

**Measuring Bias in International News:
A Large-scale Analysis of News Agency Coverage of
the Ukraine Crisis**

Kohei Watanabe

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Declaration

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Abstract

I present a new methodological approach to measuring news bias, aiming to settle the disagreement on how to define and measure bias in media and communication studies in this thesis. Unlike earlier research on TV news or newspapers, I choose international news agencies' coverage of the Ukraine crisis in this study as a case to highlight the strength of the new approach. Utilizing newly-developed geographical news classification and sentiment analysis techniques, I analyse news coverage of the Ukraine crisis by Russia's official news agency, ITAR-TASS, along with the independent news agency, Interfax, over two years to estimate partisan news bias resulting from state-ownership. In this longitudinal content analysis, I focus on the change in sentiment of ITAR-TASS's news coverage of Ukraine relative to Interfax's coverage during periods following six key events in the crisis.

The analysis shows that the sentiment of ITAR-TASS's news on Ukraine's democracy and sovereignty changed significantly after key events, reflecting the desirability of these events to the Russian government. ITAR-TASS's news coverage became the most negative when the new Ukraine government launched military operations against pro-Russian separatists in east Ukraine, claiming that the revolution was instigated by Ukrainian fascists, who threatened the safety of ethnic Russians. This result indicates that the Russian government utilized the news agency for international propaganda to justify its actions. Further, an additional content analysis including western news agencies revealed that Reuters's news coverage of the Ukraine crisis during this period was strongly correlated with ITAR-TASS, being influenced by the Russian government's false statements on Ukraine. Reuters news stories were circulated

internationally, and published in the most popular news sites in the United States without context.

I argue that the publication of the Russian government's false narratives by American online news sites through Reuters indicates the vulnerability of today's international news gathering and distribution system, and the rapidly changing relationship between states and corporations in the global news industry. This suggests that western news agencies' use of temporary correspondents in covering rapidly developing international crises increases the risk of spreading false information globally. In this case, western news agencies are, in effect, supporting international propaganda by non-western states.

Keywords

Foreign news; International news agency; Text analysis; Media globalisation

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Introduction

Objectivity in news reporting is one of the most extensively discussed topics in journalism, and many studies on bias in news have been conducted (Barkho, 2013; Donsbach & Klett, 1993; Maras, 2012), but news bias has been defined and measured in different ways depending on the structure of the media system studied (Hopmann, Aelst, & Legnante, 2012, p. 241). Aiming to settle this disagreement, I propose a new methodological approach to measuring news bias that is flexible enough to be applied even to the most polarized media systems. I choose Russia's state-controlled news agency, ITAR-TASS, as a case, and estimate partisan bias in its news coverage of the Ukraine crisis in this study.

The Ukraine crisis started in November 2013 as anti-government protests erupted in Kiev, triggered by the Ukraine government's sudden announcement to strengthen economic ties with Russia instead of with the European Union. Pro-EU rallies in the capital grew rapidly and the protesters eventually ousted President Viktor Yanukovich in February after violent confrontations with the police. Russia responded to the collapse of the pro-Russian government by annexing Crimea in March despite strong condemnation from the new Ukraine government, as well as from the United States and the European Union. The crisis ended in mid-2014, but Crimea remains under Russia control and pro-Russian militants in east Ukraine remain active.

The Ukraine crisis was not only an important geo-political event but also an interesting case for political communication research, because many news stories on the crisis were produced and circulated internationally, not only by the American or West European news media but also by the Russian media. The competition in covering the

crisis between the two sides has been described as an “information war” by media observers (Galeotti, 2015; Hutchings & Szostek, 2015). While the western media mostly reported the crisis as a democratic revolution against the corrupt regime in Kiev while focusing on Russia’s intervention on Ukrainian territory, the Russian media reported the crisis as a Ukrainian nationalist takeover that threatened the safety of ethnic Russians.

Earlier results of content analyses of news stories on Ukraine (Boyd-Barrett, 2015; Freedman, 2014; McIntosh, 2015), which showed the Russian state-controlled media’s coverage of the pro-European Ukraine regime was very negative, claiming it was connected to ‘fascists’ or ‘nationalists’, also support the view that the Ukraine crisis was a propaganda war. As a result of propaganda from the Russian state-controlled media, confused western audiences perceived the Ukraine crisis as a conflict between Ukrainian nationalists and ethnic Russian minorities, a story tailored by the Russian government in order to have an excuse to annex eastern Ukrainian regions. Pomerantsev (2014) has even stated that Russia was “in control of defining ‘reality’”, not only domestically, but also internationally.

In media and communications literature, the *propaganda model* refers to the collusion of states and corporations in spreading information via mass media to promote their own interests (Herman & Chomsky, 1988/1995), this being a different meaning from “propaganda” as a political message concerning enemy countries in wars (Jowett & O’Donnell, 2011). However, when the model is applied to the global news industry, it bears a meaning that is very close to the traditional sense of propaganda, or *mediated public diplomacy*, which aims to nurture a favourable attitude towards a home nation among foreign publics using communication media (Nye, 2008). In recent years, the Russian government has implemented strategic international communication by investing

heavily in its state-owned international media outlets (Lankina & Niemczyk, 2015). The establishment of Russia Today (RT) in 2005 was one such example, and the restructuring of its public diplomacy arsenal in 2013, which resulted in the closure of RIA-Novosti, was a move designed to enhance the effectiveness of Russia's foreign propaganda. When Russia dispatched its special forces to Crimea and East Ukraine, the Russian government needed to justify its actions to the foreign public, thus it mobilized all its state-controlled international media. Such a combination of hard power (military) and soft power (communication media) is called "hybrid warfare" (Galeotti, 2015).

Use of the mass media to promote western states' political and economic interests has been highlighted by critics since the NWICO debates (Masmoudi, 1979), this line of argument culminating in the theory of media imperialism (Herman & McChesney, 1997; H. I. Schiller, 1991). Paterson (2011) argues that western news agencies such as Reuters and AP prioritize the interests of major western media and states in their news services. In light of this influential theory, the competition between western and Russian media during the Ukraine crisis would appear to be just another example of political-economic divisions in the media, but the result of my longitudinal analysis of news coverage by the western and Russian news agencies suggests that it is not. The difference in news coverage between ITAR-TASS and Reuters was not as sharp as media imperialism theory predicts. When the crisis rapidly expanded beyond Kiev following Russia's annexation of Crimea, Reuters produced news stories that were surprisingly similar to ITAR-TASS's newswires, being dependent on the Russian government's press releases and effectively supporting Russia's international propaganda. This unexpected result suggests that western media companies and non-western governments can jointly perform global propaganda when corporate interests are no longer linked to national interests.

This thesis is highly critical of the Russian government and its news agency, but it by no means suggests that the American or West European news agencies are more trustworthy than their Russian counterpart. I believe that western media are also biased but in a different way, and this is exactly why I did not compare ITAR-TASS with Reuters, AP, or AFP as a benchmark to measure bias in the Russian news agency. If I compare a Russian news agency with a western news agency, the estimated bias will contain all kinds of differences in news coverage caused by the cultural values and economic and political ideologies of their home nations. Therefore, I chose Interfax, a Russian commercial news agency, as a benchmark to exclude differences caused by the news organisations' home nations.

The goal of this thesis is to establish a new methodological approach to measuring news bias through an analysis of ITAR-TASS's coverage of the crisis. ITAR-TASS is the successor of the Soviet TASS agency and the official news agency of the Russian Federation. Although news bias is broadly defined in literature as a lack of "objectivity" in news reporting (Maras, 2012), I focus on partisan bias that is defined as a lack of impartiality. This definition of bias overlaps with classic propaganda, defined as "the deliberate, systematic attempt to shape perceptions, manipulate cognitions, and direct behaviour to achieve a response that furthers the desired intent of the propagandist" (Jowett & O'Donnell, 2011, p. 7).

Studies in political communication often feature TV news or newspapers, but international news agencies are very important in the news industry as suppliers of foreign news to those "retail" news media whose networks are becoming even more important now that national news organizations are retreating from foreign news gathering (Riffe & Budianto, 2001). Therefore, if the news stories supplied by news agencies are biased, the

content of many news outlets could be affected, misleading a mass audience. Further, news audiences have access to news stories produced by news agencies through retail news outlets, but news audiences are more directly exposed to news stories produced by news agencies in recent years because news agencies serve not only traditional news media but also online news portals (Bielsa & Bassnett, 2008; Paterson, 2005).

It is still not common to study autocratic regimes' news agencies in international communication research, but ITAR-TASS's coverage of the Ukraine crisis offered a unique opportunity: my new approach could be tested against the expectation that ITAR-TASS's news content would reflect the wishes of the Russian government, considering the Russia latest strategy of enhancing its "soft power" and strong economic and political interests in Ukraine (Lankina & Niemczyk, 2015; Simão, 2016). Furthermore, the partisan nature of Russia's media, where the mass media is often affiliated with political groups and utilized to promote the political interests of the owners (Dobek-Ostrowska & Smaele, 2010; Vartanova, 2011), also supports the expectation.

I compare ITAR-TASS's English-language news on Ukraine with Interfax's to measure bias caused by the influence of the Russian government, focusing on key events that were clearly desirable or undesirable to the regime. My use of the independent Russian news agency as a benchmark unit was to exclude any effect from the nature of events and the country's national ties to Ukraine. In my analysis, all the news stories on Ukraine's democracy or sovereignty published by these news agencies over two years were analysed in terms of positive-negative sentiment, and relative changes in ITAR-TASS's coverage of Ukraine are considered as news bias caused by state-ownership, when they correlate with the desirability of preceding events to the Russian government.

This longitudinal content analysis was accomplished with the new computational content analysis techniques that I developed for this study.

The analysis shows that ITAR-TASS's coverage of Ukraine's democracy or sovereignty reflected the desirability of the key events to the Russian government, suggesting it is strongly influenced by the Russian government. ITAR-TASS's news coverage of Ukraine became extremely negative when the Ukraine military launched anti-separatist operations in east Ukraine, claiming the new government's ties with fascists and ultra-nationalists. These narratives, however, affected Reuters news stories on Ukraine during that period, and could have reached western news audiences through the most popular online news sites in the United States.

Structure of the thesis

This thesis comprises four separate research papers. The first two papers answer substantive questions in political communication and international communication, while the last two address methodological problems in the computational analysis of news. Although the methodology sections and appendices in the first two papers explain how the content analysis was performed, details of the methodology on geographical news classification and sentiment analysis are fully explained only in the last two papers. The two substantive papers and one methodological paper have already appeared in media and communications journals, *The European Journals of Communication*, *The Journal of International Communication*, and *Digital Journalism*. The fourth paper is under review at *Communication Methods and Measures*.

In the first paper, entitled "Measuring news bias: Russia's official news agency ITAR-TASS's coverage of the Ukraine crisis" (Watanabe, 2017a), I discuss the

theoretical background of my approach to news bias, reviewing political communication literature, and apply the new methodology to measure bias in ITAR-TASS's coverage of the Ukraine crisis. The analysis shows that ITAR-TASS's news coverage of Ukraine systematically responded to occurrences of events undesirable to the Russian government. This indicates that the state-owned news agency's coverage of Ukraine was biased by influence from the Russian government. The bias in ITAR-TASS's news stories was caused by a very weak distinction between facts and opinions in its news content. The news agency's stories not only quoted Russian officials' statements, but also western sources, intending to add credibility and newsworthiness to its content for foreign audiences.

In the second paper, "The spread of the Kremlin's narratives by a western news agency during the Ukraine crisis" (Watanabe, 2017c), I also analyse news coverage of the Ukraine crisis by the western news agencies, Reuters, Associated Press, and Agence France-Presse. The result shows that the Reuters stories published during the period following Russia's annexation of Crimea strongly correlated with the ITAR-TASS stories conveying the Russian government's narratives regarding the safety of ethnic Russians as being threatened by Ukrainian nationalists. This indicates that Reuters was either heavily dependent on Russian government press releases or ITAR-TASS's newswire during this period. These stories were circulated internationally and appeared in the most popular online news sites in the United States without any contextualization. Although this does not mean Reuters was complicit in Russia's propaganda, it highlights the vulnerability of today's international news gathering and distribution.

The third paper, "*Newsmap*: A semi-supervised approach to geographical news classification" (Watanabe, 2017b), introduces the new semi-supervised geographical

news classification technique used in the first two papers to identify news stories mainly about Ukraine. I argue that, although simple keyword matching has been often used to identify geographical foci of news stories, it often fails to determine the most important country in news stories due to the limited sizes of the geographical lexicon. *Newsmap* solves this problem by automatically extracting names of people, organisations and places associated with countries from a corpus of news stories. In an evaluation of its classification accuracy with 5,000 manually classified news stories, I demonstrate that this new technique outperforms simple keyword matching classification and geographical information extraction systems.

In the fourth paper, “Big Media Analysis: Application of Vector Space Models to Document Scaling”, I explain how the domain specific sentiment analysis was performed in the first two papers. While supervised document scaling models demand very large training sets to accurately analyse diverse news content, I propose the use of unsupervised vector space models on a large corpus of news stories to calculate semantic similarity between unseen words and predefined words for document scaling. In the sentiment analysis, manually chosen general positive-negative words were given to the model as semi-supervision, and words associated with sovereignty and democracy were scored based on their proximities to the ‘seed’ words. This technique, named latent semantic scaling (LSS), is also developed into a very efficient fully supervised model in this paper for more complex document scaling tasks.

Contribution of this study

The study presented here focuses on the international crisis, but the new approach to measuring news bias contributes broadly to the field of political communication. In

earlier studies, news coverage disproportionate to fixed benchmarks has often been seen as unbalanced, or biased. Typical of such benchmarks was the 50-50 coverage rule specified in the US Federal Communication Commission's policy, which demanded national TV broadcasters treat the two main political parties equally (Sambrook, 2012). Although this policy was abolished in 1987, the use of fixed benchmarking survived and even prompted recent studies outside of the United States that measure bias based on election results (c.f. Brandenburg, 2005; Hopmann et al., 2012). However, the use of fixed benchmarks in measuring news bias is unsuitable when the news market is highly competitive and fragmented, because all the news media that produce content appealing to politically segmented audiences would appear biased.

The new approach presented here is more suitable for today's diverse news market, because it accepts differences between news organizations, excluding the effect of institutional variables in estimating news bias. Although the international news system, which is comprised of very different news organizations, is more complex than any national news system, I have demonstrated that measuring news bias is still possible in this context. The key to accurate estimation of news bias lies in the choice of benchmark medium, which determine the type of bias to be measured. Although good benchmark media may not exist in some cases, the new approach still works with a composite benchmark made up of several comparable media. For example, in a project on media coverage of street protests in Russia, Lankina, Watanabe, and Netesova (2016) compared state-controlled TV and newspapers with a benchmark comprised of two independent news agencies. As news markets become increasingly diverse, it becomes more difficult to find non-media benchmarks of news bias, but it also becomes easier to find media benchmarks.

Newsmap is useful not only in studies of international news but also of domestic news because it can accurately identify news stories about foreign events erroneously retrieved from news databases with simple keyword searches. In fact, Lankina et al. (2016) used this geographical technique to separate out stories on Russian street protests from stories on the Middle East. More broadly, *Newsmap* introduces semi-supervised machine learning techniques to media and communications studies. Applying such techniques to other types of classification tasks would greatly improve the accuracy and efficiency of computational text analysis of media content. One prospective application is the topical classification of social media posts, which is difficult for supervised machine learning techniques to achieve without a very large training set due to the high lexical diversity of such posts.

Finally, while the LSS technique is only used for sentiment analysis of news stories in this study, it nevertheless offers a general technique to turn very efficient vector space models (e.g. LSA, NMF, LDA or Word2vec) into semi-supervised or fully-supervised models for document scaling. Lankina et al. (2016) also used this technique in their project on Russia's street protests to capture subtle changes in state-controlled media's framing. In their project, the supervised LSS technique successfully constructed a model that replicated manual coding on the dimension of protests as freedom of expression vs. social disorder from only 15 manually coded documents. The efficiency of supervised LSS technique will make computational content analysis less expensive and more accessible to researchers in media and communications.

Earlier studies of international communication

There are two fields in international communication research that are relevant to this study: the representation of foreign countries in news and international flows of news. In my first paper, I focus on the representation of Ukraine in news published by ITAR-TASS, whereas the second paper concerns flow of news about the crisis from Russia to the United States through western news agencies. In earlier studies on representation of foreign countries, researchers revealed that news coverage was globally concentrated on North America and Western Europe (Galtung & Ruge, 1965; Lazano et al., 2000; Meyer, 1989; Paik, 1999; Sreberny-Mohammadi, 1984), and that western news media extensively covered Africa and South America only in the events of violent conflicts or natural disasters (El Zein & Cooper, 1992; Golan, 2003; Larson, 1984; Paik, 1999; Weaver, Porter, & Evans, 1984; Wilke, Heimprecht, & Cohen, 2012). In studies on international flows of news, researchers criticized western news agencies, namely Reuters, AP, AFP, and UPI, because they gathered and distributed many of the foreign news stories on Africa and Latin America for both western and non-western news media (Galtung & Ruge, 1965; Lazano et al., 2000; Matta, 1979; Meyer, 1989; Paterson, 2001; Schramm, 1978; Stuart, 2001).

Nonetheless, there are few mentions of earlier studies of international news in this thesis, not only because of lack of space, but also because of the theoretical and methodological confusion in the field originating from post-colonial countries' claims in international organizations in the mid-1970s (Hur, 1984; Stevenson & Cole, 1984a). Many media and communications scholars treated little news coverage of Asia, Africa and Latin America in the western media as an indication of unidirectional news transaction between the developed and developing countries, being influence by the

discussion for a New World Information and Communication Order in the UNESCO. Furthermore, earlier researchers, who were also influenced by debates in journalism, considered the coverage concentrated on developed countries and the negative representation of developing countries in the western media biased, because coverage deviated from the 50-50 benchmark in both cases.

The theory of media imperialism (Herman & McChesney, 1997; H. I. Schiller, 1991), which criticizes western media companies' global domination and the spread of western ideology, is also an important theoretical concept in this research, but it is only briefly mentioned in the conclusion of the second paper solely due to lack of space. Therefore, I discuss the theory in this introduction in relation to the NWICO debate, and return to it in the concluding chapter.

The NWICO debate

In the 1960s, leaders of newly independent countries in Asia, Africa and Latin America formed a group of nations called the Non-Aligned Movement, aiming to promote their economic and political interests in international fora. They gained bargaining power as exporters of natural resources in the oil crisis, and led the General Assembly of the United Nations to declare the establishment of a New International Economic Order (NIEO) in 1974 to correct the global imbalance of economic power. These countries also pursued greater autonomy in communication by proposing a New World Information Order, which was approved in 1976 as the New World Information and Communication Order (NWICO) (Nordenstreng, 2012). Two years later, the MacBride Commission was created by UNESCO to investigate problems in international communication. The result of the investigation was published in the report *Many Voices*

One World in 1980 and widely discussed in the general conferences (Carlsson, 2003; Masmoudi, 2012). According to Masmoudi (1979), who was one of the members of the commission, there were seven main problems in international communication: (1) unidirectional flow of information from developed countries to developing countries, (2) inequality in information resources, (3) developed countries' desire for global dominance, (4) underrepresentation and misrepresentation of developing countries, (5) survival of colonial relations, (6) undermining of the economic, social and cultural spheres of developing countries, and (7) dissemination of biased media content about developing countries.

The NWICO debate concerned international communication, but it had inherited its frame of discussion from the preceding discussion on international trade (Frau-Meigs, Nicey, Palmer, Pohle, & Tupper, 2012; Masmoudi, 1979). There was a clear correspondence between the goals of the NIEO and the NWICO: the aims of the NIEO were to ensure the rights of every nation to control foreign investment and the operation of transnational companies, expand world trade to increase exports from developing countries, and enhance cooperation between developed and developing countries for global economic growth (White, 1975); while in the NWICO, the goals were to introduce international regulation on the flow of information, increase information flows from developing to developed countries, and promote developing countries' participation in international exchanges of information. The MacBride report's (UNESCO, 1980) philosophical language also amalgamated economic and cultural issues: the word 'imbalance' was repeatedly used in referring to problems in the international transaction and content of international news. The report claimed that 'imbalance' existed in news flow (a) between developed and developing countries, (b) between the capitalist and the

communist blocs, (c) between developing countries, and (d) within the capitalist and communist blocs per the size of the countries, and (e) in coverage of political and non-political (social, economic, and cultural) news, 'good' and 'bad' news, and current events and their backgrounds.

The vague concept of 'imbalance' had a profound impact on the way research on international news would be conducted. After an exhaustive review of international news studies published between 1970 and 1982, Hur (1984) pointed out the confusion regarding the most crucial theoretical and methodological problems in the field. According to him, an international news flow analysis is a "flow or transaction analysis which deals primarily with the volume and direction of news flow between and among countries" and an international news coverage analysis is "content analysis which deals with not only the amount, but also the nature and type of international news disseminated across national boundaries" (Hur, 1984, p. 367).

'Biased' international news

Following the NWICO debate, coverage concentrated on developed countries and the negative representation of developing countries were considered 'bias' in foreign news reporting. Gerbner and Marvanyi (1977) showed in a multinational study that countries in North America and Western Europe tend to receive the highest news coverage. Mayer (1989) reproduced their finding in an analysis of daily newspapers in Africa and Latin America: the United States received the most attention with 7% and 20% of the coverage in the respective regions. Paik (1999) found that Africa occupied only 3% of news coverage in a content analysis of 33,159 international news articles in the *Wall Street Journal*. Lazano et al. (2000) conducted a content analysis of newspapers in Latin

America in 1997 and reported that Europe and North America were the most covered regions after Latin American countries.

News coverage concentrated on developed countries has been found not only in newspapers but in TV news. Weaver et al. (1984) found that in network evening news in the US Africa and Latin America received the least coverage, while the Middle East and West Europe received the most. Larson (1984) also reported that the most frequently covered countries by US network news between 1972-1981 were the United States and the Soviet Union. Golan (2003) found that only 1% of news stories solely covered African countries in American TV news in 1999. In a study of British TV news programmes in 1999, the same coverage concentrated on developed countries was found (DFID, 2000). In a more recent study of TV news in 17 countries, Wilke et al. (2012) found that Europe (40%) received the highest coverage, followed by North America (23%), Asia (19%), the Middle East (18%), South America (9%) and Australia/Oceania (3%), and Africa (3%). Nonetheless, Wu (2000) explains that the concentration of news coverage on developed countries is due primarily to logistical and economic factors. He statistically analysed data from an earlier multi-national study, and found that geographical distances and trade relations were among the most important predictors of foreign news coverage.

The negative representation of developing countries in news was identified even in the seminal work on international news. Galtung and Ruge (1965) found that negativity of events was one of the most important factors that determined news coverage in Norwegian newspapers, and expressed concerns regarding the negative representation of developing countries, because it facilitates “an image of these countries as dangerous, ruled by capricious elites, as unchanging in their basic characteristics, as existing for the benefit of the topdog nations, and in terms of their links to those nations” (Galtung &

Ruge, 1965, p. 84). An analysis of international news coverage in *The New York Times* in the 1970s and 1980s revealed that, respectively, more than 50% and 85% of coverage of African countries were related to crises (El Zein & Cooper, 1992). Larson (1984) found that the proportion of the crisis theme in US TV news was the highest in news on developing countries and stated “Africa tends to be ignored by the US television networks except in the case of a war or crisis of major proportions” (Larson, 1984, p. 70). A similar tendency has been found repeatedly in American and British TV news (DFID, 2000; Golan, 2008; Miller, 2007; Paterson, 1992). Riffe and Budianto (2001) reported an increasing volume of negative news on developing countries in US network news between 1970 and 2000.

Media imperialism

The western news media usually enjoy a high degree of independence from the state thanks to their commercial nature, but this does not mean that their news coverage is unbiased. According to Herman and Chomsky’s (1988/1995) propaganda model, even commercial news media can be manipulated by a government through public releases, called an ‘information subsidy’, which help to reduce the news media’s operational costs of news gathering. Researchers of news routines also support their argument, pointing out that the news media’s choice of news sources is determined by their productivity and authoritativeness, which eventually concentrates reporters around official sources (Fico, 1984; Gans, 1979; Tuchman, 1978). Herman and Chomsky’s propaganda model was further developed into a theory of media imperialism in the context of economic and cultural globalization (Herman & McChesney, 1997; H. I. Schiller, 1991). The theory states that western media companies not only promote corporate interests in domestic

markets, but also participate in propaganda against foreign countries through their exported media products by justifying the global dominance of western states and corporations, supporting the main argument for the NWICO by leaders of developing countries.

While the theory of media imperialism draws a divisive picture of the world, emphasizing the reflection of geo-political interests in media content, theories of media globalization describe the world differently. Appadurai (1990, p. 296) states that “the new global cultural economy has to be understood as a complex, overlapping, disjunctive order, which cannot any longer be understood in terms of existing centre-periphery models”. He underscores his claim with the concept of “mediascape”, stressing the production and consumption of media content which disregards national borders. Such a globalist view of media systems is also supported by journalism scholars who describe the international expansion of western journalism practices (Golding, 1979; Matta, 1979). Despite the western origin of objective journalism (D. Schiller, 1979; Schudson, 2001; Shaw, 1967), and the cross-national differences in professional ideology found by international surveys (Patterson & Donsbach, 1996), a number of scholars argue that it is possible that western journalism has spread to the non-western world as a result of the commercialization of the news industry (Hallin & Mancini, 2004; McManus, 1994). In fact, after his fieldwork in Interfax, Boyd-Barrett (2014) reported a high degree of independence from the government and western-standard professionalism of its journalists.

International flows of news

'Biased' coverage of developing countries has often been attributed to unidirectional flows of news from developed to developing countries. Nordenstreng and Varis (1974) also claimed that the 'free flow of information' is a one-way flow from developed countries to developing countries after studying international TV programme trade. Masmoudi (1979) identified a lack of effective legislation regarding international information flows and criticized the overemphasis on senders' rights and neglect of recipients' rights in the concept of freedom of information. According to Stevenson and Cole (1984a), there were five problems involved in the unidirectional flow of news: (1) western perspectives distort or exclude authentic non-western values from the news, (2) news stories from countries in which western countries do not have immediate interests are excluded, (3) only a little news from developing countries goes into the global news network, (4) distorted or negative news of developing countries is sent back to them, (5) news from the western news agencies do not contribute to the modernization of underdeveloped societies or the establishment of nation states.

In discussion on international flows of news, the dominant roles of western news agencies have attracted special attention. Galtung & Ruge (1965) reported that 95% of news items in Norwegian newspapers about crises in Congo, Cuba and Cyprus in the 1960s were delivered by AP, UPI, Reuters, and AFP. In a study by Matta (1979) in 1965, nearly 60% of news published in Latin American newspapers was attributed to western news agencies. Schramm (1978) analysed 14 Asian newspapers' coverage of non-Asian developing countries in 1977 and found that three-quarters of news stories were supplied by western news agencies. Meyer (1989) found in African and Latin American newspapers that around 60% of news stories were from western news agencies in the mid-1980s. Lazano et al. (2000) reported that European and American news agencies were the

most important news sources for Latin American newspapers in 1997, despite the diversification of their sources in the 1960s and 1970s. Stuart (2001) studied Bahamian newspapers in 1997 and 1998, and found 42% and 30% of news stories were provided by the American (AP) or French (AFP) news agency.

However, a large-scale study revealed more complicated patterns in international news flows. Kim and Barnett (1996), in a network analysis of international newspaper and periodical trade, revealed that the United Kingdom, West Germany, France, and the United States were the most central exporters, while all other African, Asia and Latin American countries, except for Japan, Hong Kong, Singapore, India, South Korea and Mexico, were peripheral in the network. They also found eight geographical-linguistic clusters in the network, where European and North American countries were the most central and highly interdependent.

Influence of international news

It is widely agreed that our understanding of the world is heavily reliant on indirect experience through the news media (Page & Shapiro, 1992; Van Ginneken, 1998). Early studies suggested a greater impact of biased news coverage on audiences in foreign affairs than in domestic affairs. The influence of foreign news is not limited to citizens, but also to policymakers and journalists. Policymakers monitor the mass media to assess the importance of foreign events to domestic politics and to react accordingly (Van Belle, 2008; Van Belle, Rioux, & Potter, 2004). Journalists also depend on foreign news stories delivered by international news agencies, as well as elite newspapers and satellite news broadcasters, in writing news stories for domestic audiences (Bielsa & Bassnett, 2008; Laville & Palmer, 2012).

Citizens

Page and Shapiro (1992) found public opinion in the United States to be much less stable on foreign rather than domestic issues in their historical analysis, claiming that instability in public opinion on foreign issues is due to the influence of the mass media. They noted that “many events, however—especially distant happenings in foreign affairs—do not directly and immediately affect ordinary citizens and, therefore, do not speak for themselves. These cannot have much impact on public unless they are reported in the mass media” (Page & Shapiro, 1992, p. 321). The influence of international news coverage has been found in changes in audiences’ perceptions of the importance of foreign policy issues (Du, 2012; Iyengar & Simon, 1993) and attitudes toward foreign countries (Kioussis & Wu, 2008; Wanta, Golan, & Lee, 2004; Wanta et al., 2004; Zhang & William Meadows III, 2012). Iyengar and Simon (1993) found a strong correlation between the amount of televised news coverage of the Gulf War and the number of respondents who answered in a poll that the war was the most important problem facing the United States. They argued that the extensive coverage of the war raised the salience of war-related issues, while it overshadowed other issues, such as the budget deficit, drugs or crime, all of which had been salient before the war had started. In a multinational study using BBC World Service Poll data, Du (2012) found correlations between the salience of key news events for the public and the amount of news coverage by leading national newspapers in 10 out of 11 countries in Europe, America and Asia.

Several studies on international news and public opinion have also showed that extensive coverage of foreign countries increases the perceived importance of such countries among audiences. Wanta, Golan and Lee (2004) analysed the relationship between news coverage and the perceived importance of countries, extending the agenda-

setting theory, and revealed a strong correlation between the amount of news coverage by ABC, CBS, NBC, and CNN and the perceived importance of foreign countries with three to six month time-lags. Zhang and William Meadows III (2012), who found a similar relationship between international news coverage and audiences' attitudes towards foreign countries, concluded that the "salience of the countries in the media leads to an increased perceived importance of foreign countries among the US public" (Zhang & William Meadows III, 2012, p. 88).

Other studies have shown that negative coverage of a foreign country has a particularly strong impact on audiences. Wanta, Golan, and Lee (2004) reported that negative news coverage of foreign countries on TV news correlated with negative perceptions of those countries by the American public, while there was no such correlation in positive news coverage. Kioussis and Wu (2008) similarly reported that foreign countries' public relations efforts in the United States increased positive news coverage, but only negative news coverage affected the attitudes of the public. Moreover, using a similar research design, Zhang and William Meadows III (2012) also found a stronger impact of negative news coverage on attitudes of audiences.

Policymakers

The influence of foreign news coverage on policymaking has been discussed from the 1990s in relation to the 'CNN effect' (Belknap, 2001; Gilboa, 2005; Groshek, 2008; Hawkins, 2011; Livingston, 1997; Robinson, 1999, 2002; Seib, 2002; Strobel, 1997), which suggests that satellite or cable TV channels' rolling news coverage of crises overseas has a very strong influence on the foreign policy making process. The existence of such an effect has often been denied (Gilboa, 2005; Gowing, 1997; Livingston, 1997),

but recent large-scale analyses of the media coverage of disasters have revealed that news coverage, at least, has an influence on the foreign aid policies of democratic states (Eisensee & Strömberg, 2007; Van Belle, 2008; Van Belle et al., 2004).

Van Belle, Jean-Sébastien and Potter (2004) studied the influence of news coverage on foreign aid programmes in the United States, the United Kingdom, Canada, France and Japan between 1985 and 1995, and found that foreign news coverage was a strong predictor of the financial aid provided by those countries. They explain that foreign aid is organised predominantly through a bureaucratic process, and non-elected officials tend to rely on news coverage to judge the political importance of foreign disasters. Eisensee and Strömberg (2007) also found strong correspondence between news coverage and US foreign aid in an analysis of more than five thousands disasters that had occurred in 143 countries between 1968 and 2002, concluding that “relief decisions are driven by news coverage of disasters and ... this news coverage is crowded out by other newsworthy material” (2007, p. 722).

However, causal relations between news coverage and foreign policies are still under discussion. Eisensee and Strömberg (2007) argues that they are interrelated, because (1) news coverage of disasters triggers citizens to lobby policymakers, (2) decisions to supply foreign aid bring good publicity for policymakers, (3) extensive news coverage of disasters indicates public interest, and (4) news coverage itself increases public interest in disasters. Van Belle et al. (2008; 2004) elaborated on the last point and emphasized the influence of media coverage on bureaucrats rather than on the public, arguing that news coverage is an indicator of the political importance of foreign disasters for bureaucrats, who use information from the media to avoid being publicly accused of negligence.

Journalists

It is widely recognized that international news agencies have a strong agenda-setting influence on TV and newspapers (Boyd-Barrett, 1980). The media agenda-setting influence of international news agencies has been found as a correspondence of news coverage between national news media and news agencies. Stevenson and Cole (1984b) found that the amount of news coverage between newswires from western news agencies (AP, UPI, AFP and Reuters) and local newspapers in Latin America in the 1980s were strongly correlated, and argued that these news agencies were influencing newspapers' editorial decisions. Link (1984) compared the number of news stories attributed to news agencies (UPI, AP, and AFP) and newspapers' own correspondents in Mexican and Brazilian newspapers, and found strong rank correlations between them. Although this is not direct evidence of media agenda-setting, the result suggests an influence of news agencies on newspapers' own news gathering activities. Du (2012) argued, after his multi-national study of media agendas, "the significant correspondences suggest that an international intermedia agenda-setting function may exist among the news media in different countries about the globally significant events of 2005" (Du, 2012, p. 11).

Nevertheless, it is not only international news agencies that have an agenda-setting influence on foreign news coverage. Wu (2000) has shown that CNN is also a predictor of news coverage, and Roberts and Bantimaroudis' (1997) interviewed Greek journalists and found, as well as news agencies, that satellite news broadcasters (CNN and French TV-5), leading newspapers (*The New York Times*, *The Times*, and *Le Monde*), and news magazines (*Time*, *Newsweek* and *US News and World Report*) influenced their news choices. More recent studies have also showed that journalists monitor satellite

news channels (CNN and BBC) and the websites of leading newspapers to find important foreign news (Bielsa & Bassnett, 2008; Laville & Palmer, 2012).

Conclusion

In the NWICO debate, coverage concentrated on developed countries and the negative representation of under-developed countries were considered as 'bias' in international news (Masmoudi, 1979). This debate strongly influenced international news research in the 1970s and 1980s, and scholars found that North American and West European countries were the most frequently covered regions, while African or South America countries were featured only in the events of natural disasters or violent conflicts. Such 'biased' news coverage is often attributed to western news organizations' domination in the international news system.

Further, earlier discussions on bias in international news were based on a variant of the Anglo-American concept of impartiality, which took the position that news media must cover developed and developing countries equally. The 50-50 benchmark was valid for national news coverage by the US media, but it was not valid for US international news coverage that targeted American audiences. However, the demand to allocate the same news coverage to all countries seems based entirely on the "arbitrary assumption that each region has an equal chance of newsworthiness" (Gerbner & Marvanyi, 1977, p. 57). Furthermore, accusations against the western of covering developing countries in too negative a light also seem unfounded because such negativity may only reflect the objective reality that social disruption is more frequent in those countries (Stevenson, 1984).

An alternative approach to assessing bias in international news would be to abandon fixed benchmarks and adopt instead benchmarks created from media coverage to control for the difference between countries and organizations. For example, Ishii (1996) predicted the number of news stories on countries in Japanese newspapers by the GDP and population of those countries, and defined deviation from these predicted values as bias in foreign news coverage. Watanabe (2013) measured western cultural bias in US-based news portals by comparing the international news coverage of their US and Indian editions using national newspapers as benchmarks. I will further develop this alternative approach to news bias in the following chapters of this thesis.

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Measuring news bias: Russia's official news agency ITAR-TASS's coverage of the Ukraine crisis

Abstract

Objectivity in news reporting is one of the most widely discussed topics in journalism, and numbers of studies on bias in news have been conducted, but there is little agreement on how to define or measure news bias. Aiming to settle the theoretical and methodological disagreement, the author redefined news bias and applied a new methodology to detect the Russian government's influence on ITAR-TASS during the Ukraine crisis. A longitudinal content analysis of over 35,000 English-language newswires on the Ukraine crisis published by ITAR-TASS and Interfax clearly showed that ITAR-TASS's framing of Ukraine was reflecting desirability of pivotal events in the crisis to the Russian government. This result reveals Russia's strategic use of the state-owned news agency for international propaganda in its 'hybrid war', demonstrating the effectiveness of the new approach to news bias.

There is almost unanimous agreement on the importance of independent journalism among scholars of mass communication, and objectivity in news reporting is one of the most widely discussed topics in journalism (Barkho, 2013b; Donsbach & Klett, 1993; Maras, 2012). The independence of journalists is a precondition for objective news reporting (Barkho, 2013a). Importantly, journalistic independence provides objective, or unbiased, political information allowing for effective democracy, constrains the power of the mass media, and maintains the trust of the public in mass media (Maras, 2012). Further, biased news reporting leads to the marginalization of certain social groups, misperceptions of political agendas, and public disenchantment and cynicism (Brandenburg, 2005). Researchers have embarked on empirical studies of bias in news on elections (Brandenburg, 2005; Hopmann, de Vreese, & Albæk, 2011; Kahn & Kenney, 2002; Robinson & Sheehan, 1983), wars (Aday, 2010; Aday, Livingston, & Hebert, 2005; Dickson, 1994; Entman & Page, 1994; Pfau et al., 2004), and foreign countries (Chaudhary, 2001; Jones, 2008; Meyer, 1989; Miller, 2007), but there is little agreement on how to define or measure news bias.

In the empirical studies, one school of thought defines the lack of objectivity in news as unbalanced coverage of different subjects (Brandenburg, 2005; Cushion, Lewis, & Groves, 2009; D'Alessio & Allen, 2000; Dominick, 1977; Hopmann, Aelst, & Legnante, 2012). Within this conception of news bias, researchers focus on the sheer number of articles and the length of airtime allocated to certain issues, events or actors. Other groups of researchers pay attention to tones of news reports, using metrics such as 'positive-negative' (Aday, 2010; Brandenburg, 2005; Hopmann et al., 2012; Pfau et al., 2004; e.g. Robinson & Sheehan, 1983), 'favourable-unfavourable' (e.g. Hofstetter, 1976) or 'supportive-critical' (Aday et al., 2005; Entman & Page, 1994; Kleinnijenhuis, Van

Hoof, Oegema, & De Ridder, 2007). In this approach, news reporting with predominantly positive or negative tones is considered to be biased.

The definition of news bias must be operationalizable in empirical inquiries, but it should also be based on the theories of media effect. Agenda-setting theory suggests that the amount of news coverage allocated to certain issues, events or actors influences their perceived importance among audiences (“what to think about”) (Besova & Cooley, 2009; Hester & Gibson, 2003; McCombs, Llamas, Lopez-Escobar, & Rey, 1997; Salwen & Matera, 1992; Wanta, Golan, & Lee, 2004), but, if our primary interest is investigating the mass media’s role in shaping news audiences’ attitudes towards subjects (“how to think”), we must scrutinise the ways those subjects are represented in news reporting. According to the theory of second-level agenda-setting, or priming, news reporting focusing on negative or positive aspects of events, issues and actors has a significant impact on an audience’s attitude toward them (Entman, 1993; Hester & Gibson, 2003; Iyengar & Simon, 1993; McCombs et al., 1997). The concept of media framing, which is defined as “selecting and highlighting some faces of events or issues, and making connections among them so as to promote a particular interpretation, evaluation and/or solution” (Entman, 2004, p. 5), also establishes a link between news reporting and people’s understanding of public affairs.

Selective media frames manifest as unbalanced tones of news stories, which become either positive or negative when they concern events, favourable or unfavourable when they concern opinions, or supportive or critical when they concern policy options. However, not all news stories with a predominantly positive or negative tone can be considered biased, because tone can be a simple reflection of objective reality, i.e., tones of news reports will be profoundly negative when stories describe inherently negative

events, such as natural disasters, armed conflicts or social disruptions, as Stevenson (1984) correctly point out in negative representation of the under-developed countries in foreign news. Also, tones become overwhelmingly supportive of the status-quo when disagreement among political elites is absent (e.g., the aftermath of the 9/11 attacks), as Bennett's (1990) index theory suggests. The reflection of objective reality in the tones of news reporting poses methodological challenges in measuring news bias. Entman (2007), who is agnostic regarding objective reality, has even proposed an approach to news bias focusing only on the balanced coverage of different aspects of events, issues or groups.¹

This methodological challenge has constrained how news bias has been defined and measured in earlier empirical studies. The adoption of concepts such as 'balance' and 'fairness' as proxies to objectivity has been a common practice among researchers, as well as regulators, because of the difficulty in measuring objectivity itself (Maras, 2012). The Fairness Doctrine of the Federal Communication Commission, which required American broadcasters to produce 'balanced' news reporting on public agendas between 1949 and 1987, has strongly affected the concept of news bias in scholarly debates, but 'balance' in news reporting is not so obvious in countries where the political landscape is more complex and the simple 50-50 benchmark derived from the US two-party system does not hold (Hopmann et al., 2012). Some researchers of European media have resorted to benchmarks constructed based on the number of seats political parties hold in legislatures (Brandenburg, 2005), but it seems unrealistic to expect equal coverage of

¹ Entman is still dependent on his own knowledge of objective reality in identifying which aspects are not covered by the news when applying this approach.

political groups in polarized media systems where partisan journalism is the norm. As a result of this, empirical studies on news bias have concentrated in the United States.

Aiming to facilitate empirical studies on news bias in complex media systems, I present a new approach to measuring news bias, taking Russia's official news agency ITAR-TASS's English-language news coverage of the Ukraine crisis as an example. My case selection was motivated not only by the significance of the crisis in Europe to international politics, but also by the severity of the above mentioned methodological challenges; in this case, the challenges were made particularly severe by a rapidly changing situation on the ground and a lack of non-media benchmarks with which to assess balance in the news coverage. In my approach to news bias, I will conceptualize objectivity in news reporting as coverage of all possible newsworthy stories, and analyse ITAR-TASS's news coverage in relation to Interfax's broader news coverage. In this setting, Interfax serves as a benchmark unit, which helps us to measure bias in ITAR-TASS's news reporting caused by the Russian government's influence excluding the effects of the inherently positive or negative nature of the events on the ground. I estimated the amount of bias in ITAR-TASS's news reporting using longitudinal data, which I produced by content analysing all the news stories on Ukraine published by the two news agencies over an 16-month period starting from January, 2013.

My statistical analysis of the longitudinal data will clearly show that ITAR-TASS's framing of democracy and sovereignty in Ukraine systematically biased during the crisis corresponding to the desirability of the situation in Ukraine for the Russian regime. The main causes of bias were (1) highly critical comments made by Russian officials on Ukraine, which the news agency quotes very frequently, and (2) profoundly negative descriptions of events related to Ukraine by the news agency. However, ITAR-

TASS's news articles tend to present the Russian government's views on Ukraine in an 'objective' style of writing, blurring the distinction between opinions and facts. The systematic bias in ITAR-TASS's news coverage of the Ukraine suggests the importance of ITAR-TASS in Russia's 'hybird wars', which utilizes non-military means to achieve military goals.

Hypotheses

ITAR-TASS is a prominent example of a state-owned news agency. Its roots can be traced back to the imperial era, when the first Russian news agency, the Russian Telegraph Agency (RTA), was created by the tsar in 1866. The operation of the first news agency was limited to domestic clients, but a more international agency, the St. Petersburg Telegraph Agency, was established by the government in 1904 to overcome Russia's dependence on the German news agency, Wolf, for the international distribution of news. After the 1917 October Bolshevik revolution, newspapers and magazines were obliged to publish information received from a new central news agency, ROSTA, which integrated all national and regional information agencies, and later became the Telegraph Agency of the Soviet Union, known as TASS. This news agency was directly controlled by the state and often used for propaganda during the Soviet era. According to Vartanova and Frolova (2010, p. 264) "TASS was different from other international agencies in that it acted as a voice of the Soviet government which tended to speak to the peoples of the world through its official spokesmen". TASS survived the collapse of the Soviet Union,

and was subsequently renamed ITAR-TASS.² Today, it is the official news agency of the Russian Federation and owned and administered by the government, enjoying exclusive access to official information.

The influence of the Russian government as the owner of the news agency alone might have caused bias in its news reporting of the Ukraine crisis, in which Russia has vested interests, but it is also important to note that the general level of press freedom and the journalistic culture in Russia is very different from in Western countries. The media system of Russia is characterized as Polarized model, in which journalists practice partisan reporting, commercial news media experience frequent state interventions, and media figures are integrated into the elite political network (Dobek-Ostrowska & Smaele, 2010; Vartanova, 2011). This limited press freedom and partisan journalism in Russia is expected to increase the degree to which ITAR-TASS reflects the wishes of Russia's political elites, and therefore I expect to find *consistent patterns in the framing of mediated communication that promote the influence of Russia on Ukraine*, which indicate an existence of bias in ITAR-TASS's news caused by the Russian government's influence.³ In fact, Horvit (2006), in his research on news agencies' framing of the debates around the US-led intervention into Iraq in 2003, found that 54% of the ITAR-TASS stories sourced Russian government officials, and 53% of the paragraphs in its stories

² ITAR-TASS was renamed TASS in September 2014 again to emphasize its connection to the predecessor (TASS, n.d.).

³ This statement was originally "consistent patterns in the framing of mediated communication that promote the influence of one side in conflicts over the use of government power" (Entman, 2010, p. 166).⁴ See Appendix 1 for more detailed timeline of the crisis.

were negative toward US policy. His finding predicts that the ITAR-TASS framing of the Ukraine crisis will reflect the desirability of pivotal events to the Russian government, and therefore I formulate my first two hypotheses as following:

H1: ITAR-TASS's framing of the Ukraine crisis will become more positive when the situation in Ukraine is desirable to the Russian government.

H2: ITAR-TASS's framing of the Ukraine crisis will become more negative when the situation in Ukraine is undesirable to the Russian government.

Although the literature details theory largely based on studies of the news coverage of elections, wars or foreign countries by retail news media (such as newspapers or TV), I adopt this theoretical framework as a starting point, aiming to identify necessary changes for wholesale news media (news agencies). D'Alessio and Allen (2000) identified three types of bias in news reporting in their meta-analysis of election studies: 'coverage bias', 'gatekeeping bias' and 'statement bias'. According to their definitions, coverage bias stems from unbalanced amounts of news coverage allocated to particular subjects; gatekeeping bias is a result of selection or deselection of particular kinds of stories; and statement bias is caused by inclusion of journalists' opinions. Coverage bias is expected to increase the salience of a particular country for the international audience as concentrated media coverage has an agenda-setting effect; both gatekeeping and statement bias are likely to cause attitude changes among audiences, because the arbitrary selection of stories and insertion of opinions have a second-level agenda-setting effect.

Considering ITAR-TASS's status as an official news agency, I expect to find gatekeeping bias caused by the prioritisation of Russian official sources in its coverage of the Ukraine crisis. Therefore, my third hypothesis is:

H3: Bias in ITAR-TASS's reporting of Ukraine is caused by high representation of Russian government officials in its stories.

However, it is unlikely to find personal opinions in ITAR-TASS's news coverage, because it adopts the 'objective' style of writing in newswires. Alternatively, I expect to find 'corporate bias', in other words, one driven by the ideological, social and political orientations of media organizations (Barkho, 2013a). This is as opposed to 'personal bias', which would derive from the educational, religious, economic or racial background of individual journalists. Therefore, my fourth hypothesis is the following:

H4: Bias in ITAR-TASS's reporting of Ukraine is caused by its corporate views on Ukraine, but not by the personal views of the journalists.

Methodology

In the studies on news coverage of national politics in the United States, unbalanced volumes or tones of news stories were seen as indications of news bias, but such an approach is not appropriate in measuring bias in ITAR-TASS's news reporting of the Ukraine crisis, because (1) there is no ground to expect ITAR-TASS to cover different sides of the conflict equally (i.e., Russian news agencies more likely to report the Russian government's views sympathetically, even without the influence of the Russian government, because of their greater access to Russian sources and Russians'

psychological attachment to the country), and (2) the rapidly changing situation on the ground affects the tones of news reporting (i.e., a more negative tone in a story might be caused merely by occurrences of more inherently negative events, such as violence confrontations or social disruptions, not by it being negatively framed intentionally).

In order to overcome these problems, Interfax, a Russian news agency that is independent from the Russian state (Boyd-Barrett, 2014), is included in the analysis as a benchmark unit. Interfax was founded in a radio station in Moscow independently of the government in the last days of the Soviet Union. Operating as a commercial enterprise, it generates a significant portion of its revenues from its economic news service. According to earlier studies, 85% of Interfax clients consisted of banks and financial enterprises, 10% insurance and audit companies and 5% privatized enterprise; it has developed a wide range of products that include providing electronic financial information and analytical reports, and has become a leading supplier of information on Russia and CIS countries. Thanks to its successful commercial operation, Interfax maintains a high level of independence from the Russian government (Boyd-Barrett, 2012; Rantanen & Boyd-Barrett, 2004; Vartanova & Frolova, 2010).

I can identify bias caused by the Russian government's influence ('state-ownership effect'), while excluding the effect of ITAR-TASS being based in Russia ('home-country effect') by using Interfax as a benchmark unit. This benchmarking also allows us to control for inherently negative or positive events that affect news content of ITAR-TASS ('real-event effect'). In this approach, I focus on changes in ITAR-TASS's news coverage relative to Interfax's corresponding coverage, and relative changes after pivotal events are treated as bias caused by the influence of the Russian government. This is an application of the difference-in-differences technique, which is widely used in

econometrics to estimate the impact of policy interventions (c.f. Card & Krueger, 1994), although it is much more limited for a number of reasons. First, I cannot assume a high stability in benchmark units (media outlets) in studies of media since the spread of information is much less restricted than it is in policy interventions. Second, I often cannot find multiple benchmark units on which to base my statistical estimation of the uncertainty of observed news bias: this is because there are few media outlets comparable to those in which I am interested. Third, the occurrence of media bias can proceed pivotal events when they are predictable (staged events). However, unlike other social scientists, who only have access to numeric data, I can scrutinize original texts produced by the news media, and supplement the quantitative data with rich textual information to overcome the limitations.

Pivotal Events

In the early days of the crisis, there were events with which I can relatively easily associate Russia's political interests, but, as soon as the fight between Kiev's military forces and separatists began, the Russian regime's wishes became increasingly obscure. Therefore, I restricted my analysis to the period from January 1, 2013 to April 21, 2014, the day before the Kiev government relaunched its anti-separatist operations. Table 1 presents pivotal events in the Ukraine crisis with their desirability to the Russian regime.⁴

Table 1: Pivotal events in the early stage of the Ukraine crisis

Date	Label	Event	Desirability
September 03, 2013	E1	Yanukovich demands legal reforms to MPs for EU association plan	Negative
November 21, 2013	E2	The trade agreement with the EU is abandoned by Yanukovich	Positive
January 16, 2014	E3	Protest against the pro-Russian regime in Kiev intensifies	Negative
February 22, 2014	E4	Yanukovich is removed from presidency by the parliament	Negative

⁴ See Appendix 1 for more detailed timeline of the crisis.

March 16, 2014	E5	Crimea referendum is held and 95% support accession	Positive
April 15, 2014	E6	Military operations against separatists are launched	Negative

Data Collection

For my content analysis, I downloaded the English-language news stories covering Russia and CIS countries published by ITAR-TASS and Interfax respectively from the Nexis and Integrum databases between 2013 and 2014.⁵ I collected 103,236 stories for Interfax and 87,725 for ITAR-TASS, after removing duplications. I also downloaded 21,718 Reuters reports from the Factiva on Ukraine, but they were used solely for manual reading and dictionary construction, as explained in Appendix 2.

Content Analysis

To perform a statistical analysis of news reporting by the news agencies, I content analysed the downloaded news stories in terms of their geographical focus and positive-negative framing of the state of *democracy* and *sovereignty* in Ukraine. Both geographical classification and framing analysis were accomplished by employing computerized content analysis, which relies on dictionaries constructed by lexicon expansion techniques (c.f. Pang & Lee, 2008; Turney & Littman, 2003). The geographical dictionary comprises not only names of places but also of institutions and persons related to the crisis for a higher classification accuracy. The framing dictionaries contain words related to democracy and sovereignty and scored in terms of their positive-negative sentiments.

⁵ The sources were the World service wire of ITAR-TASS; CIS and Russia General Newswires and Kazakhstan, Belarus, Ukraine and Asia Newswires of Interfax.

Construction of these dictionaries was based on statistical analysis of the corpus of news stories that I downloaded to avoid arbitrary choices of words.

The adoption of computerized techniques is not only for efficiency in analysing the large volume of news stories published over 16 months, but also for consistency, which is usually difficult for human coders to achieve. The geographical classifier removed almost all the news articles not about Ukraine, accomplishing 0.94 in precision and 0.83 in recall. The framing analysis could replicate human judgements, achieving strong correlation between machine and human coding both in democracy ($r=0.77$) and sovereignty ($r=0.70$) (see Appendix 2 for details explanation and validation of the computerized method).

Statistical Model

To estimate news bias in ITAR-TASS's news reporting, the continuous sentiment scores were regressed on indicators for time period following the pivotal events ($e_1 \dots e_6$), a dummy variable for ITAR-TASS (g), and their interactions ($e_1g \dots e_6g$) with a random intercept (u) clustered by day:

$$Y = \beta_0 + \beta_1 e_1 \dots \beta_6 e_6 + \delta g + \gamma_1 e_1 g \dots \gamma_6 e_6 g + u + \varepsilon$$

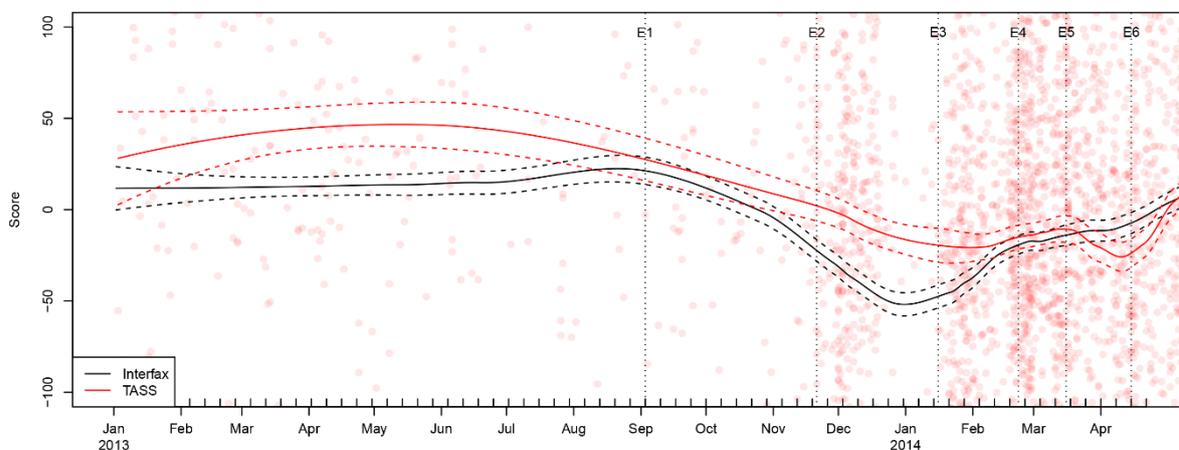
The inclusion of random intercept is to accurately estimate differences between ITAR-TASS and Interfax by controlling for variance caused by time-dependent heterogeneity. In this model, δ captures time-independent institutional heterogeneity, $e_1 \dots e_6$ are real-event effects, and the coefficients $\gamma_1 \dots \gamma_6$ are Russian government-ownership effects, in which I am most interested.

Analysis

The data produced by my content analysis is visualized in Figures 1 and 2, where red circles represent sentiment scores of individual ITAR-TASS news articles, and black and red curves respectively show average sentiment scores of news articles published by Interfax and ITAR-TASS. The average sentiment scores are interpreted as representing the positive-negative framing of democracy and sovereignty in Ukraine by the Russian agencies at particular points of time during the crisis.

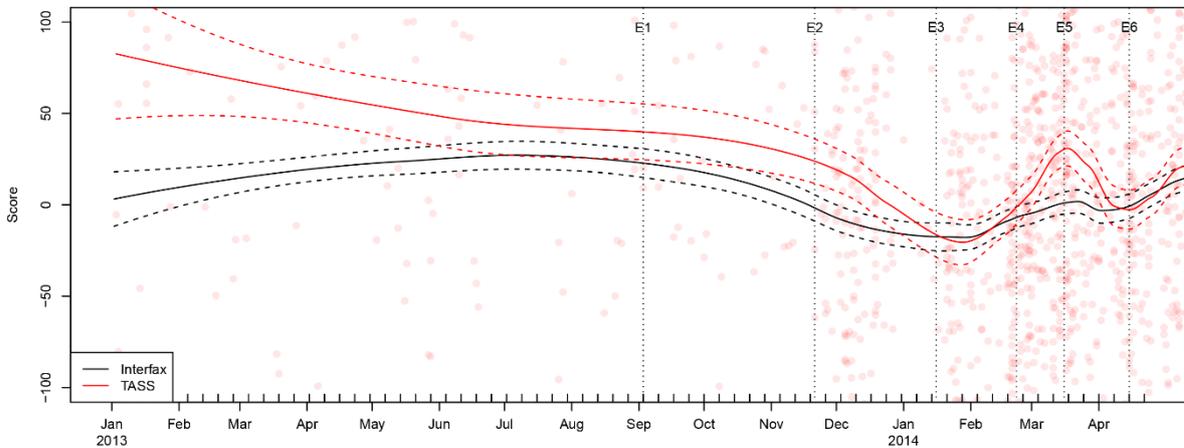
In Figure 1, the red curve runs higher than and parallel to the black line before E1 showing that the framing of Ukraine's democracy was normally more positive by ITAR-TASS than by Interfax. However, ITAR-TASS's coverage shifts toward negative after E1, when the president called for legal reforms to join the EU, but it returns to the normal level of positivity relative to Interfax over E2-E3, following the abandonment of the trade agreement with the EU. A sharp negative shift occurs after E3, and its framing becomes almost as negative as Interfax's over E4-E5. Finally, its framing moves sharply negative after E5, reaching peak negativity around E6, coinciding with the launch of the anti-separatist operation by the Kiev government.

Figure 1: Framing of democracy



In Figure 2, the difference in the framing of sovereignty between ITAR-TASS and Interfax over E1-E2 remains approximately the same as the pre-E1 period. A negative shift of framing starts only after E2, and the relatively positive framing by ITAR-TASS disappears in E3-E4, when the anti-government protests intensify in Kiev. Nevertheless, its framing rapidly improves from E4 toward E5 when the Crimean referendum was held, but it, again, becomes as negative as Interfax after E6.

Figure 2: Framing of sovereignty



Amount of bias

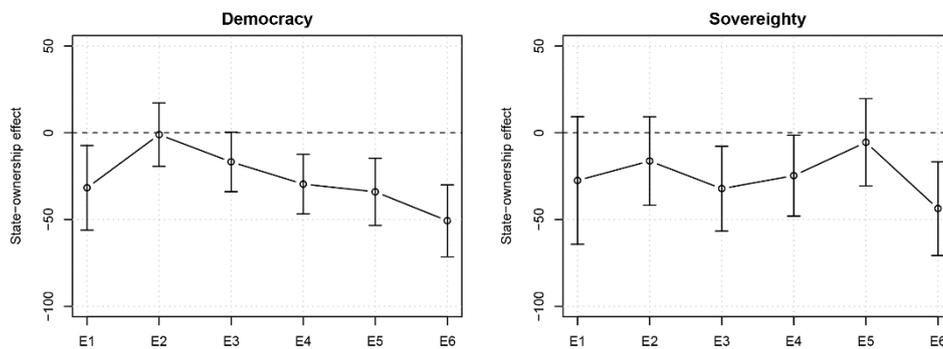
The amount of bias in the framing of the Ukraine crisis by ITAR-TASS was estimated using the statistical model, the results being presented in Table 2. In the table, the most important coefficients are found next to the interactions between the time indicators (E1-6) and the dummy variable for ITAR-TASS (TASS), which measures effects of Russian government’s ownership. The estimated state-ownership bias is also summarized in Figure 3 with 95% confidence intervals.

Table2: Framing of the Ukraine crisis by ITAR-TASS

	<i>Dependent variable:</i>					
	Democracy			Sovereignty		
	(1)	(2)	(3)	(4)	(5)	(6)
TASS	31.033*** (6.953)	22.735*** (6.946)	22.416*** (6.943)	34.783*** (9.695)	27.411*** (9.954)	27.231*** (9.910)
E1	14.575** (6.655)	17.458*** (6.525)	17.663*** (6.517)	16.757* (8.916)	20.562** (8.949)	20.538** (8.874)
E2	-42.680*** (6.007)	-40.624*** (5.920)	-40.111*** (5.913)	-19.738** (7.990)	-19.243** (8.012)	-18.363** (7.928)
E3	-45.593*** (5.883)	-45.494*** (5.828)	-44.906*** (5.821)	-27.975*** (8.108)	-30.279*** (8.149)	-29.495*** (8.053)

E4	-24.071*** (6.628)	-16.678** (6.560)	-15.750** (6.554)	-4.876 (8.844)	-2.373 (8.895)	-0.714 (8.780)
E5	-17.029*** (6.492)	-7.679 (6.467)	-7.175 (6.458)	-16.221* (8.511)	-10.020 (8.624)	-10.128 (8.518)
E6	-27.771** (11.119)	-15.346 (11.047)	-14.695 (11.027)	-19.681 (14.534)	-12.285 (14.658)	-11.271 (14.460)
Russia		-23.663*** (3.052)	-23.481*** (3.050)		-18.714*** (3.757)	-18.516*** (3.741)
Quote	(Krippendorff, 2004)	-70.038*** (4.066)	-34.341*** (12.456)		-2.375 (5.204)	89.584*** (16.076)
Quote^2			-41.860*** (13.807)			-105.207*** (17.413)
TASS:E1	-31.737** (12.422)	-31.808*** (12.110)	-31.787*** (12.102)	-27.482 (18.747)	-30.023 (18.768)	-31.778* (18.688)
TASS:E2	-1.067 (9.320)	-0.390 (9.085)	0.172 (9.081)	-16.277 (12.990)	-15.150 (12.987)	-14.970 (12.930)
TASS:E3	-16.794* (8.741)	-17.785** (8.522)	-17.681** (8.517)	-32.245*** (12.456)	-30.403** (12.434)	-30.872** (12.381)
TASS:E4	-29.571*** (8.744)	-34.481*** (8.594)	-34.003*** (8.590)	-24.722** (11.887)	-25.576** (11.987)	-25.141** (11.937)
TASS:E5	-38.267*** (9.185)	-41.076*** (9.205)	-39.884*** (9.208)	-14.107 (12.094)	-17.361 (12.454)	-15.024 (12.408)
TASS:E6	-52.389*** (13.013)	-54.172*** (12.887)	-53.512*** (12.881)	-48.739*** (16.583)	-53.991*** (16.825)	-52.927*** (16.757)
TASS:Russia		10.958** (5.118)	10.944** (5.115)		13.335* (7.048)	14.804** (7.024)
Constant	8.998*** (3.264)	48.364*** (3.840)	43.364*** (4.176)	12.560*** (4.426)	22.348*** (5.205)	9.795* (5.572)
Observations	6,723	6,723	6,723	4,180	4,180	4,180
Log Likelihood	-40,066.280	-39,871.670	-39,863.540	-24,936.590	-24,916.190	-24,894.250
Akaike Inf. Crit.	80,164.550	79,781.340	79,767.070	49,905.170	49,870.380	49,828.500
Bayesian Inf. Crit.	80,273.530	79,910.750	79,903.280	50,006.530	49,990.730	49,955.180
Note:						*p<0.1 **p<0.05 ***p<0.01

Figure 3: Estimated state-ownership effect



As summarized in Figure 3, ITAR-TASS's coverage of democracy in Ukraine becomes statistically significantly more negative (-31.7, $p < 0.05$) than during pre-crisis after Yanukovich's speech (E1), indicating the Russian government's influence on ITAR-TASS. Its framing of Ukraine then becomes as positive as the pre-crisis period after the abandonment of negotiation (E2). The change following the intensified anti-regime protest (E3) is only marginal (-16.7, $p = 0.054$), but the collapse of the regime (E4) (-29.5, $p < 0.01$) and Crimea referendum (E5) (-38.2, $p < 0.01$) are strongly significant. The framing of democracy in Ukraine becomes increasingly negative, reaching -52.3 points ($p < 0.01$) after the start of anti-separatist military operations (E6). This result clearly shows that all the events, other than E5, are followed by changes in framing toward the same direction as predicted by their desirability for the Russia regime.

ITAR-TASS's framing of sovereignty becomes significantly negative (-32.2, $p < 0.01$) only after anti-regime protests intensify (E3), because earlier events did not have serious implications for Ukraine's sovereignty. Framing starts shifting toward the positive (-24.7, $p < 0.05$) from the collapse of the regime (E4), and then negativity completely disappears ($p = 0.21$) after the Crimea referendum (E5), but Kiev's military operations against pro-Russian separatists (E6) brings it to the most negative level (-48.7, $p < 0.01$).

These changes also match the patterns, that the author expected based on the desirability of events for the Russian government.⁶

Source of Bias

The statements of Russian officials frequently quoted in ITAR-TASS's news articles are one of the main sources of bias. In my statistical analysis, a dummy variable for mentions of Russian entities (Russia in Table 2) created from the secondary-country category by the geographical classifier shows that articles mentioning Russian entities are 23.6 points ($p < 0.01$) more negative about the democracy in Ukraine, and higher proportions of quotes in articles (Quote in Table 2) lead to more negative framing of the country ($\beta = -70.0$, $p < 0.01$). The effect of mentions of Russian entities also appeared to be statistically significantly negative ($\beta = -18.7$, $p < 0.01$) on framing of sovereignty (model 5), but proportions of quotations have no significant effects in this subject ($p = 0.64$). Yet, further exploration of the data revealed that quadratic terms of the proportions (Quote²) have very strongly significant effects in both democracy ($\beta = -41.8$, $p < 0.01$ in model 3) and sovereignty ($\beta = -105.2$, $p < 0.01$ in model 6).

⁶ Confirmation of the statistical findings by manual reading of the news stories is presented in Appendix 4.

Figure 4: Non-linear relationship between sentiment and quotes

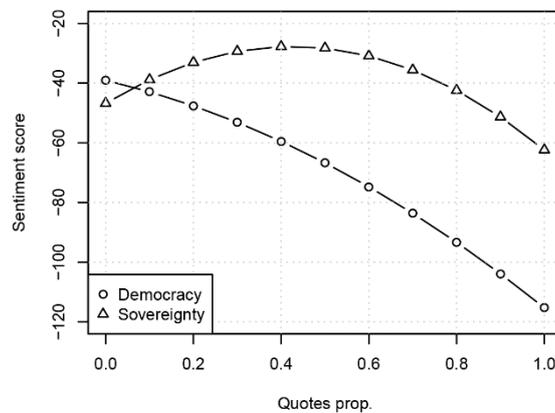


Figure 4 presents sentiment scores predicted by the model 3 and 6 for news articles which mentioned Russian entities and were published by ITAR-TASS after E6. These articles clearly show a non-linear association between framing scores and proportions of quotations, which suggests that there are, at least, three types of biased news stories. The first type simply describes situations regarding democracy and sovereignty in Ukraine negatively with little or no quotation of sources (less than 30% of wordage), while the second largely relies on negative comments on Ukraine made by Russian officials or pro-Russian Ukraine leaders (more than 70%). In the third type, relatively positive comments on Ukraine made by foreign actors, who are important in stories on sovereignty, are quoted (30-70%), but these are followed by very negative descriptions of the situation in the country, which are barely relevant to the quotes, to make the overall framing in the news articles more negative (examples of these three types are presented in Appendix 5).

Discussion

In my analysis of the framing of democracy and sovereignty in Ukraine by ITAR-TASS's English-language service, I found that the news agency's framing reflected the

desirability of the preceding events for the Russian government, i.e., only the abandonment of the trade agreement with the EU and the Crimean referendum were framed in as positive a manner as news on Ukraine had been in the pre-crisis period. Apart from the periods following these two events, framing of the Ukraine crisis was profoundly negative, the most negative framing appearing after the launch of military operations against pro-Russian separatists. In this period, ITAR-TASS's framing of democracy and sovereignty shifted 1.88 and 2.47 times greater than Interfax's framing toward the negative, whereby I estimated the amount of bias in ITAR-TASS's coverage to be as large as -52.3 points regarding democracy and -48.7 points regarding sovereignty. These findings support my first and second hypotheses (H1 and H2), and thus I argue that ITAR-TASS's news coverage of Ukraine was biased, reflecting the interests of the Russian government in the country.

The strategic coverage of the Ukraine crisis by ITAR-TASS is indicative of the importance of the news agency in Russia's 'hybrid wars', which utilizes non-military means to attain military goals. In recent years, researchers have paid special attention to Russia's satellite news channel, Russia Today (RT), as a medium for public diplomacy (Galeotti, 2015; Nelson, Orttung, & Livshen, 2015), but very few studies on ITAR-TASS have been conducted from this perspective. The findings of this research suggest that the soft power strategy of Russia, which has been advanced by Vladimir Putin since 2012 (Light, 2015), is more comprehensive than previously thought, namely, in addition to the dissemination of news stories directly to foreign audiences via RT, the Russian government utilizes ITAR-TASS to reach foreign news media, bypassing the Western media's foreign correspondents in Moscow, who tend to be negative about the regime (Evans, 2005). To achieve this goal, ITAR-TASS even mixes its own very negative

descriptions on Ukraine with positive comments of Western leaders, who are generally more newsworthy than Russian officials for Western audiences, in its news coverage, creating the non-linear relationship between the sentiment scores and the numbers of quotation. This is a sophisticated propaganda technique to increase the chance of its news stories to be accepted and redistributed by foreign news media.

By scrutinizing the three types of biased news stories, I have discovered that the main sources of bias in ITAR-TASS's coverage of Ukraine were (1) statements of Russian officials, to which the Russian news agency grants higher prominence, and (2) negative descriptions of the situation in Ukraine, supporting my third and fourth hypotheses (H3 and H4). These causes are to a large extent consistent with the typology developed by D'Alessio and Allen (2000), but not entirely so, because ITAR-TASS's news articles are written in an 'objective' style without making clear distinction between opinions and facts as required in Western journalism. In other words, the typology of news bias developed in research on the Western media does not fully apply to the non-Western media, in which opinions are disguised as facts.

Based on the findings, I propose three changes in its definitions of news bias to extend the scope of the typology. First, D'Alessio and Allen have defined statement bias as a result of inclusion of journalists' opinions, but it should not be restricted to direct expression of opinions (e.g., expressly support or criticize actors or ideas), because opinions can be blended into news stories in various forms, some of which are very difficult to distinguish from 'objective' description of events or issues. In fact, much of the bias in ITAR-TASS's news stories on Ukraine was caused by descriptions with excessive emphasis on their negative aspects of events. Second, as Barkho (2013a) pointed out that sources of bias are not only backgrounds of individual journalists

(personal bias) but also ideological, social and political orientations of media organizations (corporate bias), statement bias should encompass insertion of opinions of media organizations as well as of individual journalists, because personal opinions of journalists were not found in ITAR-TASS's news stories at all. Third, gatekeeping bias was very broadly defined as it is caused by selection or deselection of particular kinds of stories, but it should be redefined as *bias caused by prioritization of particular sources*, since quotation of news sources is the most significant source of bias, which can be easily distinguished from statement bias. These proposed definitions of news bias are summarized in Table 3.

Table 3: Types and definitions of news bias

Type	Cause	Structure	Example	Measurement
Statement bias	Insertion of opinions of journalists or media organizations	No quote	Stories emphasising social disruption caused by pro-EU protesters	Positive-negative framing of events, issues or actors in relation to benchmark units
	Description of events or issues with focus on particular aspects			
Gatekeeping bias	Quotation of particular type of sources	Direct or indirect quotes with attribution	Stories quoting Russian officials who criticise military operations against pro-Russian separatists	

Finally, the revelation of the systematic bias in ITAR-TASS's news coverage of Ukraine demonstrates that the new methodology is an effective approach to measuring news bias. Although I have focused on ITAR-TASS in this research, the new approach is not limited to studies of news agencies or international news media: It is particularly useful in research on media bias in countries with a multi-party or authoritative political system, where estimation of news bias has been very difficult due to the lack of non-media benchmarks. In research on the news bias in multi-party political systems, one can choose a news organization with a particular characteristic (e.g., ownership, political

affiliation, etc.) that is expected to cause bias in its news content. Then, the news content should be compared with news content produced by other news organizations lacking that characteristic. Even if partisan journalism is widely practiced, inclusion of multiple benchmark units selected from the entire political spectrum should allow estimation of news bias. Authoritative media systems usually have very few independent or anti-regime media outlets, but comparison between the state-controlled media should show relative sizes of news bias correspondingly to media outlets' susceptibility to the media control as I have shown elsewhere (Lankina & Watanabe, Forthcoming). I invite readers to research on objectivity of news in some of the most problematic media systems, where biased news reporting is the pressing issue to democracy.

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Appendix

Section 1: Timeline of the Ukraine Crisis

During this period, important events occurred nearly every week, but I pay special attention to six events presented in Table 1. The first pivotal event was President Yanukovich's speech in the Rada of Ukraine on September 3, 2013 (E1), demanding legal reforms to the members of the parliament for an association agreement with the EU, which Russia had been trying to prevent. On November 21, he suddenly announced termination of negotiation with the EU (E2), which caused a large pro-European protest in Kiev on December 1. When the anti-protest laws were passed by the parliament, violent confrontation between protesters and the police started on January 16, 2014 (E3). After a month of intense anti-regime protests, the pro-Russian regime collapsed on February 22 (E4), as the president was officially removed by the parliament. Following the collapse of the Yanukovich government, Russian soldiers appeared in Crimea, and the local government announced a secession referendum from Ukraine, which was then changed

to accession to Russia on March 6. The referendum was held on March 16 (E5) and reportedly over 95% of Crimeans voted to join Russia. On the next day, the United States and European Union launched sanctions against Russia. On April 7, pro-Russian protesters in Donetsk, Luhansk and Kharkiv occupied government buildings, demanding a referendum on independence, but the Kiev government responded by launching military operations (E6).

Section 2: Computerized Content Analysis

Geographical Classification

Since I was only interested in stories related to the Ukraine crisis, I performed geographical classification to exclude news stories not mainly covering the country. The most common approach in computerized geographical classification seems to be simple keyword matching based on a list of place names, but this approach fails to identify the geographical associations of news stories that do not explicitly mention names of places (Watanabe, 2017). To overcome this problem, a list of place names was extended using the ITAR-TASS's foreign news stories.⁷ By extending the list, my geographical dictionary is not limited to names of countries or cities, but includes names of people and organizations (such as Putin, White House or NATO), which are also important indicators of locations.⁸

⁷ Since Russia has treated Crimea as a part of Russia after the annexation, the region was classified separately and merged into Ukraine.

⁸ The numbers of stories that were mainly about Ukraine were 7,101 for Interfax and 4,899 for ITAR-TASS in democracy, and 5,469 for Interfax and 2,549 for ITAR-TASS in sovereignty.

The geographical classifier achieves higher accuracy in identifying countries the most strongly associated with news articles; however, it is also able to identify the countries second most strongly associated with articles. For example, news stories, which were identified as having the strongest association with Ukraine, were also associated with other countries, such as with Russia or the United States. Since the second degree association countries were usually the home countries of actors mentioned in the stories, my geographical classifier helped us to understand the differences between news content according to the location of news sources.

Framing Analysis

For this analysis, I constructed new sentiment dictionaries on *democracy* and *sovereignty* using a technique called Latent Semantic Scaling (LSS), which automatically identifies entry words relevant to democracy and sovereignty, and assigns continuous sentiment scores to the words. Its algorithm was originally developed by Deerwester et al. (1990) as Latent Semantic Analysis, and introduced to social scientific text analysis by the current author. In repeated experiments, it has been demonstrated that the dictionaries created with this technique can content analyse political documents and news stories as accurate as human coders (author forthcoming).

In the automated dictionary construction by LSS, the corpus of news stories was statistically analysed in terms of patterns of word occurrences: entry words to the dictionaries were selected by their frequency of co-occurrence (collocation) with democracy ('democra*') or sovereignty ('sovereign*') within 10-word windows in the corpus, and sentiment scores of entry words were calculated by their contextual similarities to a set of general English positive and negative words commonly used in

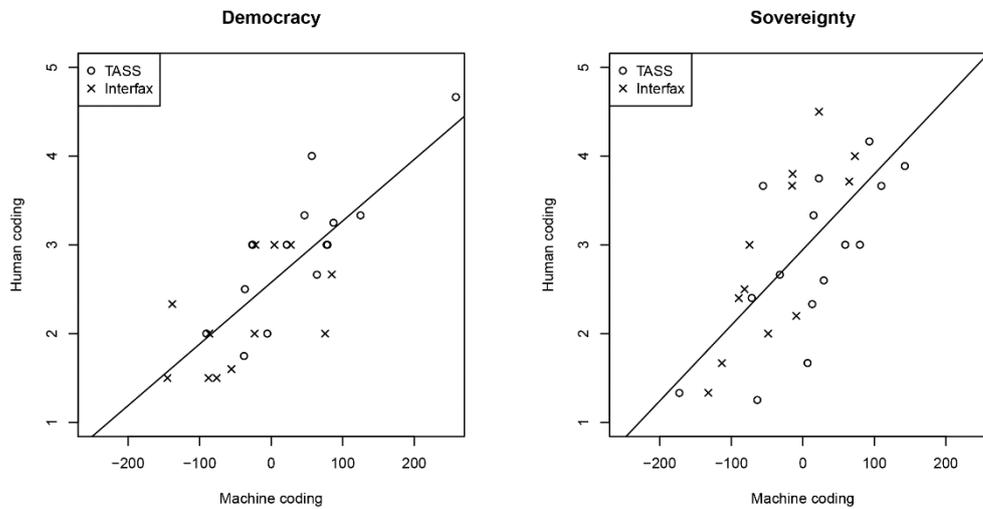
computer scientific literature.⁹ The sizes of the democracy and sovereignty sentiment dictionaries produced for this research are respectively 875 and 681 words.¹⁰

Sentiment scores assigned to each of the news stories were calculated by taking the sum of scores in the dictionaries weighted by frequency of words in the document. This scoring method, first used by Benoit and Laver (2003), makes the machine coding more robust against occurrences of words irrelevant to democracy or sovereignty in news stories. The scores assigned to news stories were normalized by shifting the overall means to zero and by rescaling a standard deviation equal to 100 points for easier interpretation of the results. I tested the accuracy of the coding by the dictionary by manually coding a random sample of 30 news stories. In the manual coding, each sentence of the news articles was coded on a five-point scale, and then scores for news stories were calculated by taking the average scores of sentences (see next section of this Appendix for definitions of negative and positive news). The agreement between machine and manual coding measured by Pearson's correlation coefficients were $r=0.70$ in sovereignty, $r=0.77$ in democracy (Figure 1). I found some random errors in machine coding, but it has little effect on my statistical analysis as they set off each other in my large dataset.

⁹ The general English positive-negative seeds were identified by Turney and Littman (2003). Positive words are "good, nice, excellent, positive, fortunate, correct, superior", and negative words are "bad, nasty, poor, negative, unfortunate, wrong, inferior".

¹⁰ The dictionaries are publicly available at http://koheiw.net/wp-content/uploads/2017/01/dictionary_ukraine.zip.

Figure 1: Agreement between machine and human coding

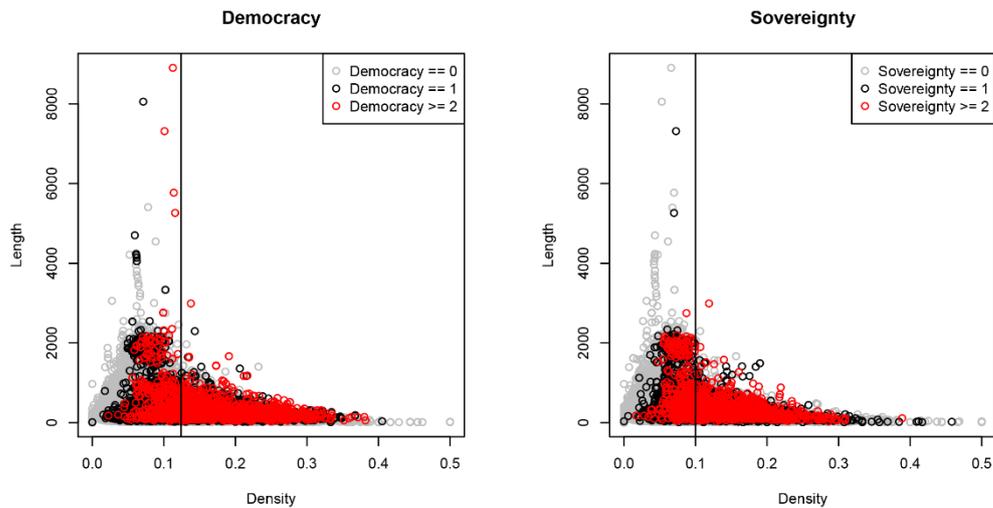


Entry-word Density Filtering

In order to selected news stories related to certain topics, simple keyword matching often utilized, but this method is sensitive to length of texts, favouring longer articles. Alternatively, I measured normalized frequency, or density, of words strongly related to democracy or sovereignty in each of the stories, and imposed a fixed threshold to select highly relevant stories. To set a reasonable threshold, I first generated a subset of news stories, in which democracy ('democra*') or sovereignty ('sovereign*') occurs at least twice, and then obtained the first quantile of the density of the related words in the subset. The topic-related words are also entry words of the framing dictionaries, but, importantly, selection of relevant news stories is independent of the sentiment scores (correlations between the sentiment scores and the log-likelihood collocation statistics were $r=0.02$ in sovereignty and $r=0.10$ in democracy). As shown in Figure 2, the thresholds (vertical lines) obtained from the subsets (red circles on the right) separate short stories from large clusters of long less relevant stories (grey and black circles on the

left). Stories on the right-hand side of the vertical lines are likely to be related to either democracy or sovereignty, even if they do not contain these words. After the exclusion, the numbers of items were 15,862 for Interfax and 19,192 for ITAR-TASS in democracy and 16,523 for Interfax and 13,178 for ITAR-TASS in sovereignty.

Figure 2: Entry-word density filtering



Section 3: Manual Coding Rules

This appendix presents the definitions of positive or negative sentences in news stories in my manual content analysis. In the content analysis, each sentence in a news article was classified as 1 (very negative), 2 (negative), 3 (neutral), 4 (positive) or 5 (very positive). Degrees of positivity or negativity were judged based clearly of reporting, i.e., explicit or concrete sentences were labelled as 1 or 5. Sentences not related to democracy or sovereignty were classified as such and excluded from the calculation of document scores.

Democracy

Positive.

Reaching agreement based on dialogue (e.g. signing a truce; ratifying a treaty); discussion between different parties (e.g. in the parliament or formal meetings); actions based on people's support; actions respecting laws and the constitution (e.g. fair elections).

Negative.

Use of violence against political opponents; coercion of opponents by political power or physical force; Infringement or limitation of civil rights (e.g. Arrest or prosecution of citizens); abuse of political power or excessive power concentration; existence of obstructions to dialogue; people's expression of discontent against the government (e.g. mass anti-government rallies); lack of transparency in political institutions; restriction on journalists and mass media.

Sovereignty

Positive.

Foreign nations or transnational bodies' (e.g. EU or NATO) recognition of Ukraine's regime; Ukraine government officials to cooperate with foreign leaders; Ukraine government maintain social order in the country with law enforcement agencies or the military; political process complying with Ukraine's laws and treaties; foreign nations to provide financial or military support to Ukraine.

Negative.

Denial of the legitimacy of Ukraine government (e.g. link to 'neo-Nazi' or 'nationalists'); possibility of foreign invasion in Ukraine; spread of social disorder that threatens the stability of the Ukrainian regime (e.g. 'coup' attempts); foreign nations

sanction against Ukraine government officials or former officials (e.g. Victor Yanukovich).

Section 4: Confirmation of Statistical Findings

This appendix presents results of manually reading news stories by the author, which confirm findings in the statistical analysis.

Democracy

The positive change in framing after E2 corresponds to the abandonment of the trade agreement with the EU as ITAR-TASS publishes positive stories emphasizing the importance of the economic ties between Ukraine and Russia. For example, one story, scoring 273.2 points, reports a meeting between members of the parliament from both Russia and Ukraine on policies enhancing economic cooperation between the two countries (November 28; 273.2). During this period, ITAR-TASS also releases President Yanukovich's comment addressing the importance of the "triangle relationship" between Ukraine, the EU and Russia (November 29; 265.2). The news agency also quotes the Ukrainian prime minister, who supports the Custom Union with Russia, Belarus and Kazakhstan, and Eurasian economic integration (December 27; 203.4).

The reason for the negative framing after E5 is that many news stories published by ITAR-TASS after the referendum in Crimea are critical of the state of democracy in the other part of Ukraine. For example, one story reports that, according to a Ukrainian air force commander, over 90% of air force personnel in Crimea swear allegiance to Russia, because the annexation was caused by "the unconsidered actions of the Kiev leaders who give unclear orders and directions" (March 20; -346.1). The Russian foreign minister notes that the accession of Crimea to Russia is an opportunity to stop "current

outrages committed by ultra-nationalistic and extremist forces which business people and journalists, dissenters, Russian speakers and our compatriots fall victims to” (March 20; -191.9) and to recover from the misfortune caused by “people relying in many respects on extremists, neo-Nazis and radicals, who do not take into account interests of a great part of the Ukrainian nation” (March 21; -302.0).

In response to the launch of the anti-separatist military operation by Kiev, ITAR-TASS produced more stories accusing the Ukraine government for the use of force against citizens. In another story, Belarus’s Prime Minister is quoted as saying “we in Belarus want all the problems to be solved by peaceful means” (April 15; -196.2). ITAR-TASS quotes Dmitry Medvedev’s post on Facebook, in which he argues that the creation of a modern Ukraine is possible only based on “equality of peoples and their languages” (April 15; -171.7). In another story, Crimean leader, Sergey Aksyonov, expresses support for people in East Ukraine, and is quoted accusing the new Ukrainian government saying “instead of dialogue with their people, [the] illegal authorities in Kiev have dispatched troops and gunmen they control to suppress a peaceful protest of residents in southeast Ukraine” (April 16; -177.9).

Sovereignty

The changes in framing of sovereignty do not respond to the earlier pivotal events (E1 and E2), because these events did not produce stories strongly related to Ukraine’s sovereignty. Sovereignty becomes a more prominent theme when the survival of the pro-Russian regime comes into question following the intense protests (“coup d’etat” or “extremists”) and when Western nations start supporting protesters (“flirting”) and introducing sanctions (“blackmail”). Russia’s annexation of Crimea marks the climax of the “sovereignty” of the region during the crisis in ITAR-TASS’s news reporting. The

negativity after the beginning of anti-separatist operations (E6) is caused by reports on discrimination and violence against Russian-speaking minorities in East Ukraine, and Russia's willingness to intervene in Ukraine to protect "compatriots".

After the Crimean referendum, ITAR-TASS publishes a large number of very positive stories. For example, one story published on the day of referendum reports that 93% of the voters supported accession to Russia (March 16; 160.7) and that the voting turnout among Crimean Tatars was as high as 40% (March 16; 181.5). The agency reports on the next day that empowered representatives of the Crimean Supreme Council are to sign a treaty for the accession of Crimea to Russia (March 17; 199.3). Russia's labour minister states that Crimea's accession is an important event that will lead to the creation of "positive conditions for development, employment and business activity of citizens" (March 19; 285.2). The following week, the news agency publishes a story quoting the Belarusian president, who claims that Crimea is a part of Russia as a matter of fact (March 23; 174.9).

Stories published by ITAR-TASS after the launch of military operations against pro-Russian separatists particularly focus on human rights and the equality of Russian speakers in Ukraine. One story quotes a UN Assistant Secretary General for Human Rights who warns of the risk of the "propagation of ideas of ethnic, racial and religious hatred" by pro-European activists, particularly before the presidential election scheduled on May 25 (April 15; -172.7). In other stories, sources express their strong support for Russian speakers in Ukraine. In one article, Sergey Aksyonov states "illegal authorities in Kiev have dispatched troops and gunmen they control to suppress a peaceful protest of residents in southeast Ukraine" and continues "we give full moral support to residents of Slavyansk, Kramatorsk, Donetsk and other cities" (April 16; -111.9). Finally, the

strongest message was Vladimir Putin's statement that "the Federation Council has empowered the president to use armed forces in Ukraine. I do hope that I will not have to use this right and that political and diplomatic means would resolve all acute problems of today in Ukraine" (April 17; -69.9).

Section 5: Three Types of Biased News Stories

The examples below show those two types of negative framing; the first article is scored -172.6 points without any quotations, while the second article is scored -111.8 points with 76% of words in quotations.

Type 1: No Quote

UN warns about dangers of nationalistic rhetoric in Ukraine

GENEVA, April 15 (Itar-Tass) - UN has warned about the dangers posed by nationalistic rhetoric in Ukraine, which may affect the situation in the country.

A report on the observance of human rights in Ukraine drawn up by the UN Assistant Secretary General for Human Rights Ivan Simonovic says this problem has particular significance now that the country is getting closer to the presidential election scheduled for May 25.

Propagation of ideas of ethnic, racial and religious hatred on the part of some political forces and separate individuals, which only serves as instigation to discrimination and animosity, as well as the nationalistic rhetoric that made itself manifest during protests on Kiev's Independence Square may wield a very heavy impact on the situation in the country, the report says.

Type 2: Composite of Quotes

Russia's Crimea supports protesters in southeast Ukraine

SIMFEROPOL, April 16 (Itar-Tass) - Russia's Crimean residents support residents in the cities of Slavyansk, Kramatorsk and other Ukrainian cities against whom "the Kiev junta" had dispatched troops and gunmen, acting Crimean leader Sergey Aksyonov told news agency CrimeaInform on Wednesday.

"Instead of dialogue with their people illegal authorities in Kiev have dispatched troops and gunmen they control to suppress a peaceful protest of residents in southeast Ukraine," Aksyonov said.

He said with confidence that "people will give a proper assessment to these criminal actions of Kiev junta backing on Nazi order and ideology."

"We give full moral support to residents of Slavyansk, Kramatorsk, Donetsk and other cities, where people protect their rights and freedom today," the acting Crimean head said, noting that Crimean residents were also prepared "to give needed material aid and receive families."

"We will not leave you in trouble! Crimea succeeded to protect themselves from the Nazis, I am convinced that southeast Ukraine will manage to do the same," Aksyonov said in conclusion.

Type 3: Quote with Description

The following story exemplifies the third type showing the technique used by ITAR-TASS to frame Ukraine negatively with quotations from non-Russian sources. In this article, quotations from the Italian foreign minister, which account for only 38.3% of words, are very positive but followed by very negative descriptions inserted by the Russian news agency, which overshadow the positivity making the overall score close to zero (-0.71 points).

Italian foreign minister lauds Geneva agreements on Ukraine

ROME, April 18 (Itar-Tass) - Italian Foreign Minister Federica Mogherini has lauded agreements reached in Geneva at a meeting of representatives of Russia, the United States, the European Union and Ukraine on Thursday.

"Agreement in Geneva means a turnaround in the Ukrainian crisis, the beginning of the phase of dialogue," Mogherini said, adding that it is the start of a new path "in which we believed and for the sake of which we worked, but which had not been predetermined".

"Now the agreed measures should be implemented, tensions in the east of Ukraine should subside, all sides should take a responsible position, violence should be stopped, including with the help of the OSCE mission," she said.

"It is very important for the set of constitutional reforms to continue quickly, in conditions of transparency for the benefit of all Ukrainians and stability in the region," the Italian Foreign Ministry said in a statement.

The Geneva Statement adopted after Thursday's meeting on Ukraine in particular envisions that all illegal armed formations should be disarmed in Ukraine, all administrative buildings unblocked and all protesters except for those who committed serious crimes pardoned.

Political and economic turmoil has embraced Ukraine after a coup rocked the country in February. Amid deadly riots that involved radicals in February 2014, new people were brought to power in Kiev, whom Moscow does not recognize as Ukraine's legitimate leaders.

The crisis deepened when Crimea, where most residents are Russians, refused to recognize the legitimacy of the de facto Ukrainian authorities. Crimea reunified with Russia on March 18 after a referendum two days earlier in which it overwhelmingly voted to secede from Ukraine and join the Russian Federation.

After the reunification, which Kiev does not accept despite Russia's repeated statements that the Crimean plebiscite conformed to the international law, pro-federalization protests against the new Ukrainian authorities erupted in Ukraine's Russian-speaking southeastern territories.

The spread of the Kremlin's narratives by a western news agency during the Ukraine crisis

Abstract

The description of the Ukraine crisis as an 'information war' in recently published studies seems to suggest a belief that the Russian government's propaganda in the crisis contributed to Russia's swift annexation of Crimea. However, studies focusing on Russia's state-controlled media fail to explain how Russian's narrative spread beyond the 'Slavic world'. This study, based on quantitative and qualitative analyses of news coverage by ITAR-TASS, Reuters, the AP, and AFP over two years, reveals that Russian's narratives were internationally circulated in news stories published by a western news agency. Although this by no means suggests that the western news agency was complicit in Russia's propaganda effort, these news stories were published on the most popular online news sites, such as Yahoo News and Huffington Post. These findings highlight the vulnerability of today's global news-gathering and distribution systems, and the rapid changes in relationships between states and corporations in the media and communications industry.

A pro-European demonstration in Independence Square in Kiev escalated into a long-lasting confrontation between Russia and the West, attracting extensive coverage by news media. The news media's attention to the Ukraine crisis was not surprising, but it was unusual in terms of the international flows of information. During recent wars in Iraq and Afghanistan led by the United States, information was gathered and distributed mainly by the American and the European news media, but during the Ukraine crisis, a substantial amount of news was produced and circulated by the Russian media, including Russia's state-controlled national TV broadcasters (e.g. Channel 1, Russia 1, and NTV), the state-owned satellite TV broadcaster, RT, and the state-controlled international news agency, ITAR-TASS.

The competition in covering the Ukraine crisis between the western and Russian media has been described as an "information war" by media observers (Galeotti, 2015; Hutchings & Szostek, 2015). Earlier results of content analyses of news stories on Ukraine (Boyd-Barrett, 2015; Freedman, 2014; McIntosh, 2015) showed that the Russian state-controlled media's coverage of the pro-European Ukraine government was very negative, claiming it was connected to 'fascists' or 'nationalists' in attempt to delegitimize the new regime. The Russian TV also continuously broadcasted films and documentaries on Nazi's invasion in USSR to recall the historical experience of Russians, and news stories on the alleged crucifixion of an ethnically Russian boy and the murder of heavily pregnant Russian woman by Ukrainian nationalists in an east Ukrainian city (Hill, 2015; Lankina & Watanabe, Forthcoming).

The Russian media's narrative that the revolution in Kiev is a 'coup' by fascists and ultra-nationalists, who threatened the safety of the Russian-speaking minorities in Ukraine would allow Russia to 'protect' its compatriots by invading Ukraine as it did

Georgia (Simão, 2016). During the 2008 Georgian War, Russia was unsuccessful in international communication, but the Russian government has heavily invested in the international media to enhance its 'soft-power' in recent years (Avgerinos, 2009; Lankina & Niemczyk, 2015), and it utilized the state-owned international news agency's to achieve its military goals during the Ukraine crisis (Watanabe, 2016). The Russian government's narratives circulated by the mass media created groups of people, both inside and outside of the country, who perceived the Ukraine crisis as a conflict between Ukraine nationalists and ethnic Russian minorities. To counter the narratives, the US State Department, which supported the new Ukraine regime, released a document entitled "President Putin's Fiction: 10 False Claims About Ukraine", contrasting Russia's claims with the 'facts' (US Department of State, 2014). It is not easy to quantify the impact of Russia's propaganda during the Ukraine crisis, but recent publications on Russia's information operation during the crisis by foreign policy and security think tanks suggest that it was a success (Paul & Matthews, 2016; Snegovaya, 2015; StratCom, 2014). After an extensive review of Russia's information operations, Jaitner and Mattsson (2015) concluded that Russia's information warfare significantly contributed to its successful annexation of Crimea.

In those studies, however, the focus is on Russian-language TV broadcasts and social media that target the Russian speaking population in Russia and the Eastern European countries, and they do not address Russia's propaganda beyond the "Slavic world". Russia's English-language news broadcaster, RT, which created a channel targeting American audiences in 2011, is often mentioned in literature on Russia's soft-power (Avgerinos, 2009; Cottiero, Kucharski, Olimpieva, & Orttung, 2015; Evans, 2005; Light, 2015; Nelson, Orttung, & Livshen, 2015; Saari, 2014), but a sobering analysis

conducted by Xie and Boyd-Barrett (2015) before the outbreak of the crisis suggests RT's impact on the American population has been very limited due to the small number of audiences. Snegovaya (2015, p. 19), in a paper on the Ukraine crisis, confirms their view by saying that "an increasing number of analysts point out that RT's power to shape the narrative in the West is overstated". If the Russian media's reach is constrained to Russian-speaking communities, there are no worries regarding its influence on the North American and Western European public, and no need to spread counter-narratives, as the US State Department have done by publishing the unusual documents rebutting the Russian government's claims about Ukraine.

There is clearly a significant gap between the actual and the perceived ability of the Russian media to spread the government's narratives internationally. This gap leads us to the question of how Russia spread its narratives beyond the Russian speaking communities during the Ukraine crisis. To answer this question, the author analysed news coverage of the Ukraine crisis by today's most influential international news gathering and distribution agencies, namely Reuters, the Associated Press (AP) and Agence France-Presse (AFP). News stories on Ukraine published by these three news agencies from 2013-2014 were content analysed, and compared with news stories published by Russia's state-controlled news agency, ITAR-TASS. The result shows that Reuters' coverage of Ukraine during a 3-month period after the annexation of Crimea correlated highly with that of ITAR-TASS, and that some of Reuters' news stories conveying Russian governments' narratives were published on popular online news portals in the United States. This is a channel of Russian propaganda that has not been identified in earlier studies.

This discovery, however, by no means suggests that Reuters was complicit in Russia's propaganda effort, but shows the vulnerability of today's international news gathering and distribution system. While newspapers, TV broadcasters and news portals are increasingly dependent on the news agencies for foreign news gathering, they are under strong pressure to produce news stories at lower costs because general news services are unprofitable. The economic pressure encourages their foreign correspondents to rely on official sources in governments, some of whom are intent on exploiting international news agencies as a medium of foreign propaganda. Since western news agencies are still highly trusted, stories that contain propagandist messages are circulated internationally and published on online websites without professional gatekeeping.

Reuters, AP and AFP

Reuters, the AP and AFP are today's most influential news agencies. They were founded in the western capitals in the middle of the 19th century, and developed as "fundamentally national organizations" (Boyd-Barrett, 1980, p. 36) in terms of their ownership structures and sources of revenues. However, these news agencies have transformed several times in their long histories. While the AP and AFP are still tied respectively to the United States and France by their owners and clients, Reuters is hardly a British organization as it is owned by a multi-national media and information company. The greatest challenge facing these news agencies is the rapid decline in the news market due to the emergence of new technologies, and their general news services are only sustained by cross-funding from more profitable financial information services.

Reuters, the AP and AFP were all founded as commercial enterprises, but they developed in different relationships with their governments. AFP's predecessor, Havas,

was established in Paris as an advertising agency in 1835, and developed its news agency service with privileged access to France's official news sources and telegraph network. Reuters was established in London as an international news agency in 1851, and grew along with the expansion of the British Empire, enjoying access to the government's communication facilities. The origin of the AP is the creation of a non-profit corporation in 1848 by newspaper publishers in New York. The AP lacked access to the government's telegraph networks and was initially barred from entering a cartel established by European agencies, but it grew quickly as the lucrative domestic newspaper market expanded (Boyd-Barrett, 1980).

AFP kept its close relationship with the French government and became an official news agency (OFI) in 1940 under the Vichy government in order to contribute to its propaganda. Reuters has never been an official agency and has been protected from government interventions due to its lack of involvement in domestic news distribution, but it received funds from the British government and was involved in propaganda for foreign countries during and between the world wars. The AP maintained higher degrees of independence from the government thanks to the strong tradition of media freedom in the United States, but its executives have occasionally expressed shared interests with the government, and its historical relationship with the Central Information Agency is opaque (Boyd-Barrett, 1980; Palmer & Tunstall, 1991).

After the Second World War, state funding to the European news agencies declined steeply, and they were required to be self-sufficient. AFP's status changed from an official agency to a cooperative news agency of French newspapers to ensure independence from the state in 1957, but its chief executive was appointed by the parliament and the government remained the most important client, whose subscription

fees accounted for 50% of its revenue. In the 1970s, Reuters was receiving funds from the British government through the provision of foreign news to the BBC World Service (Boyd-Barrett, 1997).

Since the UK's news market was relatively small, 80% of Reuters' revenue was from overseas clients in the 1970s. AFP also lacked a large domestic news market, but its revenues from foreign clients only accounted for 20%, so it relied on clients in the public sector for more than 70% of domestic revenues (Boyd-Barrett, 1980; Moisy, 1996; Tunstall, 1999). In contrast to its European counterparts, the AP was enjoying the world's largest domestic news market. Most of the clients of the AP were the American and Canadian media and the revenue shares of foreign clients were only 20% to 30% in the 1970s (Boyd-Barrett, 1980).

In the 1960s, Reuters launched financial information services to compensate for the small domestic demands, but its financial services grew exponentially along with the liberalization of the financial markets. Between 1977 and 1995, its overall revenue multiplied by 40, and its revenue share exceeded 90% of its total revenue by 1989 (Boyd-Barrett, 1998; Palmer & Tunstall, 1991). Its profit from financial services was invested in the acquisition of a wide range of companies in the communication industry in the 1990s, and it became one of the largest multi-media companies in the world (Moisy, 1996). In 2008, Reuters was acquired by a Canadian media company, Thomson, and became a part of a multi-national media and information company. The AP also provided financial information services for non-media clients in alliance with Dow Jones, but this had not exceeded 25% of its revenues by 1996. AFP was also involved in financial news services for extra revenue, and distributing financial news supplied by Bloomberg (Boyd-Barrett, 1997; Palmer, Boyd-Barrett, & Rantanen, 1998). It has been diversifying its

clients and services to reduce its dependency on public financing, but its status as a cooperative news agency prevents it from investing private capitals into new technologies (Laville, 2010; Palmer & Tunstall, 1991). Currently, financial information services are the main sources of funds for general news services at Reuters and the AP, although the contribution is much less in the latter.

The emergence of the internet accelerated the diversification of the news products of the news agencies' services because the abundance of online news content makes it impossible for them to keep high subscription fees for general news services (Sambrook, 2010). Today, news agencies are providing new types of products, such as professional information services, specialist reports, feature materials and multimedia content (Bielsa & Bassnett, 2008; Laville & Palmer, 2012; Palmer & Tunstall, 1991; Sambrook, 2010). Apart from the diversification of the product line-up, news agencies are also expanding their range of customers, who include internet service providers. The bulk of studies have shown that news agencies are one of the most important providers of news materials for online news sites (Garcia, 2008; Paterson, 2005; Quandt, 2008; Taming & Broersma, 2013; Thurman & Myllylahti, 2009; Watanabe, 2013).

Methodology

The methodology of this research is a combination of quantitative and qualitative content analyses. The quantitative content analysis is employed to discover a period when the western news agencies' coverage of Ukraine was affected by Russia's narratives over the two years, and the qualitative content analysis is performed focusing on a smaller number of news stories published in that period. In both the quantitative and the qualitative analyses, Russian's narratives were identified in ITAR-TASS's news stories

on Ukraine, following the earlier study (Jaitner & Mattsson, 2015). Russia also has Interfax, which has stronger ties with western information companies, but it is an independent commercial news agency (Boyd-Barrett, 2014; Vartanova & Frolova, 2010).

ITAR-TASS is a successor of the Soviet TASS, which was actively involved in international propaganda. The root of ITAR-TASS can be traced back to the Russian Telegraph Agency (RTA), which was created by the tsar in 1866. Its news service was initially limited to domestic clients, but Russia started the international distribution of newswires in 1904 through the St. Petersburg Telegraph Agency, which was created to overcome Russia's dependence on a German news agency. After the communist revolution in 1917, the official news agency underwent several name changes, but finally became the Telegraph Agency of the Soviet Union, known as TASS, which was controlled by the Soviet authorities and often utilized as a propaganda medium of the communist party. After the collapse of the Soviet Union, TASS was succeeded by ITAR-TASS, becoming one of the official news agencies of the Russian Federation along with RIA Novosti. After the government's decision to disband RIA Novosti in December 2013 due to its disobedience to the media control (Lankina & Niemczyk, 2015), ITAR-TASS became the only official news agency of the Russian Federation that is funded and administered by the government (Vartanova & Frolova, 2010).¹

Data collection

As Jowett & O'Donnell (2011) note that research on propaganda requires a systematic and longitudinal analysis of news content, the author collected and analysed

¹ ITAR-TASS was renamed TASS in September 2014 again to emphasize its connection to the predecessor (TASS, n.d.).

all the news stories on Ukraine published between January 1, 2013 and December 31, 2014 by the four news agencies. The sources of data were three news databases: Integrum for ITAR-TASS, Factiva for Reuters, and Nexis for the AP and AFP. For ITAR-TASS, all the stories in the database in 2013-2014 were downloaded, but for Reuters, the AP and AFP, considering the large numbers of stories they publish, only stories related to Russia or Ukraine were downloaded with the search terms “russia*” or “ukrain*”. The total numbers of news articles downloaded were 90,131 from ITAR-TASS and 21,795 from Reuters, 12,154 from the AP, and 31,898 from AFP excluding duplications.

Content analysis

The content analysis focused on news framing of democracy in Ukraine because it is central to the crisis as it relates to the mass protests that toppled the pro-Russian Ukrainian government and the following secessionist movement in south and east Ukraine. Content analysis is particularly challenging when news sources are prolific, but this research achieved an analysis of all the downloaded news stories by employing automated geographical classification and dictionary-based sentiment analysis techniques (Watanabe, 2017). The advantage of utilizing computerized techniques in this project is not only their efficiency, but also their consistency in analysing the content of news stories collected over a two-year period, which is very difficult for human coders to achieve.

Geographical classification

It is obvious that not all news stories searched and downloaded from the sources with the keyword queries were mainly about Ukraine. Therefore, the author selected news stories about Ukraine using a geographical classifier which accurately identifies the main geographical focus of news stories (Author, 2016). This geographical classifier recognizes diverse sets of geographical traits, including the names of people or

organizations (such as Arseny Yatsenyuk, OSCE or Black Sea Fleet), which are obtained from an automatic expansion of the list of place names based on co-occurrence of words (c.f. Qiu, Liu, Bu, & Chen, 2009). The expansion of the geographical lexicon is achieved by utilizing a large corpus of world news, which is, in this project, the complete set of news stories published by ITAR-TASS in 2013-2014.² After the geographical classification, the numbers of news stories were reduced to 15,203 (16.8%) in ITAR-TASS, 3,899 (17.8%) in Reuters, 1,370 (11.2%) in the AP and 4,967 (15.5%) in AFP.

Framing analysis

The manner in which the news agencies reported democracy in the Ukraine crisis was analysed in terms of news framing (Entman, 2004). The frames in their news reporting are negative, neutral or positive, depending on the aspect of the crisis focused on, or the news source relied upon, and their temporal variations allow the author to compare the overall similarity in news coverage patterns between the news agencies. Positive frames of Ukraine's democracy are agreement based on dialogue (e.g. signing a truce; ratifying a treaty); discussion between different parties (e.g. in the parliament or formal meetings); actions based on people's support; actions respecting laws and the constitution (e.g. fair elections). Negative frames are use of violence against political opponents; coercion of opponents by political power or physical force; Infringement or limitation of civil rights (e.g. Arrest or prosecution of citizens); abuse of political power or excessive power concentration; existence of obstructions to dialogue; people's expression of discontent against the government (e.g. mass anti-government rallies); lack of transparency in political institutions; restriction on journalists and mass media.

² Crimea was treated as a separate territory in the classification and later merged into Ukraine.

Framing of Ukraine with respect to democracy was measured by constructing a topic-specific dictionary for computerized content analysis developed based on Latent Semantic Analysis (LSA) (Deerwester, Dumais, Landauer, Furnas, & Harshman, 1990). Words in the dictionary are those strongly associated with topics, which are identified by co-occurrences (collocation) with the target word ‘democra*’. These words are then weighted by estimated semantic similarity to general English positive and negative words in a semantic space of the news corpus smoothed by LSA.³ As a result, a dictionary on democracy that is comprised of 874 topic-related entry words accompanied by continuous scores representing positive-negative sentiment was produced.

The dictionary on democracy assigned positive-negative framing scores to each of the news stories. The overall score of a news story was calculated as weighted-averages of the sentiment scores of words in the stories, ignoring all the words that did not appear in the dictionary. This scoring method has been proposed by Benoit and Laver (2003) and makes the scoring robust against occurrences of words irrelevant to the topic. The document scores were finally zero-centered and normalized making the standard deviation equal to 100. The quality of this dictionary-based coding was assessed by manually content analysing 30 randomly sampled news stories. The agreement between machine and manual coding measured by Pearson’s correlation coefficient was $r=0.77$.

Topic filtering

³ The general English positive-negative seeds were identified by Turney and Littman (2003). Positive words were “good, nice, excellent, positive, fortunate, correct, superior”, and negative words were “bad, nasty, poor, negative, unfortunate, wrong, inferior”. See Landauer and Dutnais (1997) and Author (2015) for details of the technique. The dictionaries are available at http://koheiw.net/wp-content/uploads/2017/01/dictionary_ukraine.zip.

The dictionary was not only used for the framing analysis, but also for filtering out news articles unrelated to the topic. Since the dictionary is comprised of words strongly associated with the topics, the relevance of news articles to the topic can be judged based on the density (normalized frequency) of the entry words. For topic filtering, the author first generated a subset of the news corpus by selecting news articles in which topic-related target words appear more than once. Then, the first quantile density of entry words in the subset was calculated to obtain a threshold. Finally, the threshold was applied to the entire corpus to exclude articles not strongly related to the topic. Although this approach mechanically discards the lowest 25% of the articles in the subsets, it effectively excludes long irrelevant articles while retaining very short relevant articles. As a result of the geographical classification and topic-filtering, the total numbers of news stories mainly about Ukraine's democracy became 5,149 (5.7%) for ITAR-TASS, 1,342 (6.1%) for Reuters, 757 for AP (6.2%), and 2,033 for AFP (6.3%).⁴

Analysis

In the Ukraine crisis, there were at least six pivotal events relevant to democracy, which are labelled as E1-6 in the following analysis. The first pivotal event was Victor Yanukovich's speech in the Ukrainian parliament calling for legal reforms for the EU association plan on September 03, 2013 (E1), but the Ukrainian government suddenly changed its mind and announced it was abandoning trade negotiations with the European

⁴ The large gaps in the number of news stories is partially due to the difference in formats of news stories, and the differences become smaller in total number of words. ITAR-TASS is still the most productive (0.91 million), but only 1.5 times more than AFP (0.61 million); Reuters (0.31 million) and AP (0.27 million) are much closer.

Union on November 21 (E2), which triggered anti-regime rallies in Kiev. The peaceful pro-EU rallies turned into violent confrontations between protesters and the police, which led to the death of civilians on January 16, 2014 (E3). In the middle of the confrontation between the protesters and the police, Yanukovich disappeared from Kiev and was removed from presidency by the parliament on February 22 (E4). Soon after the collapse of the Yanukovich government, Russia announced a referendum on Crimea's status and, reportedly, 95% of Crimean voters supported accession to Russia on March 16 (E5). Following Crimea's accession to Russia, the Kiev government launched military operations against separatists in the eastern Ukraine regions on April 15 (E6). The Ukrainians elected Petro Poroshenko as a new president on May 17 (E7) and held a parliamentary election on October 26 (E8).

Figure 1 shows the total number of words in the news stories published by the news agencies in 7-day periods. After E1, there are only small changes in increase in wordage in ITAR-TASS, but there are significant increases in all the news agencies after E2 and E3. The peaks of news coverage were around E4 in all the news agencies, but the western news agencies' coverage significantly decreased in E4-6. News coverage of Ukraine by AFP and Reuters was intense around E7, but it was only ITAR-TASS that extensively covered events around E8. It is clear from this chart that Russian and French news agencies played key roles in news coverage of the Ukraine crisis. The interesting pattern in this figure is the almost equal amount of information published by those two news agencies in the early stage of the crisis (E2-4), although they were focusing on different elections in the later stage (E7-8).

Figure 1: Weekly wordage of news on democracy in Ukraine published by news agencies

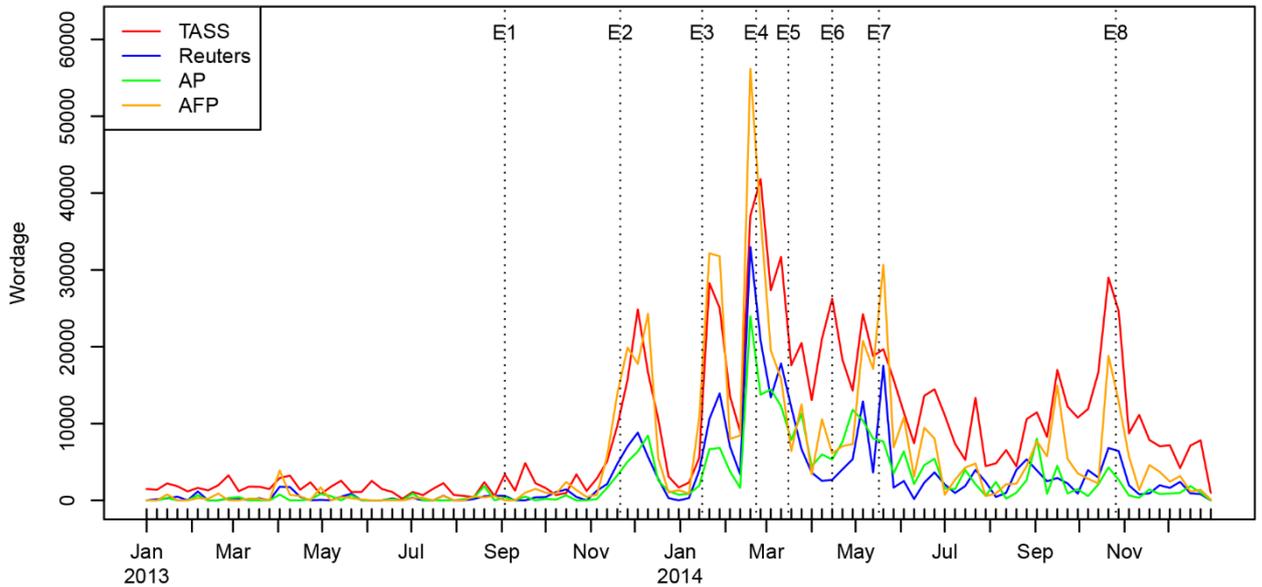
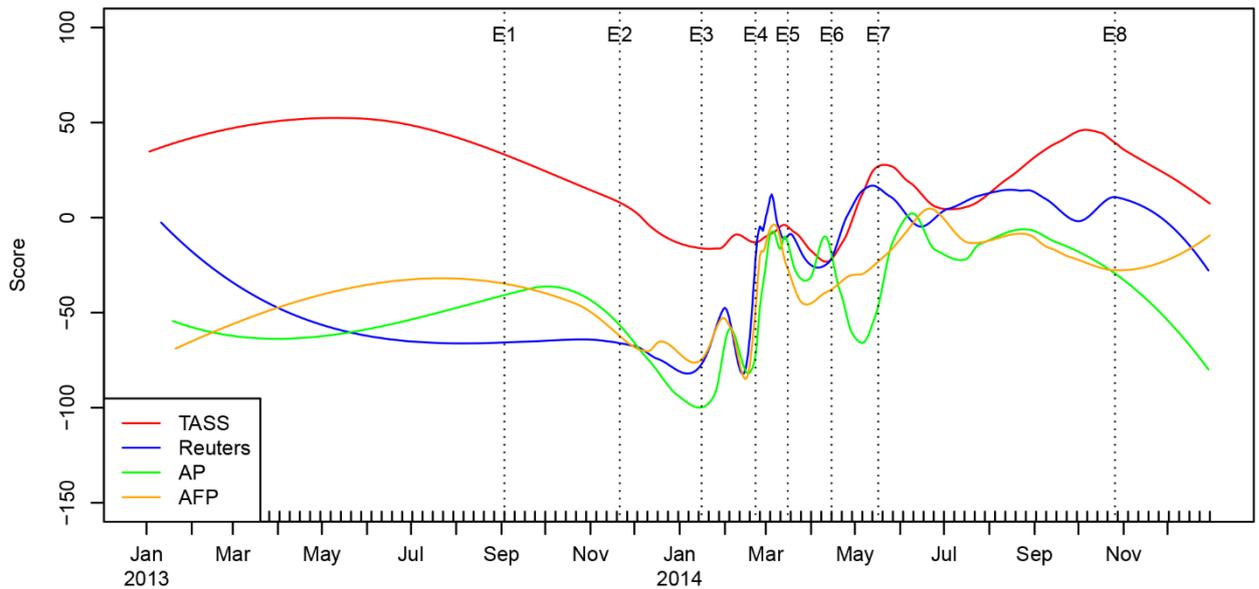


Figure 2 represents framing of democracy in Ukraine by the news stories published by the news agencies, where coloured curves are the averages of the sentiment scores calculated by local-regression (LOESS). The western news agencies' coverage of Ukraine correlated highly with each other in the early stage of the crisis (E1-5), but this pattern disappeared in the later stage. Their coverage of Ukraine was considerably negative until E4 since their news on Ukraine was dominated by stories about political and social disruptions, but it became significantly positive after E4 as the collapse of the Yanukovich government ended the violence against protesters. In contrast, ITAR-TASS was consistently more positive about Ukraine than other news agencies except for the period following the collapse of the pro-Russian regime (E4-5). However, despite the contrasting overall news coverage patterns between the western and the Russian news agencies, there was a strong correlation between Reuters and ITAR-TASS following the

Russian annexation of Crimea (E5), which indicates that the content of the news stories published by these two news agencies were very similar during this period.

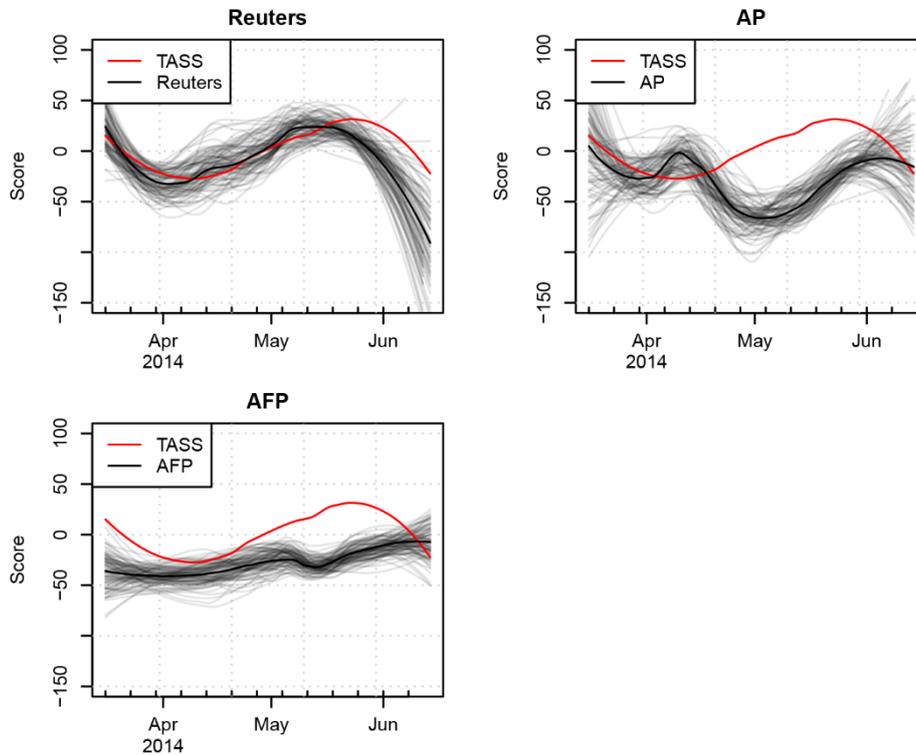
Figure 2: Framing of democracy in Ukraine by news agencies



To further investigate these intriguing patterns, the author first calculated the similarity in coverage of Ukraine between Reuters and ITAR-TASS only including the news articles published over the 90-day period following the annexation (March 16 to June 14, 2014). The correlation of the changes of the mean framing scores was as high as $r=0.89$ between Reuters and ITAR-TASS, while it was only $r=0.07$ for AP and $r=0.33$ for AFP. Yet, these correlation coefficients are only point estimations, because we cannot trust the confidence intervals of the Pearson's correlation coefficients for the smoothed sentiment scores, which are not independent of each other. Therefore, the author took a non-parametric approach known as bootstrapping to test if the correlation between Reuters and ITAR-TASS was simply by chance. Bootstrapping is widely used to estimate

uncertainty in statistics by repeatedly resampling and calculating the statistics with replacement: the author repeated random resampling of Reuters news stories with replacement and calculated its correlation with ITAR-TASS for each of the sub-samples. By repeating this process 10,000 times, 10,000 correlation coefficients were obtained to establish if Reuters's curve was statistically significantly correlated with ITAR-TASS's curve. The proportion of positive correlation coefficients can be interpreted as confidence in the correlation between the news agencies not being zero. Figure 3 illustrates this bootstrapping process by showing first 100 curves generated by resampling (grey), along with the original curves (black and red). From the bootstrapping, 99.9% of the correlation coefficients were positive and median value was $r=0.81$ between ITAR-TASS and Reuters, while these values were 57.8% and $r=0.06$ in AP and 69.2% and $r=0.21$ in AFP. This result suggests that the Reuters' framing of democracy in Ukraine during the period following the annexation of Crimea was statistically significantly correlated with ITAR-TASS at 99.9% confidence.

Figure 3: Correlation in framing of the democracy in Ukraine after Russia's annexation of Crimea.



Although the above statistical analysis already shows very high confidence, the author also searched for actual news stories that created very strong correlation between Reuters and ITAR-TASS in the dataset. It was, in fact, not difficult to find Reuters news stories that highly resemble ITAR-TASS's news stories in the 90-day period. Among many of such stories, two of the most striking examples are presented below. In the following examples, key words or phrases are underlined by the author for the readers' convenience, but these are original and complete news stories.

Example 1

This Reuters' news article dated March 16, 2014 originated from Moscow and reported a discussion on the Ukraine crisis between Russian and American foreign ministers, but it was dominated by the Russian government's views on Ukraine. It

emphasized the importance of international support for “constitutional reforms” in Ukraine and the need to protect the “interests of all regions” in its eastern regions; it also quoted the Russian foreign minister claiming “massive lawlessness” against Russian-speaking minorities. These were typical of the Russian government’s narratives reiterated in ITAR-TASS’s coverage of the crisis.

Reuters

Lavrov, Kerry agree to work on constitutional reform in Ukraine - Russian ministry

MOSCOW, March 16 (Reuters) - Russian Foreign Minister Sergei Lavrov and U.S. Secretary of State John Kerry agreed on Sunday to seek a solution to crisis in Ukraine by pushing for constitutional reforms there, the Russian foreign ministry said.

It did not go into details on the kind of reforms needed except to say they should come "in a generally acceptable form and while taking into the account the interests of all regions of Ukraine".

There was no immediate confirmation from Washington.

In their second phone conversation in two days, Lavrov also urged Kerry to use the influence of the United States to encourage authorities in Kiev to stop "massive lawlessness" against Russian-speaking population.

"Sergei Viktorovich Lavrov and John Kerry agreed to continue work to find a resolution on Ukraine through a speedy launch of constitutional reform with the support of international community," the ministry said in a statement.

ITAR-TASS**URGENT - Int'l community should appeal to launch constitutional reform in Ukraine - Russia foreign minister Lavrov**

LONDON, March 14 (Itar-Tass) - The international community should appeal to launch a constitutional reform in Ukraine, Russian Foreign Minister Sergey Lavrov said after talks with U.S. Secretary of State John Kerry in the British capital on Friday.

"The international community should appeal to launch the process of constitutional reform, the Verkhovna Rada (Ukrainian parliament - Itar-Tass eds) should invite all regions without exception to involve in it," the Russian foreign minister noted.

URGENT - SERGEI LAVROV CONFIRMS RUSSIA'S POSITION ON CRIMEA REFERENDUM

MOSCOW, March 16 (Itar-Tass) - Russian Foreign Minister Sergei Lavrov has confirmed Russia's position on the referendum in Crimea.

In a telephone conversation with US Secretary of State John Kerry on Sunday, Lavrov said Russia's position on the referendum in Crimea remained unchanged. Lavrov and Kerry "agreed to continue contacts to search for ways to settle the crisis in Ukraine in order to launch a constitutional reform in the country in respect of all Ukrainian regions", the Russian Foreign Ministry said.

URGENT - Lavrov urges US to use influence on Kiev authorities to make them stop mass lawlessness against Russian speaking population

MOSCOW, March 16 (Itar-Tass) - Russian Foreign Minister Sergei Lavrov urged the United States to use its influence on Kiev's authorities to make them to stop mass lawlessness and arbitrariness against the Russian speaking population.

"In recent times ultranationalist and radical forces stepped up the activities in Ukraine's south-east. Victims among civilians are reported. Radicals' actions seriously destabilise the situation," Lavrov said in a telephone conversation with US Secretary of State John Kerry on Sunday.

Kerry said the USA took necessary efforts that would yield positive results soon.

Example 2

On April 20, 2014, Reuters published a story on gun shooting in Slaviansk based on the Russian foreign ministry's statement. This story reproduced the minister's account of the event, which links the revolution in Kiev with a far-right nationalist group, and strongly resembled ITAR-TASS's stories published on the same day, which emphasized the Kiev government's responsibility for "de-escalating" the violence caused by "nationalists and extremists", and the Russian government's surprise and anger at the violence.

Reuters

Russia says Ukraine clash shows Kiev not disarming militants

MOSCOW, April 20 (Reuters) - A fatal gun battle overnight near the eastern Ukrainian city of Slavyansk shows that the Ukrainian authorities are failing to rein in armed extremists, Russia's foreign ministry said on Sunday.

In a statement, the ministry said an unspecified number of innocent civilians were killed in an attack by armed men from "Right Sector," a far-right nationalist group which figured prominently in the overthrow of Moscow-backed president Viktor Yanukovich in February.

"Russia is indignant about this provocation by gunmen, which testifies to the lack of will on the part of the Kiev authorities to rein in and disarm nationalists and extremists," the statement said.

It said it was a source of surprise that the incident had happened after Russia, the European Union, the United States and Ukraine signed an April 17 accord in Geneva calling on people to desist from using violence or intimidation.

"Russia insists on the strict implementation by Ukraine of the commitments it took upon itself to de-escalate the situation in the south-east of Ukraine," the ministry's statement said. (Reporting by Christian Lowe; Editing by Richard Balmforth)

ITAR-TASS

URGENT - Militants' provocation in Slavyansk proves Kiev's authorities not willing to disarm nationalists and extremists - Russia's FM

MOSCOW, April 20 (Itar-Tass) - The militants organized the provocation on the night of Sunday in Ukraine's Slavyansk (Donetsk region). It proves the Ukrainian authorities are not willing to disarm nationalists and extremists, Russia's foreign ministry says in a statement published on Sunday.

"At the night of Sunday, April 20, the Easter armistice was broken in Slavyansk. The attack of the armed militants from the so-called Right Sector claimed lives of innocent civilians. The Russian side is indignant at this provocation of the militants, which proves Kiev's authorities are not willing to control and disarm the nationalists and extremists."

Russia insists on Ukraine's fulfilment of obligations to de-escalate situation in south-east - Russian FM

(Adds details) MOSCOW, April 20 (Itar-Tass) - Russia insists on Ukraine's strict observance of the obligations it has undertaken to de-escalate the situation in Ukraine's south-eastern regions, Russia's foreign ministry said commenting on the events in Slavyansk, where militants from the Right Sector had breached the Easter armistice.

"We are surprise[d] the tragedy happened already after signing on April 17 in the Geneva the statement of the four-sided meeting featuring representatives of Russia, the US, the EU and Ukraine, which contains the urge to refrain from any force actions, threats and provocations," the foreign ministry said.

"The Russian side is indignant at this provocation of the militants, which proves Kiev's authorities are not willing to control and disarm the nationalists and extremists," the foreign ministry said adding the local people found in the attackers' cars weapons, maps of the region and symbols of the Right Sector.

Discussion

Overall, there were significant differences in news coverage of the Ukraine crisis among the western news agencies. AFP was very active in covering the early stage of the Ukraine crisis and its total wordage was as high as ITAR-TASS's. This is not surprising if we consider the French news agency's strong ties to the government. In contrast, Reuters and the AP were less active in covering the crisis, presumably because of their higher degree of independence from the governments of their home countries. More importantly, the Reuters news coverage after the Crimean referendum strongly correlated with ITAR-TASS's coverage, replicating the Russian government's narratives as shown in the two examples.

Reuters' publication of such news stories does not necessarily mean that the western public was exposed to Russia's narratives because its news services are primarily for news media whose foreign news editors chose which news stories to be published in newspapers or on websites. However, it is widely known that online news sites are heavily dependent on news agencies for foreign news gathering (Hamilton & Jenner, 2004; Paterson, 2011; Riffe & Budianto, 2001; Sambrook, 2010; Watanabe, 2013). To examine the possibility that Reuters' news stories conveying Russian's narratives were exposed to the public through online news sites, the author searched news stories published by Yahoo News and Huffington Post in 2014 for keywords 'Ukraine' and 'fascist' or 'nazi'. Yahoo News and Huffington Post are the most popular news sites in the United States, which attracted over 100 million unique visitors in January 2015 (Pew Research Center, 2015). In this search, it was easy to discover large numbers of Reuters news stories that replicate the Russian government's views, including those presented as examples (c.f. Huffington Post, 2014c, 2014a, 2014b, Yahoo News, 2014a, 2014b, 2014c, 2014d). According to the

by-lines in news summaries that the author collected in 2014 from the RSS feeds of Yahoo News and Huffington Post, respectively, 21% and 10% of foreign news stories were supplied by Reuters. Given the high popularity of the online news sites and their dependency on Reuters, it is very likely that substantial numbers of American news readers were exposed to Russian's narratives in their daily news consumption.

The striking similarity between news stories published by Reuters and ITAR-TASS can be explained in only two ways: either Reuters reporters were totally dependent on press releases from the Russian government or they were subediting news wires supplied by ITAR-TASS. Although there was a report that indicates that the Russian government attempted to influence western journalists by giving them exclusive access to high ranking officials (Evans, 2005), and this is a possibility that we cannot exclude, we have no information to determine which was the case. Nonetheless, there are factors that could explain the Reuters news coverage. While the AP and AFP are still largely American and French news agencies in terms of their ownership, today's Reuters is a multi-national corporation without strong ties to any of the home countries. This lack of connection to countries makes the news agency less reluctant to distribute news materials supplied by Russia. Also, for the media and technology giant, its news agency services are the least economically viable, only accounting for 2% of its total revenues (Thomson Reuters, 2016), and therefore, its journalistic resources for the Ukraine crisis could be insufficient to the extent that its reporters were forced to rely on the Russian government's official sources.

Another factor, which is rather technical, is the style of the Reuters news stories. The average length of Reuters news stories was 238 words, which is considerably shorter than in the AP (366 words) and in AFP (301 words). These short stories, as clearly show

in the examples, tend to rely on few sources and lack contextual information. Concise reporting is the classic style in newswires, and this is not problematic when recipients of newswires are news editors who have access to different news sources and the ability to correctly interpret news reports based on their background knowledge. However, when these stories based on the Russia government's statement are published on popular online news sites without proper contextualization, they could mislead general audiences about the nature of the Ukraine crisis. Newswires are often updated several times with additional information, but updated stories do not always reach the audiences of the original stories on news portal sites. Once the audience believed that the revolution in Ukraine was a coup by nationalists, it was easy for them to reinforce their beliefs through selective exposure to online content via search engines or social media.

In the quantitative content analysis, a strong correlation between Reuters and ITAR-TASS was found only after the referendum in Crimea, but this does not necessarily mean that Reuters' reliance on Russian's official sources only started after this event. As shown in Figure 1, Reuters was particularly inactive in covering Ukraine during this period, while ITAR-TASS was very active in doing so. This suggests that the large input from the Russian officials following the referendum could have increased the prominence of their narratives in the small number of Reuters stories, and made Reuters' coverage of Ukraine correlate nearly perfectly with ITAR-TASS. In this case, the Russian government's narratives had been circulated internationally by the news agency from the earlier stage of the crisis.

The findings of this study by no means suggest that Reuters were complicit in Russia's international propaganda effort, but they highlight the vulnerability of today's international news gathering and distribution systems. In news gathering, on the one hand,

more and more western newspapers and TV broadcasters are retreating from foreign news gathering. According to Pew Research Center (2015), the numbers of foreign bureaus of CNN, Fox News and MSNBC decreased by 10% (from 53 to 48) between 2010 to 2015. A decrease in foreign correspondents usually increases their dependence on news agencies, but news agencies are also making losses in traditional news services and these are sustained only by cross-funding from financial information services. As earlier news production studies have shown (Fico, 1984; Gans, 1979; Tuchman, 1978), the lack of sufficient journalistic resources has a direct impact on the quality of news content. As Fico (1984, p. 42) eloquently stated, “the more constrained the reporter, the more narrow the range of sources relied upon and thus the more narrow the diversity of perspectives presented to the public”. In news distribution, news agencies’ stories are published on new portal sites with little gatekeeping and no editing to quickly fill the large capacity of the online media (Arant & Anderson, 2001; Cottle & Ashton, 1999; Garcia, 2008; Phillips, 2009; Quandt, 2008; Tameling & Broersma, 2013), these stories often appearing with the logo marks of the still-highly-trusted news agencies. Newswires are not only published to the most popular news sites, but also on small news sites all over the world. These stories are then copied and shared on social media, removing the traces to the original sources.

In conclusion, the Ukraine crisis clearly showed us that national boundaries are becoming almost meaningless for some of the western news agencies. Historically, western news agencies are tied to their counties of origin based on their ownership and source of revenues, but Reuters was first to cut such ties. Even today, Reuters is the main supplier for British newspapers, but it is also one of the main sources of the most popular online news sites in the United States. Reuters was also heavily dependent on the Russian

government's official news sources in the international crisis, in which Russia collided with the United States and the European Union over vital strategic interests, and the news agency almost undermined the interests of the western countries. This discovery rebuts the theory of media imperialism that claims the western multi-national media corporations are complicit in their governments' international propaganda (Herman & Chomsky, 1988/1995). For multi-national corporations like Reuters, the interests of their home countries are not the priority in pursuit of their own economic interests. Given the rapidly changing relationship between the states and corporations in the media and communications industry, we must further investigate flows of information in the global news gathering and distribution system as they have a substantial impact on world politics.

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Newsmap: A semi-supervised approach to geographical news classification

Abstract

This paper presents the results of an evaluation of three different types to geographical news classification methods: (1) simple keyword matching, a popular method in media and communications research; (2) geographical information extraction systems equipped with named-entity recognition and place name disambiguation mechanisms (Open Calais and Geoparser.io); and (3) a semi-supervised machine learning classifier developed by the author (Newsmap). Newsmap substitutes manual coding of news stories with dictionary-based labelling in creation of large training sets to extract large number of geographical words without human involvement, and it also identifies multi-word names to reduce the ambiguity of the geographical traits fully automatically. The evaluation of classification accuracy of the three types of methods against 5000 human-coded news summaries reveals that Newsmap outperforms the geographical information extraction systems in overall accuracy, while the simple keyword matching suffers from ambiguity of place names in countries with ambiguous place names.

In recent years, there has been a growing interest in so-called ‘digital methods’ that aim to answer important questions in media studies by collecting and analysing data available on the internet (Rogers, 2013). In this context, social media such as Twitter, Facebook, and Instagram are attracting much attention, but the scope of digital methods is not limited to user-generated content; some of the researchers collected news stories online to study mainstream news media (Blondheim, Segev, & Cabrera, 2015; Watanabe, 2013; Zuckerman, 2003, 2008). Zuckerman, in his pioneering Global Attention Profile project, gauged news media’s attention to foreign countries by automatically searching the websites of the *New York Times*, *Washington Post*, BBC, and CNN. More recently, Watanabe (2013) collected news stories from newspapers and online portals (Google News and Yahoo News) in India and the United States to detect cultural biases in the news portals run by American IT giants. Blondheim *et al* (2015) collected economic news stories from 35 online news sites between 2012 and 2015 to study changes in the prominence of certain countries in the world economy.

It is relatively easy to construct a very large dataset of news stories through machine-readable pages such as RSS (Rich Site Summary) feeds, and the number of people who collect news stories online for research purposes is expected to grow. In those studies, it is very common for the researchers to apply computer-assisted content analysis due to the size of the datasets, which are too large for manual content analysis. In fact, in the abovementioned studies, classification of news stories in terms of their geographical focus was performed by constructing a dictionary and searching for keywords in the documents. This is a widely-used method in computer-assisted content analysis in media studies, but there are at least two alternatives: geographical information extraction systems and machine learning techniques. Geographical information extraction systems

are a set of natural language processing technologies that recognize entities (e.g. places, people and organizations) in documents to associate them with locations in knowledge databases. Machine learning is a data-driven approach to geographical classification of documents, where algorithms discover association between words and locations in training data.

In this paper, I will present the results of my systematic evaluation of the three approaches to geographical news classification with 5,000 manually coded news summaries to highlight their strengths and weaknesses. A keyword dictionary is constructed from existing sources (gazetteers), and information extraction systems are those publicly available through Web APIs (Open Calais and Geoparser.io), but I have developed a new machine learning technique, Newsmap, to overcome the short comings of the other two methods.¹ In this new technique, a geographical classifier is constructed from a corpus of news stories with weak supervision given by a small manually compiled dictionary. The classifier recognizes not only names of places but people and organizations, and scores words according the levels of association with countries. Despite the minimal human input, this technique archives high classification accuracy, particularly in recall, thanks to the richness of information in the training data.

The result of the evaluation will show that the large dictionary created from gazetteers is confused by place names that appear in more than one country, most often in the United States and United Kingdom, and names of people that are also used in names of places. The geographical information extraction systems, however, perform very well

¹ R package is available at <https://github.com/koheiw/newsmap>.

in term of precision but not in terms of recall, because their knowledge databases have only a limited amount of information on people and organizations associated with locations. Newsmap performs as well as geographical information extraction systems in precision, and outperforms these in recall, thanks to the large amount of information extracted from the training data.

The basic unit of geographical classification in this paper is nation for consistency with earlier studies of foreign news, although I am fully aware that this approach has been criticised for being ‘methodological nationalism’ (Wimmer & Glick Schiller, 2002). Focus on nations seems particularly odd in studies of international news because these studies are often motivated by today’s rapid political, economic and cultural globalization, but I argue that nation is still a suitable unit for foreign news classification, because news stories often mention names of countries to locate foreign events. When we focus on regional or supra-national levels, results of the national-level classification can be aggregated into groups of countries.

Definition of Geographical Focus of News Stories

Although there are several studies on news coverage of foreign countries, definitions of geographical focus have not been clearly stated in the literature. Therefore, geographical focus in this research is defined as *locations of events or issues that stories are mainly concerned with*, as it seems the most widely agreed. Nonetheless, there are stories that cannot be classified based on this definition. In those cases, the following criteria are applied in order. If there are no events or issues in the story, classification is performed based on the main actors’ association with countries; when news stories do not concern countries, they are classified as regions (Africa, America, Antarctic, Arctic, Asia,

Europe, Oceania); when news stories have no information on location or no association with locations (e.g. stories on space science), they are treated as unclassifiable.

Challenges in Geographical Classification of News

Automated identification of places in documents has been studied in computer science, and it is becoming increasingly important for geographical information retrieval systems that interpret user queries and return information on specific locations (Buscaldi, 2011; Martins & Calado, 2010; Zaila & Montesi, 2015). The main challenge in the development of geographical information retrieval systems is the ambiguity of place names (or toponyms). For example, “nice” can be either Nice in France or an English adjective (geo/non-geo ambiguity), and “London” refer to either the UK’s capital or a city in Canada’s Ontario (geo/geo ambiguity). To solve these ambiguities, knowledge-based, map-based and data-driven methods have been developed for geographical information extraction systems (Zaila & Montesi, 2015). In the knowledge-based system, it is assumed that the places with larger population or physical areas are more likely to occur in documents. In the map-based disambiguation, places in closer proximity to unambiguous or disambiguated locations in the same document are chosen over others. Data-driven methods extract association between place names from data with or without human supervision. These techniques are utilized in geographical information extraction systems such as the Edinburgh Geoparser, CLAVIN, Open Calais and Geoparser.io.²

² The Edinburgh Geoparser: <https://www.ltg.ed.ac.uk/software/geoparser/>; CLAVIN:

<https://clavin.bericotechnologies.com/>; Open Calais: <http://www.opencalais.com/>; Geoparser.io: <https://geoparser.io>

Nevertheless, the challenges in geographical classification of news stories are different from those in geographical information retrieval for at least three reasons. These differences demand development of a specialized system for geographical news classification, but also make creation of it relatively easy. First, systems should determine the single most relevant location to a document in classification tasks, while documents are given multiple geographical tags in information retrieval applications. Second, important geographical traits in news stories are not only names of places, but also names of widely recognized people (e.g. Barak Obama) or organizations (e.g. the Pentagon), because locations associated with these actors are often not explicitly mentioned in news articles. Third, geographical traits in news stories are less ambiguous than other types of documents, because it is very unlikely that news worthy events to occur concurrently in places with the same; even if it happens, professional journalists distinguish between places very clearly in news articles (Smith & Crane, 2001).

With the absence of specialized tool, geographical news classification was often performed by simple keyword matching in earlier studies texts (Blondheim et al., 2015; Watanabe, 2013; Zuckerman, 2008), but it is difficult to determine the most strongly associated counties based on word counting, particularly in short texts, and they usually lack information on people and organizations associated with particular locations, which also offer important information on stories geographical focus (Roberts, Bejan, & Harabagiu, 2010). One can create a geographical dictionary that also contains names of people and organizations, but it is challenging to maintain such a dictionary, especially when the research project spans a long period concerning multiple countries, because there are many key figures and organizations whose association with locations changes regularly. For example, occupiers of influential public offices change constantly;

previously unknown groups or individuals suddenly attract the attention of the public; organizations merge with others and change names; people and organizations simply move from one country to another. Those who maintain large geographical dictionary must respond to all these occurrences.

Fully supervised machine learning techniques such as the naive Bayes classifier have been used for various document classification tasks, but creation of a training set is particularly difficult when the number of potential classes is larger and documents are not uniformly distributed across the classes. For instance, in the classic human-labelled benchmark dataset, Reuters-21578, all the 21,578 documents fell into 175 location classes (countries), even though there were over 200 countries in the world at the time. Supervised geographical classifiers never correctly classify stories about countries that are missing in the training set (Buscaldi, 2011).

Newsmap: semi-supervised geographical news classifier

Newsmap is a data-driven approach to geographical news classification. It constructs a classifier from a news corpus with weak supervision given through a manually compiled small dictionary. This “semi-supervision” frees us from the burden of manually classifying thousands of news stories to train a model. The advantages of this technique are the following: (1) the classifier recognizes not only names of places, but also names of people and organizations, (2) the classifier can identify the most relevant countries based on continuous scores attached to words in the model, (3) the classifier can be constructed and updated with minimal human involvement, and (4) very large training data can be used to train the classifier for infrequent classes.

This section explains the procedure to construct a Newsmap classifier in detail. The examples presented to enhance readers' understanding are taken from the experiment. The training set is news summaries collected from the Yahoo News website in 2014 as detailed at the beginning of the Experiment section.

Feature selection

Newsmap identifies proper names solely based on capitalization of words following the earlier work (Smith & Crane, 2001; Wacholder, Ravin, & Choi, 1997). This method is not comparable to syntactical named-entity recognition, but the purpose here is to select features that the classifier should extract from the corpus. This simple approach works sufficiently well with single-word names, but identification of multi-word names requires (e.g. New York or Prime Minister David Cameron) a different mechanism. Wacholder et al (1997) created a system to automatically identify multi-word names in the corpus based on pre-defined rules, which requires considerable manual inputs, but it is based on statistical estimation of association between words in Newsmap, exploiting today's greater computational capacity.

Newsmap identifies multi-word names by estimating strength of contiguous collocations of capitalized words based on an algorithm proposed by Blaheta and Johnson's (2001). The system first extract all the sequences capitalized words (8,321 unique combinations were found in the training corpus) from the training corpus.³ Then, it performs pair-wise comparison of sequences in terms of the occurrences of the same

³ Sequences that appear less than 10 times and more than five word long are ignored to limit the number.

words in the same positions. Here an absence of trailing capitalized words (show by □ signs), which suggests the combinations are semantically complete, are also considered as a match. For example, “British Prime Minister David Cameron” and “British Prime Minister Tony Blair” are sequences of $n = 6$ words and have $m = 4$ matches:

Sequence 1	British	Prime	Minister	David	Cameron	□
Sequence 2	British	Prime	Minister	Tony	Blair	□
Match	TRUE	TRUE	TRUE	FALSE	FALSE	TRUE

In the next example, where the lengths of sequences are different, the number of matches is $m = 2$:

Sequence 1	British	Prime	Minister	David	Cameron	□
Sequence 2	British	Airways	□	□	□	□
Match	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE

After comparing the sequences with all other sequences, we obtain odds ratios λ of perfect or no matches over partial matches in a log-linear model for each of the sequences:

$$\lambda = (n - 1) \log C_0 - \sum_{m=1}^{n-1} \log C_m + \log C_n$$

where C_m denotes the number of sequences that have m matches. To test statistical significance of the odds ratios, their standard errors are obtained by taking squares of the sum of inverse of the counts:

$$\sigma = \sqrt{\frac{(n - 1)^2}{C_0} + \sum_{m=1}^{n-1} \frac{1}{C_m} + \frac{1}{C_n}}$$

The threshold for the statistical significance is set to z-score $\lambda/\sigma > 3.09$, which is a 99.9% confidence level. Continuing with the above example, “British Prime Minister David Cameron” was found insignificant in this test due to occurrences of “British” in many other sequences, but “Prime Minister David Cameron” was found significant.

Seed dictionary

In Newsmap, seed dictionary is the only manual input to the system, and serves as semi-supervision. The seed dictionary that I created contains names of 239 countries and their major cities, as well as their demonyms.⁴ For example, the keywords registered to the seed dictionary for Ukraine and Iraq are only {Ukraine, Ukrainian*, Kiev} and {Iraq, Iraqi*, Baghdad}. Names of cities in the seed dictionary are restricted to the capital and the largest cities; therefore, the total number of keywords for all 239 countries is 800 words, on average, only 3.3 words per country.

Word scoring

Newsmap calculates associations scores of words solely based on co-occurrences of words, therefore does not require costly syntactical analysis of a large corpus. Firstly, the system searches individual documents for keywords in the seed dictionary (simple keyword matching) and gives them class labels (countries); secondly, the system aggregates the frequency of words according to the class labels to create contingency tables. In the contingency table presented below, c_j is a country of interest and \bar{c}_j is all

⁴ The seed dictionary is available at <https://github.com/koheiw/Newsmap/tree/master/data>

other countries; w_i is the word for which scores are calculated and \hat{w}_i is all other words;

F values are all raw frequency counts of words in respective classes.

	c_j	\bar{c}_j
w_i	F_{11}	F_{01}
\hat{w}_i	F_{10}	F_{00}
$w_i + \hat{w}_i$	$F_{1.}$	$F_{0.}$

The estimated score \hat{s} of word w_i for a country c_j is calculated as the association between w_i and c_j subtracted by the association between w_i and \bar{c}_j :

$$\hat{s}_{ij} = \log \frac{F_{11}}{F_{1.}} - \log \frac{F_{01}}{F_{0.}}$$

Table 1 shows scores given to the words most strongly associated with Ukraine and Iraq. The keywords for Ukraine in the seed dictionary only match “Ukraine”, “Ukrainian” and “Kiev”, but many new words are identified based on cooccurrences: Mariupol, Lugansk and Slovyansk are small but important cities in the Ukraine; President Viktor Yanukovich, Prime Minister Arseny Yatseniuk and President Petro Poroshenko are the leaders of the country before and after the Euromaidan revolution in early this year. Similarly, the keywords in the seed dictionary for Iraq only match “Iraq”, “Baghdad”, “Iraqi” and “Iraqis”, but the classifier discovered names of smaller cities (Anbar, Ramadi, Fallujah, Kirkuk and Tikrit, including their spelling variants), political leaders (Saddam Hussein and Prime Minister Nuri) and key ethnic groups (Iraqi Kurds and Iraq’s Sunni).

Table 1: Top 50 features for Ukraine and Iraq in Newsmap

	Ukraine	Score	Iraq	Score
1	Ukraine	11.84	Iraq	11.58
2	Ukrainian	10.36	Baghdad	10.56
3	Kiev	10.34	Iraqi	10.39
4	Ukrainians	7.94	Iraqis	8.15

5	Ukrainian President Petro Poroshenko	7.64	Anbar	8.14
6	Mariupol	7.15	Ramadi	7.55
7	President Petro Poroshenko	6.94	Fallujah	7.51
8	Prime Minister Arseny Yatseniuk	6.92	Iraqi Kurdish	7.50
9	Natalia Zinets	6.84	Kirkuk	7.42
10	Lugansk	6.72	Tikrit	7.36
11	Pavel Polityuk	6.71	Falluja	7.32
12	Donetsk Ukraine	6.63	Maliki's	7.25
13	Sloviansk	6.61	Arbil	7.20
14	Ukrainian President Viktor Yanukovich	6.54	Iraqi Kurdistan	7.12
15	Slaviansk	6.48	Iraqi Kurds	7.08
16	Richard Balmforth Kiev	6.46	Prime Minister Nuri	6.97
17	Petro Poroshenko	6.38	Irbil	6.90
18	Crimean Tatars	6.36	Isabel Coles	6.74
19	Kharkiv	6.12	Iraqi Prime Minister Nuri	6.73
20	Yanukovich	6.05	Baiji	6.71
21	President Viktor Yanukovich	6.04	Samarra	6.68
22	Slavyansk	6.03	Amerli	6.56
23	Andriy Lysenko	5.98	Levant	6.54
24	Andriy	5.98	Iraq PM	6.53
25	Ukraine PM	5.98	Sistani	6.51
26	Hrabove	5.97	Raheem Salman	6.47
27	Kramatorsk	5.89	Diyala	6.40
28	Pavel Polityuk Kiev	5.86	Baquba	6.32
29	Kiev's	5.85	Sinjar	6.29
30	Poroshenko's	5.84	Arbil Iraq	6.15
31	Ukrainian President Viktor Yanukovich	5.82	Sadr	6.15
32	Poroshenko	5.81	Mosul Dam	6.15
33	Natalia Zinets Kiev	5.80	Iraq's Sunni	6.13
34	Tatars	5.75	Baghdad's	6.11
35	Luhansk	5.75	Jurf	6.10
36	Donetsk	5.74	KRG	6.08
37	Vitaly Klitschko	5.73	Mosul	6.03
38	Ukraine's Poroshenko	5.68	Saddam Hussein	6.03
39	Right Sector	5.64	Basra	6.00
40	Richard Balmforth	5.64	Iraqi PM	6.00
41	Volodymyr	5.62	Ahmed Rasheed	6.00
42	President Viktor Yanukovich's	5.59	Raheem Salman Baghdad	5.97
43	Anton Zverev	5.57	Grand Ayatollah Ali	5.94
44	Oettinger	5.54	Kurdistan Regional Government	5.91
45	Serhiy	5.52	Ned Parker	5.91
46	Interior Minister Arsen Avakov	5.49	Ahmed Rasheed Baghdad	5.91
47	East Ukraine	5.49	Michael Georgy Baghdad	5.88
48	Vyacheslav Ponomaryov	5.43	Maliki	5.85
49	Donetsk People's Republic	5.43	Sinjar Mountain	5.82
50	Ukraine's Moscow	5.40	Sadr City	5.76

Classification

Newsmap predicts countries most strongly associated with documents in the classification stage simply by finding a country that yields the largest total scores \hat{s} weighted by the normalized frequency of word f_i in documents:

$$\hat{c} = \underset{j}{\operatorname{argmax}} \sum_i \sum_j \hat{s}_{ij} f_i$$

Experiment

There are several geographical information extraction tools available both in the forms of open source software packages and Web APIs, but I have chosen only the latter type to compare with Newsmap, because the former type are hardly accessible to media and communications scholars as they demands users advanced knowledge of Java and operation systems, whereas the online interfaces of Open Calais and Geoparser.io require only a short block of code in widely-used programming language (e.g. Python or R). They are commercial services but offers free access through non-commercial user accounts. Open Calais is provided by Thomson Reuters, one of the largest companies in the media and information industry and the owner of Reuters news agency, which gives the expect that Open Calais is optimized for extracting geographical information from news articles. Dlugolinsky et al (2013) have reported that it recognizes 39 types of entities and its performance in identification of geographical locations in microblog posts is the best among six well-known knowledge extraction tools. Geoparser.io is an online service started in 2016, specialising in geographical information extraction from natural texts. The founder of the service is one of the original developers of CLAVIN, who aims to

improve the accessibility of geographical information extraction tools by providing the online interfaces (Greenbacker, 2017).

In addition to these geographical information extraction tools, I constructed a geographical dictionary, which contains 27,678 place names in 255 countries to replicate the methodologies in earlier studies (Blondheim et al., 2015; Zuckerman, 2003, 2008). The dictionary combines the list of the names of countries, administrative districts and cities with a population larger than 15,000. The gazetteers were created originally for the United States National Geospatial-Intelligence Agency's GEOnet Names Server (NGA) and Geological Survey's Geographic Names Information System (GNIS), but have been made available at GeoNames.⁵

These gazetteers are also used by the above-mentioned geographical information extraction systems. In applying the dictionary, English stopwords were removed from the documents and case-sensitive matching was performed to minimize false positive matches.

Table 2 summarizes the different approaches to geographical classification of news in Newsmap, Open Calais, Geoparser.io and the gazetter. Newsmap as a semi-supervised machine learning technique is ignorant about syntactical structure of documents, and named-entity recognition is solely based on capitalization of words; it requires training sets to be taken from the same time period as the test set to learn time-dependent association between names and places; it downplay ambiguous names that appear in

⁵ GeoNames: <http://www.geonames.org>

different countries by assigning small weights.⁶ Open Calais and Geoparser.io utilize syntactical analysis in named-entity recognition, and lookup gazetteers for place names identified; place names are disambiguated exploiting the contextual information (map and knowledge-based). The dictionary as the simplest method performs neither named-entity recognition nor place name disambiguation, merely searching the list of place names for the words in documents.

The differences in the ways these methods detect geographical traits result in how they determine the focus of news stories. Newsmap ranks countries based on continuous scores assigned to names, but Open Calais only gives entities (places, persons or organizations) discrete relevance scores ranging from 0.0 to 1.0 in five steps, which does not always help identify the single most important country; Geoparser.io and the dictionary only report the positions and number of countries discovered. Therefore, when Open Calais gives the same total relevance scores to more than one country, identification of the top country becomes random among these; when Geoparser.io or the gazetteer find multiple countries with the same frequency, documents are classified into the country first mentioned.

Table 2: Characteristics of the geographical classification methods

	Type	NE recognition	PN disambiguation	Relevance scoring
Newsmap	Machine learning	Capitalization	Temporal	Continuous
Open Calais	Web API	Syntax	Contextual	Discrete
Geoparser.io	Web API	Syntax	Contextual	None
Gazetteer	Dictionary	None	None	None

⁶ For example, names of athletes who travel frequently and appear in many different countries in the training set gain only small weights for all the countries. Therefore, their impact on the overall classification is small.

Dataset

Training set

In this experiment, the Newsmap classifier was constructed from a corpus of online news. I have been subscribing to the Yahoo News US edition, which continuously supplies news stories produced by international news agencies (mainly AP, AFP, and Reuters) via a RSS feed, and a total of 156,980 items were collected in 2014 (approximately 13 million words). These texts are not complete news articles but summaries containing both headings and lead sentences. Use of newswires collected online is advantageous in the construction of a geographical news classifier because (1) news agencies tend to cover a wider range of countries than the retail media (Watanabe, 2013), and (2) subscription to RSS feeds allows users to sample stories without any pre-filtering. The Newsmap classifier constructed with the seed dictionary and the corpus contains 68,755 words for 227 countries. This training process takes only less than five minutes to complete on a laptop computer.

Test set

The classification accuracy of the four methods were measured by a set of manually coded news stories. This dataset is also comprised of news summaries collected online in 2014 but from different outlets: *The Times* (UK), *The New York Times*, *The Australian*, *The Nation* (Kenya), and *The Times of India*. From the collected news summaries, a balanced sample of 5,000 was randomly taken and classified by human coders in terms of their geographic association. The dataset needs be this large because international news coverage typically follows a power-law distribution, in which

countries with little influence internationally appear only very infrequently. The motivation behind the choice of news sources was also to include countries that are under-represented in the western news media.

Manual coding of news stories was performed using an Oxford-based online recruiting platform, Prolific Academic.⁷ The dataset was divided into 20 subsets, each containing 250 items, and participants were asked to choose countries most strongly associated with the news items, focusing on the location of the events that the stories mainly concerned (single-membership).⁸ The coders' performance was constantly monitored using gold-standard answers created by the author, and coded subsets that did not achieve more than 70% agreement with the gold standard were discarded. Eventually, the same items were coded by at least three different coders, and the inter-coder agreement measured by Fleiss' multi-coder Kappa was $\kappa = 0.75$. After disagreement among coders was settled by the majority rule, the coders' agreement with the gold standard became $\kappa = 0.88$. The main causes of disagreement were (1) the difficulty in identifying countries most strongly associated with international stories, and (2) the coders' lack of knowledge about differences between countries with similar names (e.g. Congo Republic and The Democratic Republic of the Congo). Such imperfection of human coding imposes a ceiling on the accuracy found in the experiments, even if the

⁷ Prolific Academic: <https://prolificacademic.co.uk>

⁸ The use of regional and 'I do not know' categories were also allowed if necessary. The coding instruction is available online: http://koheiw.net/wp-content/uploads/2015/02/Newsmap_coding_04_online.pdf.

classifications were perfect from the experts' point of view, but their coding was treated as true answers.

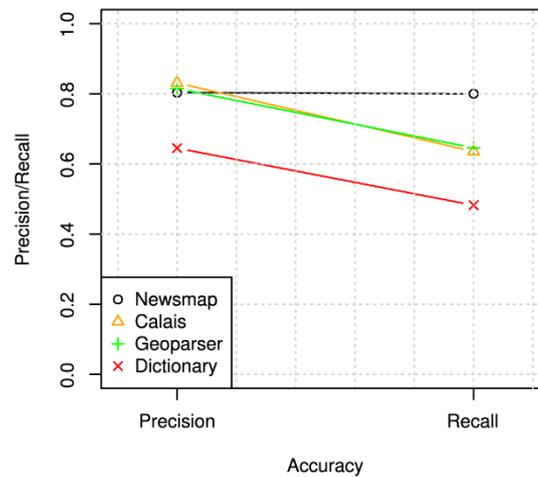
Measurements

To simulate the most common setting in media studies where researchers select news stories based on their geographical focus, the classification is single membership in this experiment. Measurements of the classification accuracy are micro-average precision and recall, which are the standard measures for document classification tasks in computer science literature. 'Precision' is the ability of classifiers to retrieve ONLY relevant items, while 'recall' is the ability to retrieve ALL the relevant items. There is usually a trade-off relationship between the two abilities, and high precision often leads to low recall, and vice-versa. Low precision indicates many false positive cases, and low recall indicates many false negative cases. Micro-average precision and recall are calculated by pooling the classification results of all the classes, while macro-average precision and recall are the average of precision and recall separately calculated for each class.

Results

The results of the experiment show that the overall classification accuracy of Newsmap is 0.80 both in precision and recall, while they are 0.83 and 0.63 in Open Calais, 0.81 and 0.64 in Geoparser.io and 0.64 and 0.48 in the dictionary (Figure 1). The harmonic means of precision and recall (F1 scores) are 0.80, 0.72, 0.72 and 0.55, respectively.

Figure 1: Overall classification accuracy



In Figure 2, we find roughly the same level of precision across the most frequent countries in Newsmap, Open Calais and Geoparser.io. Exceptions are the Newsmap’s relatively poor performance in the United Kingdom (GB), China (CN) and Malaysia (MY), and Open Calais’s lack of precision figure in South Sudan (SS). There is no precision figure for Open Calais, because it does not distinguish between Sudan and South Sudan. The dictionary’s precision varies and its precision is as high as other methods in many of the countries, but very low in some of the countries for the ambiguity of place names: its precision is low in the United Kingdom (GB) because the country shares many place names with the United States (US); stories about gay rights campaigns were misclassified into Russia (RU) because the country has a city called “Gay”; many of the stories about the former Egyptian president Mohamed Morsi were classified into India (IN) because of the Indian city of “Morsi”; many stories on Nigel Farage, a British Politician, were classified into South Africa (ZA) because of his first name; Many stories on social cohesion were classified into South Sudan (SS) for a state named “Unity”; a

large number of stories about the United States were classified into Japan (JP) because of a small coastal city called “Obama”.

Figure 2: Precision in the top 20 countries

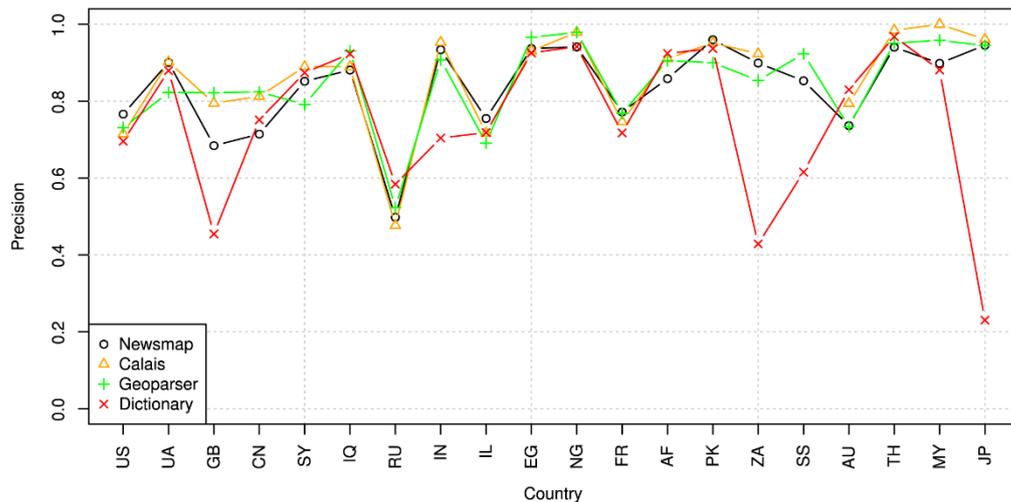
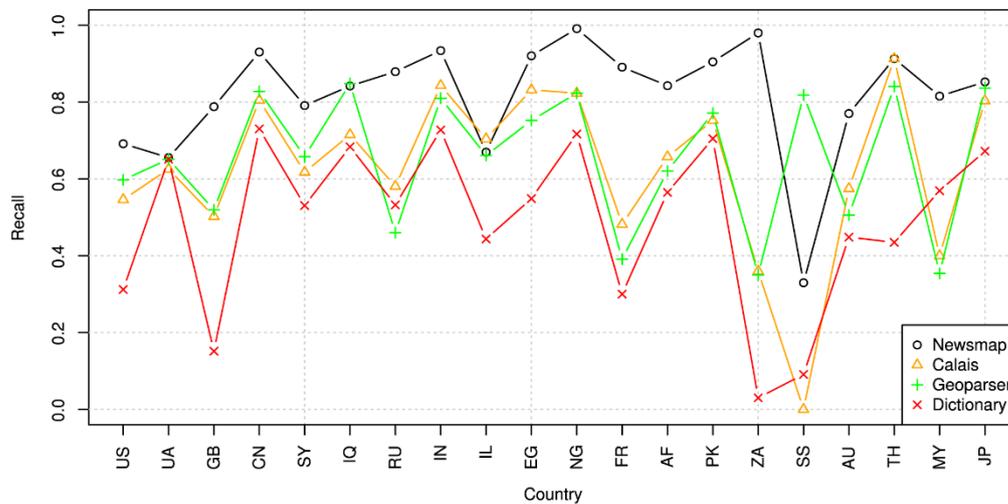


Figure 3 shows that Newsmap’s recall is higher than or equal to other methods in nearly all the countries. Open Calais and Geoparser have similar levels of recall, but they are very different in South Sudan (SS). Since Open Calais classifies none of the story about the country correctly, its recall is zero, but it is over 0.8 in Geoparser.io. Newsmap also suffers in South Sudan, although it is still better than the dictionary. The dictionary’s recall figures are much lower than other methods in the United States (US) and the United Kingdom (GB), reflecting the misclassification caused by the above-mentioned ambiguity; the very low recall in South Africa (ZA) and South Sudan (SS) is due to Cameroon’s “South” region.

Figure 3: Recall in the top 20 countries



Discussion

In the experiment, I have shown that Newsmap's precision is as high as Open Calais and Geoparser.io, both of which are equipped with syntactical named-entity recognition and contextual place name disambiguation mechanisms. This result suggests that weighting geographical traits based on the levels of ambiguity found in a concurrent corpus is an effective way of avoiding errors, and that ranking countries by total scores of geographical words is very accurate in determining the most strongly associated countries. The very low precision of the dictionary in several countries highlights the importance of place names disambiguation mechanisms in methods based on unweighted word counts as in Geoparser.io. Nonetheless, the dictionary's precision was as high as other methods in countries that have less ambiguous names (e.g. Ukraine, Syria, Iraq, Greece and Nigeria).

The much higher recall of Newsmap, Open Calais and Geoparser.io than that of the dictionary suggests that names of people and organizations are very important

geographical traits in classification of news, in which widely known entities appear without explicit mentions of their home countries. Surprisingly, Newsmap's recall was even considerably higher than that of Open Calais and Geoparser.io. One could argue that this result is produced by the particular design of the experiment, but this is not the case. The figures are close to those shown in an earlier study conducted by Dlugolinsky et al (2013): the precision and recall were respectively 0.80 and 0.67 in recognizing locations. There is no surprise that Geoparser.io has roughly the same precision and recall figures as Open Calais's because they utilize very similar technologies.

The high precision of Newsmap is largely owing to its ability to recognize multi-word names, because the ambiguity of names is much higher when they are separated into single words. While the ability of the other methods to recognize multi-word names is constrained by the size of knowledge databases and gazetteers, Newsmap extracted various multi-word names from the training corpus. Although Buscaldi (2011) noted that the data-driven methods are uncommon in geographical information extraction systems due to the lack of manually labelled data despite their technological advantages, Newsmap has shown that the lack of training data is not an unsurmountable problem: simple keyword matching can be a substitute for manual coding. With the only 800 manually chosen keywords, Newsmap extracted 68,755 words from the Yahoo News corpus, which is an 86-times increase in the size of the geographical vocabulary.

Simple keyword matching has been the popular approach to geographical news classification in media studies, but the dictionary's poor performance highlights the limitation of word counting-based classification, not only in geographical classification of news but in other applications. One might argue that its poor performance is due to the inappropriate size of vocabulary (either too small or too large) for the task, but

determining the optimal size of vocabulary is very difficult: its recall will increase but its precision will decrease if the dictionary is larger containing names of smaller cities; its precision will increase but its recall will decrease if the dictionary is smaller only including the name of the countries and administrative districts. Additionally, the heuristic rule to determine the most relevant country in the dictionary method is clearly not the reason of its poor performance, because Geoparser.io performed very well based on the same rule.

Semi-supervised machine learning was utilized only for the geographical classification in this study, but nothing seems to limit the scope of its application. In general terms, the advantages of the semi-supervised document classification are the high degree of control given by a manually compiled seed dictionary, and the high reliability of parameters estimated in large training data. These features would solve challenges researchers face when they apply unsupervised (e.g. topic models) and fully-supervised (e.g. naive Bayes) document classifiers. The benefit of semi-supervised learning becomes greatest in multiclass classification tasks, but it is also useful in binary classification tasks.

The fully automated multi-word feature identification algorithm used in Newsmap can also be adapted to other applications since the original purpose of the model was the identification of phrasal verbs (c.f. Blaheta & Johnson, 2001). Identification of multi-word features would improve the classification accuracy of other bag-of-words models, not only because it reduces the ambiguity of single words but also because it alleviates violation of the independent assumption by frequently cooccurring words (McCallum & Nigam, 1998). The solution is identifying multi-word features by the algorithm and redefining their word boundaries (i.e. concatenating components of multi-word features) (Lewis, 1998). There are other association measures that can identify occurring words

(e.g. pointwise mutual information or likelihood ratio), but only a very few measures can be applied to sequences of words in variable lengths (Blaheta & Johnson, 2001).

Finally, it is worth mentioning problems readers would face in applying the geographical classification methods in actual research. As for Newsmat, it requires large corpus of news to train a classifier, but, unlike the experiment, where two separate datasets were used for training and testing, the same dataset can be used in practice as far as it is large enough to cover all the countries the researchers wish to select or exclude.⁹ As for Open Calais, its Web API is much more accessible than the open source packages in Java, but it is still not straightforward to extract geographical information from its output. This is not only due to the large size of its output in XML, but also to the variety of geographical labels attached to entities.¹⁰ Further, Open Calais only allows non-commercial user to call the API 5000 times a day with one to three second intervals. In these respects, Geoparser.io's Web API is much more user-friendly, because it returns only geographical information in JSON format, all the countries being identified by the standard country code, and it does not impose strict limits on non-commercial users. As for the dictionary method, removal of English function words (stopwords) and case-sensitive match is necessary to reduced false positive classification. The precision figure can be 10 points lower without this precaution in this method.

⁹ If such a corpus is not available, the author is willing to provide the Yahoo News corpus on request.

¹⁰ It required the author to classify labels manually. For example, North Korea has at least four labels: "North Korea", "N. Korea", "North Korean" and "North korean".

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Big Media Analysis: Application of Vector Space Models to Document Scaling

Abstract

Computerized analysis of media content is often challenging because diverse topics in news stories cause high data sparseness. Although supervised machine learning techniques usually require large training sets for accurately analysing diverse content, this paper proposes the use of vector space models for this purpose. Vector space models, such as LSA, NMF, LDA or Word2vec, are used to extract semantic information from large corpora fully automatically to reliably estimate parameters for words that rarely appear in small training sets. This new technique is illustrated with two examples from large-scale content analysis projects: international news agencies' coverage of the Ukraine crisis 2013-2014, and Russian news media coverage of street protests 2011-2014. These examples show advantages of the new technique in document scaling over 'off-the-shelf' dictionaries and Bayesian supervised-machine learning techniques.

Computerized content analysis has become increasingly popular in social research. The forefront of this computerization seems to be political science, where new statistical techniques have been created for the analysis of legislative speech transcripts or political party manifestos (e.g. Benoit & Laver, 2003; Lauderdale & Herzog, 2014; Slapin & Proksch, 2008). Political scientists owe their lead in computerized content analysis much to the public availability of political documents in electronic formats. Yet, not only political documents have become available in electronic formats in recent years: newspaper articles or TV news transcripts have also become available on the internet or in commercial databases (e.g., Nexis or Factiva).

However, computerization in content analysis is still very limited in media studies despite the increased availability of electronic data. Several factors explain the slow adoption of computerized content analysis for media research, including issues of copyright protection of media sources and the qualitative orientation of the field, but the great content diversity of news articles explains this slow uptake more: news content analysts face greater challenges in computerization, because news articles discuss a wider range of topics and views than political documents. The diverse topics and opinions in news stories result in a larger variety of vocabulary, thus most documents share only up to 1-5% of words with other documents (Phan, Nguyen, & Horiguchi, 2008). Add-one smoothing and word stemming have been commonly used to address this data sparseness problem in computerized content analysis (Manning, Raghavan, & Schütze, 2008): words are given the pseudo count of one regardless of the patterns of their occurrences in the data in add-one smoothing, or words endings are mechanically truncated according to

pre-defined rules to reduce the variety of word types in word stemming, but these techniques supply no extra information that would improve the accuracy of analysis.

Content analysts face the greatest challenge when they apply supervised-learning techniques (e.g., naive Bayes classifier) to media content, because they have to create very large training sets to compensate for data sparseness (Manning et al., 2008; Phan et al., 2008). While each document contains only a fraction of the total vocabulary, whose distribution is highly concentrated around commonly used words that have little substantive meaning (e.g. function words), a training set must be comprised of thousands of manually labelled documents. In recent years, online crowd sourcing has made creation of large training sets easier, but it is not a solution for all the content analysts, because it requires payment to participants; moreover, even if funds are available, it is difficult to recruit participants for non-English materials.

For these reasons, it seems that the dictionary-based method, which is based on a long list of manually chosen words, has been most popular in computerized analysis of media content to date. For example, Roberts and McCombs (1994) identified media agendas in newspaper articles; Kellstedt (2000) analysed the framing of racial issues in *Newsweek* in terms of egalitarianism or individualism; more recently, Segev and Miesch (2011) identified the framing of the Israeli-Palestinian conflict in six languages; and Young and Soroka (2012) predicated opinion poll results by analysing news coverage of a Canadian federal election. Many content analysis dictionaries are also made publicly available: the General Inquirer Dictionary (Stone, Dunphy, Smith, & Ogilvie, 1966), LIWC (Francis & Pennebaker, 1993), the Regressive Imagery Dictionary (Martindale, 1975) or DICTION (North, Lagerstrom, & Mitchell, 1999). Yet, adoption of these off-the-shelf dictionaries raises concerns regarding the validity of measurements, due to a

lack of transparency in the dictionary making procedure (Grimmer & Stewart, 2013; Neuendorf, 2002).

This paper presents a new content analysis technique called Latent Semantic Scaling (LSS), developed by the author to perform large scale content analysis of English and Russian news articles for recently published studies (Author, 2017a, 2017b, 2017c). LSS performs document scaling tasks in a similar way to Wordscore (Benoit & Laver, 2003), but it exploits the efficiency of vector space models (VSMs) to extract semantic information automatically from a large corpus (Turney & Pantel, 2010). Most VSMs, such as latent semantic analysis (Landauer & Dutnais, 1997) and latent Dirichlet allocation (Blei, 2012), are unsupervised techniques, but LSS enables VSMs to become semi-supervised or fully-supervised machine learning techniques for theory-driven content analysis in media studies.

In the first half of this paper, I will demonstrate the possibility of applying VSMs to document scaling tasks by accurately measuring positive-negative tones of news stories on democracy or sovereignty in Ukraine with a semi-supervised technique (c.f., Author 2017a). To highlight its advantage over existing computerized content analysis techniques, I will also apply the Lexicoder Sentiment Dictionary (Young & Soroka, 2012) to the same task. In the second half, I will explain how VSMs can be become fully-supervised document scaling models by analysing Russian-language news stories in terms of the framing of street protests (c.f., Author 2017b). The dimension for this document scaling is more complex than sentiment, being whether street protests are framed as freedom of expression or social disorder. I will also apply Wordscore to the same task to show the strength of the VSMs over Bayesian models in analysing media content.

VSM for document scaling

VSMs are very useful in analysing media content, because they automatically extract semantic information from a corpus (Turney & Pantel, 2010), but their raw outputs are no more than vector representations of words. Therefore, there are two steps in LSS before applying a VSM to document scaling: (1) selecting features relevant to the subject of interest, and (2) specifying an axis of the document scaling. The feature selection is performed with *target words*, which express concepts on which the researcher focuses, and the specification of the axis is achieved with *seed words*, which define dimensions that the researcher wishes to measure. Here, words frequently used in conjunction with target words are selected as features, and the feature words used in similar contexts as seed words are given large polarity scores. This is a combination of syntagmatic and paradigmatic analyses, which have been treated as two different approaches to automated synonyms extraction in the literature (c.f., Schütze & Pedersen, 1993; Turney, 2001; 2003). This combination is advantageous, because syntagmatic and paradigmatic analyses capture very different types of the semantic relations of words.

In implementation of LSS, syntagmatic analysis is performed as collocation analysis with fixed word windows, and paradigmatic analysis as latent semantic analysis (LSA) with a cosine similarity measure. The document scaling model is essentially a large set of subject-specific feature words with continuous scores representing their polarities. Although the structure is very simple, it is dissimilar to the products of lexicon expansion techniques, which have been developed by computer scientists to generate a large lexicon automatically from a small set of pre-defined words (c.f., Liu & Hu, 2004). With the continuous scores given to feature words, LSS can adopt Wordscore's document scoring method, making the results more accurate than that of dictionary-based content analysis.

The most straightforward application of LSS is sentiment analysis of news on specific subjects. In this application, a set of general positive-negative seed words is the only manual input to LSS. I will elaborate on how the document scaling technique works through construction of a model that measures positive-negative tones in news stories on Ukraine’s democracy or sovereignty. This model was utilized in a longitudinal analysis of English news stories published by the Russian news agency ITAR-TASS, during the 2014 Ukraine crisis (Author 2017a, 2017b).

For the construction of the model, I created a large corpus of English-language news stories published by ITAR-TASS, Interfax, and Reuters between January 2013 and December 2014, downloading 240,173 full-text articles from news databases. As pre-processing, I segmented all the news articles into sentences and removed all the capitalized words. Sentence segmentation is necessary to prevent collocation analysis and LSA from being affected by preceding and succeeding sentences; removal of capitalized words is required to limit the impact of proper nouns and adjectives on LSA in inferring general meanings of words.

Feature selection

LSS utilizes collocation analysis to select features that are strongly associated with democracy or sovereignty. The system identifies words frequently co-occurring near target words in the corpus. The target words here were ‘democra*’ and ‘sovereign*’, and windows size was set to 10. The level of association with target words was measured by the likelihood ratio statistic, or g-score (Hoey, 2012). To compute g-scores, the system counts the occurrence of a word w_i and all other words \bar{w}_i within 10 words ($d_i \leq 10$) from the target words, and constructs contingency tables:

	$d_i \leq 10$	$d_i > 10$
--	---------------	------------

w_i	n_1	n_2
\bar{w}_i	n_3	n_4

With these tables, the system calculates g-scores g_i for w_i by comparing observed counts n_j with expected counts e_j , which are estimated by the marginal distribution of the observed counts in the same way as a chi-square test:

$$g_i = 2 \sum_j^{J=4} n_j \cdot \log\left(\frac{n_j}{e_j}\right) \quad (1.1)$$

For the sentiment analysis models on democracy and sovereignty, the system selected up to 1,000 features with $g_i > 10.83$, the critical value for a 99.9% confidence level if their observed counts are greater than their expected counts, $n_1 > e_1$. The number of features selected through these criteria was 778 for democracy and 626 for sovereignty. All the features for democracy seem to be intuitively related to the topic, but there were a few financial words, such as ‘debt’ and ‘bonds’, also present (Table 1). These financial words were erroneously selected, but they had a limited impact on the final outcomes of the content analysis.

Table 1: Top 20 features for democracy and sovereignty

Rank	Democracy	G-score	Sovereignty	G-score
1	human-rights	8,503.6	integrity	11,446.2
2	institutions	3,292.0	territorial	8,216.5
3	law	3,055.1	independence	2,932.5
4	supremacy	2,938.1	respect	2,097.4
5	elections	2,649.4	state	2,043.2
6	reforms	2,505.5	rating	1,681.2
7	rule	2,494.0	states	1,245.6
8	values	1,934.9	right	1,223.7
9	principles	1,572.3	debt	1,200.6
10	freedom	1,515.7	country	974.2
11	election	1,486.8	ratings	947.7
12	standards	1,468.9	independent	880.6
13	freedoms	1,161.3	bonds	837.1
14	party	1,151.6	dispute	698.0
15	society	1,116.5	islands	661.5
16	country	1,051.3	principles	656.9
17	political	911.2	non-interference	536.2
18	free	859.3	national	497.0

19	opposition	793.3	internal	493.1
20	parliamentary	727.8	violation	464.0

Word scoring

The system estimates sentiments of the feature words based on their distances to seed words in a latent semantic space. The seed words are a set of general English words that express positive or negative sentiment {good, nice, excellent, positive, fortunate, correct, superior} and {bad, nasty, poor, negative, unfortunate, wrong, inferior} (Turney & Littman, 2003). Although the semantic proximity between words can also be calculated in a raw term-document matrix, a latent semantic space enables much more accurate estimation, because singular value decomposition (SVD) of a term-document matrix reduces noise and sparseness, only leaving essential semantic information (Turney & Pantel, 2010). Although earlier studies suggested that feature weighting by tf-idf or PMI improves the accuracy of similarity computations in VSMs, feature weighting is not performed in LSS as it does not improve results.

For the sentiment analysis models on democracy and sovereignty, the term-sentence matrix X , which was derived from a large corpus and consists of 270,000 rows and over a million columns, was too noisy and too sparse to estimate semantic proximity (left in Figure 1). SVD decomposed the matrix into three matrices, U , D and V , and constructed a matrix \hat{S} with only 300 columns (right in Figure 1):

$$X \approx \hat{X} = UDV' \quad (1.2)$$

$$\hat{S} = UD \quad (1.3)$$

With the matrix \hat{S} , the system estimated the sentiments of words taking the mean of cosine similarity to each of the seed words: the sentiment score v_i for a word w_i is a

mean cosine similarity to seed words weighted by seed scores p_j , which are simply +1 for the positive seed words and -1 for the negative seed words. Here $\cos(w_i, s_j)$ denotes cosine similarity between two row vectors corresponding to words w_i and s_j in the matrix \hat{S} .

$$v_i = \frac{1}{n} \sum_j^n \cos(w_i, s_j) \cdot p_j \tag{1.4}$$

Figure 1: Notional illustration of dimension reduction by SVD

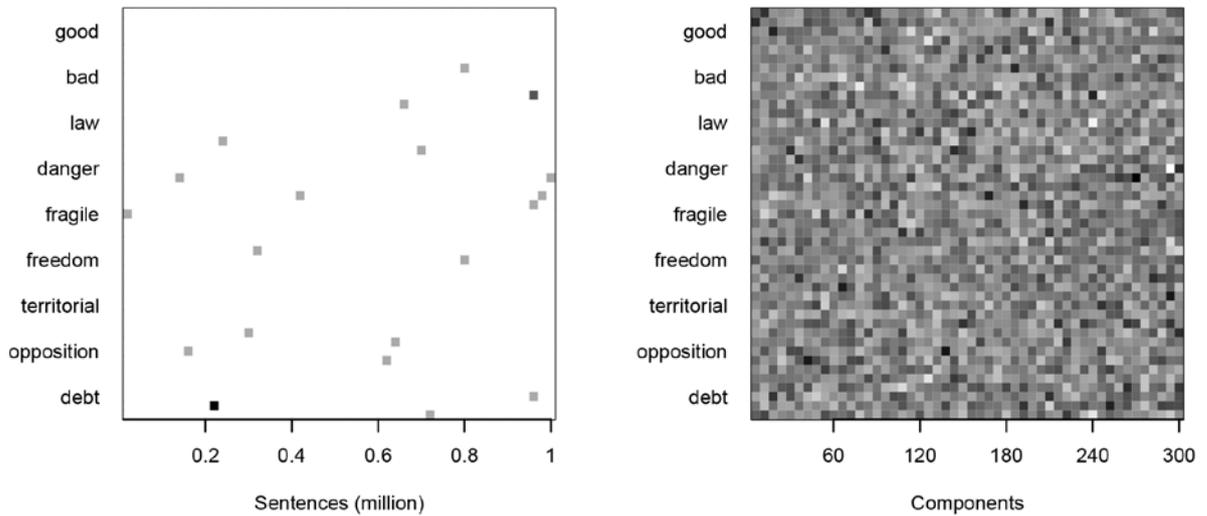


Figure 2 illustrates this word scoring method in a semantic space, where the positive-negative dimension (the dotted line) is defined by two sets of seed words, and words w_1 and w_2 , are located at different distances from positive seed words but at the same distance from negative seed words. Due to their greater proximity to the positive seed words, w_1 gains a higher score than w_2 , reflecting its importance as a word precisely on the positive-negative dimension.

Figure 2: Concept of spatial word scoring in LSS

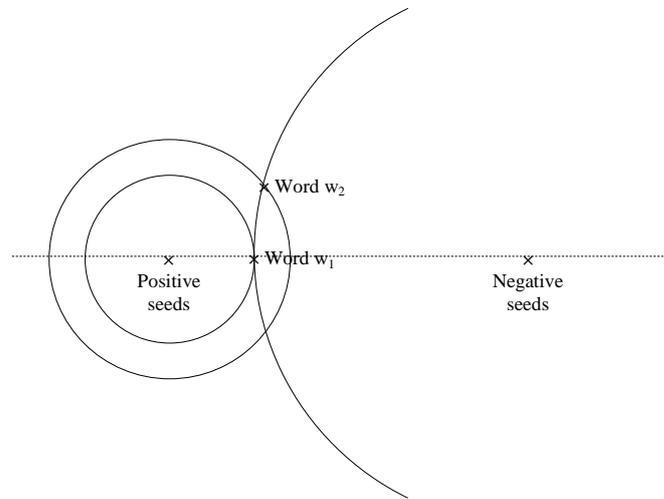


Table 2 and 3 present the top 20 most positive and negative words on democracy and sovereignty. In both tables, many of the words are intuitively positive or negative, but some are not. For example, ‘intensify’ in democracy, is not always used positively, but we cannot judge if its score is accurate unless we investigate its usage in the large corpus. Also, ‘upon’ in sovereignty is a function word lacking substantive meaning, but it could be removed easily if a larger list of stopwords were to be utilized. More importantly, roughly the same scores given to different forms of the same words (‘strengthening/strengthen’ and ‘strong/strongly’) indicate that the estimation of the sentiment the words is accurate (Manning et al., 2008).

Table 2: Most positive and negative words for democracy

Rank	Positive	Score	Negative	Score
1	normalising	0.0075	bears	-0.0142
2	inter-parliamentary	0.0074	danger	-0.0138
3	tangible	0.0068	fear	-0.0129
4	praised	0.0066	threatening	-0.0126
5	intensify	0.0060	inability	-0.0121
6	strengthening	0.0058	pose	-0.0111
7	strengthen	0.0055	blow	-0.0110
8	establishment	0.0053	themselves	-0.0110
9	co-operation	0.0047	itself	-0.0106

10	peoples	0.0045	helping	-0.0105
11	milestone	0.0041	voice	-0.0105
12	consolidate	0.0040	moving	-0.0103
13	contribute	0.0040	strong	-0.0103
14	importance	0.0039	strongly	-0.0103
15	develop	0.0037	watchdog	-0.0103
16	dialogue	0.0037	criticism	-0.0101
17	achieve	0.0034	beacon	-0.0100
18	chairman	0.0034	fragile	-0.0099
19	promote	0.0034	posed	-0.0097
20	upcoming	0.0033	deeply	-0.0096

Table 3: Most positive and negative words for sovereignty

Rank	Positive	Score	Negative	Score
1	relations	0.0099	risk	-0.0166
2	allied	0.0069	low	-0.0137
3	normalise	0.0067	threatening	-0.0126
4	strengthening	0.0058	lose	-0.0124
5	mutual	0.0056	default	-0.0122
6	strengthen	0.0055	negative	-0.0120
7	establishment	0.0053	risks	-0.0114
8	positive	0.0047	likelihood	-0.0113
9	peoples	0.0045	wealth	-0.0112
10	unquestionable	0.0042	pose	-0.0111
11	thanked	0.0040	themselves	-0.0110
12	upon	0.0040	survival	-0.0107
13	contribute	0.0040	itself	-0.0106
14	importance	0.0039	consequence	-0.0106
15	develop	0.0037	threatened	-0.0105
16	dialogue	0.0037	loss	-0.0104
17	adherence	0.0033	afford	-0.0104
18	invariable	0.0031	strong	-0.0103
19	pragmatism	0.0030	strongly	-0.0103
20	commitment	0.0029	posing	-0.0103

Once sentiment scores are given to the feature words, the LSS model is ready for sentiment analysis of news articles. When words $w_{i...l}$ occur in a news article a total of m times, v_i are the sentiment scores of the words, and f_i are the frequency counts of the words w_i , the sentiment of the news article, or the document score, d' is computed as:

$$\hat{d} = \frac{1}{m} \sum_i^l v_i \cdot f_i \quad (1.5)$$

Validation

I applied the document scaling model to two samples of news stories (democracy or sovereignty) on Ukraine published by the Russian agencies (ITAR-TASS and Interfax) to test their validity. I also applied the Lexicoder Sentiment Dictionary, which was created originally to analyse Canadian newspapers' coverage of elections, to the samples as an example of an off-the-shelf dictionary.¹ With dictionary-based content analysis tools, including Lexicoder, the sentiment score of a document d is the difference between the normalized frequency of positive or negative words, which is defined as:

$$d = \frac{n_{\text{pos}} - n_{\text{neg}}}{l} \quad (1.6)$$

where n_{pos} and n_{neg} are numbers of positive or negative words in a dictionary, and l is the total number of words in the document.

Figure 3 and 4 compare document scores assigned by computerized content analysis (Lexicoder or LSS) with those assigned by manual content analysis.² In stories on democracy, many scores computed by Lexicoder are accurate, although the overall correlation is only moderate ($r=0.46$) due to overestimations of positivity (#6, #16) or negativity (#26). In LSS, there are two large errors (#8, #27), but other documents are accurately scored, achieving stronger correlations with human scores ($r=0.77$). In sovereignty, however, Lexicoder underestimates the positivity of many documents, but

¹ Lexicoder has a negation words handling mechanism, but I adopted the common bag-of-words approach.

² Raw scores of LSS are rescaled to between -100 and $+100$. In manual coding, I classified on a five-point scale {1: very negative, 2: negative, 3: neutral, 4: positive, 5: very positive}, and calculated document scores by taking means of sentence scores.

extreme cases (#6, #21, #25) are scored very accurately, hugely affecting the correlation coefficient ($r=0.65$). LSS is less accurate in sovereignty than in democracy, creating random errors around the regression line, but it still outperforms Lexicoder in this subject ($r=0.70$).

Figure 3: Sentiment of news on democracy

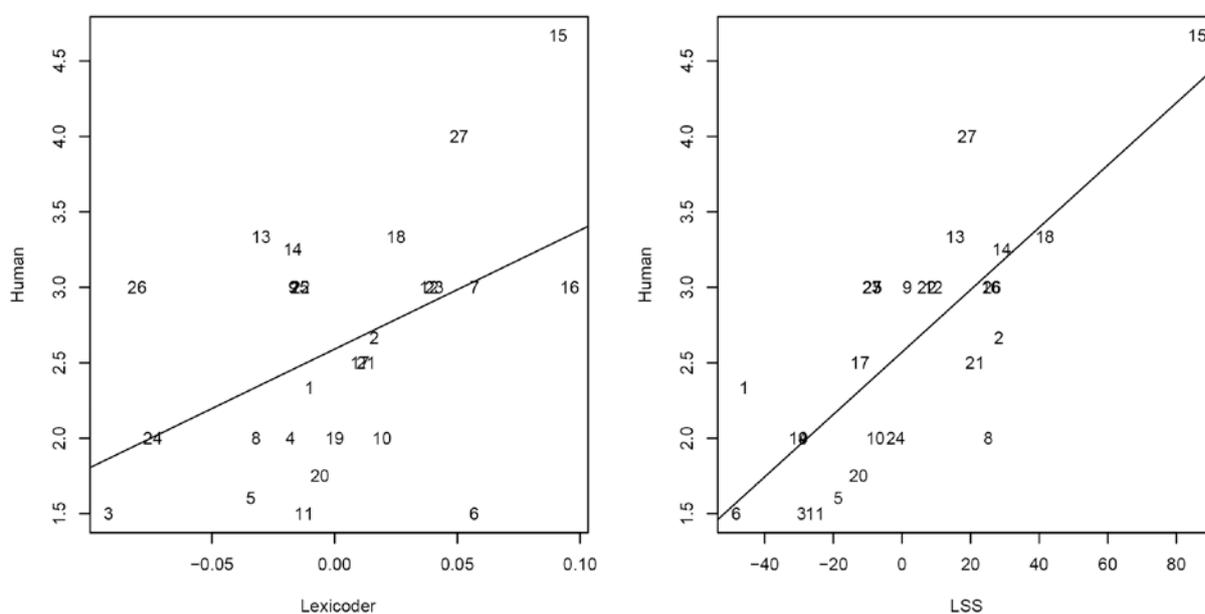
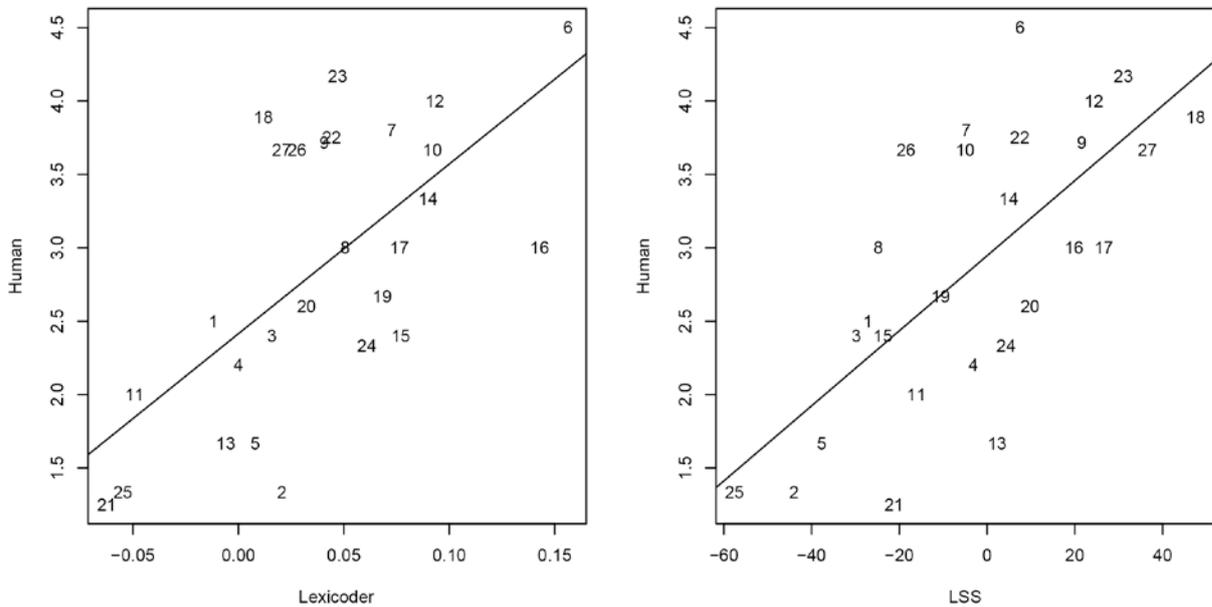


Figure 4: Sentiment of news on sovereignty



Supervised-VSM document scaling

I have constructed document scaling models on sentiment with existing seed words, but nothing prevents researchers from selecting seed words themselves and applying them for their own purposes. However, the manual selection of seed words is sometimes difficult to achieve, particularly when one wishes to measure complex dimensions in news content. An example of such complex dimensions is the media's framing of street protests as 'freedom of expression' vs. 'public disorder' (Author 2017c). Therefore, I will present a fully-supervised VSM document technique that is based on an algorithm that selects seed words automatically guided by manually coded documents.

In the supervised-LSS, a larger corpus is supplied as external data to aid estimations of the parameters for words that do not, or only rarely, appear in a training set. As a similar approach, Nigam et al. (2000) proposed an iterative algorithm based on a naive Bayes classifier, in which a supervised model is trained on both machine-

classified and human-classified documents to improve the reliability of parameter estimation. Phan et al. (2008) incorporated parameters estimated in Wikipedia pages by LDA models into a maximum entropy model trained on manually classified documents for the same purpose. Although the techniques proposed by the computer scientists are very complex, fitting VSMs to training data in LSS is achieved by a simple forward stepwise algorithm, maximizing correlations between manually derived scores and estimated scores given to documents in a training set.

The external data is a corpus of news articles constructed from the same source as the training and test sets. I constructed a corpus of Russian-language news stories published by state-controlled newspapers and TV broadcasters in Russia (Channel 1, NTV, Russia 1, *Izvestiya*, *Komsomolskaya Pravda*, and *Russian Gazette*) between 2011 and 2014 (Author 2017c). The corpus contains 39,787 full-text news articles or transcripts of news casts on street protests. As before, I segmented news articles into sentences and eliminated all proper nouns and adjectives from the corpus.

I took a random sample of 30 news articles from the corpus, and asked three native Russian speakers to classify each sentence of the articles on a 5-point scale ranging from framing the protests ‘explicitly as social disorder’ to ‘explicitly as freedom of expression’. I aggregated the sentence scores to obtain accurate document scores, and then allocated the first half of the documents to a training set and the last half to a test set.

Fitting VSM model

The goal in fitting a VSM to a training set is to discover 5 to 10 pairs of polarity words that define the freedom-disorder dimension. Since there are too many types of words in the large corpus, two criteria are applied initially to select candidates. First,

candidates are only those strongly associated with the target words, which are identified by the collocation analysis. This is in fact the same criterion as for the selection of feature words. I selected candidates from the top 10% of 10,380 types of words that occur at least five times within a 10-word window from “protest” (“протест*”) in the Russian news corpus.

Second, candidates are only those strongly correlated with the dimension without being paired with other candidates. To test the level of correlation with the freedom-disorder dimension quickly, the system calculates pair-wise cosine similarities between all the top features in an SVD-reduced matrix, \hat{S} . When cosine similarities for all pairs are stored in a symmetric matrix, D , it has $K = 1,038$ columns and rows corresponding to the seed candidates $c_{k...K}$. Within the matrix D , scores for words are found in the k th row or column vector when word c_k is the candidate:

$$d_k = D_{.k} = D_k. \quad (2.1)$$

The system takes a weighted sum of d_k by the normalized frequency of words in training documents to obtain temporary document scores (Equation 1.5), and records their correlation with manual scores as r_k . These correlation coefficients allow the system to prioritize the candidates in the stepwise selection process. I selected only 50 seed candidates with the largest absolute correlation coefficient from both sides of polarity in the study. Their seed scores p_k are assigned in the following manner:

$$p_k = \begin{cases} +1, & r_k > 0 \\ -1, & r_k < 0 \end{cases} \quad (2.2)$$

Then, the seed candidates are given adjusted scores to make the scoring of documents more consistent when they are combined into a single seed set. An adjusted

seed score \acute{p}_k is a raw seed score weighted by the inverse of average squared similarity to other candidates in the matrix D :

$$\acute{p}_k = p_k \cdot \frac{1}{\sum D_{\cdot k}^2 \cdot \frac{1}{K}} \quad (2.3)$$

This adjustment is not only to equalize document scores obtained from the varying similarity vectors d_k , but also to increase the dispersion of seed words in the semantic space. A candidate's high average similarity to other candidates indicates that it is in a dense cloud of candidates in the semantic space, but ideal seed words are diffused in the space, covering wide regions of the semantic space. Seed words widely dispersed across the semantic space are less likely to overfit the training data.

With the top seed candidates from both polarities, the system constructs pairs of seed words $\{c_k, c_l\}$, identifying a partner c_l for c_k such that (1) the partner has an opposite polarity, $p_l \neq p_k$; (2) the model $d_{\{k,l\}}$ yields a higher correlation coefficient than before the paring, $r_{\{k,l\}} > r_k$ and $r_{\{k,l\}} > r_l$; and (3) the correlation becomes the strongest with the partner, $r_{\{k,l\}} \geq r_{\{k,\bar{k}\}}$. Starting from the seed candidate with the largest absolute correlation coefficient $|r_k|$, all other seed candidates enter this stepwise paring process. This process continues until at least five pairs have been found, and new pairs start decreasing the overall correlation (this takes around 30 seconds on a laptop computer).

Table 4 shows seed words that are automatically selected through the stepwise selection process. Although it is difficult to judge the suitability of seed words without being familiar with the contexts in which they are used, the freedom-of-assembly seeds seem to be related to legal or administrative procedures, while the social-disorder seeds seem to describe either the attributes or behaviour of protesters.

Table 4: Automatically selected freedom-disorder seed words

Seed word	Seed word (English translation)	Seed Score
подали	filed	74.7
сопровождалось	accompanied by	58.7
атаковала	attacked	53.8
бессрочной	termless	44.7
стычки	clashes	39.3
основополагающие	fundamental	-48.9
использования	utilization	-98.1
подчиняющиеся	obeying	-130.2
госпереворот	coup	-149.0
нежелания	unwillingness	-306.0

Validation

I applied the LSS model and Wordscore to the 15 manually coded news articles in the test set for comparison. In Wordscore, when there are H manually scored documents, the score for a word v_i is its average frequency weighted by document scores d_h in training set:

$$v_i = \sum_h^H \frac{f_i}{k_h} \cdot d_h \quad (2.4)$$

where k_h is the total number of words in the h th document. In training the Wordscore model, I eliminated words that did not occur more than five times to obtain the best result.

Figure 5 shows document scores assigned to the training set by LSS and Wordscore. Wordscore reproduces scores assigned by human coders ($r=0.93$) much better than LSS ($r=0.85$); 95% confidence intervals are also very small in Wordscore, indicating high confidence in estimated scores. However, LSS ($r=0.76$) performs much better than Wordscore ($r=0.39$) in the test set (Figure 6). While LSS's confidence intervals are nearly the same size as in the training set, they became much larger in the test set in Wordscore. This suggest that Wordscore is affected by sparseness of data, recognizing only few features in the test set.

Figure 5: Freedom-disorder framing of protests in Russian news (training set)

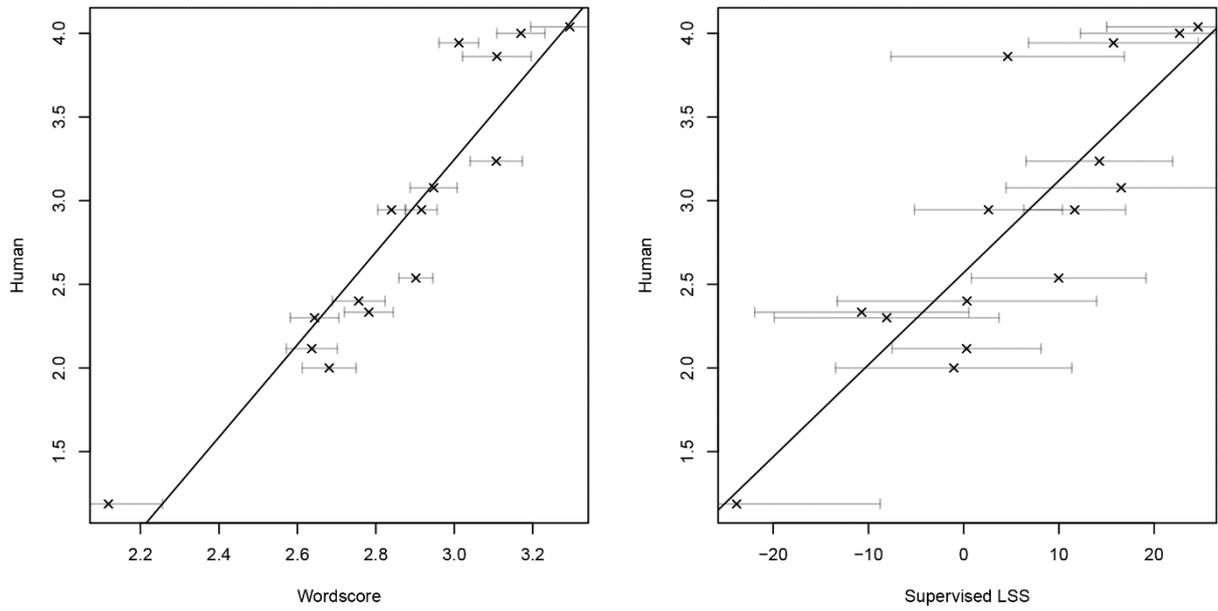
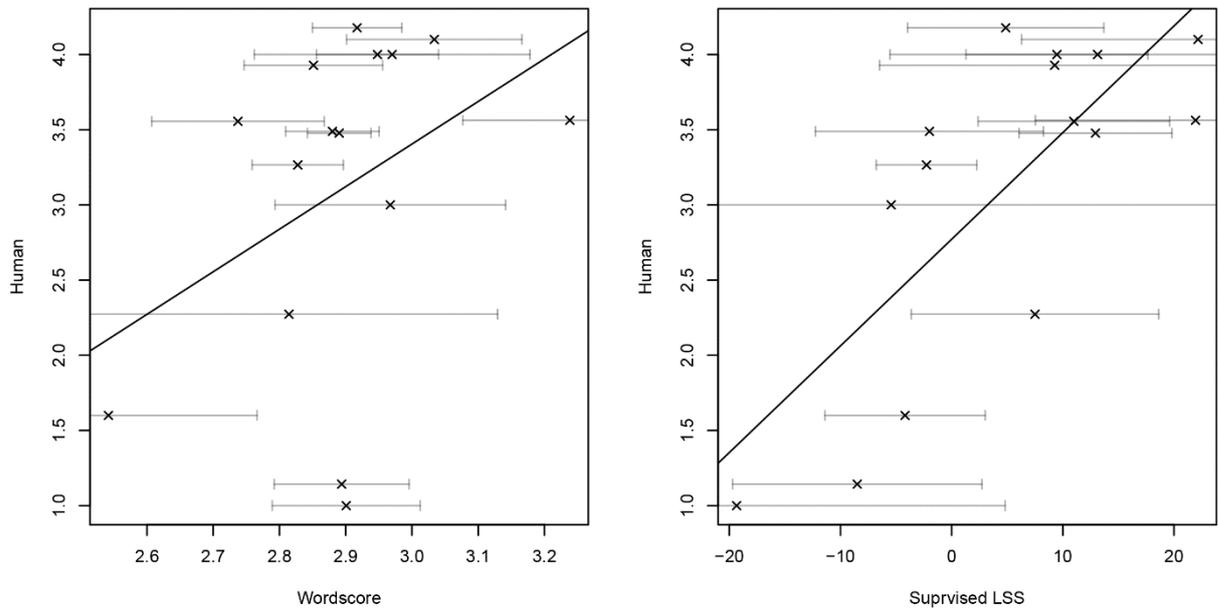


Figure 6: Freedom-disorder framing of protests in Russian news (test set)



Discussion

In the first half of this paper, I demonstrated that a VSM can be easily applied to a document scaling task as a semi-supervised machine learning technique: the only additional manual input needed was the input of target words in sentiment analysis. The result of the document scaling was as good as or even better than the manually compiled sentiment dictionary. The LSS model performed better in news stories on democracy in Ukraine, because the system extracted words used by the Russian news agencies from the corpus, which are different from those used by the North American news media. This means that content analysts can construct subject-specific document scaling models for sentiment analysis without additional costs in all research projects, avoiding the use of off-the-shelf dictionaries, which raise validity concerns when applied to new subjects (Grimmer & Stewart, 2013).

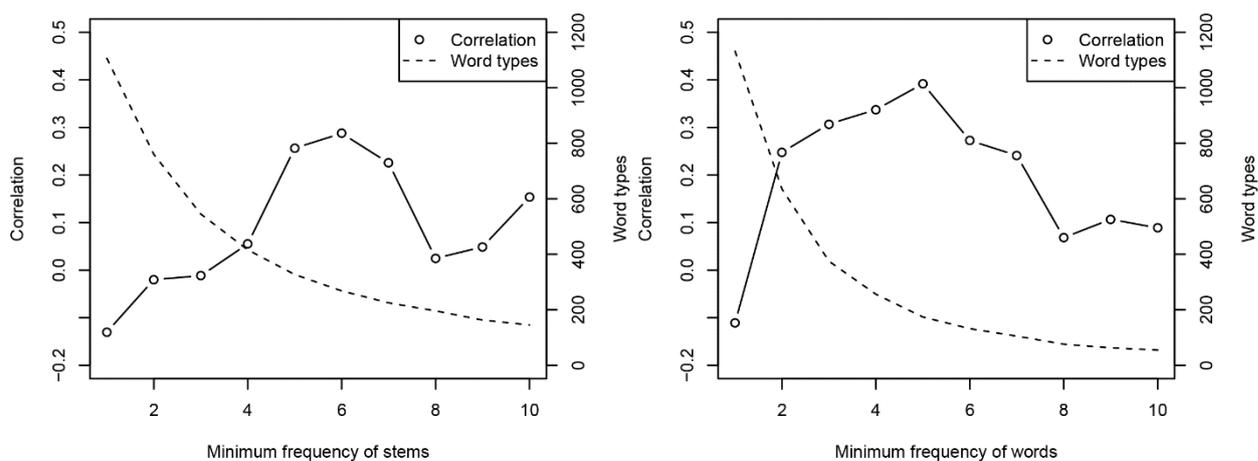
Nonetheless, the LSS model presented here was less accurate in scoring extremely positive or negative news stories than the manually compiled dictionary. This is due to the LSS's scoring method, where the polarity of a word is calculated based on its proximity to seed words representing both ends of the scale, and where extreme words beyond this range do not gain large enough polarity scores. Although the English sentiment seed words are widely applicable, their positivity or negativity is still moderate compared to the very strong words appearing in Russian newswires. This encourages us to discover extra sentiment words to make sentiment analysis more accessible.

In the second half of the paper, I showed that VSMS can also be employed in a fully supervised machine learning technique. Despite the lexical diversity in the Russian news stories, LSS replicated manual coding well with only 15 documents in the training set. This efficiency is owing to the VSM's ability to extract semantic information from

large corpora fully automatically: all features are selected based on syntagmatic association with target words, and they are scored based on paradigmatic proximity to each other in the larger corpus. Fitting the VSM to training data is achieved by automatically selecting seed words for the given dimension with the novel stepwise algorithm. Unlike the earlier techniques (Nigam et al., 2000; Phan et al., 2008) that utilize external data to expand models, no parameter is directly estimated from the training set and thus there is no need for complex mathematical operations to combine parameters from training and external data with the algorithm.

The comparison between LSS and Wordscore has shown the challenge that diverse content of news articles poses for researchers: a very large number of documents must be manually coded for supervised techniques that estimate parameters directly from a training set. In my attempt to construct the best-performing Wordscore model ($r=0.39$), I had to eliminate words that do not occur more than five times to improve the reliability of parameter estimation. As shown in the right panel of Figure 6, when all the words in the training set are included in the model, the model does not replicate human scoring at all ($r=-0.11$); when words occurring only once in the training set are excluded, the correlation increases to $r=0.24$. In this way, an increase in the threshold for minimum frequency increased the correlation until the minimum frequency became five. The same trend was also found when stemming was performed (left in Figure 7).

Figure 7: Minimum frequency of words and types of words



Nonetheless, introducing the higher threshold for the minimum frequency rapidly decreases the number of word types found in both the training and test set (the broken lines in Figure 6): there are 1,132 types of words when there is no threshold, but that number halves when the minimum frequency is set to two. When the threshold is raised to five, only 175 types are left. After this point, the correlation starts falling sharply as the model fails to recognize relevant features in the test set. In a Bayesian model, this is a bias-variance trade off and the only solution in such a model is to increase the size of training data. LSS can also be affected by this type of trade off problem, but it is easily solved by providing a large corpus without the need for expensive manual coding.

Stemming is a commonly-used technique to compensate for data sparseness, but the poorer performance of Wordscore when stemming is applied indicates that it is not a solution, and is indeed potentially harmful (left in Figure 7). The better practice is to estimate parameters separately for different forms, and assign similar values to those which have the same meanings (Manning et al., 2008). This is exactly what LSS does by estimating semantic relations between words in large external data with a VSM. Its ability

to estimate semantic relations accurately is clearly shown in the very close scores given to “strengthening/strengthen” and “strong/strongly”.

Overall, the successful application of the VSM to content analysis is due to the introduction of target words in addition to seed words. In earlier studies, collocations analysis and LSA are parallel approaches to synonym extraction (Turney, 2001; Turney & Littman, 2003), but this study made clear that these are suitable for different purposes. Collocation analysis is effective in extracting subject-specific terms, whereas LSA is accurate in identifying synonyms. Both methods are highly scalable, easily extracting and scoring subject-specific features with high confidence in corpora that are comprised of tens of thousands of news stories.

Finally, only LSA is utilized as an underlying model for LSS in this study for its accessibility, but nothing prevents us from adopting other VSMs (Turney & Pantel, 2010). Since the emergence of LSA in 1990, other models, such as NMF (Lee & Seung, 2001) and LDA (Blei, 2012), have appeared; more recently Mikolov et al. (2013) have proposed an efficient vector representation of words known as Word2vec. These VSMs are based on different distributional assumptions and constraints, but can potentially be used as an underlying model for LSS to estimate the semantic relations of words more accurately. Therefore, I encourage readers to apply those models to improve the accuracy of computerized content analysis of media content.

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Conclusion

In this thesis, I have attempted to address the methodological confusion in earlier international communication research, in which the predominantly negative representation of foreign countries was treated as news bias, regardless of the levels of social disruption in those countries. I proposed a new approach to news bias based on a difference-in-differences design commonly used in econometrics, whereby news bias is measured using a media benchmark. I measured state-ownership bias in Russia's official news agency (ITAR-TASS) utilizing the same country's commercial news agency (Interfax) as a benchmark during the Ukraine crisis.

It is unusual to choose an international news agency as a case in a study of news bias in which research focuses on newspapers and TV news in the context of domestic politics, but it was a strategic decision. The complexity of the international news system did not allow me to apply a fixed benchmark in order to analyse news bias, while a systematic comparison of ITAR-TASS with Interfax allowed me to estimate any bias caused by the Russian government's influence. Russia's involvement in the crisis also allowed me to predict how ITAR-TASS would cover key events in the presence of the Russian government's interventions. The result of the analysis has shown a correlation between ITAR-TASS's coverage of key events and their desirability for the Russian government, which suggests that ITAR-TASS's news coverage was biased because of government ownership.

The most surprising discovery in this study was the strong correlation between news coverage by Reuters and that of ITAR-TASS after Russia's annexation of Crimea, considering ITAR-TASS's role as the government's mouthpiece and Reuters' reputation

as a leading international news agency. Reuters published news stories which were heavily influenced by the Russian government's narratives that claim the Ukraine revolution was a 'coup' by fascists, and that the safety of the Russian-speaking minorities were threatened by the nationalists over the three-month period following the annexation. Through further analysis, I discovered that these news stories were published in the most popular online news sites in the United States, Yahoo News and Huffington Post. These findings demonstrate how vulnerable today's international news gathering and distribution systems are to the spread of false information.

Reuters's dependence on the Russian government for news production at the height of the crisis has an important theoretical implication. Based on the cultural imperialism thesis (Herman & McChesney, 1997; Schiller, 1991), I expected Reuters and ITAR-TASS to cover the Ukraine crisis differently according to their very different cultural, economic and political backgrounds, but they did not at the height of the crisis. More specifically, I expected Reuters, as a western media corporation, to conduct propaganda against domestic and foreign audiences in the interest of the western states, while receiving information subsidies from their governments, but the content analysis revealed that Reuters, in effect, conducted propaganda for Russia, receiving information subsidies from the Russian government. Importantly, Reuters replicated the Russian government's framing of Ukraine in news stories about its democracy, which is one of the core western values.

Reuters became involved in the Russian government's international propaganda because it ostensibly dispatched temporary correspondents to cover the Ukraine crisis. However, Reuters' newly-arrived correspondents were not able to cover the crisis independently when it spread from Kiev to the vast eastern regions, drawing a sharp

contrast with the independent reporting of Interfax, which has a news service dedicated to Ukraine. This suggests that employing temporary foreign correspondents, or ‘parachute foreign correspondents’ (Hamilton & Jenner, 2004), in covering rapidly developing international crises is dangerous because their lack of local knowledge can be easily exploited by non-western (or western) governments who offer handy news materials in order to control the international flows of information for political purposes.

If Reuters was producing the “least expensive mix of content” (McManus, 1994, p. 85) by accepting free news materials from the Russian government during the Ukraine crisis, we have to reformulate Chomsky and Herman’s propaganda model because the case of Reuters suggests that collusion between western media and non-western states is possible in a global media economy in which international media corporations’ interests are no longer strongly tied to the interests of their home countries. While the propaganda model assumes alignment between national borders and corporate interests, the two seem more independent of each other in today’s global media industry, as Appadurai (1990) argues. By adding this transnational dimension, the new model can be called the *global propaganda model*, which underscores the decreasing relevance of national boundaries to the media industry and the diminishing power of the western media in international communication.

I hope this study will become an example of how computation techniques can offer new insights into today’s international communication. The volume of information that travels across borders can overwhelm even the most resourceful research teams when content analysis is performed manually, but I have demonstrated that an individual researcher can analyse all the news stories about a major international crisis published by multiple news agencies (ITAR-TASS, Interfax, Reuters, AP and AFP) over two years

when content analysis is performed computationally. I hope that computational content analysis techniques will be widely used in international communication research because this seems to be the only way for us to develop new theories based on evidence.

Computational content analysis helps us not only to develop new theories, but also to address real-world problems such the spread of false information on the internet; computational analysis of a large body of news stories assists in the identification of key expressions in false news stories. Despite this potential, most journalism scholars at British universities have not made sufficient effort to adopt computational techniques, only accusing technology companies of not preventing the spread of false news on the web and in social media. One of a few exceptions is a new joint project by The Reuters Institute and The Internet Institute at Oxford University to tackle the spread of misinformation by utilizing computational content analysis techniques, but this project focuses on science and technology news, not political news. I hope more media and communications scholars in the United Kingdom will take an active role in detecting and preventing the spread of false political information.

I focused on international news media in this study, but the methodology presented here can also be applied to the study of domestic news media, among which a widely-accepted benchmark does not exist because of strong competition between news media companies and the fragmentation of media audiences. In fact, I have employed the same methodology to analyse Russia's national TV and newspaper coverage of anti-government protests during the same period, and revealed the state-controlled media's tendency to report nationalist rallies more positively (Lankina & Watanabe, Forthcoming). I believe that other researchers can take a similar approach to measuring news bias in various media systems.

I have developed two very efficient computational content analysis techniques for this study, *Newsmap* and LSS. *Newsmap* classifies news articles based on their geographical focus more accurately than complex geographical information extraction systems. LSS performs sentiment analysis of very specific concepts in news articles as accurately as human coders do. These semi-supervised machine learning models allow content analysts to train models with little or no manual input, making them very useful for large-scale analysis of media content in which data tend to be too sparse for commonly-used techniques due the high lexical diversity.

Nonetheless, I acknowledge that content analysis with computational tools still requires a significant amount of manual work, and does not automate content analysis, as Krippendorff (2004) correctly pointed out, calling it “computer-assisted content analysis”. In fact, my longitudinal analysis with those tools demanded extensive background knowledge of the Ukraine crisis in order to interpret the results of the computational analysis; both the presence and absence of media attention are important indicators of bias, and I needed to know about all of the occurrences and non-occurrences of important events during the crisis. This required me to spend a considerable amount of time reading news stories published by both western and non-western media, and research papers by foreign policy experts, in order to acquire detailed knowledge of the crisis.

The need for manual reading also came from the limitation of the econometric approach to media bias; we could neither assume high stability in the benchmark media, nor find multiple benchmarks. Therefore, reading news articles manually around the periods in which statistical analysis suggested an anomaly was the only way to make substantive claims with confidence. Similarly, I did not resort to time-series analysis in this study because lagged correlations in news coverage between ITAR-TASS and

Reuters do not necessarily indicate that Reuters was influenced by Russian sources. Since flows of information in the international media system are so complex and opaque, I believe mixed-methods are still the best approach in this field.

My quantitative approach stands in sharp contrast to traditional qualitative approaches in which researchers conduct interviews with journalists or observe the newsrooms of news agencies (Boyd-Barrett, 2014; Hester, 1974; Paterson, 2011), but it should be seen as a complement to traditional approaches rather than a substitute. Those qualitative studies offer very important information on how news content is produced, while quantitative studies empirically validate the claims made by those who are involved in news production. Although no interviews or ethnographic studies have been conducted in ITAR-TASS to the author's knowledge, Boyd-Barret's (2014) work on Interfax was a very important source of information on how the organization operates. In turn, my analysis showed that Interfax is much less influenced by the Russian government than ITAR-TASS, supporting Boyd-Barret's (2014) conclusion that Interfax is an independent news organization. Especially as obtaining insider information about news organizations is becoming more difficult (Paterson & Sreberny, 2004), quantitative analysis is a very useful approach.

I conclude my thesis here, but there are a few questions that need to be answered in my future research. First, I targeted *democracy* and *sovereignty* in my content analysis because those were key concepts during the Ukraine crisis, not only for western countries, but also Russia (D'Anieri, 2015), but the result of the analysis may be highly sensitive to the choice of target concepts, and the result could have been very different if an alternative concept such as *legitimacy* had been chosen instead of *democracy*. Since it is only the Russian government that claimed the legitimacy of Yanukovich's regime, news stories

related to this concept could be almost all from Russian official sources in both Interfax and ITAR-TASS, making news coverage by those two very similar. This would lead us to the conclusion that ITAR-TASS's coverage of the Ukraine crisis was not biased.

Second, I focused on the Ukraine crisis as the most important geo-political event in Europe in recent years, but the level of bias in ITAR-TASS's coverage may be different for other geo-political events such as the Syrian war, in which Russia started military intervention in 2015. I anticipate that the difference between Interfax and ITAR-TASS's news coverage of the Syrian war will be smaller than that of the Ukraine crisis due to the lesser strategic importance of Syria to Russia, but this needs to be empirically tested by content analysing its news coverage over seven years or more using the same computational techniques.

Finally, I analysed ITAR-TASS's coverage of the Ukraine crisis in terms of international propaganda, but Russia's information strategy seems much broader. After its success in international propaganda during the crisis, the Russian government created a social-media-friendly news website called Sputnik News, which currently publishes international news in over 30 languages from across the world. I must analyse this website's news content to stop false information spreading globally from Russia's state-controlled news media online.

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