

Research Statement

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My research passion lies at the intersection of global political dynamics, media portrayals, and the formation of public discourse on social and environmental issues. I specialize in environmental, science, and strategic communications, focusing on diverse methodologies such as text analytics, machine learning, and time series and panel data analysis.

In my recent study, I examined the evolution of climate news framing over time. Traditionally, environmental news narratives primarily countered developmentalism. However, in recent years, environmental narratives that do not prioritize economic growth have become marginalized in the media, which grasped my attention for my Ph.D. research.

My dissertation, “*The Political Economy of Media Framing in Korea: An Analysis of Korean News Coverage of Climate Change, 1995–2015*,” critically analyzed the evolution of climate change framing in Korean newspapers. The study explored how diverse worldviews on climate change compete within the media to define the problem and propose solutions, ultimately establishing dominant frames that align with specific agencies and ideologies.

Using machine learning techniques, I extracted topics over time and analyzed how each topic intersected with global environmental discourses, situating these discourses within Korea’s unique historical and politico-economic context. My research paid particular attention to how traditional environmental values, such as ecosystem preservation and the balance between humanity and nature, have been “appropriated” by the discourse of “Green knowledge.” This new discourse reframes environmentalism by shifting its focus away from traditional conservation values and instead emphasizing technological innovation and financial gains associated with green technology. My dissertation earned me the prestigious Ballard and Seashore Dissertation Fellowship from the University of Iowa for Spring 2019 and the Dissertation Award from the Korean American Communication Association (KACA) in 2018.

One of the biggest challenges during my dissertation was conceptualizing and measuring climate change frames using machine learning techniques. While unsupervised machine learning is effective at inductively extracting topics that naturally emerge from the data, these topics often do not align with the theoretical frames established through existing literature.

In my recent study, “*Frame-Sentiment Dynamics and Evolutions in U.S. Climate News: Semi-Supervised Machine Learning and Panel Data Analysis*,” I sought to address these methodological limitations by integrating unsupervised and semi-supervised machine learning techniques. First, I employed unsupervised machine learning to uncover organic patterns in the data, resulting in a variety of topics. I then grouped these topics based on their conceptual similarities, matching them with pre-defined frames from the literature, and identifying representative words for each category. Finally, I conducted “guided” LDA topic modeling, using the representative keywords as seed words. This approach allowed for deductive

hypothesis testing, specifically which frames had increased in prominence and which had declined. This study, using panel data analysis, revealed that market-driven solutions gained dominance in the media over time and were increasingly associated with positive sentiment. In contrast, the frame centered on climate justice and anti-developmentalism, advocating global equity, declined in prominence and were increasingly linked to negative sentiment. This study was presented at the 2024 AEJMC annual conference and is currently under review for potential publication in *Communication Research*.

Another significant research focus was established during my master's degree programs at Iowa State University and Korea University. In these programs, I majored in Communication and Journalism, and minored in Statistics while also taking courses in Political Science, including History of Political Thought and International Relations. I aimed to explore whether media reporting, influenced by international structures, could also be altered by individual country's efforts, focusing on bottom-up rather than top-down changes.

To address this question, I used time-series analysis to focus on the long-term effects that are theoretically significant but often overlooked methodologically in public relations research. I employed the Granger Causality test to understand the effects of past interventions on future outcomes.

To explain this further, the Granger Causality test first verifies the stationarity of the data, ensuring external influences are statistically controlled. By estimating a vector model with stationary series data and testing for stability (i.e., ensuring the model does not diverge over time), researchers can determine if past changes in the independent variable significantly predict future changes in the dependent variable.

This statistical logic is similar to the homoscedasticity assumption in regression analysis. Verifying that the variance of y over all x is homogeneous ensures a stable relationship between variables. Similarly, the stability of a vector model with stationary series data confirms that the relationship between variables is stable over all time points. For non-stationary data, the existence of co-integration is critical because it ensures the model is convergent and stable in the long term, and error-correction-terms are added for testing the significance of the relationship. To sum up, this allows researchers to verify the significance of past interventions in explaining current outcome, ensuring the relationship is not merely a correlation.

My master's thesis, "***Economic Outcomes of International Public Relations: A Time-Series Analysis at the Country Level***," later developed into a *Communication Research* publication, "***A Time-Series Analysis of International Public relations Expenditure and Economic Outcome***," examined the relationship between public diplomacy expenditure and economic outcomes. This work contributes to introducing methodology that can test whether individual countries' public diplomacy efforts in target nations could uniquely translate into economic effects, after controlling for other external influences, statistically.

Integrating machine learning techniques into this line of research, a publication in the *International Journal of Communication*, "***A Time-Series Analysis of Public Diplomacy***

Expenditure and News Sentiment: A Case Study of the U.S.-Japan Relationship,” examined the relationship between public diplomacy expenditure and media sentiment. This study demonstrated how public diplomacy endeavors explain news sentiment over time, as evidenced in the context of U.S.-Japan relations. It verified that Japanese agents’ expenditures in the United States significantly explained the news sentiment of the major U.S. newspapers, after controlling for trade volume and GDP.

My scholarly endeavors are dedicated to deepening the understanding of media’s role in shaping global, national, and local narratives, particularly regarding climate change and public diplomacy. I intend to continue employing a diverse array of both time-honored and cutting-edge research methodologies to shed light on the intricate interactions between media, policy, and public perception.

Specifically, my future research aims to test the hypothesis that carbon market volatility, rather than actual climate variability, better explains changes in climate change news frames. I plan to investigate how fluctuations in carbon markets, pricing, and taxation explain shifts in media narratives about climate change, while controlling for severe weather events or the degrees of anomaly over time. Furthermore, another line of research will examine the factors that lead to the emergence of dominant discourses produced by certain countries and regions within new market and political regimes, while other countries and regions are marginalized. This will involve analyzing the geopolitical and economic influences that determine which voices are amplified or suppressed in global climate change discourse.

My academic journey, starting from an undergraduate degree in engineering, has been an exploration of theoretical and methodological approaches that could answer my questions. My first question was to understand the representation of an urban space—Cheong-gye-cheon in Seoul—in Korean media. I found that it was a purposeful invention within the context of Korea’s political economy, transitioning from a manufacture-based to a service and finance-based system. Korean media actively constructed the “proper” purposes of using and the images of the space that functioned to evict small-machinery parts sellers and solicit the fast circulation of money and consumers.

After I came to the United States, I wanted to understand whether countries marginalized in the global politico-economic structure could make their voices heard and have their influence in other countries. Thus, I asked whether the activities of individual countries in a target country could uniquely translate into economic effects or positive media portrayals and sentiment. To explore this, I minored in statistics and applied time series analysis.

Deepening into critical theories during my Ph.D. study, I learned that societal structures may be neither solely formed from the top-down nor bottom-up but are continuously shaped and reshaped throughout history. To address this question, I applied computational methods to extensively examine news articles over time, aiming to draw dynamics of climate change news coverage over time. Overcoming a few challenges among many that I encountered during my dissertation, I applied “guided” LDA topic modeling in my recent study.

As I look to the future, I am eager to advance my research utilizing quantitative, qualitative, and computational methods, addressing different research questions each time. My overarching goal is to dissect how political campaigns and climate policy are interpreted and disseminated through various media platforms, influencing and influenced by global political-economic structures. Understanding this will illuminate how specific meanings of social issues are constructed in the nexus of socio-political-economic structures, and I will continue exploring political, economic, and societal discourses of social and global issues in media.