



Research article

Media framing in the digital age: Interplay of real estate and welfare narratives in South Korean news articles

Seungwoo Han

Department of Political Science and International Relations, Kyonggi University, South Korea

ARTICLE INFO

Keywords:

Framing effect
Housing
Assets
Welfare
Natural language processing
South Korea

ABSTRACT

The present study delves into the underexplored nexus between online real estate news and societal welfare news. A novel methodological approach is adopted herein: web scraping techniques amass online newspaper articles, the sentiment of which is subsequently evaluated through a neural network-informed natural language processing framework. The sentiment-oriented data is transitioned into a panel data configuration for deeper analysis. Results indicate a prevailing negative link between real estate news sentiments and those of welfare news. Intriguingly, the ascension of the conservative party amplifies this negative correspondence. This paper augments the political economy and political communication discourse by underscoring the conceivable potential influence of digital media framing on shaping public perceptions and political inclinations. It offers pertinent insights regarding the interrelation between housing wealth and political outcomes in a distinct national milieu.

1. Introduction

In contemporary academic discourse within the realm of political economy, there has been an intensified focus on discerning the connection between housing wealth, welfare policy predilections, and electoral decisions, particularly against the backdrop of escalating global wealth disparities [1–6]. The predominant thrust of such investigations has been to elucidate the relationship between home ownership, housing market valuations, and collective sentiment. This is predicated on the supposition that individual conduct is principally molded by cognizance of personal asset valuations or juxtaposition of one's assets with those of peers [7]. Nevertheless, a salient oversight in this body of work pertains to the profound influence exerted by digital news media on perceptions of housing wealth, given its pervasive reach and sway.

Despite the vast array of information accessible on the internet, individuals frequently encounter difficulties in accurately assessing the value of their assets, such as house prices. This challenge extends to comparing their assets with those of others and comprehending the dynamics of the housing market. Furthermore, verifying the accuracy and relevance of the information they obtain, in relation to the actual market conditions, presents an additional layer of complexity. This discrepancy highlights the role of mass media in shaping public perceptions through the framing effect. The framing effect refers to the tendency of mass media to shape or reshape individuals' viewpoints and lead them to adopt positive or negative perceptions toward specific agendas [8]. In a society where conservative political ideology, capital interests, and mass media are interconnected, the media's messages about real estate and welfare, which are closely associated, potentially contribute to the construction of specific frames. As individuals are exposed to news through the internet in their daily lives, these frames created by the mass media can directly or indirectly influence public opinion.

E-mail address: seungwoo.han@kyonggi.ac.kr.

<https://doi.org/10.1016/j.heliyon.2024.e25696>

Received 19 January 2023; Received in revised form 17 January 2024; Accepted 31 January 2024

Available online 8 February 2024

2405-8440/© 2024 The Author. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

To gain a deeper understanding of this phenomenon, the present study focuses on analyzing the news narratives centered on real estate and welfare discourse. By exploring the intricate relationship between news coverage on real estate and welfare, this study sheds light on the underlying mechanisms through which media framing shapes collective perspectives and positions.

In the context of privatized Keynesianism [9], there is an emerging trend among conservative parties to curtail welfare support, a move seemingly catalyzed by escalating housing wealth. Capitalists, conversely, are positioned to gain from the sustained valorization of real estate capital and its congruence with leaner governmental structures. Within this juxtaposition of political and economic endeavors, the media can potentially operate as a conduit for the narratives of conservative parties and capitalists. The focal point of this research, South Korea (henceforth Korea), has garnered the epithet “republic of real estate” due to the pivotal role of housing in perpetuating entrenched socio-economic disparities [10,11]. Further, Ref. [4] illustrate that Korea embodies the salient characteristics of a modest welfare state, making it a compelling case for probing the intricacies and broader applicability of its housing politics. Concentrating on this particular nation, the current study aspires to offer a refined comprehension of the mechanisms by which housing wealth influences political actions and outcomes within a country-specific milieu.

Korea’s distinct intertwining of political, economic power, and media vis-à-vis real estate renders it a fitting subject for scrutiny [12,13]. In this backdrop, the present research integrates the framing effect paradigm as delineated by Ref. [8] to explore the interrelation between media narratives on real estate and those of welfare in online publications. Drawing from the framing effect doctrine, the study hypothesizes a negative association between media portrayal of real estate and welfare themes. This suggests that the media’s representation of real estate intricacies may wield influence over the depiction and reception of welfare-centric subjects. Additionally, the present study proposes that the aforementioned association might be accentuated under conservative party governance. This amplification can be attributed to the conservative party’s policy inclinations and vested interests resonating with media framings around real estate, resulting in a heightened sway on the presentation and public perception of welfare narratives. Through the lens of the framing effect paradigm, this investigation endeavors to unravel insights into media framing’s pivotal role in sculpting public sentiment and the political landscape, specifically contextualized within Korea’s real estate dynamics and conservative political milieu.

This study diverges in its core objective from the prevalent scholarly discourse. Existing studies predominantly direct their lens towards examining the repercussions of fluctuations in real estate prices on individual social policy inclinations, political activities associated with welfare allocations, or the overt effect of housing affluence on welfare outlays [1–3,6,14–18]. However, this study endeavors to chart previously untrodden territory by delving into the interplay of sentiment embedded within curated online news articles pertaining to real estate and welfare—a dimension yet to be dissected in extant literature. The overarching ambition is to illuminate the architecture of online framing derived from the emotive undertones encapsulated in these journalistic pieces.

In the current study endeavor, a substantial dataset comprising over 500,000 online newspaper articles, spanning 23 years and centered around keywords “real estate,” “apartment,” and “welfare,” is amassed using web scraping techniques. Utilizing a state-of-the-art natural language processing (NLP) model underpinned by neural networks, the sentiments embedded within the titles and main content of these articles are quantified—categorized by media source and a year-month temporal frame—and subsequently structured into a panel data format. The central analytical pursuit revolves around discerning the influence of sentiment from real estate (and apartment) centered articles on the sentiment dynamics of welfare-related pieces.

This investigation furnishes pioneering empirical insights into the domain of political economy and political communication. Its revelations regarding the ripple effects of online real estate narratives on welfare-centric news intricacies enrich the prevailing literature concerning housing and welfare proclivities. Prior studies predominantly tethered the nexus between home ownership dynamics, housing market evaluations, and welfare inclinations or public fiscal commitments (e.g., Refs. [1,4]) and the correlation between housing wealth and electoral predilections (e.g., Ref. [7]). Augmenting the foundational corpus on mass sentiment, this study illuminates potential conduits through which online media avenues might recalibrate individuals’ subjective worldviews and political engagements. It adeptly underscores the pivotal role of media-constructed frames around real estate and welfare, positing them as critical mediators in the symbiotic relationship between the supply-driven and demand-driven political dimensions of welfare state dynamics in the contemporary era.

The organization of this article unfolds systematically: Section 2 delves into this study’s hypothesis, underpinned by a thorough exploration of existing literature. In Section 3, the methodological framework utilized for empirical examination is elucidated. Section 4 presents the outcomes derived from the analyses undertaken. Conclusively, Section 5 furnishes conclusions, emphasizing the ramifications and significance of the findings.

1.1. Mass media and the perceptions of real estate and welfare

The scholarly landscape addressing the interplay between home ownership, housing market valuations, and public sentiment has largely centered on individual predilections for welfare strategies and political factions. These inclinations are typically rooted in their cognizance of personal asset magnitudes and juxtapositions with distinct demographic groups or geographical sectors [1,7]. Nonetheless, a conspicuous gap in this body of work pertains to the paramount influence of online news. As underscored by Ref. [19], digital news platforms have burgeoned into paramount information repositories in contemporary society, offering effortless access to vast swathes of the populace.

As individuals navigate media landscapes featuring content on subjects like real estate dynamics or broader economic dispatches, they often ascribe significant weight to such information, albeit grappling with its intricacies. Economic news, emblematic of national fiscal trajectories and commercial machinations, is inextricably linked to quotidian experiences. Yet, the lexicon and abstract constructs intrinsic to economic discourse might pose interpretative challenges for the layperson, making such news seemingly arcane.

Regardless of its perceived opacity, economic news wields substantial influence over the psyche and behavioral patterns of individuals in their routine engagements, as expounded by Ref. [20].

Economic news, by virtue of its content, has a propensity to sway audiences according to its presented orientation. The media's tonal quality is instrumental in molding audience perceptions about the prevailing economic climate [21–23]. When individuals endeavor to comprehend and gauge the economic milieu, they predominantly lean on media depictions of the financial landscape. Their understanding and perspectives are sculpted by the media's tonal nuances [21,24–26].

Moreover, in today's information-saturated milieu, there exists a nuanced tapestry where economic, political, and societal narratives are inextricably interlaced. This complex confluence often blurs the lines, rendering it arduous for individuals to dissect and wholly fathom each segment's nuances. Consequently, the public is inclined to assimilate media framings on societal quandaries in their entirety [22,23,27,28]. Their assessments of economic and societal situations are anchored in the narratives disseminated by media outlets, leading them to form holistic interpretations of the information laid out before them [21,23,28,29].

Existing research has demonstrated the significant influence of online news platforms, social media, and other digital sources on individuals' perceptions and attitudes [30–34]. Building upon this, the present study posits that the sentiment expressed in real estate and welfare articles is negatively related, contributing to the formation of a framing effect in the public's perception. The framing effect has been widely used in psychology [35], economics [36], communication [37], political science [38–40], and sociology [41]. Framing theory provides a theoretical framework to understand how media outlets select, emphasize, and present specific aspects of an issue or event, shaping audience perception and interpretation [37,41].

Anchored in framing theory, it is posited that media frames possess the capacity to accentuate specific facets of a subject, while concurrently minimizing or eschewing other dimensions. This modulation of content can pivotally steer individual perceptions regarding the antecedents, ramifications, and potential redresses linked to a specific matter [37,42]. Preliminary inquiries into the realm of mass public sentiment underscored that the populace frequently harbors opinions that may be deemed cursory or under-informed. This state renders them predisposed to shifts in opinion, potentially orchestrated as a mechanism of societal governance [8]. Frames are pivotal vectors in this dynamic, molding public sentiment by proffering a recalibrated depiction of actuality. This is achieved through the judicious curating, structuring, and accentuating of journalistic content [37]. In the contemporary digital era, the ubiquity of the internet and the ascent of smartphones have revolutionized the modalities of information access. However, despite these technological advancements, traditional journalistic paradigms persistently hold sway over the digital information ecosystem, as elucidated by Ref. [43].

Existing scholarship underscores the intricate weave of politics, industry, and the media, shedding light on their intertwined interests and profound imprint on societal narratives [44–46]. Within the framework of privatized Keynesianism, juxtaposed with burgeoning accessibility to credit markets [9,47], housing wealth emerges as a pivotal force, molding individuals' outlooks and predispositions towards public policies and electoral inclinations—casting a deep shadow on the political theater.

Predominantly, academics have delved into the political economy of assets, delving into wealth disparities and their cascading effects on political landscapes [15,17]. Concurrently, inquiries into how private alternatives modulate policy inclinations have been undertaken [1–4,6]. In his seminal work, Ref. [1] postulates that housing wealth, akin to a buffer, engenders a cognitive aversion to wealth redistribution. The quintessence of real estate—especially housing—is deeply entrenched in one's long-term financial trajectory, markedly swaying political leanings and policy predilections. Canonical economic paradigms posit that assets serve as temporal balancers of consumption across an individual's lifespan [48]. In this vista, housing stands as both a stabilizer for consumption variances and a bulwark against the vicissitudes of the labor market [49].

Amidst this backdrop, conservative factions, championing the mantra of minimal governmental intrusion, zealously push for a rejuvenated real estate landscape. Such an endeavor kindles aspirations among homeowners for sustained asset appreciation. Concurrently, it inculcates a sentiment that wealth can be garnered through leveraging mortgages. In a milieu where capital returns eclipse earnings from labor [50], capitalist entities strategize to augment their dominion in lean governance structures, with an accent on amplifying real estate valuations and truncating welfare via privatization routes. Media companies, often mirroring interest of conglomerates regarding real estate and right-leaning political orientations [51,52], craft a calibrated narrative scaffold to modulate public perceptions. In this respect, as conservative entities ascend to governance, the augmented administrative might further entrenches the symbiotic nexus of political, financial, and media powerhouses, intensifying the framing paradigm. Drawing from these deliberations, ensuing hypotheses are postulated.

Hypothesis 1. There is a negative relationship between the sentiment expressed in real estate articles and welfare articles. This hypothesis suggests that when the sentiment conveyed in real estate news is positive, the sentiment in welfare news is likely to be negative.

Hypothesis 2. There is an interaction effect between real estate news and the conservative party in power. It suggests that when the conservative party assumes power, the negative relationship between the sentiment in real estate news and welfare news is further intensified.

1.2. Empirical analysis strategy

This section delineates the methodological framework adopted for empirical evaluations in this research. The analytical procedure encompasses four pivotal phases: 1) extraction of online news content, 2) sentiment computation through Natural Language Processing (NLP), 3) transposition of sentiment-derived data into a temporal series format, and 4) execution of panel data analytics anchored in the organized data. Each phase is elaborated upon consecutively below.

Phase 1. Extraction of Online News Content: In pursuit of an exhaustive dataset, the research leverages web scraping techniques to amass online journalistic articles. The emphasis is placed on curating articles pertinent to the research theme from search engine platforms. The assimilated content spans a considerable temporal range, facilitating a diachronic examination of sentiment trajectories.

Phase 2. Sentiment Computation via NLP: To quantify the sentiment inherent in the amassed news content, the research harnesses the capabilities of NLP. NLP provides the tools for algorithmically parsing and discerning human linguistic expressions. This investigation employs a neural NLP framework, notably the Bidirectional Encoder Representations from Transformers (BERT), to discern the sentiment of the journalistic pieces. This step necessitates the calibration of the model on an extensive labeled dataset to ensure the precise categorization of underlying sentiment in the content.

Phase 3. Transposition of Sentiment-Derived Data into Temporal Series Format: Subsequent to the sentiment computation, the derived sentiment indices are reformatted into a chronological series configuration. This entails aligning the sentiment indices with the temporal markers associated with each journalistic piece, such as publication dates. Through this temporal series structuring, the research captures chronological fluctuations in sentiment and probes its interrelation with external variables.

Phase 4. Panel Data Analytics Anchored in Organized Data: To dissect the association between sentiment embedded in real estate journalistic pieces and those centered on welfare, panel data evaluations rooted in the temporally-structured sentiment data are executed. Panel data analytics proffer insights into both sectional and diachronic nuances in the dataset. A two-way fixed effects model is utilized to gauge pertinent association, simultaneously adjusting for potential confounders and mitigating unobserved heterogeneity.

In adopting this methodological architecture, the study is poised to furnish a rigorous empirical evaluation of the nexus between sentiments embedded in online news narratives pertaining to real estate and welfare. The articulated sequential processes facilitate the meticulous curation, analysis, and organization of data. Such a systematic approach ensures that the subsequent panel data analysis is both thorough and robust, paving the way for sound inferences grounded in empirical evidence.

For data collection, this study leverages the unique capability of Korean news portals, which aggregate news from various newspapers and make it accessible within a singular search interface. This study focuses on the domains of real estate, apartments,¹ and welfare, and collected over 500,000 online news articles from the Korean search engine Naver² spanning a period of 23 years from January 2000 to October 2022. The collected data includes the title, body content, date, and media outlet of each article. For the analysis, the study utilized the neural NLP model, BERT [53],³ implemented in Python within the Google Collaboration environment. BERT has been utilized in previous studies to analyze Korean socio-political texts [54]. BERT employs pre-training on a text corpus to develop a language model capable of understanding fundamental language patterns, followed by transfer learning for specific tasks (refer to Table A3 in Appendix A for further details).⁴

The Korean Movie Review dataset, which includes 146,182 review data, Korean Sentiment Analysis Corpus of Seoul National University, which includes 7713 sentence corpus of news articles, and Kunsan National University Sentiment Lexicon, which includes 14,843 idioms and sentence structures, are combined to form a comprehensive sentiment lexicon to train the NLP model. After that, the trained NLP model measures the positive-negative sentiments of newspaper articles and converts them into a panel data structure in year-month units for each newspaper outlet.⁵ Fig. 1 illustrates the sequential steps involved in the data collection process, NLP analysis, and transformation of the collected data into time series format (panel data format).

The analysis equations utilized in this study are based on the constructed panel data and are presented as follows:

$$Y_{it} = \gamma_i + \delta_t + T_{it} + \sigma_1 + T_{it} \cdot \sigma_1 + \varepsilon_{it} \quad (1)$$

$$Y_{it} = \gamma_i + \delta_t + M_{it} + \sigma_1 + M_{it} \cdot \sigma_1 + \varepsilon_{it} \quad (2)$$

For both equations, Y_{it} accounts for Welfare news sentiment (0–1). γ_i accounts for mass media company fixed effects, δ_t accounts for year-month fixed effects, and σ_1 equals one if t belongs to Conservative government tenure and equals zero otherwise. For equation (1), T_{it} accounts for sentiment (0–1) of title of Real estate (or Apartment) news, and for equation (2), M_{it} accounts for sentiment (0–1) of main text of Real estate (or Apartment) news. In the case of sentiment, a higher score denotes that the sentiment is more positive, and vice versa.

¹ According to the Korea Housing Survey of the Ministry of Land, Infrastructure and Transport, as of 2021, about 63% of households live in apartments (or condominiums).

² As of 2022, the share of search engines in Korea is Naver 64.7% and Google 27.9%. This study collected newspaper articles searched by Naver, which has the largest share in Korea.

³ This study used the GPT-2 NLP model for robustness validation. The results using converted data based on GPT-2 can be found in Appendix B. The results are largely qualitatively similar.

⁴ This study applied BERT with the Hugging Face transformer model installed. Fine-tuning BERT model: batch size of 32, learning rate (Adam) of $2e-5$, and 3 epochs.

⁵ There are a number of newspaper articles from the same newspaper company in the same month. In this case, the average is calculated on a monthly basis. Therefore, the values have a value between 0 and 1.

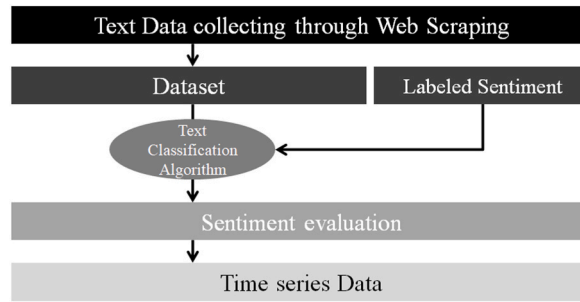


Fig. 1. Sequential steps in the data collection, NLP analysis and transformation into time series format.

2. Results

The analytical findings, delineated in [Tables 1 and 2](#), lend robust support to the propositions posited in this research. Specifically, [Table 1](#) scrutinizes the influence of sentiments conveyed in news article titles, whereas [Table 2](#) delves into the sentiments embedded within the main content of the articles. For foundational understanding, Models (1) and (4) outline the core relationships between sentiments in real estate-related news and welfare-centric news, as well as between apartment-related news and welfare-centric news. In a more nuanced exploration, Models (2) and (5) incorporate the tenure duration of the conservative administration as an augmentative variable. Meanwhile, Models (3) and (6) operationalize multiplicative interaction assessments anchored in equations (1) and (2).

Across all analyses, the results consistently indicate a negative and statistically significant effect of the primary explanatory variables, real estate news and apartment news, on the dependent variable. These findings support the hypothesis of this study, suggesting a negative association between the sentiment expressed in real estate (and apartment) news and the sentiment of welfare news. Notably, both the titles and main texts of news articles on real estate and apartments consistently influence the dependent variable of welfare news sentiment. This confirms a close relationship between the sentiment of real estate-related news articles and welfare-related news articles. Although the effects of real estate and apartment news are relatively modest in magnitude, the use of a two-way fixed effects model accounts for unobserved mass media heterogeneity and over-time trends, resulting in conservative estimates.

The analysis conducted in this study, specifically models (3) and (6) presented in both tables, reveals that the interaction term is statistically significant at the 95% confidence level when examining the conditional effects of real estate/apartment news. The results suggest that when the conservative party is in power, news articles focusing on real estate (and apartments) can exert a stronger influence on welfare-related news.

To visually depict the interpretation of the interaction specification, [Fig. 2](#) presents four plots illustrating the marginal effect of conservative government tenure moderated by the sentiment of real estate (and apartment) news in both the title and main article. The binning estimator approach by Ref. [55] is employed for these plots. Each plot in the figure represents the sentiment of the title and main text of real estate and apartment news on the horizontal axis, ranging from 0 to 1. The vertical axis indicates the marginal effect of the conservative government. The findings from the figure indicate that as the sentiment of real estate (or apartment) news increases from 0 to 1, the marginal effect of the conservative government on the sentiment of welfare news articles becomes stronger in the negative direction. Notably, the marginal effect is statistically significant among the mid-high tercile groups. These findings provide consistent and robust evidence supporting the conditional hypothesis, indicating a stronger mass media effect when the conservative party is in power.

3. Conclusions

The dynamics of individuals' inclinations towards welfare policies and their political affiliations can be deeply intertwined with their comprehension and knowledge about the real estate landscape. Such knowledge is not just limited to their own assets, but also extends to comparisons with broader market conditions and peer assets [1,7]. Given that housing, both as an asset and a basic necessity, is deeply embedded in people's daily realities, it inevitably casts a profound influence on their views towards welfare paradigms and their political choices.

In the contemporary digital age, the proliferation of online news platforms has radically transformed the ways in which individuals consume information [56]. While this ensures that the public has access to an almost infinite reservoir of information, it also poses the challenge of information overload. The sheer volume and velocity of news content, especially online, can be daunting, making it increasingly arduous for the average individual to sift through, discern, and assimilate information critically.

Delving deeper into societal structures, one observes a complex nexus between conservative political ideologies, capitalist interests, and the overarching canopy of the mass media. These entities, often operating with interlaced economic and political motivations, manifest their influence through the narratives they promote, especially concerning topics as pivotal as real estate and welfare. The media, in its role as a purveyor of information and influencer of opinion, crafts narratives or 'frames' that can potentially sway public perception in specific directions.

Given the paramount importance of housing in shaping socio-economic perspectives, coupled with its evident ties to welfare

Table 1
Effects of sentiment of title.

	DV: Sentiment of Welfare News Title					
	(1)	(2)	(3)	(4)	(5)	(6)
Real estate	-0.121** (0.017)	-0.121** (0.013)	-0.078** (0.019)			
Apartment				-0.105** (0.016)	-0.105** (0.012)	-0.067** (0.016)
Conservative		0.221 (0.308)	0.271 (0.308)		0.234 (0.308)	0.278 (0.308)
Real estate × Conservative			0.087* (0.027)			
Apartment × Conservative						-0.077* (0.024)
Constant	0.004 (0.007)	0.004 (0.305)	0.011 (0.305)	-0.013 (0.005)	-0.013 (0.305)	-0.023 (0.305)
Media FE	✓	✓	✓	✓	✓	✓
Year-month FE	✓	✓	✓	✓	✓	✓
Observations	12138	12138	12138	12149	12149	12149

* $p < 0.1$, * $p < 0.05$, ** $p < 0.001$.

Table 2
Effects of sentiment of main text.

	DV: Sentiment of Welfare News Main Text					
	(1)	(2)	(3)	(4)	(5)	(6)
Real estate	-0.096** (0.014)	-0.096** (0.011)	-0.072** (0.016)			
Apartment				-0.138** (0.023)	-0.138** (0.015)	-0.095** (0.021)
Conservative		0.215 (0.308)	0.242 (0.308)		0.237 (0.308)	0.284 (0.308)
Real estate × Conservative			-0.047* (0.022)			
Apartment × Conservative						-0.09* (0.031)
Constant	-0.006 (0.006)	-0.006 (0.305)	-0.014 (0.305)	-0.003 (0.006)	-0.003 (0.305)	0.015 (0.305)
Media FE	✓	✓	✓	✓	✓	✓
Year-month FE	✓	✓	✓	✓	✓	✓
Observations	12138	12138	12138	12149	12149	12149

* $p < 0.1$, * $p < 0.05$, ** $p < 0.001$.

perceptions, a nuanced exploration of media narratives surrounding these themes becomes indispensable. This research endeavor, therefore, sought to traverse this intricate landscape by scrutinizing the reciprocal influences between real estate-centric news and welfare-focused news. The overarching goal was to demystify the mechanisms through which mass media sculpt, project, and sometimes manipulate these frames, consequently shaping public understanding and sentiment.

The rigorous empirical evaluations undertaken in this research substantiate the theoretical postulations related to the digital media portrayal of real estate and welfare dynamics. A discernible inverse relationship emerges between the sentiment inherent in real estate-centric articles and those focusing on welfare. To elucidate, a buoyant sentiment in real estate journalism is frequently mirrored by a more somber tone in welfare narratives, and the converse holds true as well. A salient finding from this investigation is the identification of an interplay between the tenor of real estate reportage and the tenure of a conservative political regime. More precisely, during periods when the conservative faction is at the helm of governance, the aforementioned negative correlation between real estate and welfare sentiments becomes markedly more conspicuous. This observation intimates that the ascendancy of a conservative party acts as a catalyst, accentuating the variances in sentiments across real estate and welfare news.

This compendium of results underscores the intricate interrelations binding media framing, the prevailing political milieu, and the collective societal perception, especially in realms as pivotal as real estate and welfare. The insights gleaned offer a profound comprehension of the myriad ways in which journalistic narratives shape public discernment and elucidation of key issues, especially when viewed through the prism of shifting political landscapes. In dissecting the nexus between media reportage on real estate, narratives on welfare, and the overarching influence of the conservative political establishment, the present study illuminates the multifaceted levers influencing public sentiment. It underscores the imperative of a holistic appreciation of both media constructs and the prevailing political ecosystem when endeavoring to decode the oscillations in public sentiment and opinion.

This study constitutes a noteworthy addition to the scholarly domain, both in terms of its innovative methodologies and the consequential findings it unearths. To begin with, the study embarks on a pioneering methodological journey. Leveraging the capabilities of web scraping, a vast corpus of online newspaper articles was compiled. This data was then subjected to a rigorous sentiment analysis, orchestrated through the sophisticated lens of neural network-driven NLP paradigms. Subsequent to this sentiment derivation, the study transformed this voluminous sentiment-centric dataset into a structured panel format, thereby facilitating a more nuanced exploration of underlying patterns and dynamics.

Furthermore, the empirical underpinnings of this research bring to the fore compelling insights into the interplay between media narratives centered around housing and those fixated on welfare. By synthesizing the theoretical construct of the media's framing effect with cutting-edge computational techniques and neural network-powered NLP methodologies, the study delineates the intricate manner in which housing-themed journalism influences, and at times, modulates narratives related to welfare. A particularly salient observation emerging from this analysis is the amplified potency of media's framing when the nation's political reins are in the hands of a conservative party. In essence, this study not only charts new methodological terrains but also delivers pivotal empirical

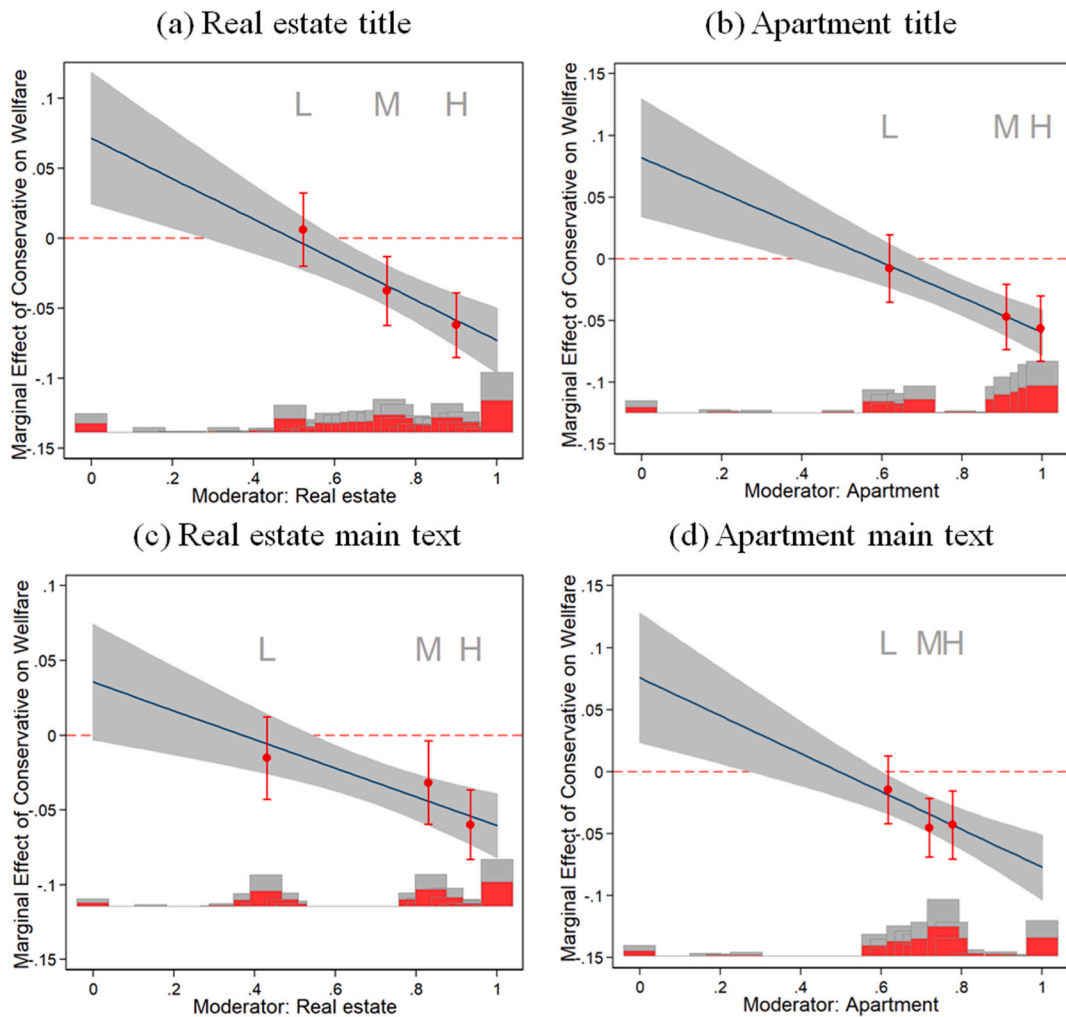


Fig. 2. Marginal Effect of Conservative Government on Welfare news. Note: Marginal effect of the conservative government tenure moderated by the sentiments of real estate (and apartment) news by title and main article in Model (3) and (6) in [Tables 1–2](#)

revelations, thereby enriching the academic discourse surrounding media framing, housing narratives, and their multifaceted intersections with political regimes.

The implications emanating from this research are multifaceted and carry profound significance for our comprehension of media and political dynamics. A cardinal takeaway is the likelihood of the existence of calculated frames, crafted strategically by the triumvirate of political, economic, and media entities. These frames, as inferred from the study, extend beyond the confines of assets and welfare, suggesting a pervasive influence over a plethora of subjects. What's pivotal is the realization that these frames, either directly or subtly, shape our perceptions and, consequently, our reactions. With the burgeoning availability of non-conventional data sources like online news articles and social media content, there emerges a promising avenue for deconstructing and understanding these relationships and the nuanced frames they give birth to.

However, while the findings of this study are illuminating, it is imperative to recognize its limitations. Primarily, the context of this study is anchored in the socio-political milieu of Korea, particularly focusing on the conservative political sector and the emblematic role of real estate as a marker of social class within Korean society. The study is framed against the backdrop where conservative political groups use real estate as a mechanism to consolidate political backing [57], and where the public's quest for real estate ownership is deeply intertwined with social class perceptions [58]. The economic trajectories endorsed by Korean conservative politics, especially their pronounced inclination towards real estate as a conduit for economic stimulation since the 1970s, provide a unique backdrop to this analysis. Moreover, the complex interplay between Korean conglomerates, known as Chaebols, which hold significant sway in the construction and real estate sectors, and their connections with the Korean mass media and political sphere, adds another layer of complexity to this landscape [59–61]. This interrelation, echoing the characteristics of the developmental state paradigm and aspects of Asian crony capitalism, forms the foundational backdrop for the findings of this research.

Moving forward, it is of paramount importance that subsequent research endeavors extrapolate this analytical framework to a

broader canvas, encompassing diverse democratic setups. Such an extension would ascertain the universality, or the lack thereof, of the interplay between real estate-centric narratives and welfare news across varied political ecosystems. Furthermore, a pressing research avenue that beckons attention is the real-world ramifications of these media frames. Specifically, discerning whether and how these constructed narratives tangibly influence the perspectives and decision-making processes of the general populace stands as a pivotal next step in this academic discourse.

This study marks a significant methodological shift by transforming raw text data into a structured format using the neural network-based NLP, specifically the BERT model, reinforced with a comprehensive labeled Korean sentiment dataset. To ensure the reliability of our results, we also utilized the GPT-2 model, the details of which are presented in [Appendix B](#). However, it is important to note that while the integration of such methodologies is gaining traction in fields like political science and social science, the practice is still in its early stages. The consistent and effective application of these methods is not yet fully established, largely due to the limited scope of extensive research validations currently available. As neural network models continue to advance, particularly with developments like GPT-4, there will likely be more discourse on the contribution of natural language processing to social science research.

As the scientific community continues to refine and advance these methods, there lies the potential for enhancing the depth, precision, and scope of analyses in forthcoming research endeavors. This beckons the academic community to remain both receptive to innovative approaches and critically vigilant of their limitations, ensuring that future investigations stand on even more robust methodological ground.

Data availability statement

Data included in article/supp. material/referenced in article. In this research, the dataset comprises textual content from approximately half a million online news articles, spanning the years 2000–2022. Given the extensive size of this dataset, direct sharing via an online repository presents logistical challenges. To address this, the author have provided the web scraping algorithm utilized for aggregating these news articles through the Naver portal, as well as the Natural Language Processing (NLP) algorithms for the analysis, in the Appendix of this study. These codes are designed for seamless integration and execution within the Google Colab environment. Researchers can employ these publicly available codes to replicate the data collection and analysis processes outlined in this study. Upon requiring access to the specified textual data, kindly initiate a formal request via email to the author, who will then facilitate the sharing of the requested information.

Funding statement

The author received no financial support for the research, authorship, and/or publication of this article.

CRediT authorship contribution statement

Seungwoo Han: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Not applicable.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2024.e25696>.

References

- [1] B. Ansell, The political economy of ownership: housing markets and the welfare state, *Am. Polit. Sci. Rev.* 108 (2) (2014) 383–402, <https://doi.org/10.1017/S0003055414000045>.
- [2] M.R. Busemeyer, T. Iversen, The welfare state with private alternatives: the transformation of popular support for social insurance, *J. Polit.* 82 (2) (Apr. 2020) 671–686, <https://doi.org/10.1086/706980>.
- [3] J.S. Hacker, P. Rehm, Reducing risk as well as inequality: assessing the welfare state's insurance effects, *Br. J. Polit. Sci.* 52 (1) (Jan. 2022) 456–466, <https://doi.org/10.1017/S0007123420000034>.

- [4] S. Han, H.Y. Kwon, Home ownership, house prices, and belief in meritocracy: evidence from South Korea and 34 countries, *Polit. Stud.* (2023) 1–19, <https://doi.org/10.1177/00323217231176677>.
- [5] L.G. Steele, J.N. Cohen, J.R. van der Naald, Wealth, income, and preferences for redistribution: evidence from 30 countries, *Soc. Sci. Res.* 108 (Nov. 2022) 102746, <https://doi.org/10.1016/j.ssresearch.2022.102746>.
- [6] A. Wiedemann, The electoral consequences of household indebtedness under austerity, *Am. J. Polym. Sci.* (2022), <https://doi.org/10.1111/AJPS.12708>.
- [7] B. Ansell, F. Hjorth, J. Nyrup, M.V. Larsen, Sheltering populists? House prices and the support for populist parties, *J. Polit.* 84 (3) (2022) 1420–1436, <https://doi.org/10.1086/718354>. Jul.
- [8] D. Chong, J.N. Druckman, A theory of framing and opinion formation in competitive elite environments, *J. Commun.* 57 (1) (Mar. 2007) 99–118, <https://doi.org/10.1111/J.1460-2466.2006.00331.X>.
- [9] L. Baccaro, J. Pontusson, Rethinking comparative political economy: the growth model perspective, *Polit. Soc.* 44 (2) (Jun. 2016) 175–207, <https://doi.org/10.1177/0032329216638053>.
- [10] S. Han, Spatial stratification and socio-spatial inequalities: the case of Seoul and Busan in South Korea, *Humanit. Soc. Sci. Commun.* 9 (1) (2022), <https://doi.org/10.1057/S41599-022-01035-5>. Dec.
- [11] S. Han, Identifying the roots of inequality of opportunity in South Korea by application of algorithmic approaches, *Humanit. Soc. Sci. Commun.* 9 (1) (Jan. 2022) 1–10, <https://doi.org/10.1057/s41599-021-01026-y>.
- [12] C.S. Park, Korean media often allied with ruling political parties, *Newspaper Res. J.* 36 (2) (Jun. 2015) 265–278, <https://doi.org/10.1177/0739532915587297>.
- [13] C.S. Park, B.K. Kaye, Public broadcasting is not much different: public and commercial broadcasters' coverage of minimum wage in South Korea, *Journal. Pract.* 16 (8) (2022) 1795–1809, <https://doi.org/10.1080/17512786.2020.1870532>.
- [14] M. Aalbers, *The Financialization of Housing : a Political Economy Approach*, Routledge, New York, 2016.
- [15] G.W. Fuller, A. Johnston, A. Regan, Housing prices and wealth inequality in Western Europe, *W. Eur. Polit.* 43 (2) (Feb. 2020) 297–320, <https://doi.org/10.1080/01402382.2018.1561054>.
- [16] A.B. Hall, J. Yoder, Does homeownership influence political behavior? Evidence from administrative data, *J. Polit.* 84 (1) (Jan. 2022) 351–366, <https://doi.org/10.1086/714932/ASSET/IMAGES/LARGE/FG6.JPG>.
- [17] A. Johnston, A. Regan, Global finance, labor politics, and the political economy of housing prices, *Polit. Soc.* 45 (3) (Sep. 2017) 327–358, <https://doi.org/10.1177/0032329217702102>.
- [18] M.V. Larsen, F. Hjorth, P.T. Dinesen, K.M. Sonderskov, When do citizens respond politically to the local economy? Evidence from registry data on local housing markets, *Am. Polit. Sci. Rev.* 113 (2) (May 2019) 499–516, <https://doi.org/10.1017/S0003055419000029>.
- [19] L.C. Abrams, E.W. Maibach, The effectiveness of mass communication to change public behavior, *Annu. Rev. Publ. Health* 29 (2008) 219–234, <https://doi.org/10.1146/ANNUREV.PUBLHEALTH.29.020907.090824>.
- [20] M.E. McCombs, *Setting the Agenda : the Mass Media and Public Opinion, Polity, Cambridge, 2004*.
- [21] J.B. Hester, R. Gibson, The economy and second-level agenda setting: a time-series analysis of economic news and public opinion about the economy, *Journal. Mass Commun. Q.* 80 (1) (2003) 73–90, <https://doi.org/10.1177/107769900308000106>.
- [22] S.N. Soroka, Issue attributes and agenda-setting by media, the public, and policymakers in Canada, *Int. J. Publ. Opin. Res.* 14 (3) (2002) 264–285, <https://doi.org/10.1093/IJPOR/14.3.264>.
- [23] S.N. Soroka, D.A. Stecula, C. Wlezien, It's (change in) the (future) economy, stupid: economic indicators, the media, and public opinion, *Am. J. Polym. Sci.* 59 (2) (Feb. 2015) 457–474, <https://doi.org/10.1111/AJPS.12145>.
- [24] C.R. Covington, K. Kroeger, G. Richardson, J.D. Woodard, Shaping a candidate's image in the press: ronald reagan and the 1980 presidential election, *Polit. Res. Q.* 46 (4) (Dec. 1993) 783, <https://doi.org/10.2307/448931>.
- [25] S. De Boef, P.M. Kellstedt, The political (and economic) origins of consumer confidence, *Am. J. Polym. Sci.* 48 (4) (Oct. 2004) 633, <https://doi.org/10.2307/1519924>.
- [26] R.K. Goidel, R.E. Langley, Media coverage of the economy and aggregate economic evaluations: uncovering evidence of indirect media effects, *Polit. Res. Q.* 48 (2) (1995) 313, <https://doi.org/10.2307/449071>. Jun.
- [27] L. Gurevich, Framing effect method in vaccination status discrimination research, *Humanit. Soc. Sci. Commun.* 9 (1) (2022), <https://doi.org/10.1057/S41599-022-01299-X>. Dec.
- [28] D.C. Mutz, Mass media and the depoliticization of personal experience, *Am. J. Polym. Sci.* 36 (2) (May 1992) 483, <https://doi.org/10.2307/2111487>.
- [29] M.J. Hetherington, The media's role in forming voters' national economic evaluations in 1992, *Am. J. Polym. Sci.* 40 (2) (May 1996) 372, <https://doi.org/10.2307/2111629>.
- [30] M.B. Ayodeji-Falade, O.O. Osunkunle, Framing of FeeMustFall students' protest by Daily Dispatch Newspaper and the effect on readers' perceptions, *Heliyon* 7 (8) (Aug. 2021) e07782, <https://doi.org/10.1016/J.HELIYON.2021.E07782>.
- [31] Z. Lyu, H. Takikawa, Media framing and expression of anti-China sentiment in COVID-19-related news discourse: an analysis using deep learning methods, *Heliyon* 8 (8) (2022), <https://doi.org/10.1016/J.HELIYON.2022.E10419>. Aug.
- [32] P. Robinson, Operation restore hope and the illusion of a news media driven intervention, *Polit. Stud.* 49 (5) (Dec. 2001) 941–956, <https://doi.org/10.1111/1467-9248.00348>.
- [33] S. Savaş, N. Topaloğlu, Crime intelligence from social media: a case study, *IEEE 14th Int. Sci. Conf. Informatics, INFORMATICS 2017 - Proc 2018-January* (2017) 313–317, <https://doi.org/10.1109/INFORMATICS.2017.8327266>. Jul. 2018.
- [34] S. Savaş, Analysis of the social media impact on the popularity of crypto-currencies, *Proc. - 6th Int. Conf. Comput. Sci. Eng. UBMK* (2021) 67–72, <https://doi.org/10.1109/UBMK52708.2021.9558921>, 2021.
- [35] D. Kahneman, A. Tversky, Choices, values, and frames, *Am. Psychol.* 39 (4) (1984) 341–350, <https://doi.org/10.1037/0003-066X.39.4.341>. Apr.
- [36] D. Kahneman, A. Tversky, Prospect theory: an analysis of decision under risk, *Econometrica* 47 (2) (Apr. 1979) 263–291, <https://doi.org/10.2307/1914185>.
- [37] R.M. Entman, Framing: toward clarification of a fractured paradigm, *J. Commun.* 43 (4) (1993) 51–58, <https://doi.org/10.1111/J.1460-2466.1993.TB01304.X>.
- [38] W.G. Jacoby, Issue framing and public opinion on government spending, *Am. J. Polym. Sci.* 44 (4) (Oct. 2000) 750, <https://doi.org/10.2307/2669279>.
- [39] D.C. Mutz, J. Soss, Reading public opinion: the influence of news coverage on perceptions of public sentiment, *Publ. Opin. Q.* 61 (3) (Nov. 1997) 431–451, <https://doi.org/10.1086/297807/2/610431.PDF>. GIF.
- [40] J. Peter, Our long 'return to the concept of powerful mass media' - a cross-national comparative investigation of the effects of consonant media coverage, *Int. J. Publ. Opin. Res.* 16 (2) (2004) 144–168, <https://doi.org/10.1093/IJPOR/16.2.144>.
- [41] E. Goffman, *Frame Analysis : an Essay on the Organization of Experience*, Harvard University Press, Cambridge, 1974.
- [42] S. Iyengar, *Is Anyone Responsible? : How Television Frames Political Issues*, University of Chicago Press, Chicago, 1991.
- [43] C. Wolf, A. Schnauber, News Consumption in the Mobile Era: the role of mobile devices and traditional journalism's content within the user's information repertoire, *Digit. Journal.* 3 (5) (Sep. 2015) 759–776, <https://doi.org/10.1080/21670811.2014.942497>.
- [44] R.M. Chiles, Hidden in plain sight: how industry, mass media, and consumers' everyday habits suppress food controversies, *Sociol. Rural.* 57 (Dec. 2017) 791–815, <https://doi.org/10.1111/SORU.12152>.
- [45] G.C. Edwards, B.D. Wood, Who influences whom? The president, congress, and the media, *Am. Polit. Sci. Rev.* 93 (2) (Jun. 1999) 327–344, <https://doi.org/10.2307/2585399>.
- [46] M. Grossmann, D.A. Hopkins, From fox news to viral views: the influence of ideological media in the 2018 elections, *Forum Fam. Plan. West. Hemisph.* 16 (4) (Dec. 2018) 551–571, <https://doi.org/10.1515/FOR-2018-0037/MACHINEREDABLECFATON/RIS>.
- [47] C. Crouch, Privatised keynesianism: an unacknowledged policy regime, *Br. J. Polit. Int. Relat.* 11 (3) (Aug. 2009) 382–399, <https://doi.org/10.1111/J.1467-856X.2009.00377.X>.
- [48] F. Modigliani, Life cycle, individual thrift, and the wealth of nations, *Science* 234 (4777) (1986) 704–712, <https://doi.org/10.1126/SCIENCE.234.4777.704>. Nov.

- [49] C.D. Carroll, Buffer-stock saving and the life cycle/permanent income hypothesis, *Q. J. Econ.* 112 (1) (Feb. 1997) 1–55, <https://doi.org/10.1162/003355397555109>.
- [50] T. Piketty, *Capital in the Twenty-First Century*: Goldhammer, Arthur, Harvard University Press, Cambridge, 2014.
- [51] P. Capriotti, Economic and social roles of companies in the mass media: the impact media visibility has on businesses' being recognized as economic and social actors, *Bus. Soc.* 48 (2) (Jun. 2009) 225–242, <https://doi.org/10.1177/0007650307305724>.
- [52] G. Grossman, Y. Margalit, T. Mitts, How the ultrarich use media ownership as a political investment, *J. Polit.* 84 (4) (Oct. 2022) 1913–1931, <https://doi.org/10.1086/719415>.
- [53] J. Devlin, M.W. Chang, K. Lee, K. Toutanova, BERT: pre-training of deep bidirectional transformers for language understanding, *NAACL HLT 2019 - 2019 Conf. North Am. Chapter Assoc. Comput. Linguist. Hum. Lang. Technol. - Proc. Conf.* 1 (Oct. 2018) 4171–4186. Accessed: Oct. 21, 2023. [Online]. Available: <https://arxiv-org-ssl.access.yonsei.ac.kr/abs/1810.04805v2>.
- [54] S. Han, Elite polarization in South Korea: evidence from a Natural Language Processing model, *J. East Asian Stud.* 22 (1) (Mar. 2022) 45–75, <https://doi.org/10.1017/JEA.2021.36>.
- [55] J. Hainmueller, J. Mummolo, Y. Xu, How much should we trust estimates from multiplicative interaction models? Simple tools to improve empirical practice, *Polit. Anal.* 27 (2) (Apr. 2019) 163–192, <https://doi.org/10.1017/PAN.2018.46>.
- [56] A. Kozyreva, S. Wineburg, S. Lewandowsky, R. Hertwig, Critical ignoring as a core competence for digital citizens, *Curr. Dir. Psychol. Sci.* 32 (1) (Feb. 2023) 81–88, <https://doi.org/10.1177/09637214221121570>.
- [57] Gimpo Residents Care Less about Partisan Politics, More about Property Boom - the Korea Times, 2023. https://www.koreatimes.co.kr/www/nation/2023/11/113_362952.html.
- [58] Luxury Apartment Ad Sparks Criticism for Inciting Classism, 2023. <https://www.koreaherald.com/view.php?ud=20230607000663>.
- [59] T.Y. Kong, Neo-liberalization and incorporation in advanced newly industrialized countries: a view from South Korea, *Polit. Stud.* 52 (1) (Mar. 2004) 19–42, <https://doi.org/10.1111/J.1467-9248.2004.00462.X>.
- [60] S.-K. Han, Breadth and depth unity among chaebol families in Korea, *한국사회학* 42 (4) (2008) 1–25 [Online]. Available: <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=51750eecda0f61c531727e8278b4e62cb3dbf91c>.
- [61] S. Park, Chaebol reforms are crucial for South Korea's future, *East Asia Forum Q* 13 (1) (2021) 21–25 [Online]. Available: <https://www.eastasiaforum.org/2021/03/24/chaebol-reforms-are-crucial-for-south-koreas-future/>.