

# Respectful Rivalry: Comparative US Media Coverage of Soviet and Chinese Space Programs, 1957–2019\*

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## Abstract

Scholars have long been aware of how the “enemy image” relates to international rivalry. Cinematic portrayals, for instance, of the Soviet Union to American audiences were overwhelmingly negative. However, attitudes toward outer space exploration are a puzzling exception, doubly so given states’ sensitivity to space’s obvious national security implications. Dominant theory predicts that technological advances in space should be zero-sum, yet this paper finds that American attitudes toward the Soviet space program were actually quite nuanced, especially as each country’s space program became more advanced. Relying on text analytic and experimental comparisons of media coverage spanning 60 years, I find that China’s program receives more favorable coverage than its Russian counterpart, especially when rated by human readers. Differential treatment, where it exists, appears to have been motivated by geopolitical rather than Huntingtonian factors. The next iteration of the paper extends the analysis to other sender sources, target countries, and substantive contexts using an expanded news media dataset and a survey experimental design.

## 1 Exploring Media Sentiment Using Text Analysis

Today, as the world nears Apollo 11’s 50th anniversary, it is China’s space activity that increasingly grabs US headlines. China’s space program technically began in the late 1960s during the Sino-Soviet split, and in 2003 China joined the US and Russia in putting humans into space [[“A brief history of China in space” 2011](#)]. Since then, it has sent several robotic landing craft to the Moon’s surface, including one milestone “first” (to the far side of the Moon), and has stated plans to visit Mars next year [[Fifield and Li 2019](#)]. The US national security community is justifiably worried about China’s growing space capabilities. Fearing that sensitive space technologies are vulnerable to theft or reverse-engineering, the US Congress passed a 2011 bill that bans NASA from collaborating on joint scientific projects with the Chinese space administration . Washington’s response slightly mirrors its tone during the early Cold War.

But do attitudes conveyed through media coverage of the Soviet and Chinese space programs differ, and if so, how? I examine this question in four steps using computerized text analysis. Specifically, I compare automated sentiment analysis to the sentiment of a sample of human readers. The findings are surprising, since coverage does differ – just not in the direction we might expect. Both sets of analyses reveal that media coverage of both Soviet and Chinese space programs is generally positive. The human readers, however, tend to interpret China’s accomplishments in an even more positive light.

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The findings may suggest that *increased* space cooperation – which arguably helped defuse tensions during the Cold War – may be the most politically expedient policy. This is because it economizes costs, boosts transparency about whether dual-use technologies are being used peacefully, and is popular with the public.

## 2 Background

In the wake of the most recent Chang’e 4 (嫦娥四号) landing in early January 2019, Leroy Chiao, a former US astronaut, penned an emotionally charged op-ed for CNN’s website. In it, he stated his “mixed feelings about these events,” his comments ranged from lauding China’s “[technically] impressive” feat to characterizing it as a clear and present rival: “China has surpassed all other nations with a new achievement. Though not exactly poised to take the United States’ spot, *China has fired a warning shot*” (e.a.). Finally, he blamed China’s achievements on shortcomings in his own country’s program, lambasting “[America’s] failure to prioritize our space capabilities”: “We had better realize this soon, or we may very well wake up to find that we are no longer top dog in the space business. And if we don’t learn from our complacency in space, we could end up losing our edge in other areas as well” [Chiao 2019].

Is Chiao’s op-ed reflective of typical media coverage, or public opinion more broadly? In order to shed light on this question, I conducted an analysis<sup>1</sup> of the full population of English-language articles on Chinese Moon exploration contained in the New York Times corpus from 2007–2019 ( $n = 29$ ), comparing it to similar articles on Soviet moon exploration in the 1960s ( $n = 52$ ). Articles were identified for their use of the terms “Lunik” (for the Soviet program<sup>2</sup>) or “Chang’e” (the Chinese program). I also explored other keyword searches using Boolean combinations.<sup>3</sup> Manual searches subsequent the scraping process revealed that the full population was indeed captured (see Figure ??).

Using a webscraping algorithm coded in Python, I collected the full text of each article, which included the raw text from the New York Times website<sup>4</sup> for articles since 1989 and page-scanned PDF images for older articles, the latter of which were then rendered in machine-readable text using optical character recognition (OCR) techniques.<sup>56</sup> To separate the paper’s opinions from those of its op-ed contributors, only articles and editorials are included in the analysis.

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<sup>1</sup>Using handcoded functions and the `quanteda` text analysis package, freely available for the R statistical programming language.

<sup>2</sup>The Soviet Moon program was commonly termed “Lunik” in American colloquial language, following from the earlier “Sputnik” missions. Various searches for other program names yielded no independent results, as the word “Lunik” was always used in conjunction with Soviet moon exploration.

<sup>3</sup>e.g. “China AND far side AND moon”.

<sup>4</sup>[www.nytimes.com](http://www.nytimes.com)

<sup>5</sup>The automated OCR process failed to produce cogent results in 11 cases. I used a team of paid transcribers on Amazon’s Mechanical Turk service to accurately reproduce these articles. I then verified the accuracy of both the human-transcribed and OCR’d documents manually.

<sup>6</sup>The dataset cannot be shared without violating the New York Times Terms of Service, but the full text is available on [www.nytimes.com](http://www.nytimes.com) and [timesmachine.nytimes.com](https://timesmachine.nytimes.com).

Comparison	Mean Score	T-Test
Dictionary vs. Context	0.488 vs. 0.312	p=0.09 <sup>7</sup>
Russia vs. China (Dictionary)	0.521 vs. 0.429	p=0.46
Russia vs. China (Context)	0.194 vs. 0.524	p=0.05 <sup>*</sup>
Dictionary vs. Context (Russia)	0.521 vs. 0.194	p=0.02 <sup>*</sup>
Dictionary vs. Context (China)	0.429 vs. 0.524	p=0.55

Table 1: Sentiment Analysis Results

## 2.1 Content Differences

Figure 3 in the Appendix contains a pair of “word clouds” that provide visual information on the type of language used in each set of articles, with centrality and font size indicating relatively high-frequency terms. Obvious topical words are by far the most-represented, whereas ancillary words are largely innocuous, suggesting linguistic objectivity. The China cloud does contain rare uses of the terms *militari-* (de-stemmed) and *soviet*, but given that these occur at roughly the same rate as *american* and *monday*, Cold War analogies do not appear to be in operation in stories covering the China program. In the Russia cloud, words like *success-*, *achiev-*, and *pioneer-* occur at greater frequency than *militari-* or *behind*.

Following Young and Soroka 2012, I then ask a sample of  $n = 283$  US-based, English-speaking Amazon Mechanical Turk workers to each read an article from the set. I then prompt the respondents to rate the article’s sentiment on the same  $[-2, 2]$  scale by asking **What is the author’s attitude toward the event described in the article?** I specifically ask readers to evaluate “author” attitudes because we are interested in measuring *document sentiment*, not reader sentiment. I then average the scores across articles by taking their mean. This enables us to make cross-comparisons with machine-based approaches like the LSD dictionary,<sup>7</sup> which evaluate intra-document linguistic patterns from an “unbiased” perspective. To ensure workers actually read the full article text, I discard any answer returned in 59 seconds or less.

The results from the sentiment analysis comparisons are shown in Figure 1. I use a standard parametric *t*-test (appropriate because the rescaled distributions are approximately normal) to compare the statistical significance of differences between comparison groups. I then apply a Bonferroni correction to the *p*-values to reduce the likelihood of Type I errors.<sup>8</sup> Intuitively, a value of 0 indicates neutrality and a value of 1 indicates “somewhat positive” sentiment. The results strongly suggest the following:

1. New York Times coverage was, on average, moderately positive for both the Soviet and Chinese Moon exploration programs.
2. Linguistically, there were no significant differences between coverage of the Chinese or Russian programs. Contextually, however, coverage of China was interpreted as substantially more favorable than coverage of the Soviet Union.
3. Coverage of Russia was significantly less favorable when modeled holistically than when modeled as a bag-of-words, but still favorable overall.

The results should be carefully conditioned. First, it should be noted that these interpretations

<sup>7</sup>LSD is a proprietary word dictionary specifically designed for news content analysis. See Appendix.

<sup>8</sup> $p = \alpha/\omega$ , where  $\omega$  is the number of independent statistical tests.

were retrospective, since ratings were given by humans in 2019. Second, I was only able to control for US residency (and work permit status), not education, demographic characteristics, citizenship, knowledge of space program events and history, or whether a respondent is a regular New York Times reader. However, researchers who study the generalizability of MTurk samples have typically been optimistic [Coppock 2018, Huff and Tingley 2015]. Regardless, this study makes no strong claim about information transmission or *reader* attitudes. In essence, the rating process asks “In the opinion of the average human reader, what is document *i*’s sentiment?” MTurkers were used only to evaluate contextual sentiment – not surveyed on their own attitudes for the purposes of generalizing these attitudes to measure wider public opinion.

The fact that contextual sentiment was lower than dictionary sentiment for Russia, and that coverage on China is overall more positive than coverage on Russia, is puzzling. The likelihood that MTurk respondents were primed for negativity against Russian space activity is low, given that media mentions in recent decades have been relatively rare. There could be several explanations. First, dictionary methods coded in time  $t$  may not be valid for stories written in time  $t - 1$  due to topic drift – a measurement problem. Another interpretation is that readers may view Russian coverage through the lens of lived or narrative history. After all, American public opinion vis-a-vis the Soviet Union during the Cold War was on the whole extremely critical. Therefore, even if media coverage was relatively objective and unbiased, readers may impute their own sentiment. Without data on respondent demographics or a post-survey questionnaire, however, we cannot draw firm conclusions. Further iterations of this study could devise an experimental setup wherein the country label is varied for bifurcated treatment and control groups.

The next steps will be to expand the dataset to include other programs, including coverage of the US program as a baseline comparison; a survey experiment; and more qualitative research on a subsample of the articles. Although qualitative analysis introduces a new set of potential threats to inference (i.e. the bias of the researcher), text analytic and qualitative comparisons can be useful as a robustness check. Table 3 contains a mapping of the context surrounding keyword use for a random subset of articles. Due to space limitations, I omit a full discussion here; future iterations of the paper will explicate the qualitative findings in greater detail. Overall, the machine- and human (MTurk)-generated scores appear robust: lunar coverage was mildly positive, often ambivalent but mostly impartial (excepting a few Soviet-era stories), and more favorable for China.

### 3 Discussion

The idea that there exists political bias in US media, and that this bias exerts direct influence public opinion, is increasingly presumed by American political observers. Because space is a domain in which national pride and national security threats are extremely salient, we should expect media outlets driven by biased inputs to politicize space events to a relatively greater degree – namely, by criticizing adversary space programs. However, the findings from this study suggest that space program coverage has, at least in the case of the New York Times, in fact been relatively objective, even during the Cold War. References are variously made to security concerns, but coverage is on the whole largely fact-based (see Figure 3) and adversary “firsts” are often spoken of in terms of being scientific advancements and achievements for humankind.

While this study does not yet offer a measured comparison of adversary programs to home-grown programs, one can reasonably assume that coverage of the latter program contains weakly greater positive sentiment. Combined with the findings that average sentiment takes on net positive values

in both the Cold War and China cases, the implications are encouraging: at least some media (in our case, a widely read and heavily influential outlet) strikes a “sportsmanlike” tone wherein wins are cause for celebration but losses result in handshakes.

The New York Times in particular is presumably read by a more educated audience; its positive tone would seem to contradict the narrative of historians who argue that Cold War space competition was an “elite” game [e.g. McQuaid 2007]. If such claims are true, it may indicate that either (a) elite papers like the New York Times did not, in fact, play a role in shaping elite (or popular) public sentiment toward space programs, or that (b) readers, including elite readers, impute their own sentiment. While either finding is interesting given popular presumptions that a nefarious “media” actively seeks to promote its agenda, the latter would particularly striking since it could mean that even if the press did have an agenda, its ability to shape attitudes by pushing that agenda may be limited because reader opinion is already entrenched in previously-adopted viewpoints. As an early USIA survey summary noted,

*“The US and the USSR space programs are generally assessed as competitive efforts ... [but] there is a widespread tendency for wishful thinking and political sympathy and dependence to color estimates of achievements in space” [Michael 1960].*

Perhaps some inherent characteristic of space exploration – such as views that implicitly invoke a kind of supranational glory associated with a new the age of discovery – may explain positive coverage even as bilateral tensions between the US and its (potential or actual) adversaries run high. If so, there are also implications for state-run media. For example, Soviet papers at the time provided highly selective coverage, and some authors have claimed (albeit without evidence) that Chinese space programs are intended as a purposeful, diversionary strategy by the central government [Loftus 2019].<sup>9</sup> But if governments that control the media can manipulate issue salience, they may be more limited in their ability to manipulate sentiment on such issues. In his interview, Sergei Khrushchev recalled Pravda coverage of Apollo 11:

*“Of course, you cannot have people land on the moon and just say nothing. It was published in all the newspapers [...] There were small articles when Apollo 11 was launched. Actually, there was a small article on the first page of Pravda and then three columns on page five [...] But if you remember [back then] when Americans spoke of the first man in space, they were always talking of ‘the first American in space’ [not Yuri Gagarin]. The same feeling was prevalent in Russia” (e.a.) [Das 2019].*

This anecdote is consistent with the tentative observation that audiences take special pride in their own space accomplishments, but “firsts” by other nations are accorded respect that even critical home government stances does not totally dampen. Conversely, the only reliable mood-dampener for American audiences would seem to be the national budget:

*“...Nor did lunar exploration in and of itself create much of a groundswell of popular support from the general public. The American public during the 1960s largely showed a hesitancy to ‘race’ the Soviets to the Moon [...] ‘Would you favor or oppose US government spending to send astronauts to the Moon?’ these polls asked, and in virtually all cases a majority opposed doing so, even during the height of Apollo. At only one point, October 1965, did more than half of the public favor continuing human lunar exploration. In the post-Apollo era, the American public has continued to question the validity of*

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<sup>9</sup>“Shooting for the stars keeps the Chinese people’s eyes skyward and away from CCP malfeasance. To borrow Karl Marx’s reference to religion, Beijing’s space policy is an opiate for the Chinese masses” [Loftus 2019].

*undertaking human expeditions to the Moon [...] [This is true even for the] recent return to the Moon with the Clementine space probe in 1994, which found evidence of embedded ice at the poles [...] [E]ven then support for human exploration was essentially equally divided” (e.a.) [Launius 2003].*

Nor is it a story of “unmanned” versus “manned” exploration, as the Gagarin case might seem to indicate: this study considered only *unmanned* Moon “firsts.” Sentiment may be especially high for manned cases (without evidence, this paper is agnostic on the matter), but it is not low for unmanned events. Indeed, only a minority of stories were *mostly* negative in tone. Among dictionary-scored articles, 25 percent of the sample ranged between -0.58 and 0.06 and the remaining three quarters took on strictly positive values. Context-scored articles exhibited only a marginally greater degree of variation (-0.83 and 0.09). While the results do not yet allow us to draw firm conclusions, they suggest that a mild space enthusiasm, not a dangerous space nationalism, is the norm.

This may be an uncomfortable finding for the US, Russian, and Chinese governments, which are justifiably cautious about both space competition (because of the international security risks) and space cooperation (because it involves the exchange of sensitive technologies). However, judging by the observational and text-analytical findings, multilateral space cooperation is likely to be a politically popular policy with the public. Moreover, if these findings can be generalized, then the press is likely in the case of space to be a friendly liaison between cooperative governments and a sympathetic public.

As the US and China reach parity in space, closer collaboration can function like an inspection and verification system, better positioning each side to reassure the other that sensitive dual-use technologies aren’t being repurposed for malicious ends. The ban on scientific collaboration between NASA and China’s National Space Administration may be counterproductive, considering that US-Soviet cooperation in space beginning in the 1970s may have contributed to the end the Cold War. None of this is to suggest that the two countries’ interests are totally aligned. But at a time when the political ambivalence between Washington and Beijing is once again waxing rather than waning, cooperation in space exploration may be a useful – and politically attractive – path forward.

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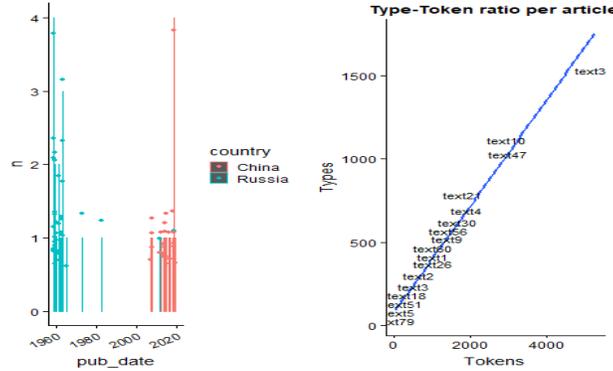


Figure 1: Article Counts by Country, 1959–2019. Data from nytimes.com.

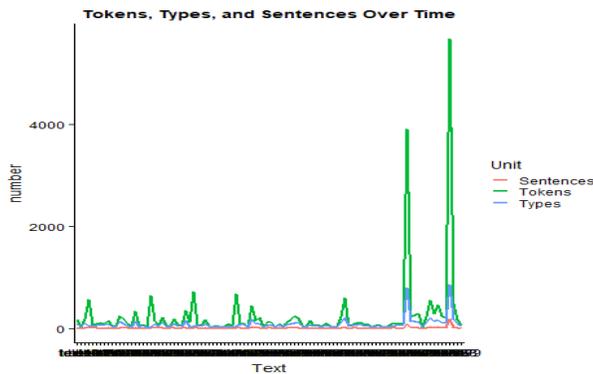


Figure 2: Article Counts by Country, 1959–2019. Data from nytimes.com.

## 4 Appendix

As is standard practice, I preprocessed the text (by removing common “stopwords,” extraneous punctuation, and word stems prior to conducting the main analysis. Although it involves some data loss, preprocessing is widely regarded as appropriate procedure in text analysis; that said, caution about the sensitivity of findings to preprocessing assumptions should be exercised [Denny and Spirling 2017]. I also investigated collocations [words appearing together at uncommon frequencies up to the fifth degree (5-grams)], which yielded predictable proper noun combinations (“Soviet Union,” “United States”) of little substantive or emotive interest.<sup>10</sup> Table 3 contains a list of “keywords in context” from a random sample of six articles in the dataset, showing the context in which the program’s respective names tend to appear, and Figure 1 plots descriptive statistics on token (word) ratios in the Document Feature Matrix (DFM). Processing yielded 23,581 tokens for Russia (5.07 type-to-token ratio) and 10,157 tokens for China (4.41 type-to-token ratio), an unsurprising difference given the greater number of Russia articles in the sample and the presence of two article length outliers (see Figure 1). Information on Tokens, Types, and Sentences over time, an established measure of textual “diversity” (alternatively, “richness” or “complexity”), are shown in Figure 2.

Next, I obtain a measure of document “distance” using the cosine similarity method,

<sup>10</sup>Future iterations will use the Justeson and Katz 1991 method for testing whether observed  $n$ -grams appear more frequently than by chance.



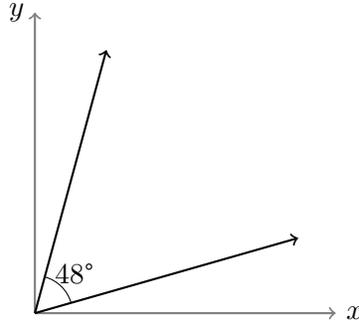


Figure 4: Plotted Cosine Similarity:  $\cos(48^\circ) = 0.67$

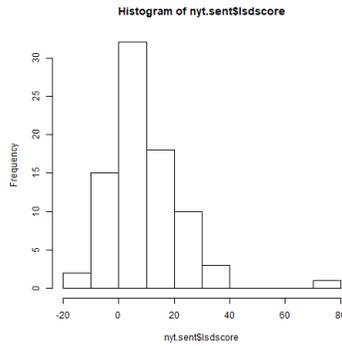


Figure 5: Histogram of Summed LSD Sentiment Scores

2015],<sup>12</sup> a proprietary dictionary available via the `quanteda` package in R. Using `quanteda`'s canned sentiment function and applying the LSD dictionary method yields counts of positive terms, negative terms, double negatives, and positives preceded by negatives for each article. I assume that these four count categories are additive and sum across columns to obtain an *overall* sentiment score for each article.

As is apparent from the histogram in Figure 5, the distribution is heavily left-skewed. I weight the summed results by word count, which discounts the effects of article length, and take the square root to mitigate skewness and temper the discounting effects. Finally, I rescale the results to occupy a more coherent  $[-2, 2]$  range. The entire process can be modeled with the formula  $\alpha \sum_{i=1}^n \left( \frac{x_i}{\sqrt{w_i}} \right)$ , where  $n$  is the number of articles in the set  $\{1..n\}$ ,  $x$  is the summation of all count categories in article  $i$ ,  $w_i$  is article  $i$ 's word count, and the scalar  $\alpha = \frac{2}{\text{argmax}(x)}$ . After rescaling, observed article sentiment ranges between  $[-1, 2]$ , with a mean sentiment of 0.488.

Before comparing articles by country case, I take an additional step. As a method based fundamentally on frequency counts, the LSD dictionary method takes a “bag of words” approach. In essence, it considers the sentiment hard-wired into particular words, disregarding context.<sup>13</sup> Yet we are also interested in the effects of context on readers. Methods to measure context are a hotly debated research program in the field of natural language processing, and n-gram analyses

<sup>12</sup><http://www.lexicoder.com/>

<sup>13</sup>For example, “success” and “achievement” might be coded as positive words, whereas “evil” and “failure” might be coded as negative. Full dictionary lists can be quite exhaustive. In our case, the LSD dictionary was compiled by the authors specifically for news media applications.

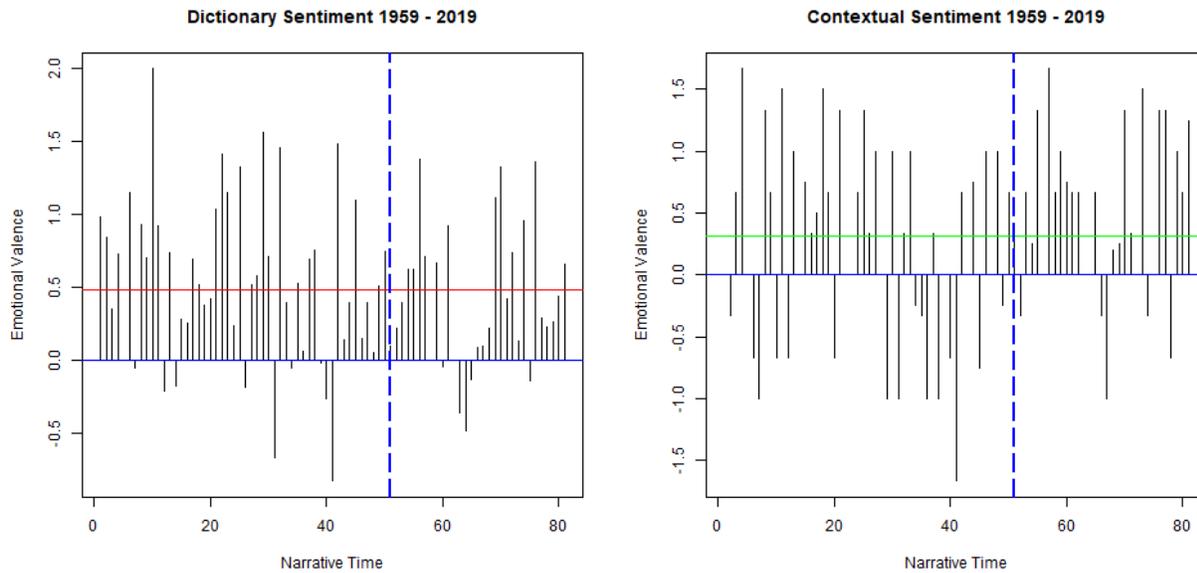


Figure 6: Article sentiment for dictionary (top) and context (bottom). Dashed vertical line indicates cutpoint between Soviet (left) and China (right) stories.

Preceding Text	Object	Succeeding Text
he added. Dr. Welsh termed the launching of	<b>Lunik</b>	IV an initial step in a very well organized
flag had been placed on the lunar surface. Finally	<b>Lunik</b>	I served to enhance interest in the icebreaking trip Politburo
propaganda gains from its historic lunar achievements.	<b>Lunik</b>	II gave Nikita S. Khrushchev much to boast about
about the successes and downplay any failures. What does	<b>Chang'e</b>	mean? In Chinese mythology, Chang'e is the goddess
has since carried out four more manned missions. The	<b>Chang'e</b>	lunar exploration program, named after a moon goddess
of landing on the moon has finally been realized with	<b>Chang'e</b>	said the China News Service, a state-run

Table 3: Keywords in Context Sample

beyond combinations of two or three words are both tricky and extremely computationally intensive. Another approach is to survey human readers, a method adopted in previous studies of media sentiment [Young and Soroka 2012].<sup>14</sup>

<sup>14</sup>This method is not without its shortcomings, as there is no way to know whether readers in time  $t$  have been primed by recent news or conversations outside of the context of the study prior to taking the survey. Dictionary methods compiled in time  $t - 1$  (upon which an n-gram analysis would be premised) are not subject to such shortcomings because they ask respondents to evaluate a given word in isolation from other words; n-gram analysis then attempts to reconstruct context. However, as stated, multi-gram approaches are complicated and rely on strong assumptions about the ability of the machine to accurately reconstruct complex speech patterns. They may also be subject to “topic drift” – differences in language usage between the time a document was written (1959–1960s) and the time the dictionary was scored (in this case, 2015).