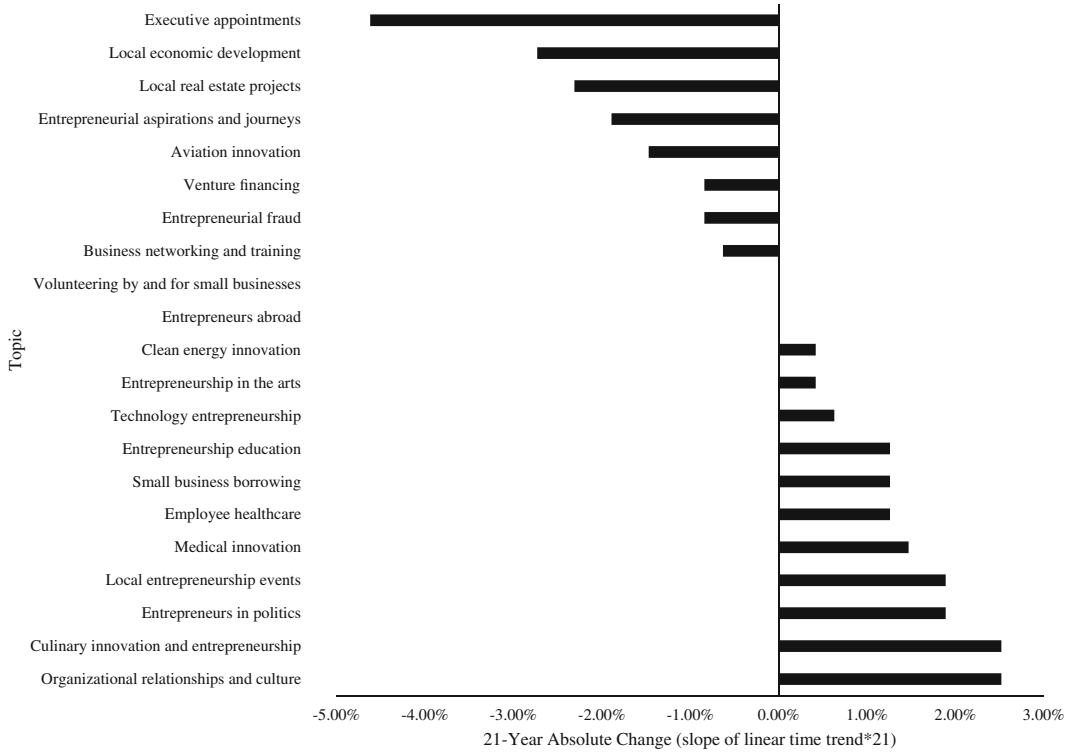


FIGURE 2 Estimated change in topic prevalence based on the slope of a linear fit.

the 99% confidence interval given the large size of our sample. We highlight the cells of interest in the correlation matrix in gray, and discuss them below.

We observed a negative, but weak correlation between emotional tone and analytical thinking ($r = -0.05$, $p < 0.001$). We also observed that emotional tone was negatively correlated to the topic of entrepreneurial fraud ($r = -0.21$, $p < 0.001$), while analytical thinking was negatively correlated to the topics of entrepreneurial aspirations and journeys ($r = -0.37$, $p < 0.001$), and organizational relationships and culture ($r = -0.17$, $p < 0.001$). News articles that were more analytical tended to have lower word counts ($r = -0.15$, $p < 0.001$) and more words per sentence ($r = 0.13$, $p < 0.001$). We also observed that the time trend variable was positively correlated with emotional tone ($r = 0.09$, $p < 0.001$) and negatively correlated with analytical thinking ($r = -0.05$, $p < 0.001$). In Figure 3, we visualized this relationship between the time trend and our study's dependent variables using a more granular calendar time measure (i.e., month and year). The high R^2 values of the fitted lines (0.79 for emotional tone, and 0.62 for analytical thinking) once again indicate the presence of a temporal trend in our data.

The results from our multivariate regression analyses are presented in Table 5. Models 1 and 2 used the full sample, and emotional tone and analytical thinking as respective dependent variables. Models 3 and 4 repeated this analysis, but only for national sources (New York Times, Washington Post, USA Today), while models 5 and 6 used only regional sources. Models 7–12 utilized subsamples based on the type of newspaper (models 7 and 8 for broadsheet papers, models 9 and 10 for business focused papers, and models 11 and 12 for tabloids). The model coefficients for the time trend variable can be interpreted as the increase (decrease) in the dependent variable (i.e., either emotional tone or analytical thinking) for a 1-year change in calendar time. Across all models focusing on emotional tone as the outcome (i.e., models 1, 3, 5, 7, 9, and 11), we observed that the time trend had a positive and statistically significant impact. The p-value for Model 3 was 0.09, indicating that this effect was only weakly significant for national

TABLE 4 Descriptive statistics and correlation matrix.

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1 Emotional tone	53.04	22.37																									
2 Analytical thinking	91.73	8.01	−0.05																								
3 Time trend	10.61	5.91	0.09	−0.05																							
4 Entrepreneurship education	0.04	0.2	0.10	0.04	0.02																						
5 Entrepreneurial fraud	0.05	0.21	−0.21	0.03	−0.01	−0.05																					
6 Entrepreneurial aspirations and journeys	0.06	0.24	0.00	−0.37	−0.03	−0.05	−0.06																				
7 Medical Innovation	0.03	0.16	0.01	0.02	0.02	−0.04	−0.04	−0.04																			
8 Aviation innovation	0.03	0.18	−0.10	0.06	−0.02	−0.04	−0.04	−0.05	−0.03																		
9 Entrepreneurs in politics	0.06	0.24	−0.02	0.00	0.03	−0.05	−0.06	−0.07	−0.04	−0.05																	
10 Clean energy innovation	0.04	0.2	−0.02	0.05	0.01	−0.04	−0.05	−0.05	−0.04	−0.04	−0.05																
11 Organizational relationships and culture	0.05	0.22	0.12	−0.18	0.03	−0.05	−0.05	−0.06	−0.04	−0.04	−0.06	−0.05															
12 Executive appointments	0.05	0.22	0.05	0.11	−0.06	−0.05	−0.05	−0.06	−0.04	−0.04	−0.06	−0.05	−0.05														
13 Small business borrowing	0.05	0.23	−0.06	0.10	0.02	−0.05	−0.05	−0.06	−0.04	−0.04	−0.06	−0.05	−0.06	−0.06													
14 Entrepreneurs abroad	0.04	0.2	−0.08	−0.06	0.00	−0.05	−0.05	−0.06	−0.04	−0.04	−0.05	−0.04	−0.05	−0.05	−0.05												
15 Local entrepreneurship events	0.03	0.16	0.08	0.08	0.03	−0.03	−0.04	−0.04	−0.03	−0.03	−0.04	−0.03	−0.04	−0.04	−0.04	−0.03											
16 Entrepreneurship in the arts	0.05	0.22	0.05	−0.05	0.01	−0.05	−0.05	−0.06	−0.04	−0.04	−0.06	−0.05	−0.05	−0.05	−0.06	−0.05	−0.04										
17 Technology entrepreneurship	0.07	0.25	−0.04	0.00	0.01	−0.06	−0.06	−0.07	−0.04	−0.05	−0.07	−0.06	−0.06	−0.06	−0.06	−0.06	−0.04	−0.06									

(Continues)

TABLE 4 (Continued)

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
18 Local economic development	0.07	0.25	0.03	0.05	−0.03	−0.06	−0.06	−0.07	−0.05	−0.05	−0.07	−0.06	−0.06	−0.06	−0.07	−0.06	−0.04	−0.07	−0.07								
19 Local real estate projects	0.07	0.25	−0.02	0.05	−0.03	−0.06	−0.06	−0.07	−0.04	−0.05	−0.07	−0.06	−0.06	−0.06	−0.06	−0.06	−0.04	−0.06	−0.07	−0.07							
20 Employment healthcare	0.06	0.24	−0.04	0.00	0.02	−0.06	−0.06	−0.07	−0.04	−0.05	−0.07	−0.05	−0.06	−0.06	−0.06	−0.06	−0.04	−0.06	−0.07	−0.07	−0.07						
21 Venture Financing	0.04	0.2	0.03	0.04	−0.01	−0.05	−0.05	−0.06	−0.04	−0.04	−0.06	−0.04	−0.05	−0.05	−0.05	−0.05	−0.03	−0.05	−0.06	−0.06	−0.06	−0.06					
22 Culinary innovation and entrepreneurship	0.04	0.21	0.05	−0.02	0.04	−0.05	−0.05	−0.06	−0.04	−0.04	−0.06	−0.04	−0.05	−0.05	−0.05	−0.05	−0.04	−0.05	−0.06	−0.06	−0.06	−0.06	−0.05				
23 Business networking and training	0.04	0.19	0.05	0.12	−0.01	−0.04	−0.04	−0.05	−0.03	−0.04	−0.05	−0.04	−0.05	−0.05	−0.05	−0.04	−0.03	−0.05	−0.05	−0.05	−0.05	−0.05	−0.04	−0.04			
24 Volunteering by and for small businesses	0.02	0.15	0.07	0.03	0.00	−0.03	−0.03	−0.04	−0.03	−0.03	−0.04	−0.03	−0.03	−0.03	−0.04	−0.03	−0.02	−0.04	−0.04	−0.04	−0.04	−0.04	−0.03	−0.03	−0.03		
25 Word count of article (logged)	6.37	0.68	−0.04	−0.15	−0.01	−0.03	0.00	0.10	0.01	−0.02	0.04	0.01	−0.04	−0.09	−0.03	0.08	0.05	0.03	−0.02	−0.01	0.00	0.02	−0.01	0.03	−0.09	−0.05	
26 Words per sentence in article (logged)	2.9	0.27	−0.05	0.14	0.10	0.01	0.06	−0.11	0.05	0.04	0.04	0.06	−0.01	−0.09	0.07	0.05	−0.13	−0.01	0.09	0.04	−0.01	0.07	0.05	−0.04	−0.27	−0.02	0.05

Note: $n = 690{,}088$ articles. Two-sided t tests.

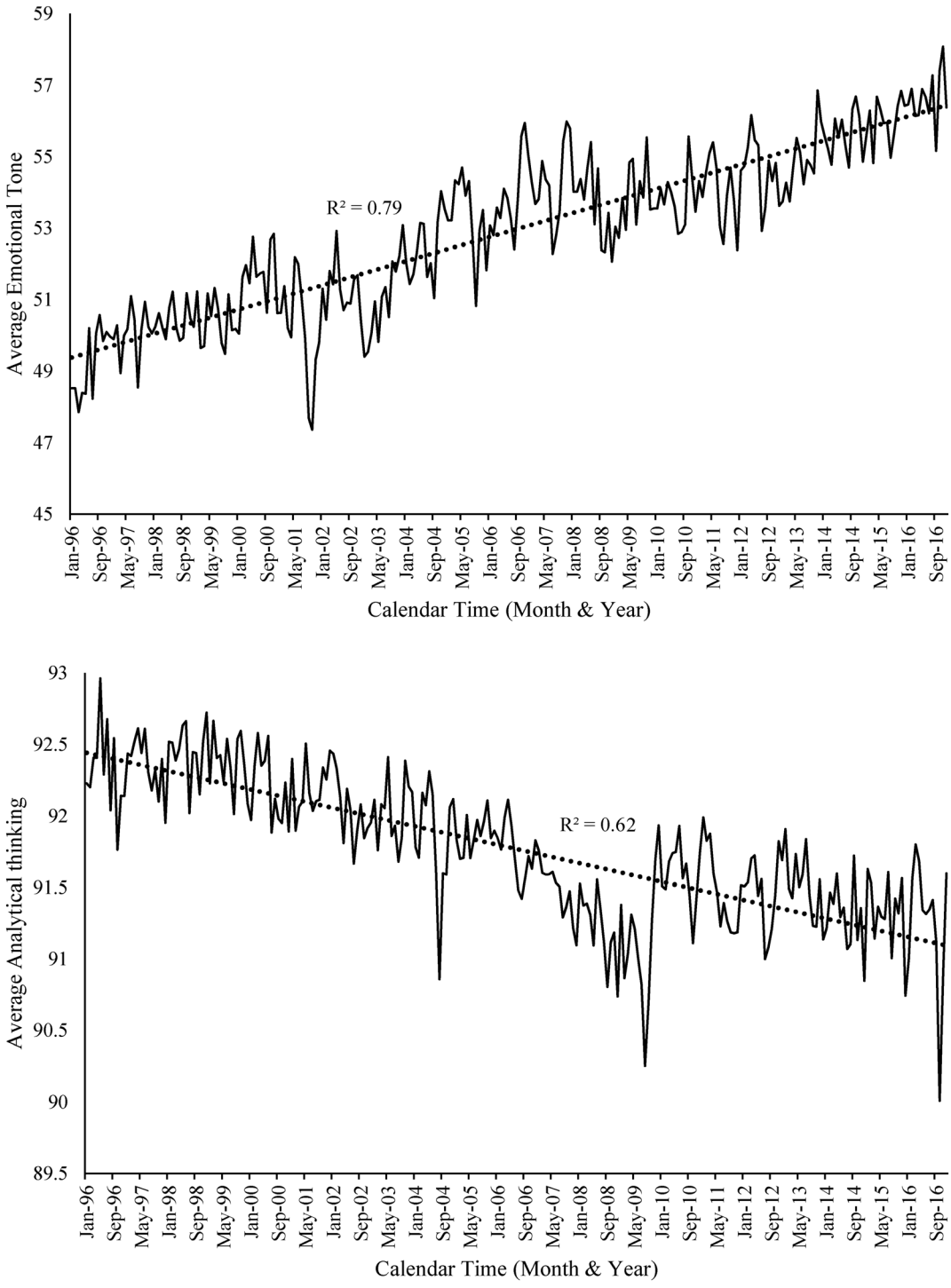


FIGURE 3 The temporal evolution of emotional tone and analytical thinking.

newspapers. Conversely, for all models with analytical thinking as the outcome (i.e., models 2, 4, 6, 8, 10, and 12), we observed that the time trend had a negative and statistically significant impact. Model 10 provided an exception—where the *p*-value was 0.13—which indicated that business focused newspapers did not exhibit a statistically

TABLE 5 Multivariate regression for emotional tone and analytical thinking (with full sample and subsamples).

	Full sample		National papers		Regional papers		Broadsheet format		Business focused papers		Tabloids	
	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Time trend	0.26***	−0.07***	0.11	−0.09**	0.28***	−0.06***	0.27***	−0.07***	0.23**	−0.07	0.19*	−0.10*
	[0.03] (0)	[0.01] (0)	[0.04] (0.11)	[0.01] (0.01)	[0.02] (0)	[0.01] (0)	[0.03] (0)	[0.01] (0)	[0.07] (0.01)	[0.04] (0.14)	[0.05] (0.01)	[0.03] (0.02)
Omitted category is entrepreneurship education												
Entrepreneurial fraud	−30.00***	−0.8***	−22.04**	−1.22+	−30.82***	−0.83***	−30.25***	−0.76***	−23.13***	−0.9*	−30.81***	−1.88+
	[0.7] (0)	[0.15] (0)	[1.89] (0.01)	[0.33] (0.07)	[0.5] (0)	[0.16] (0)	[0.76] (0)	[0.16] (0)	[1.77] (0)	[0.36] (0.03)	[2.19] (0)	[0.8] (0.07)
Ent. aspirations and journeys	−9.23***	−12.16***	−4.62	−14.37***	−9.54***	−11.91***	−9.24***	−12.12***	−6.81***	−12.15***	−11.41***	−12.90***
	[0.47] (0)	[0.3] (0)	[2.09] (0.16)	[0.43] (0)	[0.41] (0)	[0.27] (0)	[0.49] (0)	[0.32] (0)	[1.31] (0)	[0.86] (0)	[1.54] (0)	[1.4] (0)
Medical innovation	−9.29***	−1***	−5.53+	−3.09+	−9.48***	−0.79***	−9.73***	−1.04***	−4.73**	−0.07	−6.92*	−2.1*
	[0.48] (0)	[0.21] (0)	[1.31] (0.05)	[0.9] −0.08)	[0.48] (0)	[0.16] (0)	[0.53] (0)	[0.23] (0)	[1.43] (0.01)	[0.29] (0.81)	[1.94] (0.02)	[0.55] (0.01)
Aviation innovation	−21.71***	0.67***	−14.59**	−0.46*	−22.36***	0.75***	−22.08***	0.72***	−15.02***	0.808+	−21.09***	−0.73
	[0.73] (0)	[0.17] (0)	[1.04] (0.01)	[0.1] (0.04)	[0.65] (0)	[0.18] (0)	[0.8] (0)	[0.18] (0)	[1.64] (0)	[0.4] (0.06)	[1.82] (0)	[0.86] (0.44)
Entrepreneurs in politics	−11.35***	−1.58***	−6.83+	−2.24*	−11.59***	−1.57***	−11.34***	−1.54***	−8.55***	−1.11**	−14.15**	−2.95*
	[0.5] (0)	[0.15] (0)	[1.87] (0.07)	[0.39] (0.03)	[0.48] (0)	[0.16] (0)	[0.51] (0)	[0.16] (0)	[1.34] (0)	[0.29] (0)	[2.52] (0)	[0.77] (0.01)
Clean energy innovation	−11.92***	0.02	−7.32+	−0.87	−12.24***	0.08	−12.13***	0.05	−6.97**	0.32	−12.32***	−0.91+
	[0.51] (0)	[0.16] (−0.89)	[1.83] (0.06)	[0.51] (0.23)	[0.48] (0)	[0.16] (0.63)	[0.54] (0)	[0.18] (0.78)	[1.96] (0)	[0.25] (0.23)	[1.57] (0)	[0.4] (0.07)
Org relationships and culture	0.75	−7.54***	6.67+	−11.15**	0.29	−7.18***	0.99+	−7.7***	1.23	−6.75***	−1.62	−6.15***
	[0.54] (0.16)	[0.37] (0)	[1.83] (0.07)	[0.4] (0)	[0.46] (0.53)	[0.3] (0)	[0.57] (0.09)	[0.41] (0)	[1.44] (0.41)	[0.31] (0)	[2.46] (−0.54)	[0.66] (0)
	−5.27***	2.45***	−3.34*	−0.01	−5.43***	2.59***	−4.49***	2.68***	−5.84***	2.05**	−6.33**	0.48

TABLE 5 (Continued)

	Full sample		National papers		Regional papers		Broadsheet format		Business focused papers		Tabloids	
	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking
Executive appointments	[0.71] (0)	[0.24] (0)	[0.42] (0.02)	[0.38] (0.98)	[0.75] (0)	[0.22] (0)	[0.76] (0)	[0.26] (0)	[1.13] (0)	[0.49] (0)	[1.49] (0.01)	[0.62] (0.47)
Small business borrowing	−14.96***	1.25***	−10.5*	−0.22	−15.25***	1.4***	−15.22***	1.41***	−10.52***	0.78+	−15.44***	−1.2
	[0.53] (0)	[0.23] (0)	[1.73] (0.03)	[0.32] (0.56)	[0.53] (0)	[0.21] (0)	[0.57] (0)	[0.23] (0)	[1.72] (0)	[0.39] (0.07)	[1.89] (0)	[1.08] (0.32)
Entrepreneurs abroad	−16.33***	−3.69***	−11.29*	−3.47*	−16.62***	−4.08***	−16.49***	−3.65***	−7.48***	−4***	−16.62***	−5.06**
	[0.51] (0)	[0.29] (0)	[1.25] (0.01)	[0.66] (0.03)	[0.56] (0)	[0.22] (0)	[0.54] (0)	[0.3] (0)	[1.38] (0)	[0.53] (0)	[1.74] (0)	[0.99] (0)
Local entr. events	0.56	3.98***	7.72*	6.05***	0.03	3.83***	0.40	3.99***	−0.04	2.69*	4.61*	3.68+
	[0.82] (0.5)	[0.3] (0)	[1.52] (0.04)	[0.03] (0)	[0.81] (0.97)	[0.3] (0)	[0.85] (0.64)	[0.3] (0)	[2.39] (0.99)	[0.89] (0.01)	[1.59] (0.03)	[1.68] (0.08)
Entrepreneurs in the arts	−3.5***	−3.00***	0.00	−3.17+	−3.42***	−3.16***	−3.38***	−3.02***	−1.10	−1.99**	−6.48*	−3.73**
	[0.38] (0)	[0.26] (0)	[1.54] (1)	[1.07] (0.1)	[0.42] (0)	[0.17] (0)	[0.37] (0)	[0.29] (0)	[1.53] (0.48)	[0.57] (0.01)	[1.82] (0.02)	[0.92] (0.01)
Technology entrepreneurship	−12.07***	−2.11***	−4.92+	−3.11+	−12.91***	−2.05***	−12.24***	−2.09***	−8.82***	−1.84***	−11.42**	−2.82+
	[0.69] (0)	[0.25] (0)	[1.65] (0.1)	[0.89] (0.07)	[0.43] (0)	[0.24] (0)	[0.75] (0)	[0.27] (0)	[1.65] (0)	[0.33] (0)	[2.06] (0)	[1.31] (0.08)
Local economic development	−8.31***	−0.25	−6.01*	−1.16+	−8.57***	−0.19	−8.35***	−0.24	−4.65**	0.42	−10.31***	−0.55
	[0.37] (0)	[0.16] (0.11)	[0.63] (0.01)	[0.39] (0.1)	[0.33] (0)	[0.15] (0.21)	[0.38] (0)	[0.16] (0.14)	[1.52] (0.01)	[0.47] (0.39)	[0.81] (0)	[0.92] (0.58)
Local real estate projects	−11.63***	−0.02	−8.95**	−0.92	−11.75***	0.04	−11.57***	−0.07	−10.37***	0.97**	−13.05***	−0.64
	[0.34] (0)	[0.16] (0.92)	[0.45] (0)	[0.63] (0.29)	[0.36] (0)	[0.15] (0.8)	[0.35] (0)	[0.17] (0.68)	[1.21] (0)	[0.28] (0)	[1.89] (0)	[1.11] (0.59)
Employee healthcare	−13.29***	−1.88***	−6.25+	−2.91*	−13.89***	−1.81***	−13.46***	−1.9***	−7.91***	−0.68	−16.76***	−3.31***
	[0.58] (0)	[0.16] (0)	[1.63] (0.06)	[0.54] (0.03)	[0.47] (0)	[0.16] (0)	[0.61] (0)	[0.17] (0)	[1.72] (0)	[0.43] (0.14)	[1.89] (0)	[0.46] (0)

(Continues)

TABLE 5 (Continued)

	Full sample		National papers		Regional papers		Broadsheet format		Business focused papers		Tabloids	
	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking
Venture financing	−5.17***	−0.39*	−0.04	−1.41	−5.61***	−0.31*	−5.2**	−0.327+	−3.75**	−0.51	−5.40*	−1.20
	[0.53] (0)	[0.17] (0.02)	[1.69] (0.98)	[0.76] (0.21)	[0.46] (0)	[0.15] (0.03)	[0.59] (0)	[0.17] (0.06)	[1.07] (0)	[0.32] (0.14)	[1.39] (0.01)	[1.01] (0.29)
Culinary innovation	−4.36***	−1.73***	0.16	−1.73	−4.63***	−1.81***	−4.27***	−1.73***	−5.06*	−0.76*	−4.81	−2.79+
	[0.45] (0)	[0.21] (0)	[0.67] (0.84)	[0.75] (0.15)	[0.46] (0)	[0.2] (0)	[0.46] (0)	[0.22] (0)	[1.79] (0.02)	[0.26] (0.01)	[2.87] (0.15)	[1.3] (0.09)
Biz. networking and training	−4.88***	4.79***	−3.31	4.67*	−5.01***	4.79***	−4.88***	4.81***	0.1	5.46***	−11.73+	2.81+
	[0.96] (0)	[0.37] (0)	[1.22] (0.11)	[0.95] (0.04)	[1] (0)	[0.36] (0)	[0.98] (0)	[0.38] (0)	[2.39] (0.97)	[0.68] (0)	[5.11] (0.07)	[1.2] (0.07)
Volunteering by and for small biz.	−0.14	−0.26	5.81**	0.36	−0.58	−0.31	−0.17	−0.28	2.31	0.45	−2.92	−1.04
	[0.58] (0.81)	[0.23] (0.26)	[0.27] (0)	[0.73] (0.67)	[0.55] (0.3)	[0.23] (0.19)	[0.64] (0.79)	[0.26] (0.27)	[1.7] (0.2)	[0.27] (0.13)	[1.69] (0.14)	[0.63] (0.14)
Word count of article (logged)	−0.52**	−1.29***	−1.35+	−1.76*	−0.38*	−1.22***	−0.61**	−1.29***	−0.46	−1.07*	1.14**	−1.88**
	[0.19] (0.01)	[0.1] (0)	[0.41] (0.08)	[0.21] (0.01)	[0.18] (0.03)	[0.11] (0)	[0.19] (0)	[0.11] (0)	[0.58] (0.45)	[0.41] (0.02)	[0.28] (0.01)	[0.39] (0.01)
Words per sentence (logged)	0.18	5.03***	−2.36	6.38+	0.49	4.85***	−0.08	4.94***	3.64**	4.75***	3.17	8.59**
	[0.88] (0.84)	[0.63] (0)	[0.87] (0.11)	[2.03] (0.09)	[1.01] (0.63)	[0.62] (0)	[0.9] (0.93)	[0.67] (0)	[0.97] (0)	[0.75] (0)	[3.1] (0.35)	[2.06] (0.01)
Constant	65.96***	86.95***	67.1***	88.28**	64.26***	86.86***	63.63***	88.08***	54.76***	85.70***	48.31**	81.74***
	[2.62] (0)	[2.13] (0)	[1.17] (0)	[7.86] (0.01)	[2.95] (0)	[2.19] (0)	[2.53] (0)	[2.24] (0)	[4.73] (0)	[2.5] (0)	[9.63] (0)	[8.22] (0)
Month dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Newspaper dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	690,088	690,088	85,195	85,195	604,893	604,893	623,157	623,157	42,038	42,038	24,893	24,893

TABLE 5 (Continued)

	Full sample		National papers		Regional papers		Broadsheet format		Business focused papers		Tabloids	
	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking	Emotional tone	Analytical thinking
Number of newspapers	103	103	3	3	100	100	85	85	13	13	6	6
Adjusted r^2	0.128	0.259	0.108	0.276	0.126	0.258	0.129	0.259	0.081	0.253	0.169	0.277

Note: *p*-Values in parentheses. Standard errors in square brackets.
***$p < 0.001$.**$p < 0.01$.*$p < 0.05$.

significant downward trend in analytical thinking. In combination with our initial correlational analysis in Figure 2, these results demonstrate that there was a significant increase in emotional tone and concurrent decrease in analytical thinking over our 21-year observation period.

In the models presented above, we accounted for the content of news articles (i.e., the main topic) as a control variable. In doing so, we examined the cognitive and emotional characteristics of news stories independent of the articles' content. In the next step in our analysis, we delved deeper into the cognitive manifestations of national entrepreneurial culture by exploring the relationship between the thematic content of news articles and the ways in which that content was cognitive and emotionally portrayed by the news media. Specifically, we investigated how the 21 different topics we induced through topic modeling (see Section 3.4) contributed to changes in emotional tone and analytical thinking over time. To conduct this analysis, we interacted the time trend variable with the categorical variable indicating the main topic of each article. To interpret these findings, we computed the average marginal effects (Williams, 2012) of the time trend for each of the 21 possible values of the main topic categorical variable. The average marginal effect is the impact of an instantaneous change (dy/dx) change in the time trend variable on the dependent variable of interest, computed at each value of the main topic categorical variable. This analysis allowed us to identify which topics were primarily responsible for an increase in emotional tone and a decrease in analytical thinking over time. The summary of average marginal effects of the time trend for each value of the main topic is presented in Table 6.

As shown in Table 6, we observed that the time trend had the highest statistically significant positive average marginal effect on emotional tone when the main topics were about clean energy innovation ($\beta = 0.63$, $p < 0.001$), volunteering by and for small businesses ($\beta = 0.56$, $p < 0.001$), business networking and training ($\beta = 0.51$, $p < 0.001$), organizational relationships and culture ($\beta = 0.46$, $p < 0.001$), and medical innovation ($\beta = 0.44$, $p < 0.001$). Conversely, the time trend had the highest statistically significant negative average marginal effect on analytical thinking when the main topics were about entrepreneurial aspirations and journeys ($\beta = -0.30$, $p < 0.001$). To visually show the relative importance of each topic in shaping the observed time trends, we plotted the significant average marginal effects on a scatterplot as shown in Figure 4. The topics of entrepreneurial aspirations and journeys, organizational relationships and culture, and medical innovation are the most influential topics (i.e., they are the "outliers" on the scatterplot) for which the average marginal effect of time trend on both emotional tone and analytical thinking trend are statistically significant. The clear departure of the entrepreneurial aspirations and journeys topic from all other topics is an especially interesting finding because it lends additional support to prior acknowledgments of entrepreneurship being increasingly portrayed as a heroic endeavor at the expense of critically evaluating entrepreneurs and their ventures (Anderson & Warren, 2011; Barton & Muñoz, 2023; Blanco-Gracia, 2018; Johansson, 2009; Suárez et al., 2021).

4.2 | Robustness checks

We carried out several additional sensitivity analyses to ensure the robustness of our findings across alternate data subsamples, variables, and model specifications. First, as previously discussed and shown in Table 5, we executed subsample analyses where we segmented the data by the scope (i.e., national vs. regional) as well as the type (i.e., broadsheet vs. business focused vs. tabloid) of the news source. Second, given the substantial variance in the number of news articles across our sources (see Table 1), we confirmed the stability of our findings by excluding newspapers in the bottom 25% of the sample (with respect to the total number of articles). Third, we replaced *emotional tone* with two separate variables for *positive emotion* and *negative emotion*, both provided by LIWC. As anticipated, we observed a positive relationship between *time trend* and *positive emotion*, and a negative relationship between *time trend* and *negative emotion*. Fourth, given that our dependent variables are theoretically bounded between 0 and 100, we reran our models using a Tobit specification. Our results remained robust across all these sensitivity checks. Finally, we explored the question of whether the trends observed by our study may be attributed

TABLE 6 Average marginal effect of time trend for each main topic.

	DV: Emotional tone					DV: Analytical thinking				
Main topic	AME	SE	*p*	[95% conf. Interval]		AME	SE	*p*	[95% conf. Interval]	
Entrepreneurial education	0.34	0.04	0.00	0.26	0.43	−0.06	0.03	0.07	−0.11	0.00
Entrepreneurial fraud	0.11	0.04	0.01	0.03	0.19	−0.01	0.01	0.42	−0.04	0.01
Entrepreneurial aspirations and journeys	0.33	0.03	0.00	0.27	0.39	−0.30	0.05	0.00	−0.40	−0.20
Medical innovation	0.44	0.05	0.00	0.35	0.53	−0.05	0.02	0.02	−0.09	−0.01
Aviation innovation	0.23	0.05	0.00	0.14	0.33	0.00	0.01	0.92	−0.03	0.03
Entrepreneurs in politics	0.10	0.04	0.01	0.03	0.18	−0.09	0.01	0.00	−0.11	−0.07
Clean energy innovation	0.63	0.04	0.00	0.54	0.71	−0.03	0.01	0.06	−0.05	0.00
Organizational relationships and culture	0.46	0.07	0.00	0.33	0.59	−0.10	0.04	0.02	−0.18	−0.02
Executive appointments	0.30	0.05	0.00	0.19	0.41	−0.03	0.02	0.08	−0.06	0.00
Small business borrowing	−0.07	0.04	0.09	−0.16	0.01	−0.04	0.02	0.09	−0.08	0.01
Entrepreneurs abroad	0.15	0.04	0.00	0.07	0.24	−0.10	0.02	0.00	−0.14	−0.06
Local entr. events	0.31	0.10	0.00	0.12	0.50	−0.01	0.07	0.85	−0.16	0.13
Entrepreneurs in the arts	0.24	0.04	0.00	0.15	0.32	−0.08	0.02	0.00	−0.12	−0.04
Technology entrepreneurship	0.24	0.06	0.00	0.16	0.38	−0.10	0.02	0.00	−0.14	−0.06
Local economic development	0.35	0.03	0.00	0.28	0.42	−0.02	0.02	0.26	−0.06	0.02
Local real estate projects	0.26	0.03	0.00	0.20	0.32	−0.01	0.01	0.69	−0.03	0.02
Employee healthcare	0.10	0.04	0.01	0.03	0.18	−0.09	0.02	0.00	−0.12	−0.06
Venture financing	0.19	0.06	0.00	0.07	0.30	−0.05	0.02	0.01	−0.08	−0.01
Culinary innovation	0.27	0.04	0.00	0.19	0.35	−0.04	0.02	0.02	−0.08	−0.01
Business networking and training	0.51	0.09	0.00	0.34	0.69	0.00	0.04	0.91	−0.09	0.08
Volunteering by and for small businesses	0.56	0.10	0.00	0.37	0.75	−0.02	0.03	0.42	−0.08	0.03

Note: The significant effects are highlighted in gray.

to trends in general media coverage rather than to trends in media coverage of entrepreneurship topics. We did so by collecting and analyzing data from the Global Database of Events, Language, and Tone (GDELT) Project, an open-source database supported by Google that tracks news media in over 100 languages from print, broadcast, and online sources from almost every country every 15 min (The GDELT Project, 2024). Our analysis confirmed that increasing positive emotional tone over time is *not* reflective of a general increase in emotional tone in the media but is instead specific to entrepreneurship topics. A detailed explanation of this robustness analysis and results are available in Appendix C.

4.3 | National entrepreneurial culture and national entrepreneurial activity

Our second research question sought to examine the link between changes in national entrepreneurial culture and shifts in national entrepreneurial activity. This research question was inspired by previous research investigating the cognitive and emotional characteristics of news media to explain macro-collective processes such as rates of self-

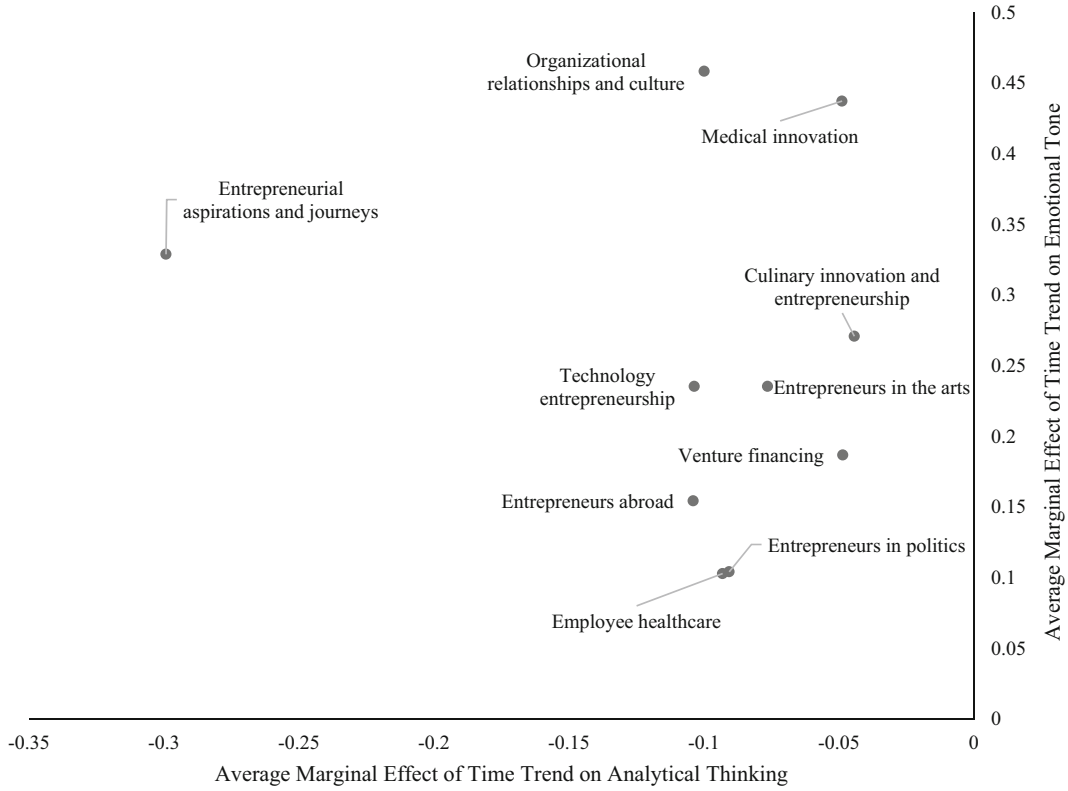


FIGURE 4 Scatterplot of average marginal effects with emotional tone as the DV (y-axis) and analytical thinking as the DV (x-axis). The average marginal effects for the 10 topics that were significant for both outcome variables (i.e., highlighted gray cells in Table 6) are plotted here.

employment (Suárez et al., 2021), and the construction of new market categories (Hiatt & Carlos, 2019; Navis & Glynn, 2010). Likewise, our aim was to investigate if the rise in emotional tone and the decline in analytical thinking contributed to our understanding of a country's entrepreneurial activity and its trajectory. To do so, we collapsed our data into a country-year panel (i.e., one observation for both emotional tone and analytical thinking) and joined it to other sources that have captured entrepreneurial activity in the United States over time. Specifically, we leveraged datasets from the Startup Cartography Project (Andrews et al., 2022), and the GEM, both available at no cost for academic use. From the former, we downloaded the national-level indices of Startup Formation Rate (SFR) and Entrepreneurial Quality Index (EQI) developed by Guzman and Stern (2015, 2020). The SFR index measures the number of new business registrations (i.e., startup quantity), whereas the EQI index measures the average growth potential of startups (i.e., startup quality). From the GEM dataset, we obtained annual measures of total early-stage entrepreneurial activity.

Using the Startup Cartography data (Figure 5a), we found that emotional tone was positively correlated with startup quantity ($r = 0.95$), and negatively correlated with startup quality ($r = -0.73$). In contrast, analytical thinking was negatively correlated with startup quantity ($r = -0.88$), and positively correlated with startup quality ($r = 0.81$). Using the GEM data (Figure 5b), we also found emotional tone positively correlated with total early-stage entrepreneurial activity ($r = 0.25$) whereas analytical thinking was almost uncorrelated to total early-stage entrepreneurial activity ($r = 0.038$, $R^2 = 0.0015$). Although these findings do not establish causal relationships, the robust correlations of emotional tone and analytical thinking with conventional measures of entrepreneurial activity generate two key insights. First, these relationships suggest that a growing positivity coupled with a declining analytical stance

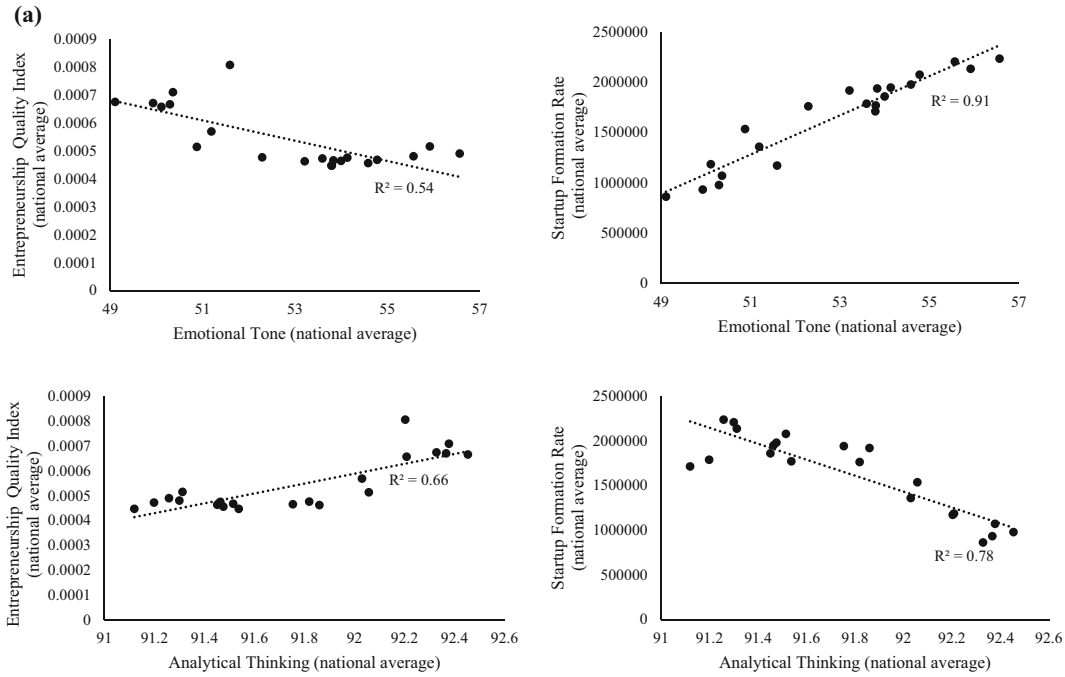


FIGURE 5 (a) Correlations between national entrepreneurial activity and national averages of emotional tone and analytical thinking (Startup Cartography Project data, 1996–2016). (b) Correlations between national entrepreneurial activity and national averages of emotional tone and analytical thinking (Global Entrepreneurship Monitor data, 2001–2016). (c) Correlations between national entrepreneurial attitudes and national averages of emotional tone and analytical thinking (Global Entrepreneurship Monitor data, 2001–2016).

toward entrepreneurship may contribute to the creation of new ventures but detract from the creation of high-growth ones. Second, the robust correlations also suggest that emotional and cognitive characteristics of news articles and other cultural artifacts may be used to develop simpler, and less resource intensive proxies for the quantity and quality of national entrepreneurial activity.

Moreover, the above findings raised the question of whether our measures of emotional tone and analytical thinking would be as good indicators of cultural attitudes as those compiled by the GEM data. Thus, we correlated annual averages of both of our indicators with the GEM's annual attitudinal measures of *perceived opportunities rate* and *entrepreneurial intentions rate* (Global Entrepreneurship Monitor, n.d.). The former measures the percentage of population between 18 and 64 years old who see good opportunities where they live, whereas the latter captures the percentage of population between 18 and 64 years old who are either entrepreneurs, or intend to start a business within 3 years (Global Entrepreneurship Monitor, n.d.). As indicated in Figure 5c, we found emotional tone to be positively correlated to entrepreneurial intentions ($r = 0.55$), and perceptions of entrepreneurial opportunities ($r = 0.58$). Conversely, analytical thinking was negatively correlated to entrepreneurial intentions ($r = -0.18$) and perceived entrepreneurial opportunities ($r = -0.37$). These findings strengthen the reliability of our measures (emotional tone and analytical thinking) of a country's cultural attitudes toward entrepreneurship.

4.4 | Using cognitive landscapes to compare (sub)cultures: Some emerging insights

The exploratory nature of our study involved several analytical pathways, which revealed new questions we had not initially considered. One of these pathways generated interesting insights about different entrepreneurial cultures

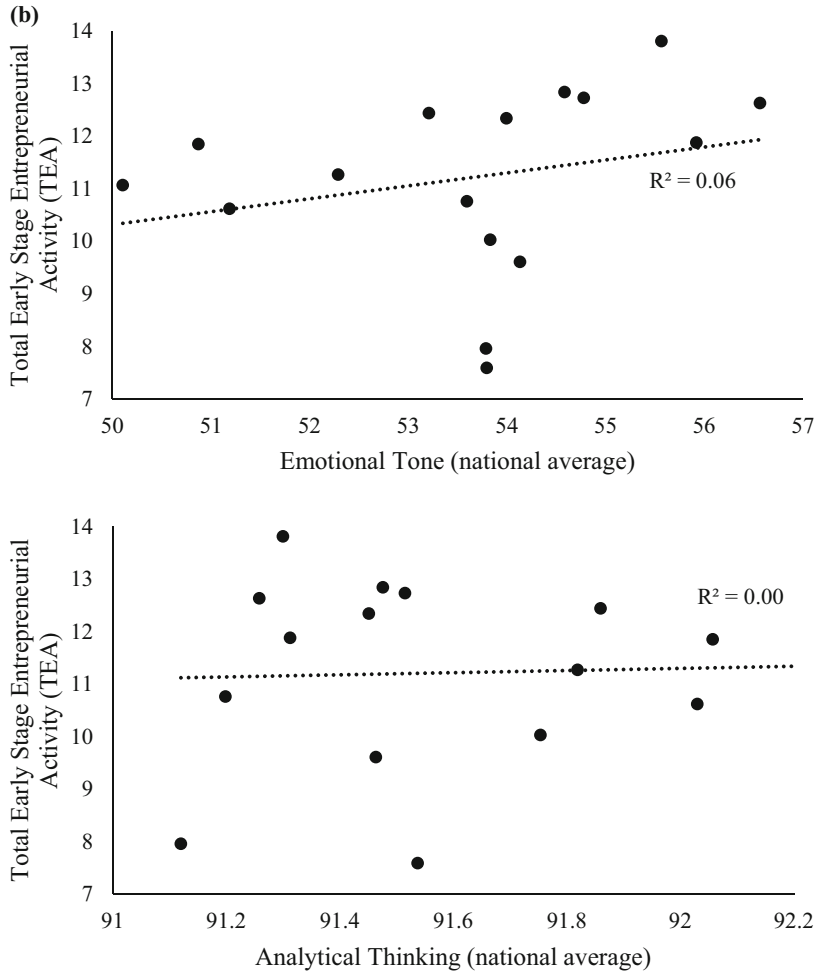


FIGURE 5 (Continued)

within the United States, and highlighted the value of extending our methodological approach to the study of cross-country cultural differences as well as the identification of entrepreneurial subcultures within the same country.

We first identified this promising pathway when we noticed the heterogeneity of topics between news sources. Prime facie, this was not particularly surprising. For example, the most frequently occurring topic in the Mercury News California (located in Silicon Valley) was about technology entrepreneurship (27.8% of articles in our sample in this newspaper), whereas the most common topic in the Washington Post (a national newspaper) was about entrepreneurs in politics (11.9% of articles in our sample in this newspaper). However, the distribution of topics across news sources allowed us to conceptualize topics as dimensions in an N-dimensional (21 in our dataset) landscape. As a result, we were able to measure cognitive distances (Lyu & Costas, 2022; Qin et al., 2021) by determining which news sources were most dissimilar (or similar) to each other, and whether the cognitive distance between news sources changed over time.

To create this cognitive space, we first collapsed our dataset by news source, and generated a vector representation for each source based on the average probability of a news article belonging to our set of topics. Thus, each news source occupied a single position within our defined high-dimensional topic space. We then applied a classical multidimensional scaling (MDS) approach (Borg & Groenen, 2005) to identify the Euclidean distance between news

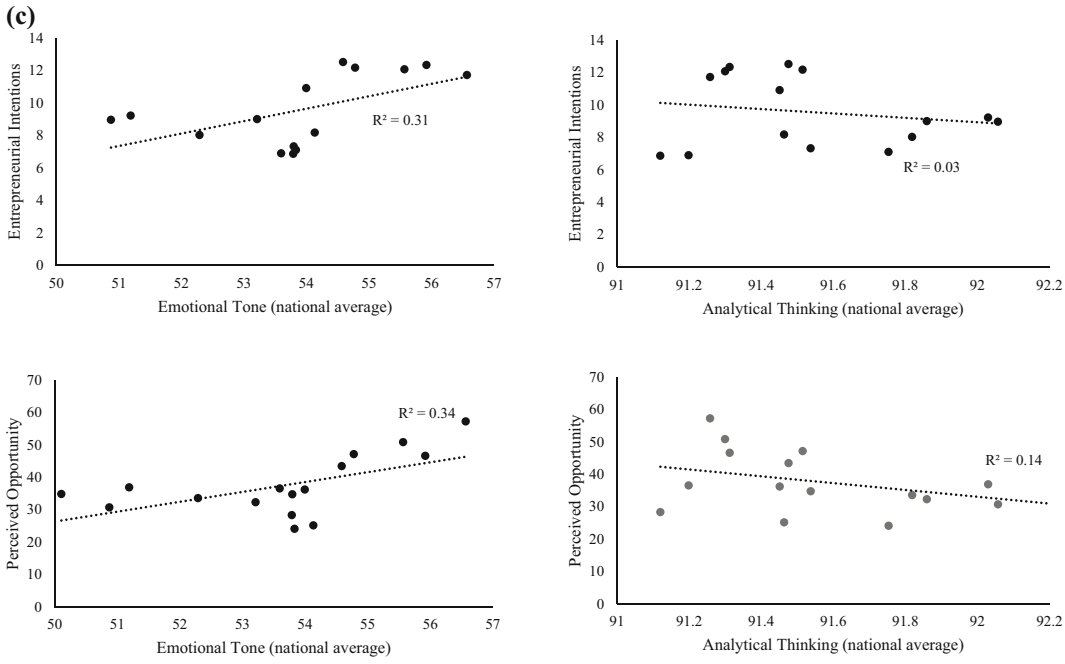


FIGURE 5 (Continued)

Code	Newspaper
2	Atlanta Journal and Constitution
3	Bangor Daily News
17	Deseret Morning News
38	Pittsburgh Post Gazette
41	Richmond Times Dispatch
48	St. Louis Post Dispatch
49	St. Paul Pioneer Press
50	Star Tribune Minneapolis
53	Telegram & Gazette Massachusetts
65	The Daily Oklahoman
68	The Denver Post
89	The Philadelphia Inquirer
96	The Washington Post
100	Tulsa World
5	Chicago Daily Herald
16	Dayton Daily News
44	Sarasota Herald Tribune
47	South Bend Tribune
52	Tampa Bay Times
62	The Charleston Gazette Mall
92	The Spokesman Review
95	The Tampa Tribune
57	The Austin American Statesman
69	The East Bay Times California
78	The Mercury News California
82	The New York Times

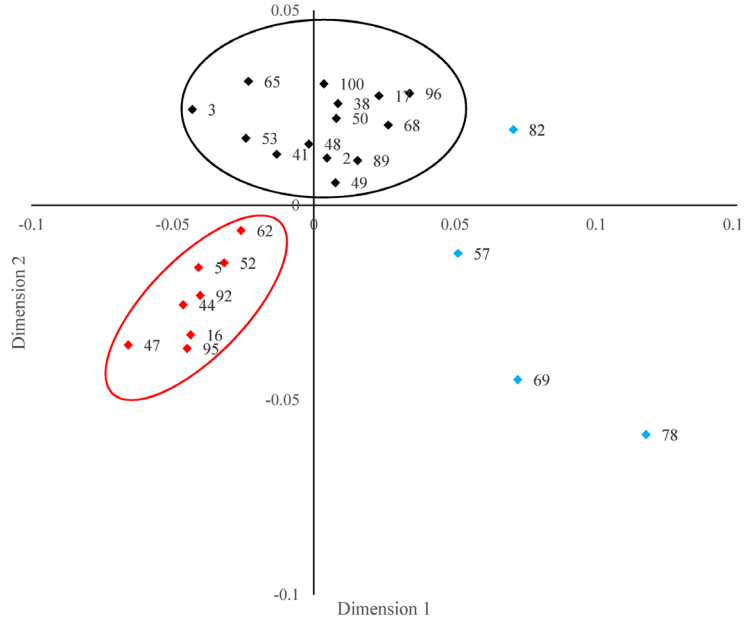


FIGURE 6 Classical multidimensional scaling (MDS) to represent cognitive dissimilarity (inferred from topic model distribution) between news media sources. For ease of visualization, we only show sources in the top 25th percentile (i.e., the 26 newspapers with the most articles) in our dataset. The color coding identifies the observable clusters in black and red respectively, as well as the "outliers" in blue.

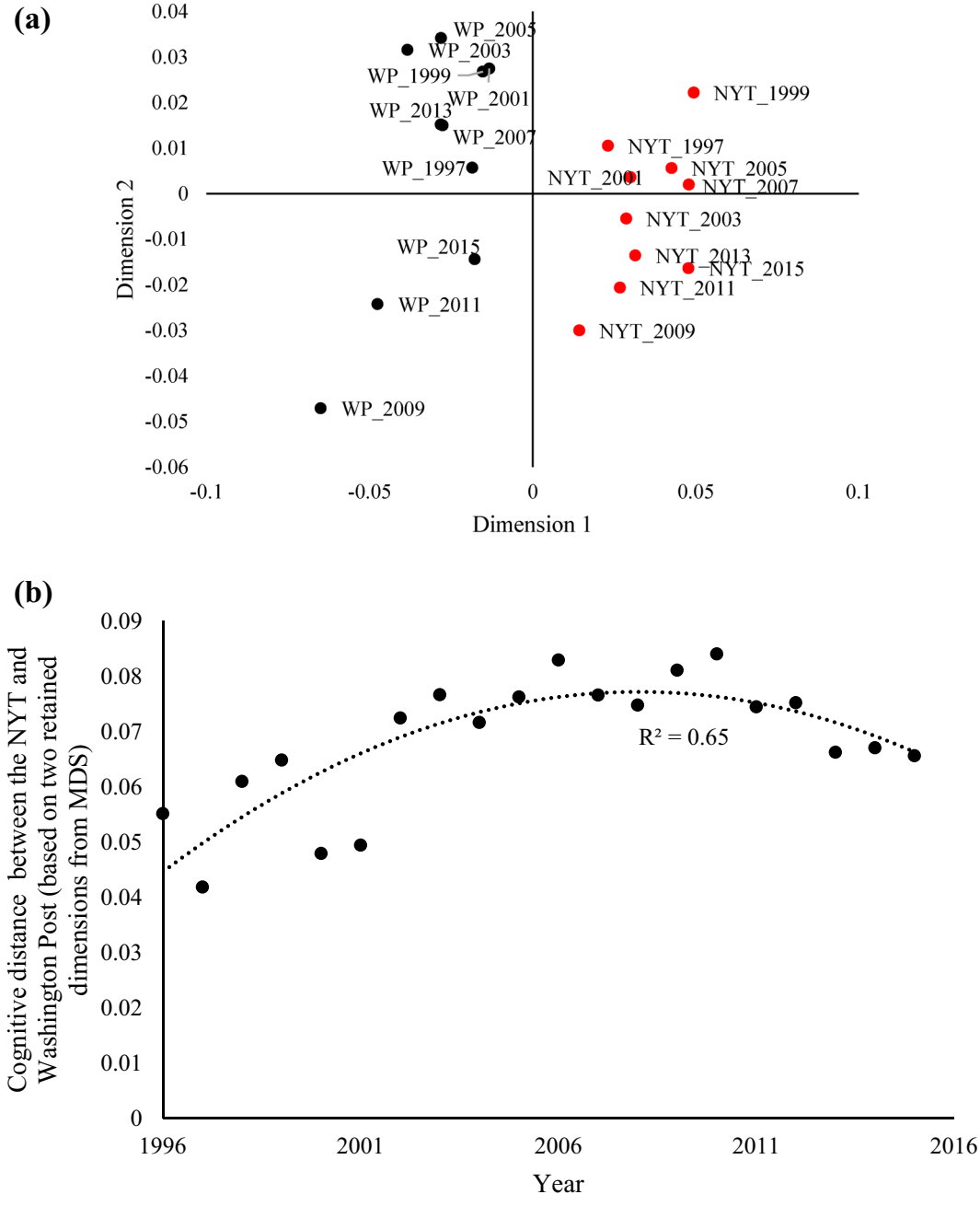
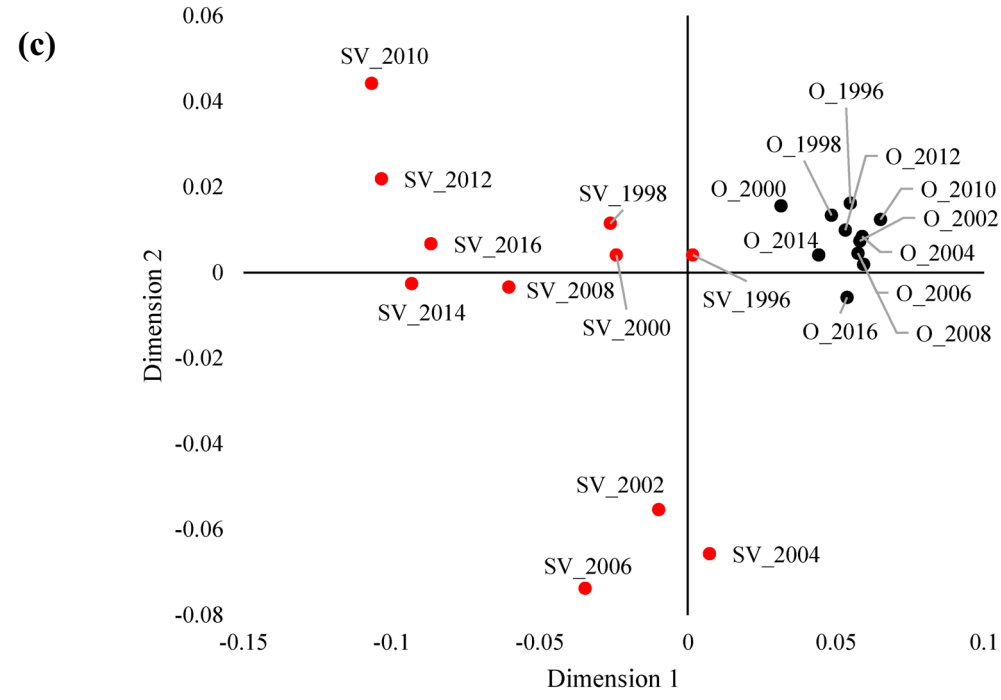


FIGURE 7 Using positions in cognitive landscape to track differences over time. Comparing two sources (panels A and B): Euclidean distance between The New York Times (NYT) and The Washington Post (WP). Comparing two groups of sources (panels C and D): Euclidean distance between Silicon Valley (SV) regional newspapers and other (O) regional newspapers. For ease of visualization, the MDS scatterplots show every alternate year.



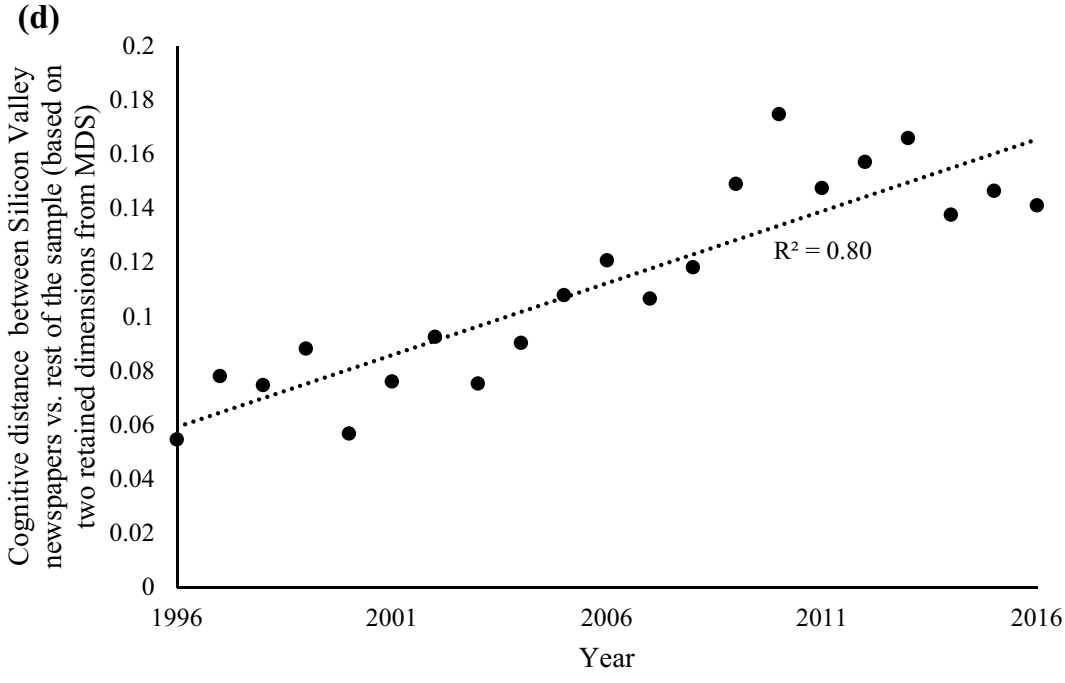


FIGURE 7 (Continued)

sources. This is equivalent to a principal component analysis of the correlation matrix of the variables (Mardia et al., 1979), which identify the probability of an article belonging to a given topic. Then, we could visualize the cognitive distance between news sources in a reduced dimensional space (i.e., typically two dimensions based on the top two

eigenvectors) that accounted for a significant proportion of variance between variables. For example, Figure 6 shows that the squared eigen values of the first two dimensions (Mardia fit measure 2) cumulatively account for 90.35% of the dissimilarity between news sources. For ease of visualizing these patterns, we focused only on the top 25th percentile of sources in our sample based on the number of articles.

As shown by the red and black markers in Figure 6, there were two major clusters representing newspapers that were "cognitively similar." Markers in blue show the "outliers," that is, the news sources that occupied a cognitively distant position in the landscape. Not surprisingly, the two papers from Silicon Valley—The East Bay Times and the Mercury News—were outliers and dissimilar from the rest of the sample due to their extensive focus on technology entrepreneurship. The Austin American Statesman occupied a unique position between the California news sources and the black-shaded cluster, reaffirming anecdotal and academic research that has suggested Austin, TX has an entrepreneurial identity that is creative and rather unique within the US context (Audretsch et al., 2017; Grodach, 2012; Pofeldt, 2016).

Our approach to creating a country's cognitive landscape is simple, reproducible, and generates results that are intuitive. Importantly, it can also be applied in a dynamic manner (i.e., leveraging the time series) by looking at positional shifts of news sources in the cognitive landscape (Stuart & Podolny, 1996). As such, this technique can be used to examine if two sources are converging (i.e., becoming more similar), or diverging (i.e., becoming more dissimilar) over time. Figure 7 (panel A) illustrates the value of this analysis by comparing the "cognitive positions" of the two national sources with the largest number of articles in our dataset: the New York Times and the Washington Post. To conduct this analysis, we created a panel data set based on the mean topic probabilities over time and re-applied the MDS approach. By comparing the Euclidean distance of the newspapers on the reduced two-dimensional MDS landscape on a year-by-year basis, we observed that these sources initially diverged in their coverage of entrepreneurship, followed by a period of convergence (Figure 7, panel B).

This approach is also useful for comparing *groups* of sources. To illustrate this, we grouped the two Silicon Valley news sources (i.e., The East Bay Times and the Mercury News), and compared them to the rest of the regional papers in our sample. Figure 7, panel C shows the MDS scatterplot, while Figure 7, panel D shows the Euclidean distance plot. We observe that, over the period of our study, Silicon Valley papers became increasingly "cognitively distant" from the rest of the country's news media. Again, these findings provide evidence of what some have referred to as the "Silicon Valley thought bubble," in which conversations and conceptualizations about entrepreneurship within the Valley are perceived as displaced and detached (Chang, 2015; Cook, 2020; Daub, 2020).

More generally, creating a multidimensional mapping of a country's cognitive landscape by grouping cultural artifacts of national entrepreneurial culture based on similarities in their cognitive characteristics provides an additional pathway to comparing national cultures. As we have demonstrated, this analysis may also be fruitful for identifying and comparing entrepreneurial subcultures within a geographic location to generate a more nuanced view of national entrepreneurial culture (e.g., Audretsch et al., 2021).

5 | DISCUSSION

5.1 | Summary of findings

Our study offers a first-of-its-kind dynamic view of national entrepreneurial culture represented through the important cultural artifact of news media stories related to entrepreneurship. This view has considered key affective (emotional tone) and cognitive (analytical thinking) elements of such media stories (and changes therein) as manifestations of cultural attitudes toward entrepreneurship over a 21-year period. Our findings point to a growing positive cultural bias toward entrepreneurship in the United States evidenced by the increase in positive emotional tone and concurrent decrease of analytical thinking over time. These trends suggest cultural attitudes in the United States may

increasingly embrace entrepreneurship but decreasingly consider entrepreneurship in a logical and evidence-based manner. Notably, this bias is not uniform across all identified topics; it is especially pronounced in discussions of entrepreneurial aspirations and journeys. In exploring the implications of this bias for national entrepreneurial activity, we find a strong and positive correlation with startup quantity (new venture formation), but a strong and negative correlation with startup quality (startup growth potential) (Andrews et al., 2022; Guzman & Stern, 2020). Importantly, patterns in emotional tone and analytical thinking correlate strongly with common measures of cultural attitudes toward entrepreneurship—entrepreneurial intentions rate and perceived opportunities rate (Global Entrepreneurship Monitor, n.d.). Finally, we have demonstrated how cognitive landscapes, generated by observed topics placed on a multidimensional matrix, can provide preliminary insights on how cultural attitudes in different places within the US converge or diverge over time. Together, these insights contribute to a dynamic and novel understanding of national entrepreneurship culture.

5.2 | Theoretical contributions

Our study makes three primary theoretical contributions. First, it extends research on national entrepreneurial culture by studying the objectified state of national entrepreneurial culture. It does so by focusing on the cognitive and emotional characteristics of a specific type of cultural artifact: entrepreneurship-related media articles. As objectified aspects of culture, media articles represent material efforts to bring to life and reify cultural attitudes (Vogus et al., 2010; Weick, 1979), while the cognitive and affective characteristics of such enactments are the channels through which cultural attitudes are explicated. In our study, the cultural practice of discussing entrepreneurship-related topics in the news explicates latent cultural attitudes toward entrepreneurship as well as their shifts over time. This view also extends our theoretical understanding of national entrepreneurial culture as a socially constructed process, which is partly influenced by the cultural context in which entrepreneurs operate (Achtenhagen & Welter, 2007; Downing, 2005; Fletcher, 2006; Kennedy, 2008; Rindova et al., 2006; Suárez et al., 2021; Vedula & Kim, 2018, 2019; Weiss et al., 2023). Enriching our understanding of such cultural processes can also be accomplished by studying other types of cultural artifacts such as movies, songs, podcasts, and social media posts related to entrepreneurship.

Second, by demonstrating that the culture of places (vis-à-vis entrepreneurship) can, and does change over time (Fang, 2005; Inglehart & Baker, 2000; McGrath et al., 1992), our study identifies a systematic and growing normative bias toward entrepreneurship in the United States. Specifically, we observe a growing embrace of entrepreneurship as a "positive affective activity," coupled with a continuous decline in discussing its merits. This pattern provides evidence of societal views of entrepreneurship in the United States increasingly suffering from the "Pollyanna principle," a bias toward focusing, processing, and remembering "pleasant over unpleasant information" (Matlin & Stang, 1978, p. 4; Suárez et al., 2021). Importantly, the strong relationships between this bias and national levels of entrepreneurial activity point to the concrete impact such cultural changes may have on entrepreneurial processes and outcomes.

Third, by offering a longitudinal view of national entrepreneurial culture, we extend prior research, which has been largely cross-sectional even when using longitudinal datasets such as the GEM data (e.g., Hechavarría, 2016; Liñán & Fernandez-Serrano, 2014; Pinillos & Reyes, 2011). Those who have adopted a longitudinal perspective have concentrated on tracking the development of particular elements within entrepreneurial ecosystems within a single city (e.g., Mack & Mayer, 2016), or have exclusively delved into entrepreneurs' perceptions of cultural norms and the subsequent influence of these norms on entrepreneurs' prospective success in establishing new ventures (e.g., Hopp & Stephan, 2012). Instead, our study identifies broad cultural changes—not exclusive to entrepreneurs, or to specific elements of ecosystems—that can happen within relatively short timeframes and are more detectable than relatively slower changes in entrepreneurs' beliefs and dispositions in a country (Vedula & Kim, 2019).

5.3 | Empirical contributions

The strong positive correlation of emotional tone with new venture formation rates, and strong negative correlation of analytical thinking to new venture growth (Andrews et al., 2022; Guzman & Stern, 2015, 2020; Hunt & Kiefer, 2017; Shane, 2009) raise two important questions for the study of national entrepreneurial culture. Does a society's growing embrace of entrepreneurship require by default lowering its critical evaluation of entrepreneurship, and with what consequences? Does greater acceptance and support for entrepreneurship produce healthier economies, and more capable entrepreneurs? Some studies have already shown that over-entry into entrepreneurship comes with substantial societal costs (Hunt, 2015; Shane, 2009). Thus, studying how we can have more and better entrepreneurs; more startups and more successful ones can be fruitful avenues for future research.

Relatedly, entities responsible for fostering entrepreneurship, including incubators, accelerators, educational institutions offering entrepreneurship programs, and policy makers, might benefit from our study. Our findings suggest that the effectiveness of any efforts to support entrepreneurship might influence and be influenced by the cultural environment in which they are implemented (Vedula & Fitza, 2019). Specifically, the emotional and cognitive characteristics of the environment in which entrepreneurship unfolds may be equally significant as the financial, intellectual, social, and regulatory measures implemented to encourage entrepreneurial activity. Thus, programs and policies intended to increase engagement in entrepreneurship may be more effective if they also consider how they are communicated to and received by relevant audiences. For example, one interesting possibility is to consider how written communication and feedback (particularly critical feedback) given by such sponsorship programs to aspiring entrepreneurs is framed, and how it impacts both individual entrepreneurs and the broader local entrepreneurial culture (Wagner, 2017). At the same time, our findings should caution against anyone lowering the entry barriers to entrepreneurship without holding entrepreneurs to rigorous standards, and without equipping them with the tools and knowledge necessary for succeeding.

Finally, the strength of the correlational relationships we have identified points to opportunities for developing alternative, "good enough" indicators of both entrepreneurial attitudes and entrepreneurial activity that are considerably less obtrusive and less resource intensive than traditional indicators. Doing so is increasingly possible given the wealth of public data available digitally, and advances in machine learning and artificial intelligence that enable reliable and rapid analysis of large volumes of text, visual, and voice data. Our study provides one illustration of how these tools can be used and combined with more conventional statistical analyses, but a wealth of opportunities exist to use machine learning to develop new measures and concepts in entrepreneurship research (Aceves & Evans, 2023).

5.4 | Methodological contributions

Our study makes two important methodological contributions. It responds to calls for using news data and other novel, big data sources to study entrepreneurship at the country level (Aceves & Evans, 2023; von Bloh et al., 2020). We do so by constructing a dataset that can be easily replicated across countries and other geographic regions with relatively little investment in the data collection process. Contrary to collecting national survey data, our approach offers a novel pathway to examining cultural attitudes toward entrepreneurship in a nonintrusive, less costly, and easy to replicate way by using machine learning (natural language processing). Importantly, our analytical approach can be applied to the study of culture within various collectives such as regions, states, and business ecosystems. Although the number of articles we have from each region is not sufficient for us to conduct a regional analysis, future studies could collect relevant articles from metropolitan statistical areas to conduct a regional analysis of entrepreneurial culture. Additionally, the availability of the LIWC software dictionary in 15 other languages (LIWC Dictionary Repository, 2024) enables the study of linguistic characteristics of cultural artifacts produced in several other languages, as well as cross-country comparisons. LIWC's default dictionary can be leveraged further to

investigate the links between cultural attitudes and its other linguistic markers such as past, present, and future orientation. Importantly, topic modeling techniques can be seamlessly applied to other types of content such as social media content, which increasingly shapes collective perceptions and emotions (Firth et al., 2019; Leonardi, 2018; Sano et al., 2019).

Another methodological contribution of our study emerges from the demonstration of how identified topics can be used to generate cognitive landscapes and associated cognitive distances (Lyu & Costas, 2022; Qin et al., 2021). We provide some illustrative examples of how this method can be used to compare sources (or groups of sources) in Figures 6 and 7. The approach can be leveraged in future research to test specific hypotheses within a causal framework. For example, one might expect that as entrepreneurs move across regional or national borders, or return to home nations after living abroad (Liu et al., 2010), they might act as "carriers" of cultural attitudes and artifacts across nations (Terjesen & Elam, 2009). Such globalization dynamics should arguably lead to more cultural convergence as cognitive understandings about entrepreneurship are shared between previously disparate groups. Examining the conditions under which such cross-cultural convergence is either enabled or impeded would be an interesting avenue for further exploration. Moreover, the cognitive distance between regions and nation-states could be used as an independent variable (analogous to how it is typically used in firm-level research) to explain several traditional phenomena of interest to entrepreneurship scholars, such as cross-border investment and new venture internationalization decisions (Deng et al., 2018; Iriyama et al., 2010; Madhavan & Iriyama, 2009; Vedula & Matusik, 2017).

5.5 | Limitations and additional future research opportunities

Naturally, our study comes with limitations. It uses only broad categories of linguistic style (i.e., emotional tone, and analytical thinking) to study the characteristics of cultural artifacts in which national attitudes toward entrepreneurship are manifested. Our focus on emotional tone and analytical thinking has been driven by their stability—and thus usefulness—across contexts (Mehl & Pennebaker, 2003; Pennebaker & King, 1999). But numerous other linguistic markers exist such as clout (i.e., the language of leadership and status), authenticity (e.g., the language of honesty and genuineness), and time orientation (e.g., the language of focusing on past, present, or future) may inform our understanding of cultural attitudes toward entrepreneurship (Boyd et al., 2022). Relatedly, our study does not capture specific collective emotions such as fear or pride about entrepreneurship (Begley & Tan, 2001; Welpe et al., 2012; Wyrwich et al., 2016). Thus, future research may create and validate dictionaries (Donohue et al., 2013) grounded in entrepreneurship-relevant theories that capture specific emotions, as well as particular cognitive processes such as specific beliefs, biases, and risk perceptions related to entrepreneurship (Felin & Zenger, 2009; Simon et al., 2000). For instance, custom dictionaries can be developed and utilized within LIWC to capture validated dimensions of culture, such as uncertainty avoidance (Hofstede, 1984) or specific emotions, such as fear of failure (Wyrwich et al., 2016).

We also recognize that our study utilizes only print media news articles. However, the tools and analytic techniques we have used are amenable to the analysis of datasets from other corpora of text such as social media data, websites, blogs, and transcribed videos (Albalawi et al., 2020; Barfar, 2019). For instance, entrepreneurship scholars may build on a vibrant research stream on social media (He et al., 2016; Nagatsu & Salmela, 2022; Sano et al., 2019) to develop custom datasets and test relationships between various markers of languages and variables of predictive value for entrepreneurship. More inclusive datasets such as the GDELT Project (see our supplementary analysis in Appendix C), which monitors the world's broadcast, print, and web news in over 100 languages, can also be leveraged by entrepreneurship scholars to generate real-time barometers of relevant entrepreneurial events along with informative visualizations (Wennberg & Anderson, 2020).

Finally, a key limitation of our study is that it establishes strong correlational, but not causal, links between media-produced cultural artifacts and national entrepreneurial activity. Future research can therefore build on our

study to test the direction of causality. One important question concerns the media's role in reinforcing or altering prevailing attitudes toward entrepreneurship. Research on the impact of media-produced artifacts may also consider other outcomes such as any changes in, and the effectiveness of, entrepreneurship policy, national rates of innovation, and recent record levels of venture funding and startup valuations (Iyer, 2022; Teare, 2022). Additional opportunities exist to develop and test a more comprehensive set of relationships by examining social, institutional, normative, economic, and regulatory antecedents to media-produced cultural artifacts. Similar lines of inquiry could examine the drivers behind the content and style of specific entrepreneurship topics covered by media. Prior research has recognized that the media's thematic choices impact whether and how certain topics resonate emotionally and cognitively with the public (Boykoff & Boykoff, 2004; Giorgi, 2017; Wirth & Schramm, 2005). Thus, we invite future research to examine the role of audience reactions in certain topics gaining prominence and being more positively portrayed or less critically discussed by the media. More broadly, we see ample opportunity to study the role of media-audience relationships in shaping collective meanings and engagement with entrepreneurship. We submit that these lines of inquiry are critical for understanding the implications of entrepreneurial culture for the health and evolution of entrepreneurial ecosystems—national or otherwise. We hope this study serves as a useful guide and roadmap.

6 | CONCLUSION

In examining the linguistic evolution of news stories related to entrepreneurship, we have developed a novel and dynamic view of national entrepreneurial culture. In doing so, we offer an alternative path to studying national entrepreneurial culture that leverages publicly available data and modern methods for extracting insights from large volumes of text to uncover latent collective-level forces that can have a powerful influence on entrepreneurial dynamics, but are not as readily observable or as salient in other datasets. Importantly, the observed positivity bias toward entrepreneurship and its strong relationship to indicators of entrepreneurial activity raises important questions about the unintended consequences of increasingly supporting entrepreneurship.

ACKNOWLEDGMENTS

The authors are grateful to the State Research Agency of the Ministry of Science, Innovation and Universities in Spain (Agencia Estatal de Investigación) for partially funding research reported in this article (MCIN/AEI/10.13039/501100011033, Grant No. PID2020-117248GB-I00). The authors also thank two anonymous reviewers and their SEJ editor, Peter Younkin, as well as the participants at IE University's Entrepreneurship Research Seminar; the Babson Conference Entrepreneurship Research Conference; and the Sustainability, Ethics, and Entrepreneurship Conference for their helpful feedback on earlier versions of this article.

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ENDNOTE

[1] Given space limitations, Table 2 shows only the top 20 words for each topic sorted based on their probability of association with each main topic. For example, the word "bank" is the 18th most frequently appearing word for the topic "executive appointments" and the 2nd most frequently appearing word for the topic "small business borrowing". This means that "bank" has a higher probability of appearing in articles about the latter topic.

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How to cite this article: Kyprianou, C., Vedula, S., Pu, W., & Fitza, M. (2025). Shifts in national entrepreneurial culture: The promise of linguistic cultural artifacts and machine learning analysis. *Strategic Entrepreneurship Journal*, *19*(1), 29–82. https://doi.org/10.1002/sej.1519

APPENDIX A: REPRESENTATIVE ARTICLES BY TOPIC

TABLE A1 Examples of articles exemplifying each of the 21 topics.

Topic	Article title	Newspaper source	Year
Aviation innovation	Delta to launch low-fare airline	Tulsa World	2002
Aviation innovation	F.A.A. says era of the air taxi is at hand	The New York Times	2006
Aviation innovation	These three defense training contracts have been set aside for small businesses	The Washington Post	2014
Business networking and training	Business meetings and seminars	South Bend Tribune	2001
Business networking and training	No title (Section: Local Business)	Star-News	2008
Business networking and training	Bulletin board	Tampa Bay Times	2014
Clean energy innovation	ISU planning to burn wood at coal-fired plant	Telegraph Herald	2010
Clean energy innovation	Downsizing nuclear power plants can fuel big benefits	Richmond Times Dispatch	2016
Clean energy innovation	Williams announces startup of second Canadian offgas processing plant	Tulsa World	2016
Culinary innovation and entrepreneurship	For Oscars, the dining is show-stopping	USA Today	2005
Culinary innovation and entrepreneurship	Food; Cook up some good stuff for spot	Daily Camera	2008
Culinary innovation and entrepreneurship	Embracing Anchovies; A long-misunderstood ingredient is moving into the mainstream	Spokesman Review	2013
Employee healthcare	Pros and cons for health insurance reform proposals	Idaho Falls Post Register	1998
Employee healthcare	Q&A with Kevin Gordon; Employers may face tax issues from recent health care reforms	The Oklahoman	2010
Employee healthcare	Healthcare reform/Special pullout; A closer look at the law	Richmond Times Dispatch	2010
Entrepreneurial aspirations and journeys	Dosty twins make a good team on, off court	The Oakland Tribune	2002
Entrepreneurial aspirations and journeys	Dealing with pain and setbacks; Is part of the game	Pittsburgh Post-Gazette	2003
Entrepreneurial aspirations and journeys	Commentary: Who knows what'll happen, let's just enjoy the ride	Colorado Springs Business Journal	2010
Entrepreneurial fraud	Rolling Meadows man faces fraud indictment	Chicago Daily Herald	1999

TABLE A1 (Continued)

Topic	Article title	Newspaper source	Year
Entrepreneurial fraud	Judge rejects businessman's new-trial plea; The request, based on a juror's post-verdict letter to the judge, came from a man convicted of falsifying data on an SBA form.	Portland Press Herald	2011
Entrepreneurial fraud	Jeremy Johnson's attorneys appealing decision to jail him pending sentencing	The Salt Lake Tribune	2016
Entrepreneurs in politics	Governorship results mixed	The Augusta Chronicle	2002
Entrepreneurs in politics	Changes sweep nation	St. Petersburg Times	2006
Entrepreneurs in politics	Smackdown in Conn.; Colo. incumbent holds on; 2012 hopefuls eye Tuesday's primary results	USA Today	2010
Entrepreneurs in the arts	A Dogg's life; Successful new album, wild side projects keep rap legend in public eye	Spokesman Review	2002
Entrepreneurs in the arts	Aviator' and Leo fly high—Capture movie and acting awards as Hilary Kos rivals	The New York Post	2005
Entrepreneurs in the arts	Young Jeezy shows wealth of "Inspiration"; Rapper's short gig loaded with plenty of hits, opulence	The Atlanta Journal-Constitution	2006
Entrepreneurship abroad	In Peru: A culture held hostage; Japanese-Peruvians have long sought to maintain low, safe profiles	Pittsburgh Post-Gazette	1997
Entrepreneurship abroad	Riots shatter French myth	Monterey County Herald	2005
Entrepreneurship abroad	Editorial cartoons speak with power against terrorist violence	The Alamogordo Daily News	2015
Entrepreneurship education	No title (Section: Neighbor; Best and Brightest)	Chicago Daily Herald	2000
Entrepreneurship education	Foundation offers scholarships	Vallejo Times Herald	2010
Entrepreneurship education	College news; Honors	LNP	2016
Executive appointments	Companies	Intelligencer Journal	2002
Executive appointments	Personnel moves	Pittsburgh Tribune Review	2008
Executive appointments	People in the news	The Philadelphia Inquirer	2009
Local economic development	Allegheny River Towns eyes development	Pittsburgh Tribune Review	2011
Local economic development	Eureka continues to hone vision for the future; council focuses in on five goals, directs staff on initiatives	Eureka Times Standard	2011
Local economic development	Zoning consolidation proposed for Lancaster	Sarasota Herald Tribune	2012
Local entrepreneurship events	Local events	San Jose Mercury News	2006

(Continues)

TABLE A1 (Continued)

Topic	Article title	Newspaper source	Year
Local entrepreneurship events	Community calendar	Telegraph Herald	2012
Local entrepreneurship events	Community calendar	Las Cruces Sun-News	2016
Local real estate projects	Lofty goals apartments downtown surge more developers see Augusta's older buildings as the new havens of residential life in the city	The Augusta Chronicle	2000
Local real estate projects	Retail rehab creeps west	St. Louis Post-Dispatch	2005
Local real estate projects	Going up/Rizpoc, Sarasota Construction moving along on mixed-use downtown project	Sarasota Herald-Tribune	2007
Medical innovation	Grant to fund Copernicus work on needle-free immunizations	Crain's Cleveland Business	2000
Medical innovation	Mind over matter, with a machine's help	The New York Times	2007
Medical innovation	Inovio deal with Roche has distant payoff	The Philadelphia Inquirer	2013
Organizational relationships and culture	Take inventory of employee morale	St. Louis Post-Dispatch	2004
Organizational relationships and culture	Domestic Transport Solutions accelerates in Arlington Heights	Chicago Daily Herald	2011
Organizational relationships and culture	Can't find good workers? Look here!	Eureka Times Standard	2013
Small business borrowing	Banks continue to tighten lending standards	Saint Paul Pioneer Press	2002
Small business borrowing	Debts down for 5th straight quarter	Charleston Gazette	2009
Small business borrowing	Fed cites easing of lending terms, increase in demand for loans	The Washington Post	2011
Technology entrepreneurship	Compaq launches Netpliance	Deseret News	2000
Technology entrepreneurship	A high-speed connection makes friends with TV	The New York Times	2004
Technology entrepreneurship	Report: Google taking photos out of Google+	San Jose Mercury News	2015
Venture financing	Austin firm has $320 million for start-ups; New fund shows strength	Austin American-Statesman	1998
Venture financing	Venture firm finds fortune over time; Baltimore's NEA first invested in 1978	The Washington Post	2002
Venture financing	Menlo Ventures raises $400M fund to back the next Uber or Tumblr	Contra Costa Times	2015

TABLE A1 (Continued)

Topic	Article title	Newspaper source	Year
Volunteering by and for small businesses	Be a volunteer	Idaho Falls Post Register	1998
Volunteering by and for small businesses	Support and care are LULAC goals	Topeka Capital-Journal	2000
Volunteering by and for small businesses	Volunteer corner	The Salt Lake Tribune	2007

Note: These articles can be accessed at https://osf.io/nkbg4/?view_only=15780f3fc15f4cc1bdae1efe8ed1f1d6.

APPENDIX B: TUNING THE LDA ALGORITHM TO IDENTIFY THE OPTIMAL NUMBER OF TOPICS

To infer the topic structure (i.e., the topics and their distributions), we needed to identify the optimal number of topics. This decision was influenced by both statistical measures and the research focus, as suggested by DiMaggio et al. (2013). Four well-established metrics (Arun et al., 2010; Cao et al., 2009; Deveaud et al., 2014; Griffiths & Steyvers, 2004) were employed for this purpose, and implemented through the ldatuning R package (Nikita, 2015). To ensure computational efficiency, we randomly sampled 1% of news articles from our complete dataset to determine the optimal number of topics for analysis. Lower metric values were considered favorable according to Arun et al. (2010) and Cao et al. (2009), while higher values were preferable for the metrics by Griffiths and Steyvers (2004) and Deveaud et al. (2014). Based on these metrics, PLDA was run with the number of topics varying from 21 to 31 (see Figure B1). We ultimately chose 21 topics because this number struck a balance between topic comprehensiveness and minimal redundancy. Beyond the number of topics, other input parameters needed specification. For the PLDA algorithm, we set $\alpha = 0.1$, $\beta\beta = 0.01$, burn-iterations $= 250$, and total iterations $= 300$. The choice of

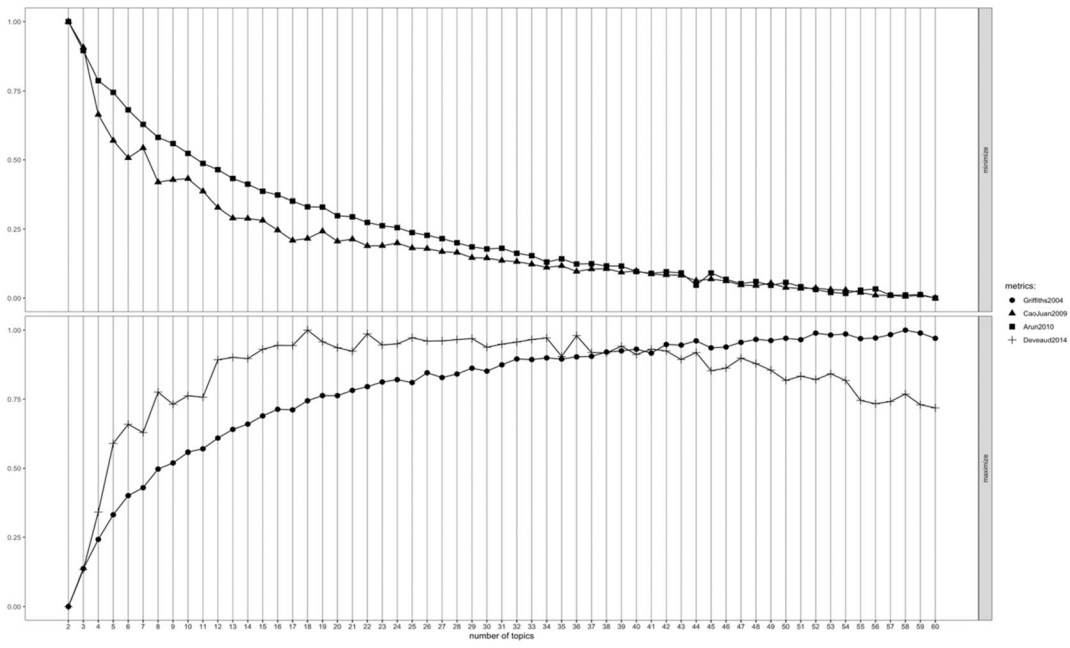

FIGURE B1 Metrics used to select the optimal number of topics.

α < 1 was made under the assumption that each news article would likely have only a few topics with high probabilities. The selection of $\beta\beta = 0.01$ adhered to the recommendation of the PLDA algorithm authors. This approach allowed us to calculate the probability that each article's content was associated with a specific topic. To determine the main topic for each article, we identified the maximum probability value across the 21 topics, assigning a value from 1 to 21 to a categorical variable named "main topic." In our regression analyses, this variable served to control for the content of each news article. It is worth noting that our results remained robust even when using a continuous measure that represented the probability each article was associated with a given topic, instead of the categorical variable.

APPENDIX C: SENSITIVITY ANALYSES TO MEASURE THE GENERAL EMOTIONAL TONE IN THE MEDIA

Our goal with this additional analysis was to capture general trends in media and compare them to the entrepreneurship-specific trends observed by our study. To do so, we utilized data collected by the GDELT Project, an open-source database supported by Google that tracks news media in over 100 languages from print, broadcast, and online sources from almost every country every 15 min, and analyzes these data to identify themes including sentiment. Importantly, these data allow us to zero in on US news media—the focus of our study.

The GDELT database is a type of "events" database, which contains records of over 300 categories of worldwide events (The GDELT Project, 2024). The database provides the average tone of all the news that mentions the corresponding events (The GDELT Project, 2015). Importantly, each record in this database describes the event's details, date, location, and (two) actors involved. Thus, the database allows us to select and filter news about specific countries and specific types of actors. GDELT codes events and actors based on the Conflict and Mediation Event Observations event and actor codebook, which was developed to study cooperation and conflict in political interactions (Arpieb, 2018; Schrodt et al., 2005). Although our study is not about political interactions, the GDELT database allows us to filter the actors related to business by using "BUS" as a keyword. Business actors include businessmen, companies, state-run enterprises, and government agencies promoting business and/or privatization, but exclude MNCs (Schrodt, 2012, p. 93; Schrodt et al., 2005).

To access the GDELT data, we used the GDELT package in Python. Our goal was to create two datasets; one for general news unrelated to business actors, and one for news related to business actors. For the "general events" dataset, we immediately ran into a data processing problem given the massive size of the GDELT data. We studied the journalism research and followed best practices for handling such situations by randomly sampling across our time span of interest (e.g., McAllister et al., 2021). Specifically, to get access to US-related news in the database, we randomly pulled 2 days' worth of data for each month ranging from 1990 to 2012—with 1 day in the first half of the month and the other in the second half of the month—and filtered the data so that the locations for the two actors and the action were all within the United States. We then separated the BUS-related data records (i.e., where either of the actors had BUS roles) to create a dataset of general, nonbusiness-related news. The size of the data for business-related actors was much smaller. Therefore, we collected all the records from the full period of 1990–2012. We retrieved the data as long as either of the actors had a role related to business.

These two datasets allowed us to analyze "historical" media sentiment for news with either a general or business nature from 1990 to 2012 by using the "average tone" variable measured by the GDELT Project itself. Note that this period covers the same years of media coverage in our study except for the last three (2013–2015). In 2013, the GDELT Project introduced various changes to how it analyzed its data. Therefore, the sentiment measure after 2013 is not comparable to before 2013. For consistency's sake, we decided to stop our analysis of the GDELT data before this change occurred.

We then analyzed the GDELT data and found the following:

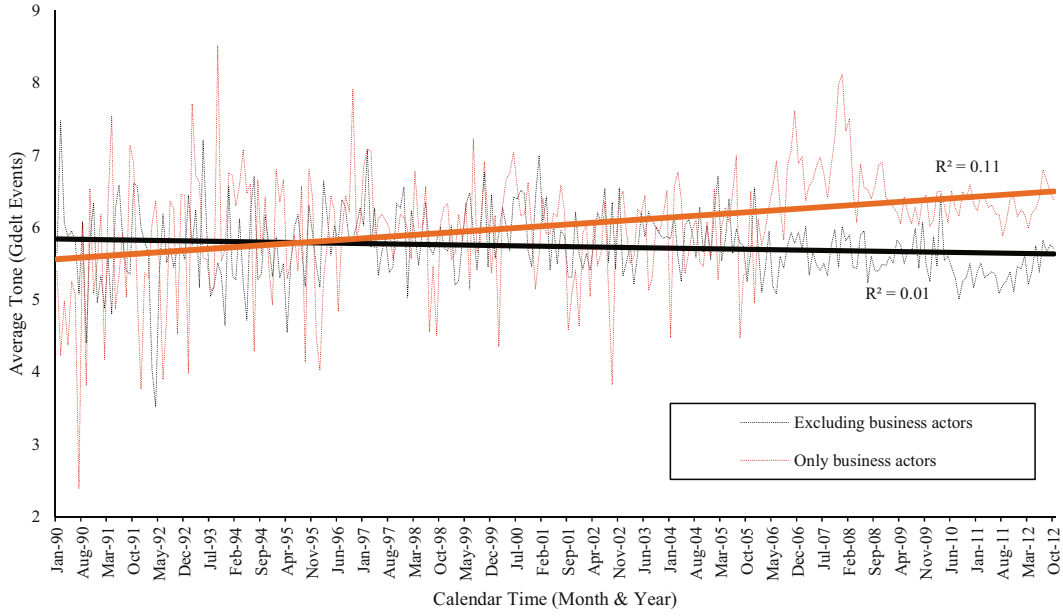

FIGURE C1 Media sentiment around events with and without business actors.

- The general (i.e., not specifically related to business) media sentiment is generally stable (or slightly declining) over time. In Figure C1, the trend line in black shows the average tone for events with actors unrelated to business. Here, there is a weak, negative correlation ($r = -0.12$, $R^2 = 0.01$).
- In contrast, media sentiment around events with business-related actors is positive. Here, the correlation is moderate ($r = 0.33$, $R^2 = 0.11$). In Figure C1, the trend line in red shows the average tone for events where either actor has a "business" role as coded by GDELT. Unfortunately, we cannot get more specific than "business" regarding the role codes, but entrepreneurial activity is necessarily a subset of this category.

Next, we conducted a set of multivariate analyses to see if the trends were robust when we controlled for other temporal fluctuations, as well as event-level variables provided by GDELT (e.g., using event code fixed effects, number of articles, and the Goldstein scale, which measures the intensity of events). The results, presented in Table C1, show that the tone trend for events with general (i.e., nonbusiness) actors was statistically insignificant once we controlled for monthly fluctuations and event-level variables. However, the tone trend for the articles that covered events with business-related actors was positive and statistically significant. Interestingly, we also found that if we used the start date of 1996 (i.e., instead of 1990) to match the start date of sampling in our paper, the trend line for the "general media sentiment" was negative and statistically significant. This is consistent with journalism research that suggests that the news in general has become more pessimistic over time (e.g., Rozado et al., 2022). A summary of our analyses is shown in the regression table below. Unfortunately, the GDELT data do not allow us to capture trends in analytical thinking.

In summary, the overall stability (or even a slight negative decrease) of general media sentiment in the GDELT data suggests our paper's findings do not reflect a general increase in emotional tone in the media but are specific to entrepreneurship. However, since we cannot use the GDELT data to track analytical thinking, and do not have any other kind of data source to address this, we cannot make the same claim for this variable.

TABLE C1 Multivariate regression analysis of event tone (with GDELT data).

	Events without business actors		Events with business actors	
DV: Average tone of events	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Time trend (year)	−0.01 (0.01) [0.23]	−0.01 (0.01) [0.47]	0.06*** (0.01) [0.00]	0.06*** (0.01) [0.00]
Month fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Event base code fixed effects	No	Yes	No	Yes
Number of news articles covering the event		−0.00** (0.00) [0.00]		−0.01*** (0.00) [0.00]
Goldstein scale (event intensity scale)		0.55* (0.27) [0.04]		1.48*** (0.41) [0.00]
Constant	25.14 (16.04) [0.12]	17.46 (16.01) [0.28]		
N	198,670	198,670	158,617	158,617
r^2	0.01	0.12	0.01	0.13

Note: Standard errors in parentheses. *p*-Values in square brackets. Standard errors clustered by month-year.
*$p < 0.05$.**$p < 0.01$.***$p < 0.001$.