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What's the Story? National Media Coverage of Higher Education in Canada

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Executive Summary

Introduction

Education is consistently one of the least covered topics in the Canadian news media. According to Influence Communication, a Canadian research firm, only 0.16% of 10.9 million stories published or broadcast in Canadian media in 2014 concerned education, both the K-12 and postsecondary education sectors (Influence Communication, 2014).

However, research has found that news coverage of more specific policy areas, such as the environment or health, has stronger effects on public perception than coverage of broad policy issues such as the economy and jobs (Brown, 2010; Kingdon, 2003; Soroka, 2002). An evaluation of the frequency and tone of media coverage of postsecondary education (PSE) in Canada can thus yield valuable insights about public awareness and opinions of this sector.

Research Question

How has coverage of Canadian postsecondary education in the Canadian media changed over the last 15 years?

We begin with a “bird’s eye view” of trends in frequency and tone of media coverage of PSE. Next, we focus in on eight key issues: cost, enrolment, skills and training, research, labour issues, programs and curriculum, government policy, and tuition. Finally, we examine regional variation in coverage.

Methodology

Our dataset was collected by Infomart, a division of Postmedia Network Inc. It consisted of thousands of Canadian news articles related to postsecondary education, spanning the years from 1995 to 2015. Articles were sourced from the following newspapers: The Telegram (St. John's), Maclean's Magazine, Montreal Gazette, Vancouver Sun, Ottawa Citizen, Toronto Star, Whitehorse Daily Star, Edmonton Journal, Regina Leader-Post, Daily Gleaner (Fredericton), Winnipeg Free Press, Calgary Herald, The Globe and Mail, Financial Post, and National Post.

These news outlets were selected by the Higher Education Quality Council of Ontario (HEQCO) in order to capture the largest circulation newspapers in major markets across the country, as well as magazines and newspapers with a national focus. HEQCO determined that the study would be limited to print media materials. While broadcast coverage is also worthy of examination, inconsistent archiving makes a comprehensive historical comparison difficult. Social media is another possible area for examination, but its relatively short history and radically different content structure makes comparisons to traditional media both impractical and potentially misleading.

For data consistency reasons, we began by removing articles published prior to 1999. Next, we used text-processing algorithms to convert the remaining corpus of articles into a data format suitable for computer analysis. Our final dataset consisted of approximately 500,000 news articles.

Due to the large number of articles in our database, we applied automated content-analysis techniques to make inferences about media coverage of postsecondary education. These text mining methods aim to classify documents into categories (Grimmer & Steward, 2013). However, there are two general approaches to this task. Algorithms that organize a collection of texts according to a scheme predefined by the researcher are commonly called supervised machine learning (Sebastiani, 2002). Algorithms that accomplish the same task by discovering categories of related documents within the collection are termed unsupervised machine learning (Blei, 2012).

We used supervised learning techniques to filter our database by classifying each article as being either about postsecondary education or not. Next, we developed an unsupervised learning algorithm to classify the remaining articles into topics, and matched these topics with our eight issues of interest. We explored these topics using network graphs, word clouds and other visualizations. We also interpreted trends within these eight topics based on the content of the articles.

Results

General

- Coverage of postsecondary education in the Canadian media has been trending downward since the mid-2000s.
- Coverage fluctuates in a seasonal pattern that coincides with the academic year: it is highest in the fall and spring, and lowest over the summer months.
- In addition to the eight key issues studied, our analysis uncovered four additional clusters of interest: scholarships and awards; plagiarism and legal issues; the societal and community role of PSE; and campus safety and security.

Key Issues

- Government policy is the central topic of coverage.
- Policy changes, budgets and elections at both the provincial and federal level prompt increased coverage of postsecondary education.
- Coverage of skills and training has increased since 1999, the sole topic of the eight we studied to do so.
- Tuition experienced the strongest decrease in coverage, except for a brief period during the Quebec student strikes of 2012–2013.
- Media coverage of labour issues and tuition is consistently negative in tone.
- Coverage of skills and training is consistently positive.

Regional Differences

- Labour issues are more likely to be covered by the media in Ontario.
- Coverage of tuition is more likely in Quebec.
- Significant provincial events, such as the Ontario double cohort and the Quebec student strikes, affect coverage trends across Canada as a whole.

Introduction

Education is consistently one of the least-covered topics in the Canadian news media. According to Influence Communication, a Canadian research firm, only 0.16% of 10.9 million stories published or broadcast in Canadian media in 2014 concerned education, both the K-12 and postsecondary education (PSE) sectors (Influence Communication, 2014). However, research has found that news coverage of specific policy areas, such as the environment or health, can have stronger effects on public perception than coverage of broad policy issues such as the economy and jobs (Brown, 2010; Kingdon, 2003; Soroka, 2002). An evaluation of media coverage of postsecondary education policy can thus yield valuable insights about public awareness and opinions of this sector.

This paper investigates how media coverage of postsecondary education in Canada has changed over the past 15 years. Utilizing computerization to analyze a very large dataset of print media, we present a “bird’s eye view” of the frequency and tone of news coverage across key issues identified by the Higher Education Quality Council of Ontario (HEQCO).

We begin with an outline of our research question, data preparation, and data analysis. We present our results in a variety of formats — graphs, timelines, topic word clouds and network charts — and interpret these data in their historical context to provide a multifaceted look at trends in news coverage of postsecondary education in Canada.

Research Question

Media coverage significantly affects public awareness and assessments of policy issues. The evidence indicates that the frequency of news coverage matters above all, though tone plays a significant supporting role.

In this paper, we address the following research question: how has coverage of Canadian postsecondary education in the Canadian media changed over the last 15 years?

We focus on coverage of eight issues identified by HEQCO for their potential importance:

Table 1: Key Issues in PSE Media Coverage Selected for Study

Cost	Labour
Enrolment	Programs and Curriculum
Jobs and Skills/Training	Government Policy
Research	Tuition

For each issue, we investigate the frequency and tone of media coverage over time, as well as the components of each topic that dominate coverage. We also examine variation across these topics between regions of Canada. In addition to mapping these variables over a 15-year time frame, we identify and attempt to explain significant breakpoints in coverage.

Methodology

Data Preparation

Our dataset was provided by HEQCO and was collected by Infomart, a division of Postmedia Network Inc. It consisted of a *corpus* (a collection of written texts) of thousands of Canadian news articles related to postsecondary education, spanning the years from 1995 to 2015. These articles (both print and online) were sourced from a variety of local and national newspapers: *The Telegram* (St. John's), *Maclean's Magazine*, *Montreal Gazette*, *Vancouver Sun*, *Ottawa Citizen*, *Toronto Star*, *Whitehorse Daily Star*, *Edmonton Journal*, *Regina Leader-Post*, *Daily Gleaner* (Fredericton), *Winnipeg Free Press*, *Calgary Herald*, *The Globe and Mail*, *Financial Post*, and *National Post*. We removed articles prior to 1999 for consistency reasons, as very few articles were included from 1995 to 1999.

These news outlets were selected by HEQCO in order to capture the largest circulation newspapers in major markets across the country, as well as magazines and newspapers with a national focus. HEQCO determined that the study would be limited to print media from this time frame. While broadcast coverage is also worthy of examination, inconsistent archiving makes a comprehensive historical comparison difficult. Social media is another possible area for examination, but its relatively short history and radically different content structure make comparisons to traditional media both impractical and potentially misleading.

Infomart also provided Excel spreadsheet files of additional information, or "metadata," about each article, such as whether it appeared in print or online. The most important of these metadata categories for our analysis was a computerized measure of tone (positive or negative) provided by Infomart. We acknowledge, however, that in examining tone, certain topics are de facto negative, such as labour disputes or tuition protests, inevitably rendering most media coverage of these topics as negative even before the reporter begins to write. Further, computing tone or sentiment can seem deceptively unambiguous when compared to the highly subjective considerations of a human analyst — an approach that was impractical given the extremely large number of articles in our data base.

The initial structure of this corpus consisted of numerous PDF files, each containing more than a thousand articles. Although PDF is a convenient format for reading, it is not optimal for computer processing. We thus converted the PDF documents to "clean" text with a program that removed all formatting and presentation information, retaining only the actual newspaper articles as a sequence of characters.

Next, we transformed this clean text into a database using a computerized process known as *parsing*. Parsing is the process by which a string of characters is analyzed by a computer and categorized into formal, meaningful parts. For example, a basic sentence-parsing algorithm takes a sentence and outputs the parts of speech associated with each word in the sentence, such as noun or verb.

In our case, we needed a parser to identify individual news articles and their components. This required complex pattern recognition, as the structure and components of each news article can vary. We created an algorithm to first identify the boundaries between articles, and second discern the components that each article contains, such as title, newspaper name, and date of publication. Each article was then linked with the additional metadata from its related spreadsheet. Finally, words in the text and titles of articles were *stemmed*, or stripped of suffixes like "ed" or "ing" leaving the root of the word intact. The stemming process ensures words with the same base meaning are counted together, increasing the reliability of our results.

Table 2 shows an example parse of a news article found in our corpus. The left column of the table contains the original text of the article, with each row containing one line of text. The right column shows the corresponding labels assigned by our parser to each line. These labels allow us to separate out the components of each article for data analysis purposes.

Overall, our corpus contained approximately 500,000 articles, with a calculated error rate — the number of articles we might have missed during processing — no larger than 0.1%.

Figure 1: Data Preparation Workflow

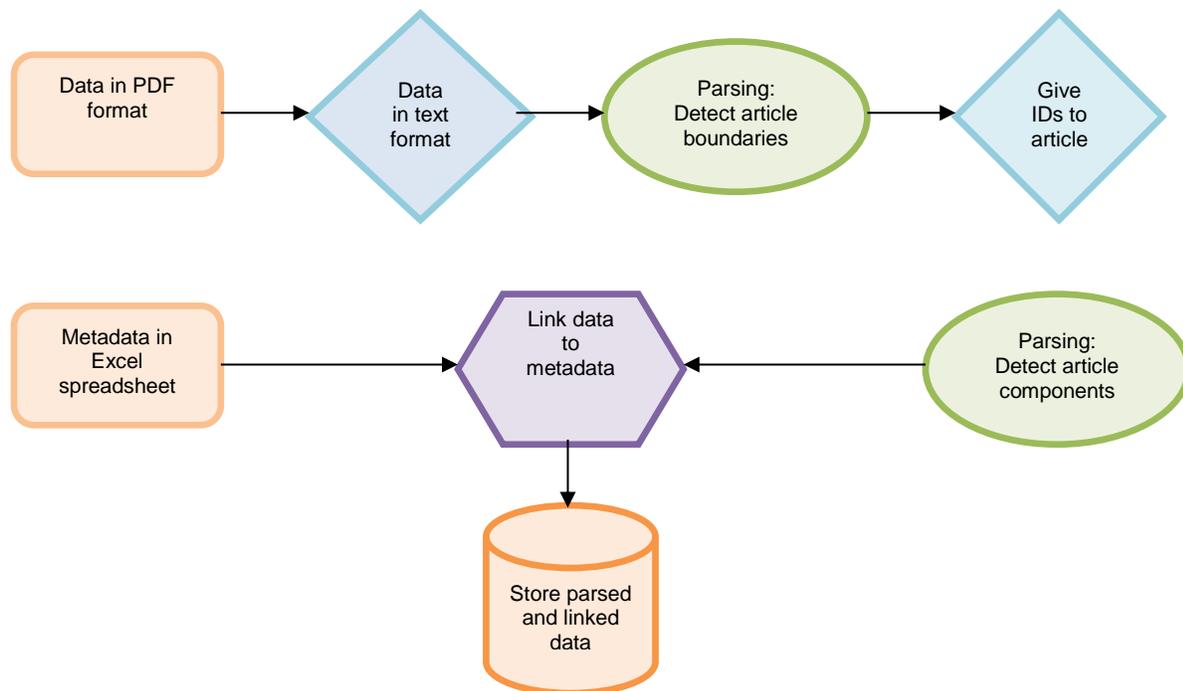


Table 2: Example of Parsed Article

Loss of buildings symbolic blow	Title
The Regina Leader-Post	Newspaper
Fri Jan 15 2010	Date
Page: D6	Page
Source: Canwest News Service	Source
In a country plagued by poverty and unrest, they	Article text
stood for years as potent symbols of hope, history	Article text
and nationalism.	Article text
Length: 404 words	Length
Tone: Neutral	Tone
Reach: 49593	Reach

This table shows an example parse of a news article found in our corpus. The left column of the table contains the original text of the article, with each row containing one line of text. The right column shows the corresponding labels assigned by our parser to each line. These labels allow us to separate out the components of each article for data analysis purposes. Colours in the left hand column visually identify which rows share a topic.

Data Analysis

Due to the large number of articles in our database, we applied automated content-analysis techniques to make inferences about media coverage of postsecondary education. These *text mining* methods aim to classify documents into categories (Grimmer & Steward, 2013). However, there are two general approaches to this task. Algorithms that organize a collection of texts according to a scheme predefined by the researcher are commonly called *supervised* machine learning (Sebastiani, 2002). Algorithms that accomplish the same task by discovering latent categories of similar texts within the collection are termed *unsupervised* machine learning (Blei, 2012).

We used supervised machine-learning techniques to track trends in coverage of postsecondary education. In addition, we applied unsupervised methods, more specifically topic modeling, to uncover latent issues that are present in articles about PSE but not predicted by our eight topics. We used this algorithm to increase the resolution of the supervised analysis by separating the interwoven discourses that constitute the more general topic. This topic structure was also analyzed as a network graph of interrelationships between topics.

Studying the coverage of a predefined set of issues amounts to a rather challenging computational task. Blindly applying a supervised learning algorithm is ineffective because it requires "teaching" a computer to distinguish the categories of interest. Teaching consists of providing the learning algorithm enough examples of the topic it needs to detect. This stage is called *training*, in which the algorithm establishes a relation between words *in* the document and the class *of* the document. For example, think of training a similar algorithm to detect email spam. It is very likely that the word "casino" is highly predictive of a document being in the "spam" category, while the word "professor" is much more likely to appear in non-spam emails.

As computers can only learn from examples, we had to provide the learning algorithm with a rather large and representative set of human-coded examples. However, to manually select such a set of examples for each of the issues would be impractical. We would run into the risk of *overfitting*, a common problem in machine learning, where the algorithm has not been provided with enough examples from which to learn. Instead of describing the actual underlying relationship between words and categories, it describes random noise.

To provide the algorithm with sufficient training data, we hand-coded a random sample of about 2,500 articles based on their title and first sentence. Coding each article as either "about" postsecondary education or not is ultimately a judgment call, although most cases were unambiguous. We followed a narrow definition when coding: the article's focus on PSE should be signaled early on, and contain explicit markers such as names of institutions or mentions of specific entities such as "students"; "college"; "universities"; or "tuition."

After reducing the dataset to only those articles that report on PSE-related matters, we used topic modeling to divide it into key issue clusters. Topic modeling is an iterative, unsupervised modeling technique. Topic-modeling algorithms output a distribution of topics likely to be found in any given article. Each topic is identified by a distribution of words that frequently and consistently appear close together in articles. These

word distributions serve as a "fishing net" to catch additional examples of the topic and further refine the accuracy of the topic model as the analysis progresses. The most representative words in each topic's lexicon can be displayed as a word cloud.

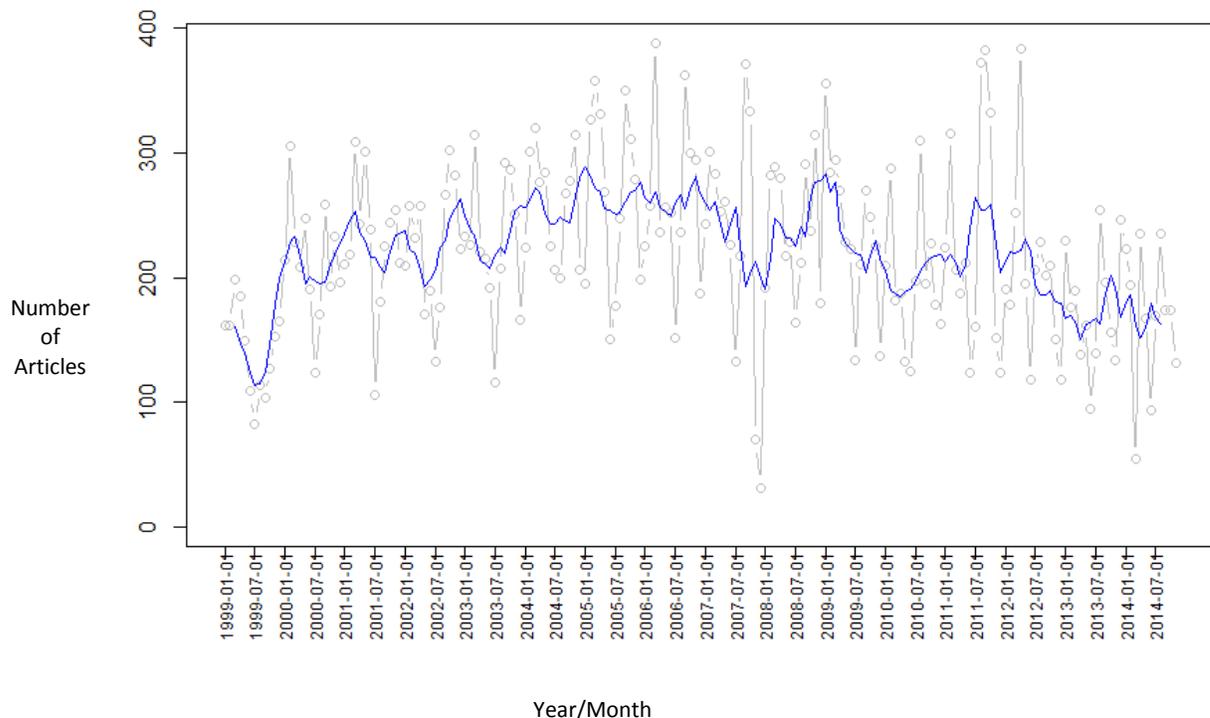
After topic modeling, we computed the relationships between topics and other variables such as the region, tone and year. Finally, our data analysis concluded with time-series analyses, which track across time both the extent and sentiment of media coverage of postsecondary education and allowed us to separate a clear historical trend from yearly fluctuation and noise. We used this time-series analysis to identify important breakpoints in coverage and sentiment, and supplemented this statistical analysis with historical research in order to interpret potential causes of these breaks.

Results

Overview

We begin with a look at general trends in postsecondary education coverage over time. Figure 2 shows the number of articles about postsecondary education per month (represented by the grey circles) together with a weighted average trend line derived from these points. As an estimate, each newspaper in our sample publishes one article about postsecondary education every two days. There is a gradual decrease in absolute coverage since the mid-2000s, a phenomenon we investigate further in Figure 3.

Figure 2: PSE Media Coverage over Time



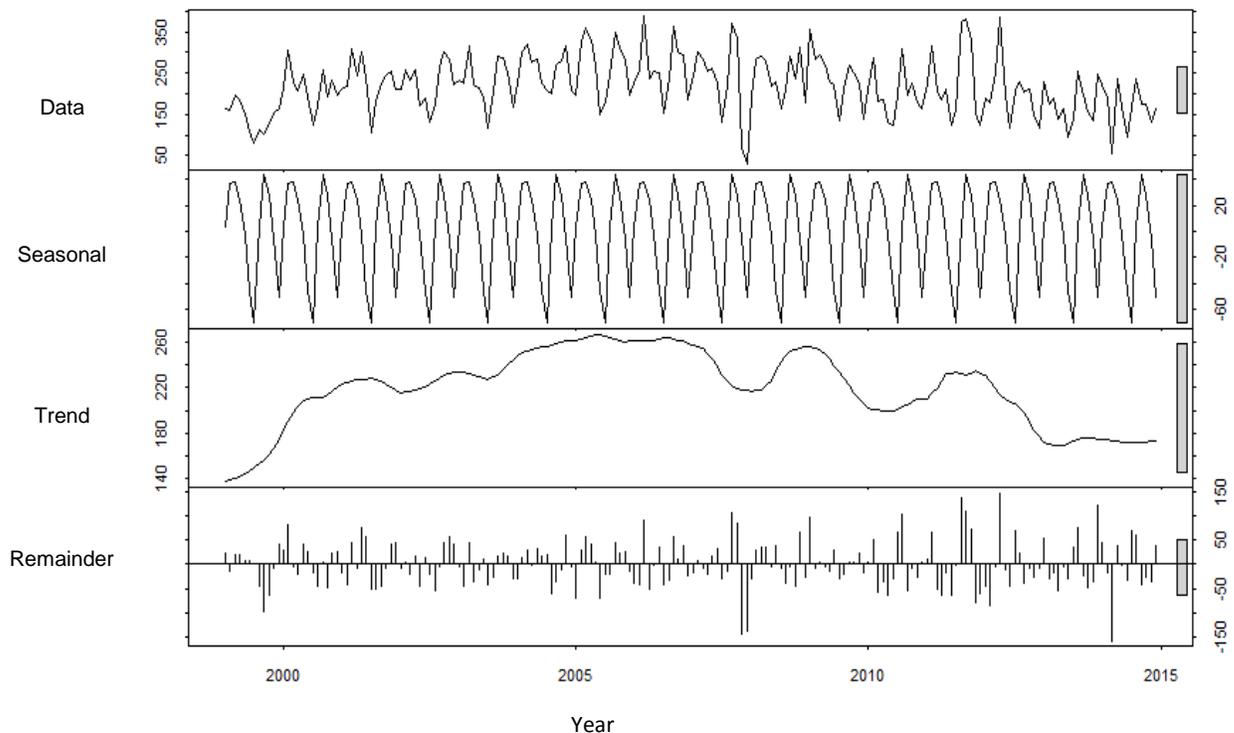
This figure shows the number of articles about postsecondary education per month in our dataset, represented by the grey circles. The blue line is a weighted average trend line derived from these points. The X axis, representing time, is graduated every six months.

We use time-series decomposition analysis to separate out components of the downward trend shown in Figure 2. The first pane of the decomposition analysis in Figure 3 shows the original data observations (“Data”). The second pane shows the seasonal, cyclical fluctuation present in the data (“Seasonal”). The third pane shows the underlying trend component of the data (“Trend”). The final pane shows the remainder of the decomposition, or “noise” in the data not linked to the trend or seasonal variation (“Remainder”).

Coverage of postsecondary education contains a clear cyclical component. Higher levels of media attention are visible in April and November, while coverage tails off over the summer months. This attention cycle corresponds approximately to the beginning and end of the academic year; when students are undergoing transition in and out of the system, postsecondary education is most visible in the media.

The decomposed Trend in Figure 3 provides a more refined trend estimate of postsecondary media coverage over time than the simple moving average shown in Figure 2. Coverage of PSE is stable during the mid-2000s, followed by a sharp decrease in 2008 likely attributable to the financial crisis of that year. This decrease marks the beginning of a downward trend in coverage of PSE until the end of our data period in 2015, interspersed with some apparent spikes in 2009 and 2011–2012.

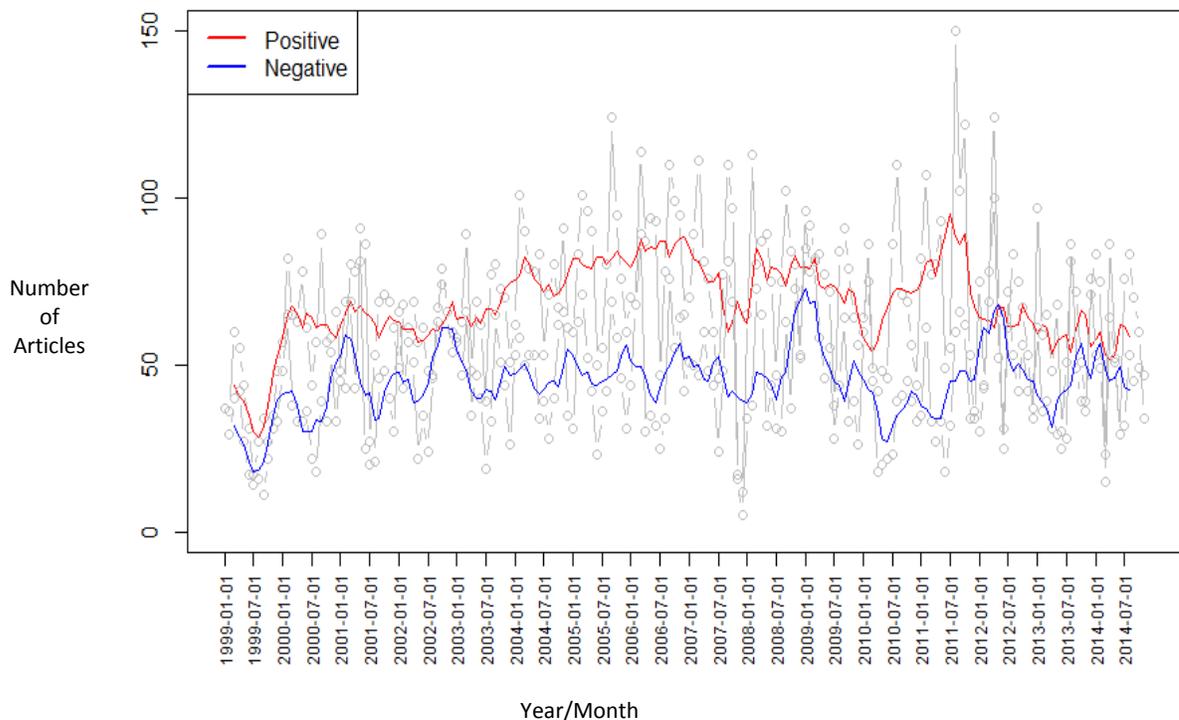
Figure 3: Time-Series Analysis of PSE Media Coverage over Time



This figure shows a time-series decomposition of the frequency of postsecondary education coverage over time. The first pane of the decomposition shows the original frequency data (“Data”). The second pane shows the seasonal, cyclical fluctuation present in the data (“Seasonal”). The third pane shows the underlying trend component of the data (“Trend”). The final pane shows the remainder of the decomposition, or “noise” in the data not linked to the trend or seasonal variation (“Remainder”).

Is coverage of PSE getting more positive or more negative? In Figure 4, we separate out the moving average trend in the raw coverage data by positive and negative tone. The spikes in coverage that occur in 2009 and 2012 are significantly negative in tone. As we will investigate further in our topic analysis, the York University strike of 2008–2009 and the Quebec student strikes of 2012–2013 are significant negative coverage events in our dataset.

Figure 4: Tone of PSE Media Coverage over Time



This figure shows the number of articles about postsecondary education per month in our dataset, represented by the grey circles. The red and blue lines are weighted average trend lines of the frequency of positive and negative coverage. The X axis, representing time, is graduated every six months.

To better understand the trends in coverage that we observe, we look more closely at the content of media coverage during this time period. We use an unsupervised learning approach to uncover latent topics that exist within the text of articles in our dataset. Figure 5 shows the main topics identified by this approach, ranked by the expected proportion of a randomly-selected article text they will cover. These topics are not exclusive of each other: an actual article can contain any number of the topics identified, including zero. Each topic is labelled in the figure by the three words most representative of that topic. For more information on each topic, the complete output of our modelling algorithm is available in Appendix B.

The topics highlighted in yellow are those that represent the eight key issues we selected for closer study. For example, Topic 12, the third most prevalent topic in the dataset, relates to government policy. Topic 10 relates to tuition, and topic 19 to programs and curriculum. As shown, these eight issues cover many of the topics uncovered by our algorithm.

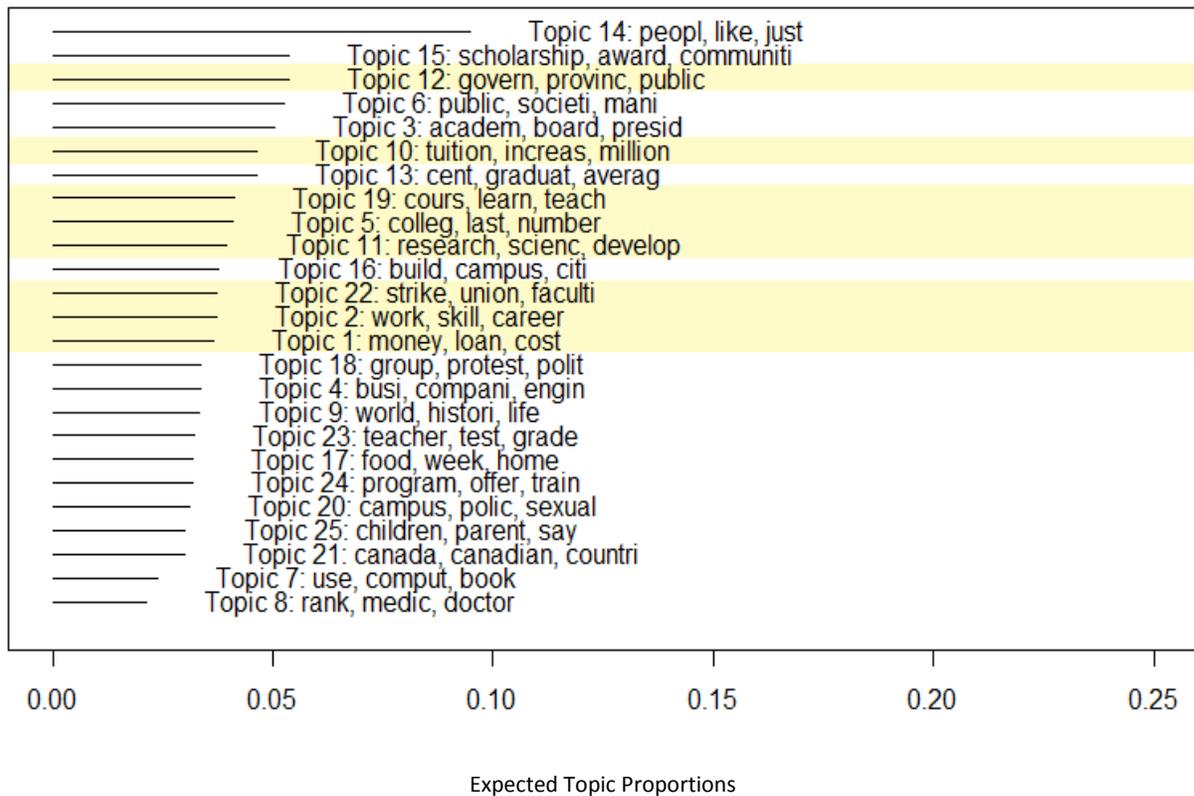
Our topic analysis also suggests some unforeseen topics common to media articles about postsecondary education. Some of these topics reflect coverage of particular program sectors, such as business (Topic 4),

history and general science (Topic 9), medicine (Topic 8) and technology (Topic 7). A few topics reflect themes that have general significance across other PSE topics studied. Topic 18 concerns political action such as protest and voting, while Topic 21 includes references to Canada and the international context. Others reflect "noise" in the data related to particularities of our corpus. For example, Topic 14 categorizes many opinion and editorial articles as a separate topic due to the stylistic choices their authors tend to make. Topic 23 concerns primary- and secondary-school education, reflecting the difficulty involved in completely separating articles about PSE from those concerning other educational sectors during our data preparation.

Of the unforeseen topics produced by our analysis, five in particular are worth highlighting. Topic 15 describes scholarships and awards. Notably, it is the most prevalent topic of PSE coverage in our analysis, and upon closer examination is highly positive in tone. Topic 3, in contrast, is strongly negative. This topic is concerned with plagiarism, legal issues and disciplinary action at postsecondary institutions. Topic 6 concerns the relationship between PSE and society in a more abstract sense, such as the tension between science and religious belief in scholarship. Topic 16 also involves a relationship with society, but in a far less abstract sense: this topic involves the role of institutions as actors in local communities. Student housing, athletic facilities and other investments that not only improve a college campus but provide benefits to the community are some examples encompassed by this topic. Finally, Topic 20 concerns safety at postsecondary institutions, including crime and policing, sexual assault, bullying and the structures created on campuses to deal with these issues.

For additional information on these topics, please refer to Appendices B and C.

Figure 5: Topics Found in PSE Media Coverage



This figure shows the 25 most probable topics of PSE coverage discovered by our topic modelling algorithm, ranked in descending order. The X axis shows the expected proportion of a given topic in an article in our dataset. That is, given a randomly selected article from our PSE corpus, we expect that a certain proportion of words in the article will reflect each topic, on average (Roberts et al., 2014). Each topic is labelled by the three words most representative of that topic. The topics highlighted in yellow are those that represent the eight issues selected for closer study.

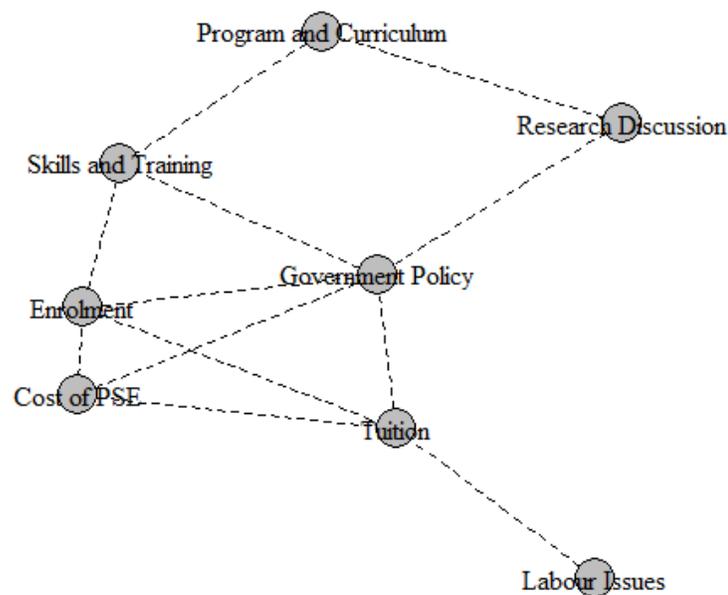
Returning to our selected topics of study, we transform our topic model into a network graph in order to better understand the relationships between these topics. In Figure 6, each of the eight topics is plotted as a node. Nodes are connected with an edge to other nodes if the topics correlate, meaning they often appear in the same news articles together.

Government policy is the central topic node in the graph, since it correlates with more topics (five) than any other node. The remaining topics split into two general groups: Enrolment, Cost and Tuition form one general group, and Programs and Curriculum, Skills and Training, and Research the second. These clusters group together “inputs” and “outputs” to the postsecondary education system, with government policy at the nexus.

Enrolment also bridges the two general groups. As we will discuss later in our topic analysis, this is likely due to the centrality of colleges to both the Enrolment and Skills and Training topics. Finally, the Labour Issues topic appears almost on its own, connected only to the main network via Tuition. This likely reflects the explicit connection made by participants in labour action between, for example, salaries and working conditions for TAs and sessional instructors, and tuition fees for graduate students (Rybak, 2009).

For a network graph including additional latent topics, please refer to Appendix C.

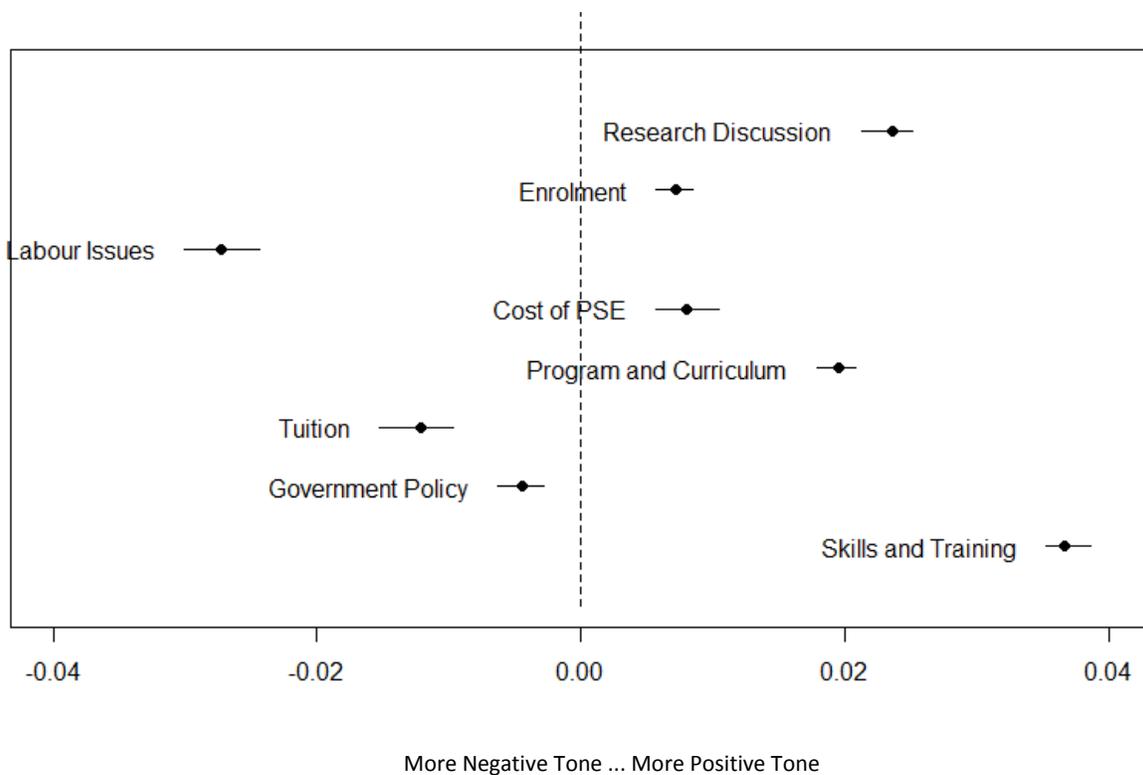
Figure 6: Network Relationship of PSE Media Coverage Topics



This figure is a network graph of the eight PSE topics studied. Each topic is plotted as a node, represented by a grey circle. Nodes are connected with an edge (dotted line) to other nodes if the topics correlate, meaning they often appear in the same news articles together.

In Figure 7, we graph the average difference in topic proportion by tone of each topic in our set. As noted earlier, Labour Issues is a very negatively-charged topic of media coverage. Tuition comes in second place for negative tone, and Government Policy in third as slightly negative on average. On the other hand, Skills and Training is an overwhelmingly positive subject of media coverage, followed by Research Discussion. For a graph of coverage tone including additional latent topics, please refer to Appendix C.

Figure 7: Tone of Media Coverage of PSE by Topic



This figure shows the average difference in topic proportion by tone of the eight PSE topics studied. That is, given two randomly selected articles from our PSE corpus, one of which is coded "Positive" in tone and one "Negative" in tone, the value along the X axis represents the difference between the proportion of words in each article about that given topic, on average.

As our next step, we focus more closely on each of the eight topics. We show each topic as a word cloud of the 15 most representative words within that topic; the font size of the words is proportional to their importance. We examine the trend of coverage within each topic over time, both as a whole and according to tone. Based on a manual review of the texts of articles classified into each topic, we offer some general interpretations of the trends we observe.

Cost

Figure 8: "Cost" Topic Word Cloud



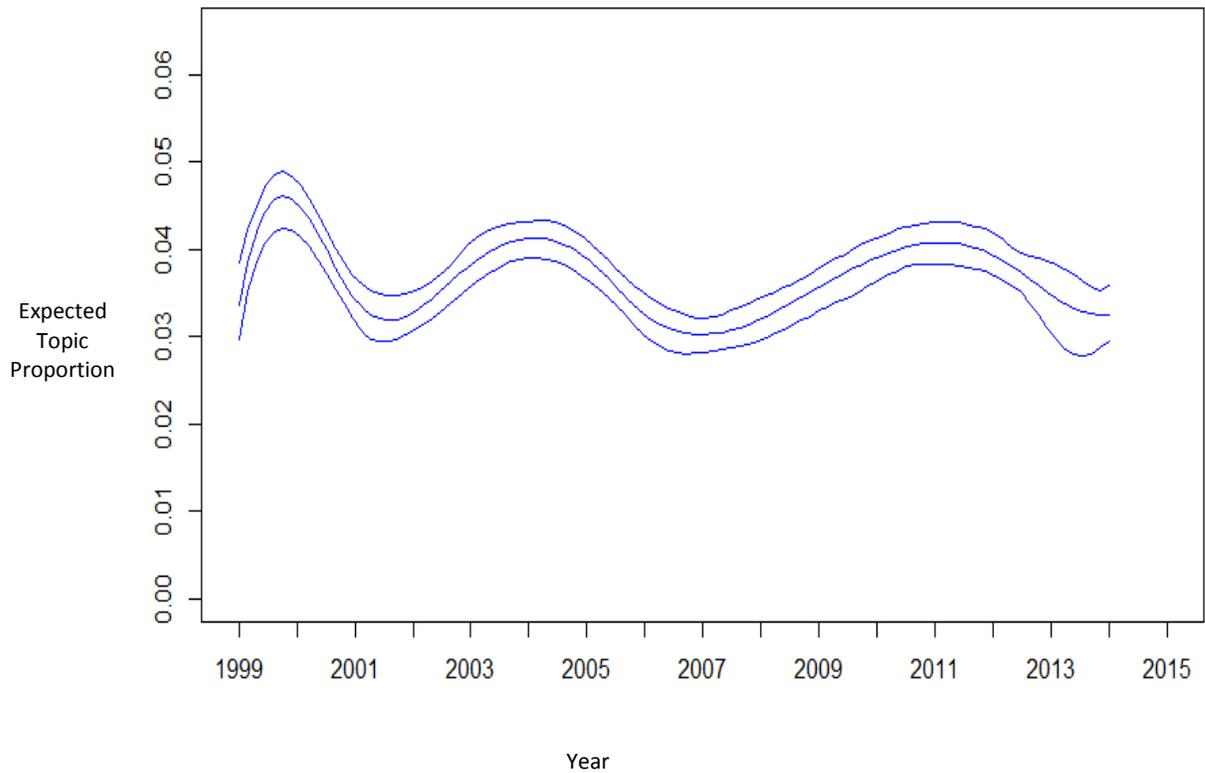
This figure shows a word cloud of the 15 most representative words within the "Cost" topic. The font size represents their relative importance.

Media coverage of the cost of postsecondary education, shown in Figures 9 and 10, revolves around policy changes and elections. A spike in negative coverage in 2000 reflected criticism of both the federal government and provincial governments, Ontario in particular. Critics argued that the turn of the new millennium combined with an economic recovery necessitated reinvestment in postsecondary education to offset cuts made in the mid-1990s ("Tough choices on university funds," 2000).

In Ontario, the Conservative government advanced a controversial overhaul of the postsecondary education system in that year, including the decision to permit private degree-granting institutions (McCarten, 2000; Mackie 2000). The Rae Report, prepared over 2004–2005 (Rae, 2005), once again drew attention to the lack of growth in provincial spending on higher education in Ontario under the Conservative government (Brown, 2004). Federal elections in 2000 and 2004 also drew attention to postsecondary education cost issues. The 2004 Budget introduced an array of new programs such as Canada Learning Bonds for low-income Canadians (Tuck, 2004), enhanced financial-aid and debt-reduction measures for students, and increased spending on the federal granting councils.

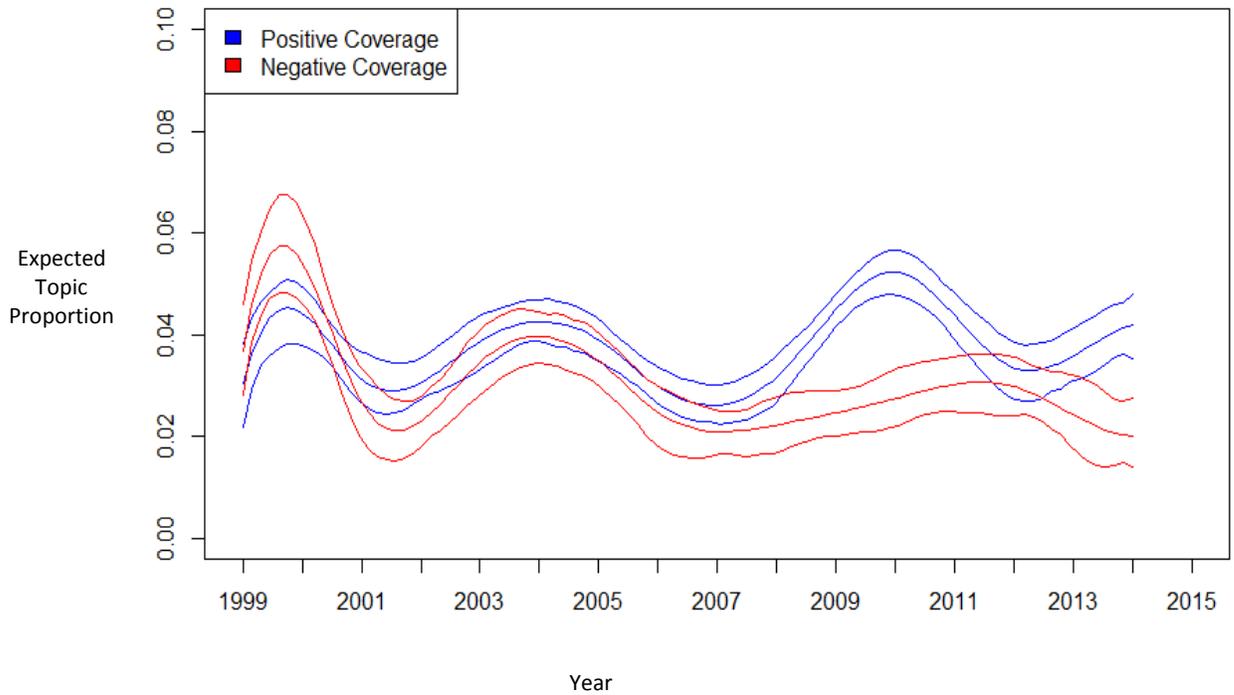
A third peak in coverage from 2010–2012 shows a more complex pattern of positive and negative tone. The negative component coincides with the 2012–2013 Quebec student protests and strike, which put the rising costs of tuition for Quebec students in the national spotlight (Seguin, 2012). The earlier, positive component of the peak is related to successive election campaigns over 2010–2011. During his leadership campaign and the subsequent 2011 federal election, Liberal leader Michael Ignatieff emphasized postsecondary education funding as a central component of his platform (Fitzpatrick, 2011). Also in 2011, Ontario, Manitoba, and Saskatchewan held elections, while Alberta and British Columbia saw a transition in leadership within the governing party. When the overall coverage trend is examined on a monthly basis by province, successive peaks in volume of coverage correspond to these election events.

Figure 9: Cost PSE Media Coverage



This figure shows the moving average trend of expected proportion of the "Cost" topic on the Y axis, over time on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

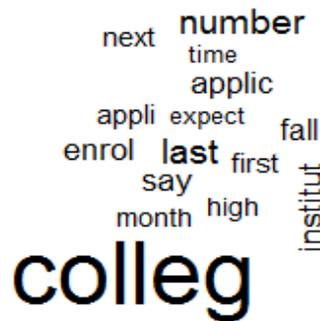
Figure 10: Tone of Cost PSE Media Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Cost" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Enrolment

Figure 11: "Enrolment" Topic Word Cloud

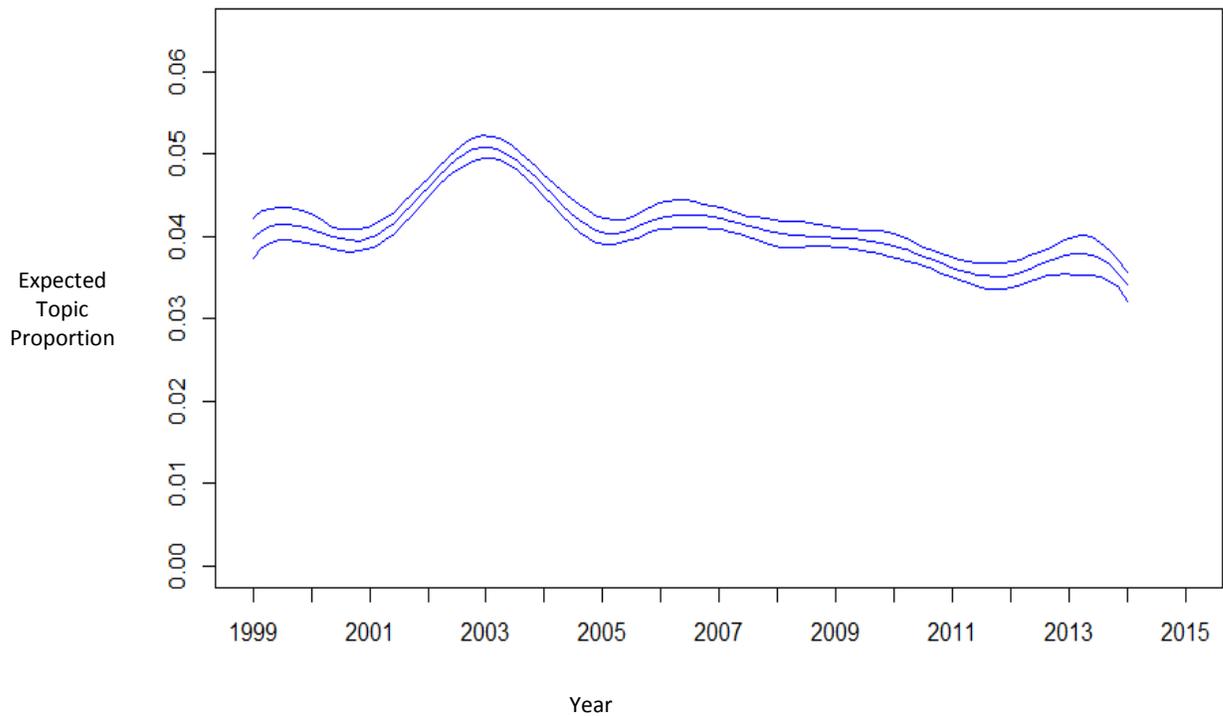


This figure shows a word cloud of the 15 most representative words within the "Enrolment" topic. The font size represents their relative importance.

Media coverage of enrolment in postsecondary education is overwhelmingly centred on the college sector, as shown in Figure 11. The position of the Enrolment topic in our network map (Figure 6) provides one hint as to why this is the case. Enrolment links together the Skills and Training topic with both Government Policy and Cost, and colleges are the main institutions where skills and training programs are offered. Articles classified in this category are often sourced from government press releases. One such example covered a 2006 decision to fund additional distance learning centres in Northern Ontario to increase postsecondary enrolment (Alphonso, 2006).

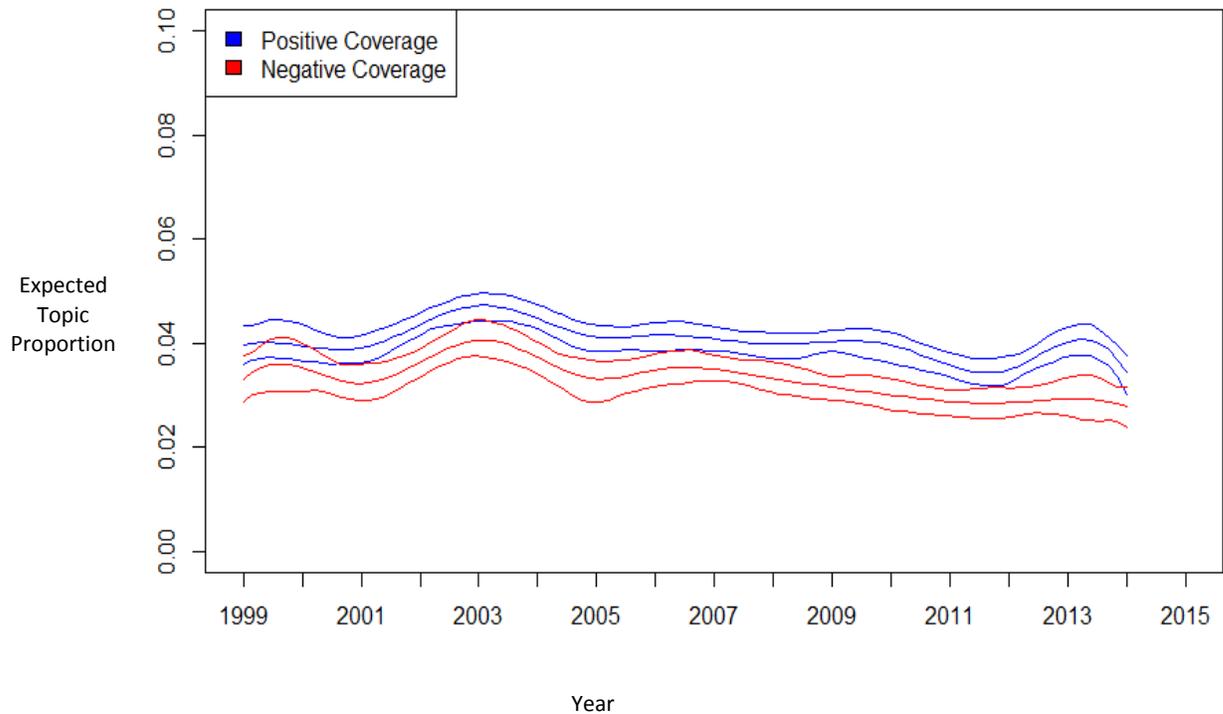
Unlike more controversial topics such as cost, the tone of enrolment coverage (Figure 13) does not follow any significant trend. Notably, a significant peak in overall coverage appears in 2003, overwhelmingly attributable to the "double cohort" in Ontario following the elimination of Grade 13 ("Double cohort students start flocking to community colleges," 2003).

Figure 12: Enrolment PSE Media Coverage



This figure shows the moving average trend of expected proportion of the "Enrolment" topic on the Y axis, over time on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

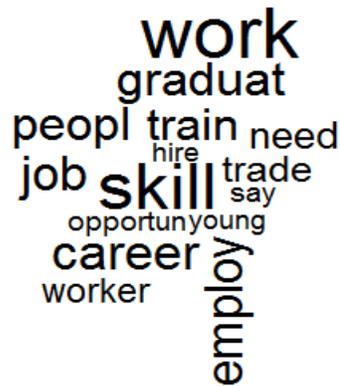
Figure 13: Tone of Enrolment PSE Media Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Enrolment" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Skills and Training

Figure 14: Skills and Training” Topic Word Cloud

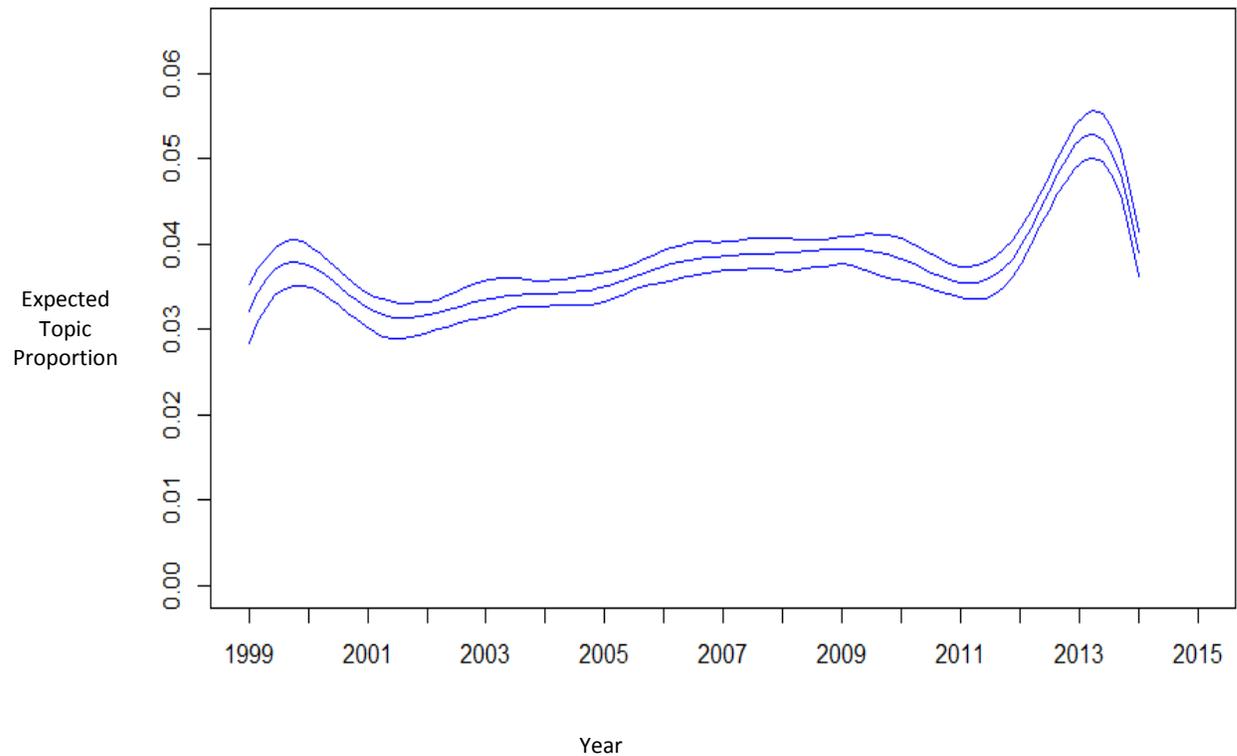


This figure shows a word cloud of the 15 most representative words within the "Skills and Training" topic. The font size represents their relative importance.

As shown earlier in Figure 7, where we compare average tone across the eight key issues, Skills and Training is by far the most positive topic in our postsecondary media-coverage analysis. Additionally, Skills and Training is the only one of the eight to show an upward trend in coverage over time. This is particularly noticeable during the Great Recession, when coverage of skills and training became more frequent and positive overall in contrast to all other topics studied.

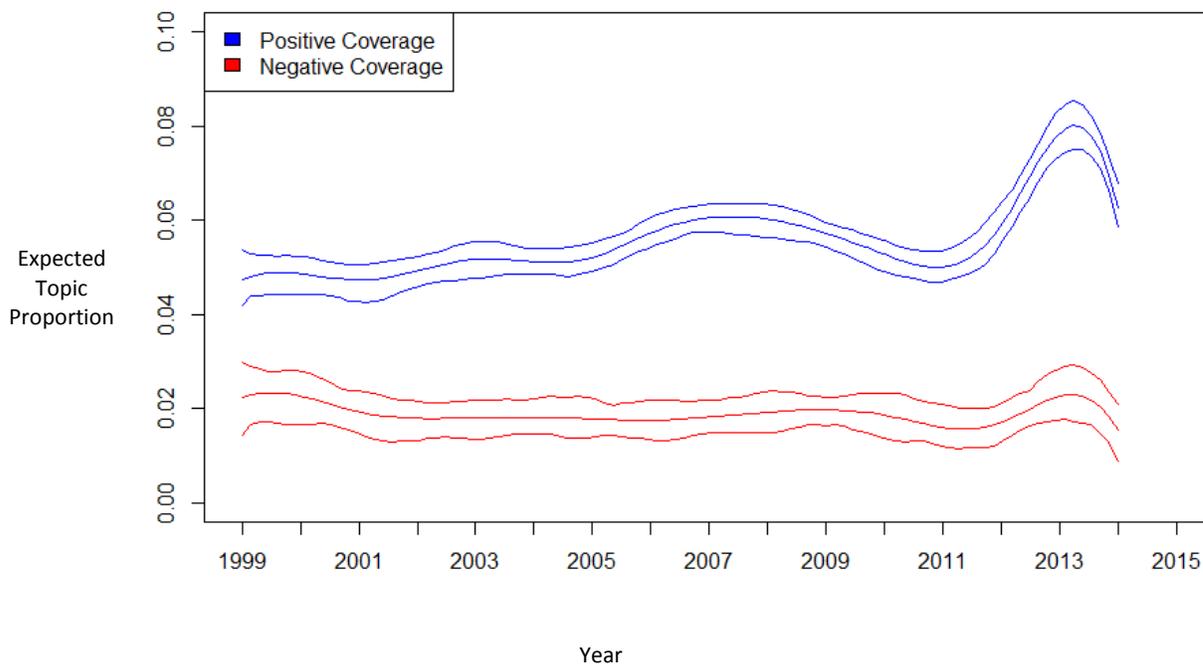
A significant peak in coverage occurs in 2013, which, when disaggregated by tone in Figure 16, is overwhelmingly positive. This peak coincides with the introduction of the Canada Job Grant in the 2013 federal budget, which provided matching federal and provincial funds for job training and apprenticeships, and additional apprenticeship grants ("Budget 2013 – The New Canada Job Grant," 2013; Campion-Smith and Consiglio, 2013).

Figure 15: PSE Media Discussion



This figure shows the moving average trend of expected proportion of the "Skills and Training" topic on the Y axis, over time on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

Figure 16: Tone of Skills and Training PSE Media Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Skills and Training" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Research

Figure 17: "Research" Topic Word Cloud

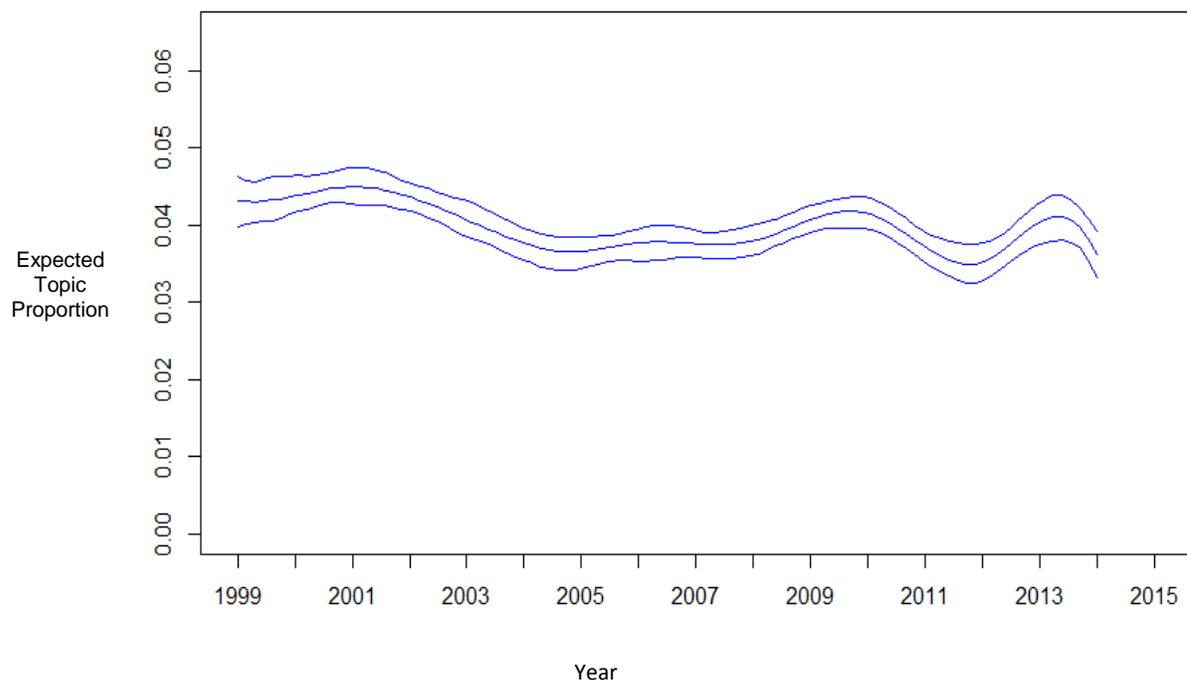


This figure shows a word cloud of the 15 most representative words within the "Research" topic. The font size represents their relative importance.

Apart from a slight downward trend, media coverage of Research has changed little over the time span studied. One noticeable breakpoint occurs in 2013, when criticism of federal government research spending priorities and “muzzling” of government scientists culminated in protests across the country (Makuch, 2013).

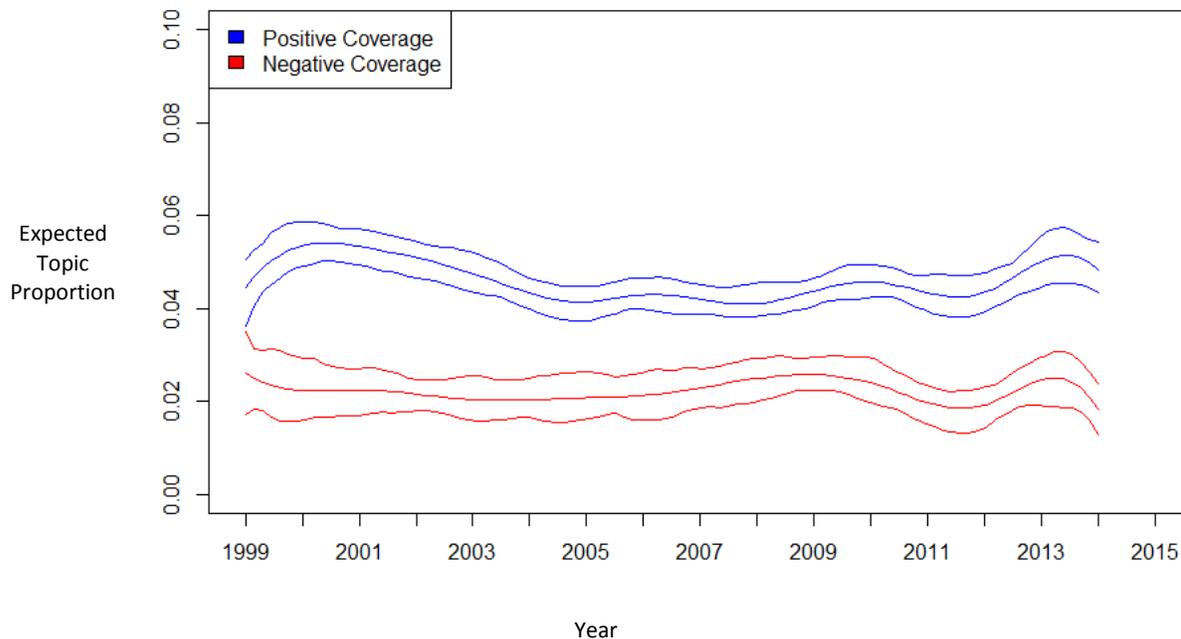
A practical reason accounts for why we find little clear trend in Research coverage over time. Interest articles highlighting new research from Canadian universities, for example in the Health or Science sections of a newspaper, were the most common style of article found in this category. A characteristic example is a 2007 Toronto Star special feature on breakthroughs in a variety of disciplines, from cancer research to astronomy, made at Toronto universities over the previous year (Calamai et al., 2007). Such coverage, while raising the public profile of the scientific contributions made by Canadian universities, is not necessarily related to events in the postsecondary education sector and occurs at relatively constant levels.

Figure 18: Research PSE Media Coverage



This figure shows the moving average trend of expected proportion of the "Research" topic on the Y axis, over time, on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

Figure 19: Tone of Research PSE Media Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Research" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Labour Issues

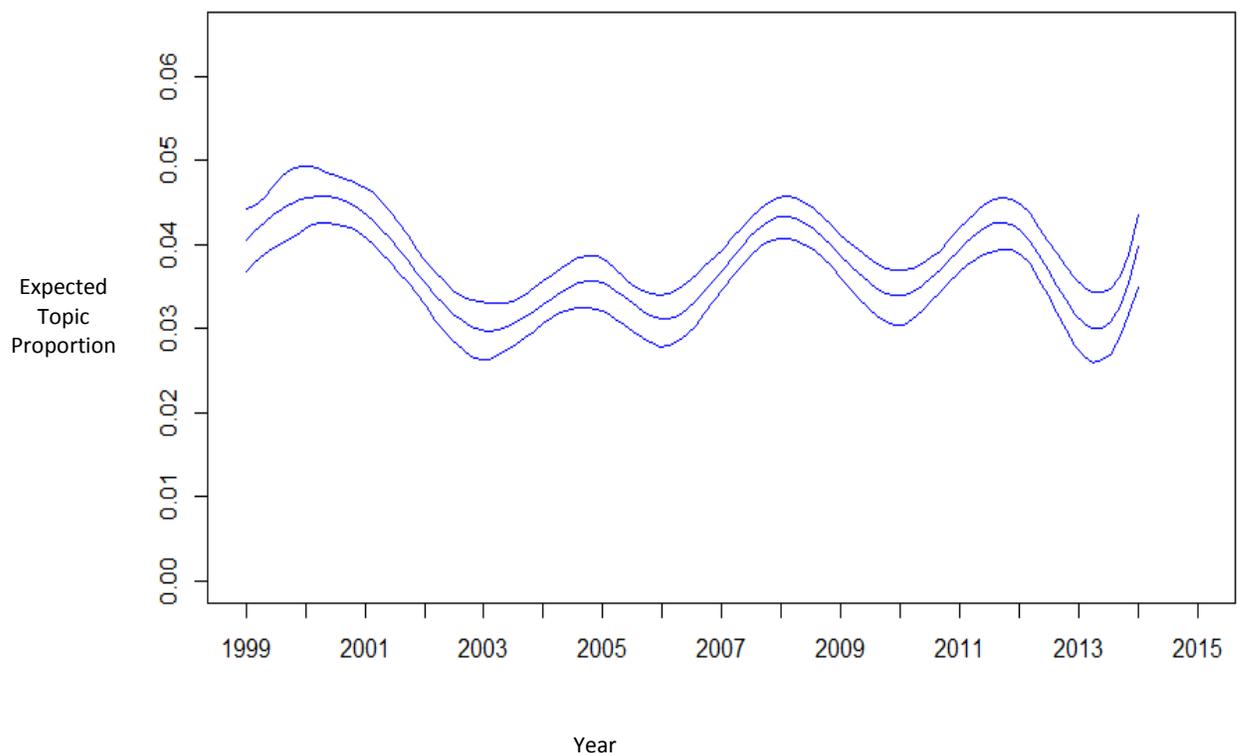
Figure 20: "Labour Issues" Topic Word Cloud



This figure shows a word cloud of the 15 most representative words within the "Labour Issues" topic. The font size represents their relative importance.

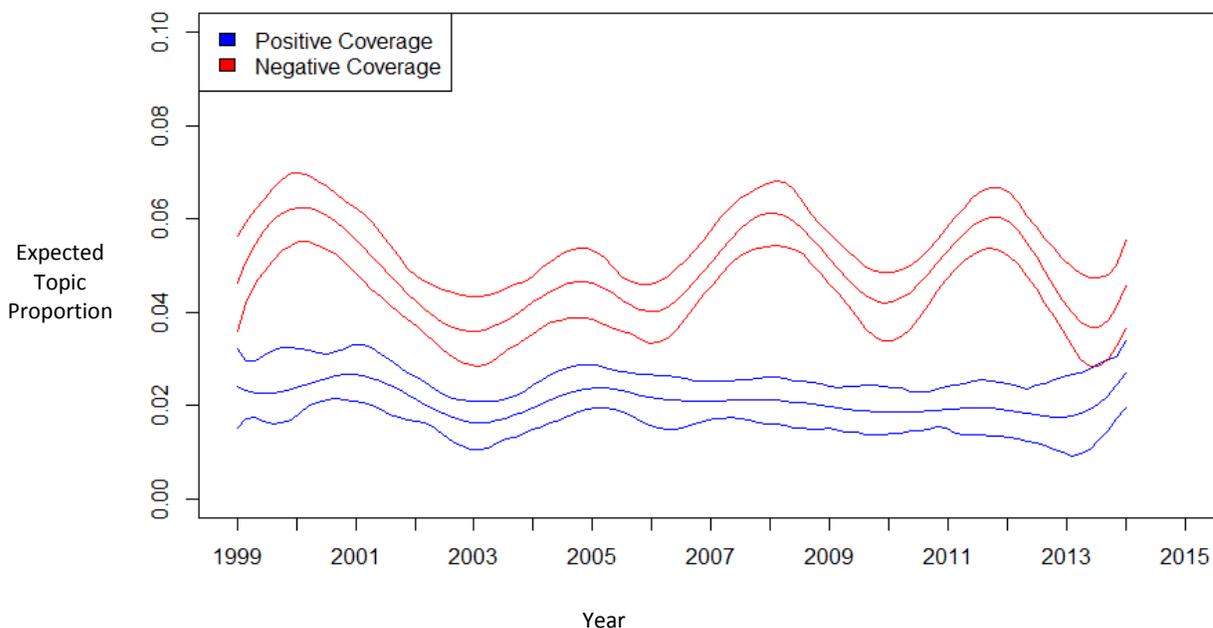
As shown in the topic network graph (Figure 6), Labour Issues is a dense and self-contained topic, not correlated with the other issues we study except for tuition. Coverage of labour issues is extremely uneven, as shown in Figure 21. Spikes in coverage directly coincide with labour disputes and strikes in the postsecondary education sector. Teaching assistants and sessional instructors went on strike at York University and the University of Toronto in 2000, and again at York University in 2008–2009 (Rushowy, 2000; Brown, 2008). A smaller spike in attention occurs in 2004–2005, when Ontario college professors and York University instructors narrowly avoided strikes (Alphonso, 2005; Brown, 2004). The Quebec student strike likewise produces a peak in coverage around 2012. When separated out by tone in Figure 22, coverage in this topic is shown to be overwhelmingly negative. Articles about labour disputes emphasized, for example, the threat posed by strikes to students' graduation and career plans, uncertainty and frustration at continuing labour action, and calls for provincial intervention (Rushowy, 2009).

Figure 21: Labour Issues PSE Media Coverage



This figure shows the moving average trend of expected proportion of the "Labour Issues" topic on the Y axis, over time on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

Figure 22: Tone of Labour Issues PSE Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Labour Issues" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Programs and Curriculum

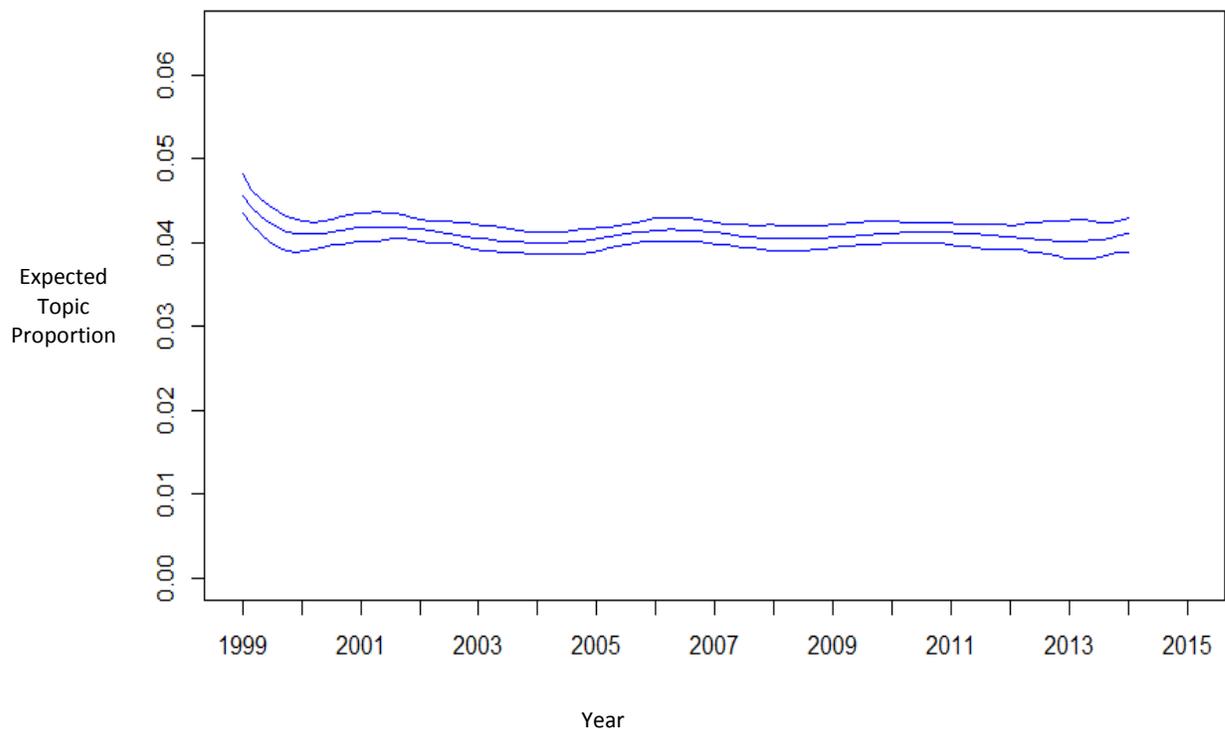
Figure 23: "Programs and Curriculum" Topic Word Cloud



This figure shows a word cloud of the 15 most representative words within the "Programs and Curriculum" topic. The font size represents their relative importance.

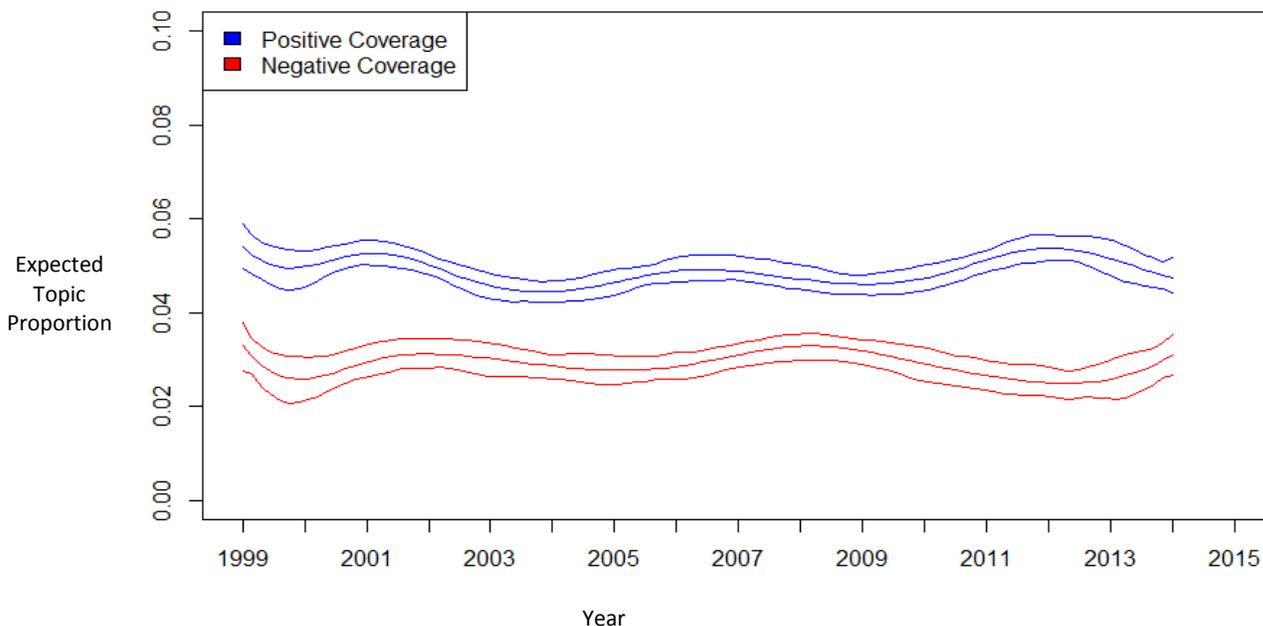
Our analysis of the Programs and Curriculum topic shows no significant trend. The majority of articles classified within this topic were informative and neutral in nature. Typical examples include the introduction of a program in sustainable agriculture at Kwantlen Polytechnic University in British Columbia (Shore, 2010), or First Nations job-training programs sponsored by SAIT in Alberta (Sankey, 2004). One potential explanation for this result is that programming is the least political of the eight topics we study. The introduction of new programs and changes made to existing courses are decisions largely taken within educational institutions themselves, unrelated to the political cycle.

Figure 24: Programs and Curriculum PSE Media Coverage



This figure shows the moving average trend of expected proportion of the "Programs and Curriculum" topic on the Y axis, over time on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

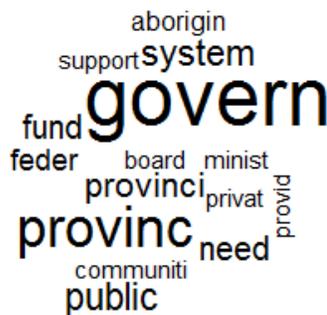
Figure 25: Tone of Programs and Curriculum PSE Media Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Programs and Curriculum" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Government Policy

Figure 26: "Government Policy" Word Cloud



This figure shows a word cloud of the 15 most representative words within the "Government Policy" topic. The font size represents their relative importance.

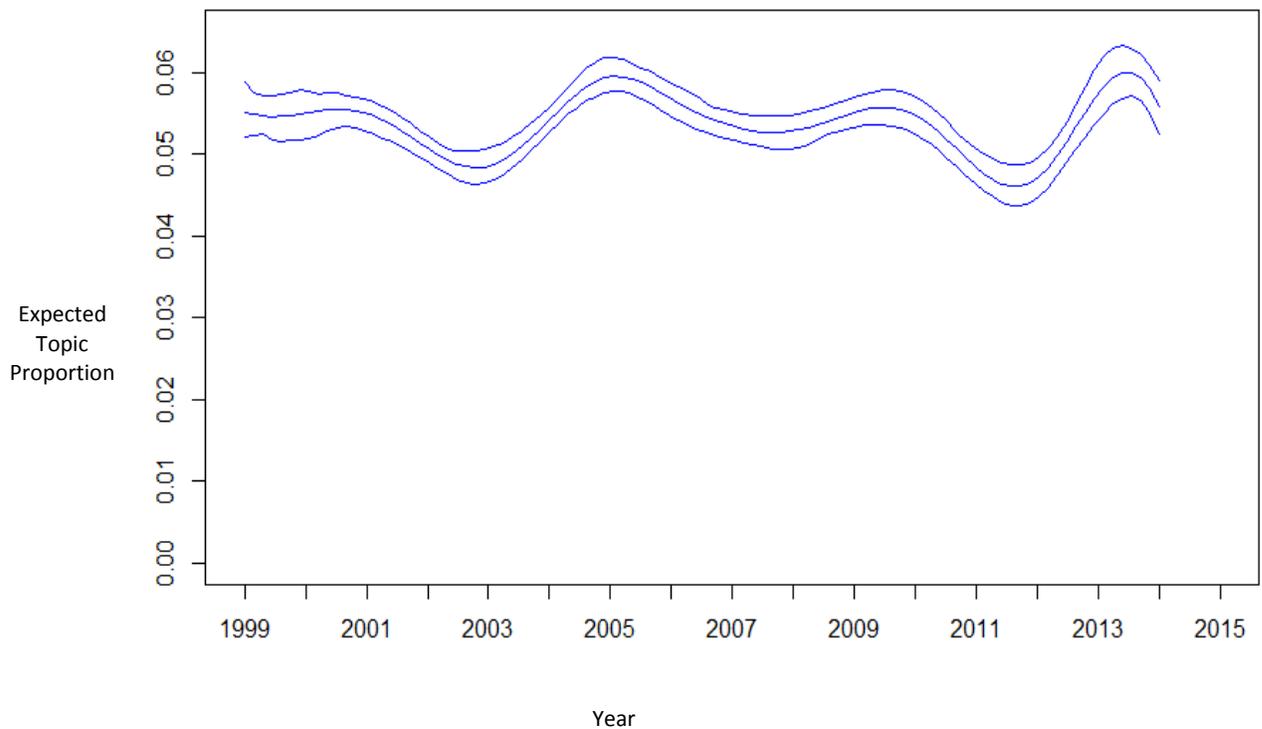
Media discussion of postsecondary education in Canada revolves around government. As previously shown in our initial topic model (Figure 5), Government Policy is the most frequently assigned topic of our eight-topic classification scheme. Government policy is also the topic most frequently correlated with others, as shown in the topic network graph (Figure 6). As a result, trends we have highlighted within other topic areas are also visible in the government policy topic analysis. For these reasons, it is difficult to analyze a unique trend in government policy coverage.

Provinces such as British Columbia, Alberta, and Ontario made significant changes to their postsecondary education systems from 2004 to 2005, which were reflected in increased media coverage. In Alberta, Premier Ralph Klein announced an overhaul of the postsecondary education system, a tuition freeze, and a massive funding injection ("Klein wisely sees education as key," 2005). In Ontario, the Rae Report spurred media discussion about the future of postsecondary education policy in Ontario, as did subsequent reactions from Premier Dalton McGuinty and his government (Sokoloff, 2005; Urquhart, 2005). Not surprisingly, this media coverage coincided with an increase in discussion of costs. Likewise, a spike in negative coverage we observe in 2000 corresponds with a similar spike in the costs topic.

Over 2009–2010, austerity policies prompted by the Great Recession also increased negative media coverage of government policy. Federal budget decisions, such as the elimination of funding for the Canadian Council on Learning and changes to research funding by the federal granting agencies, proved controversial in the media (Turk, 2009; Fitzpatrick, 2010; Galloway and Church, 2010). At the provincial level, articles from Alberta were particularly important to coverage trends during this period. Cuts to public services including postsecondary education spurred protests in Edmonton despite the government's imposition of a temporary tuition freeze (Church, 2010; Sands, 2010). Similar protests surrounding tuition increases were covered by media in Saskatchewan, Quebec, Manitoba and Nova Scotia.

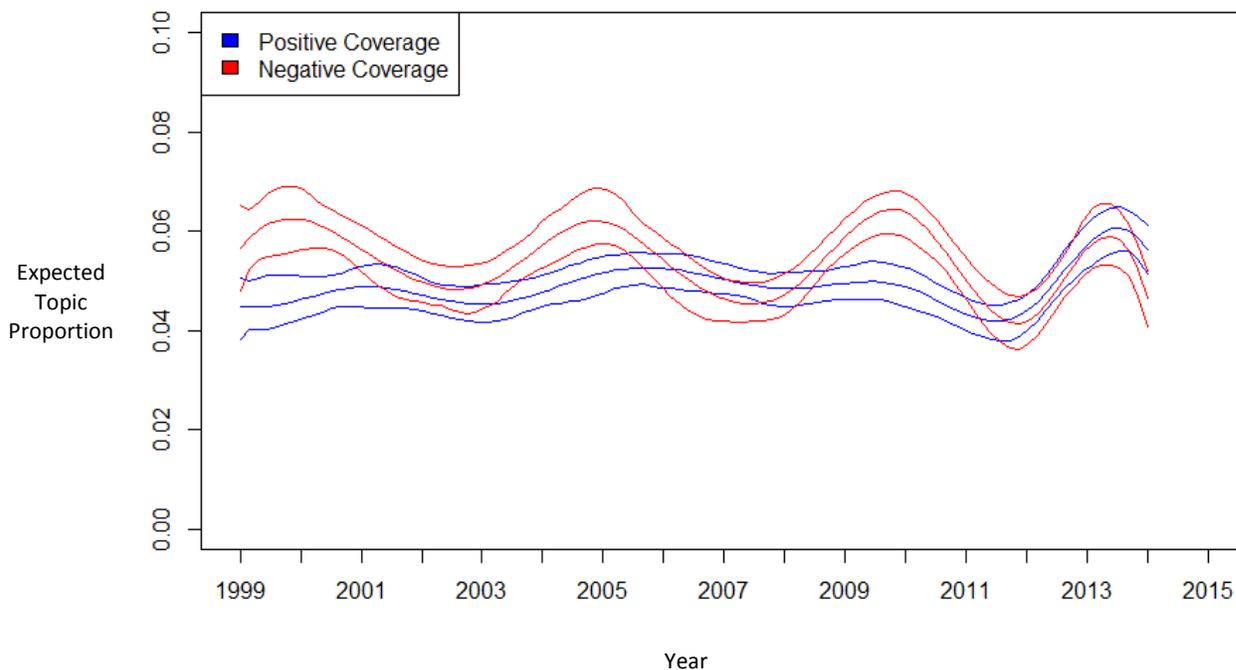
Figure 28 shows how fluctuations in negative coverage of government policy are responsible for most of the coverage trend — except in 2013. As discussed within the Skills and Training topic, positive publicity for the 2013 Canada Job Grant is responsible for an anomalous peak in positive coverage at this time. However, a simultaneous spike in negative coverage, not present in the Skills and Training topic analysis, is visible in this data. This derives from protests against proposed tuition hikes beginning with the 2012 Quebec student strikes and continuing in Quebec and other provinces over 2013.

Figure 27: Government Policy PSE Media Coverage



This figure shows the moving average trend of expected proportion of the "Government Policy" topic on the Y axis, over time on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

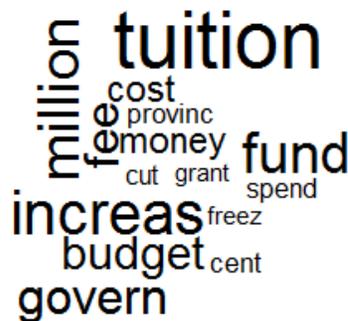
Figure 28: Tone of Government Policy PSE Media Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Government Policy" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Tuition

Figure 29: "Tuition" Topic Word Cloud



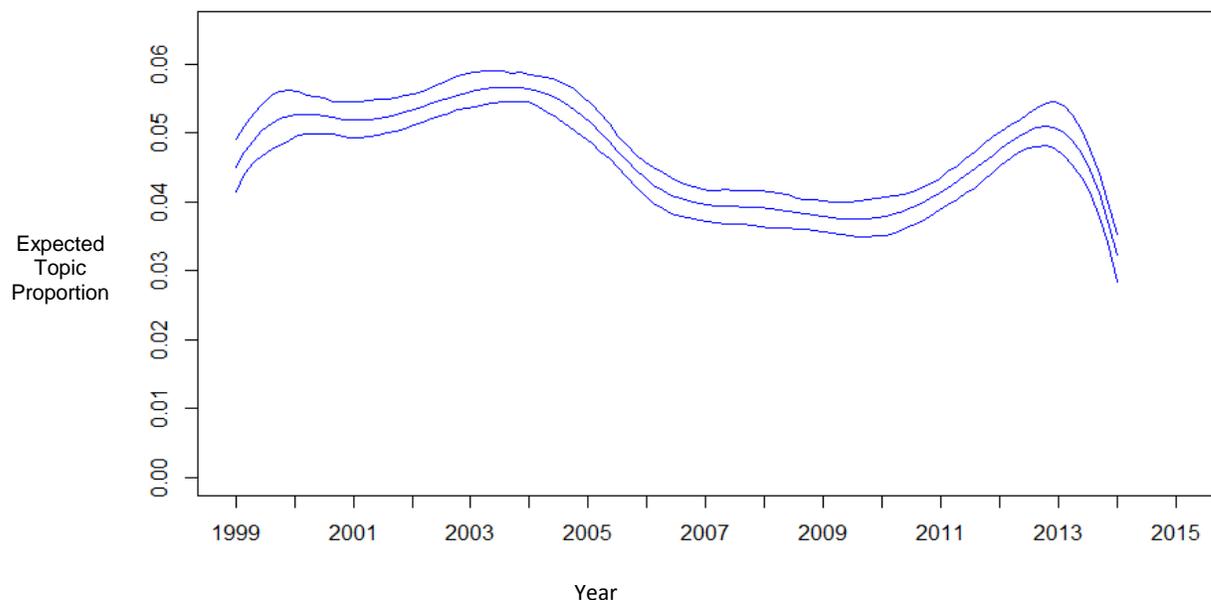
This figure shows a word cloud of the 15 most representative words within the "Tuition" topic. The font size represents their relative importance.

As previously shown in Figure 5, Tuition is the second-most prominent topic represented in our dataset of postsecondary education coverage. The general pattern of coverage shown in Figure 30 — a downward trend from the mid-2000s — is similar to the majority of other topics we examine. Likewise, a sustained peak of interest between 1999 and 2005 reflects events and policy changes observed in our examination of costs and government policy topics.

However, unlike other topics we investigate in our study, media coverage of tuition is consistently negative on average. The clearest example is the spike in negative coverage resulting from the Quebec student strikes of 2012–2013, which temporarily raised the prominence of tuition issues in nationwide media coverage to their early-2000 levels and prompted parallel demonstrations in other provinces. Articles from this period describe clashes between police and protesters, vandalism and property damage, and the use of riot-suppression gear (Wyatt, 2013). Earlier tuition protests in Quebec, such as in 2003, also involved riot-police intervention including the use of tear gas ("Quebec police tear gas student protestors," 2003).

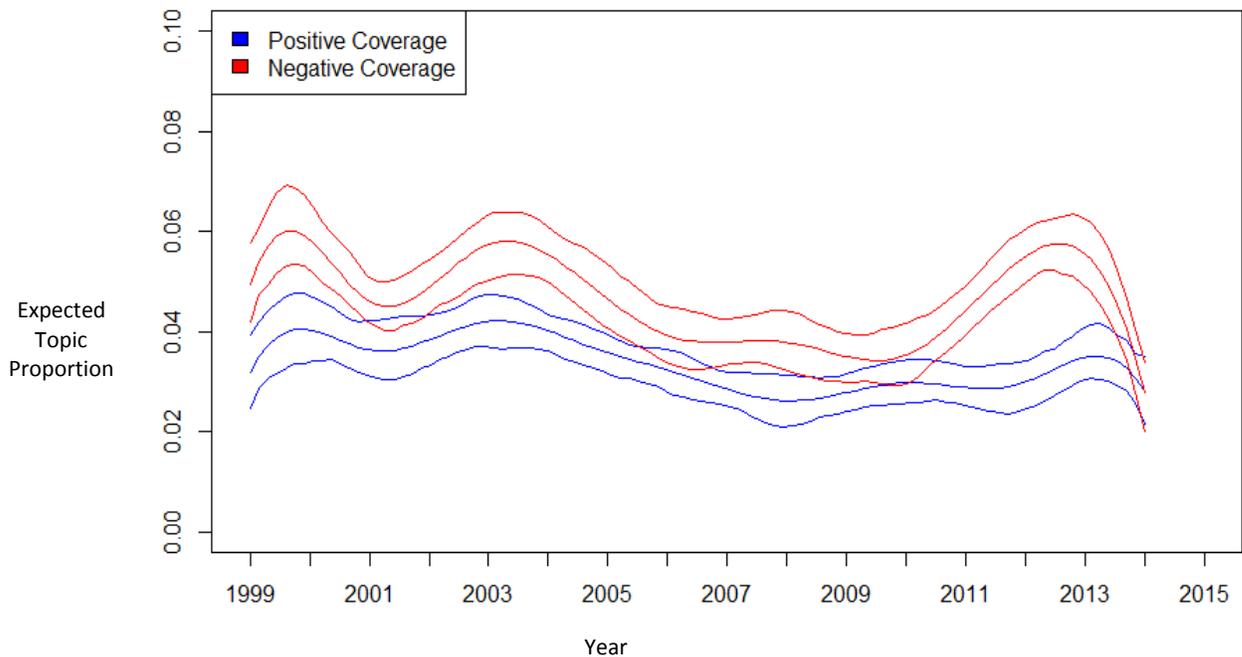
Although not nearly as violent as those in Quebec, tuition protests in other provinces over the early 2000s also attracted substantial media attention with a negative tone. In British Columbia and Saskatchewan, for example, coverage was sympathetic to demonstrating students but stressed the negative impact of proportionately high tuition increases in those provinces ("B.C.'s tuition pain," 2004).

Figure 30: Tuition PSE Media Coverage



This figure shows the moving average trend of expected proportion of the "Tuition" topic on the Y axis, over time on the X axis. That is, given a randomly selected article from our PSE corpus from a certain year, we expect that a particular proportion of words in the article will reflect this topic. The middle blue line is the trend, while the upper and lower blue lines represent a 95% confidence interval.

Figure 31: Tone of Tuition PSE Media Coverage



This figure shows the moving average trend of expected topic proportion concerning the "Tuition" topic, measured on the Y axis, over time, measured on the X axis, separated by tone: Positive is represented in blue and Negative in red. That is, given two randomly selected articles from our PSE corpus from a given year, one of which we know is coded "Positive" and one "Negative" in tone, the value along the Y axis is the particular proportion of words in each of these articles we expect will reflect this topic. The middle line in each case represents the trend and the upper and lower lines show a 95% confidence interval.

Regional Differences

The final stage of our media analysis investigates how coverage of our eight issues varies between Ontario and a set of other provinces.

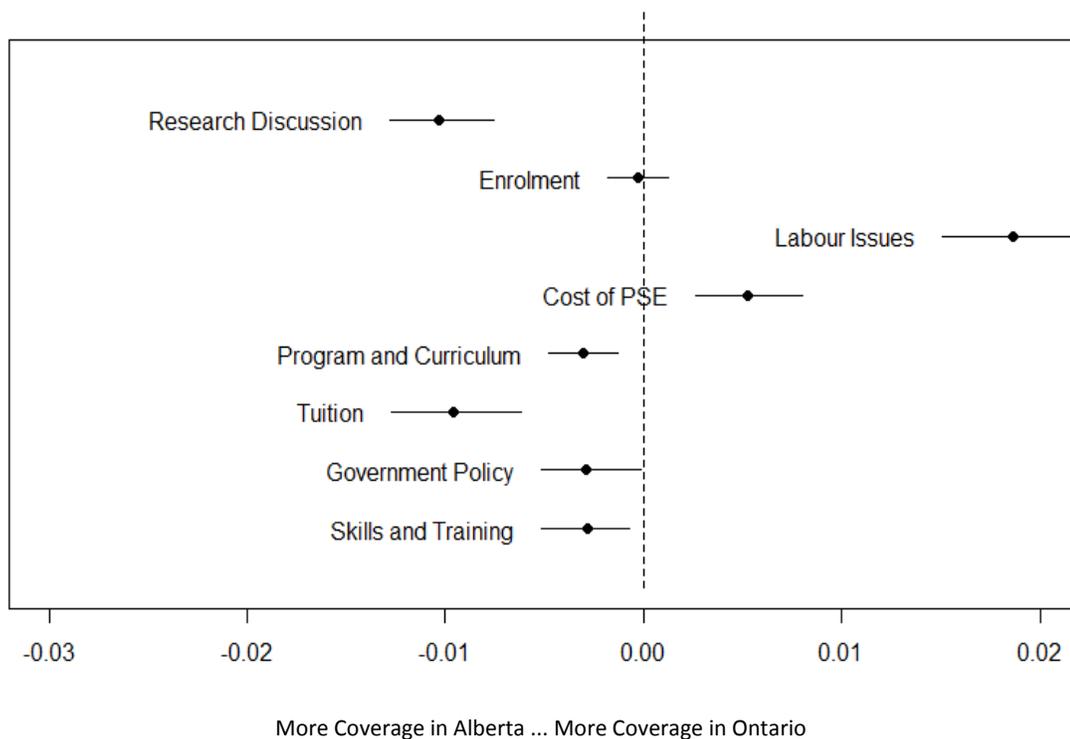
Figure 32 shows which topics are more or less likely to appear in an article in our dataset based upon the province where the article was published (in this case, either Alberta or Ontario). The dotted line in the middle of the figure represents equality: a topic positioned here is equally as likely to appear in an article from Ontario as one from Alberta. The further to the left of 0, the more "Albertan" a topic is in our dataset; the further to the right, the more "Ontarian."

The strongest difference between media coverage of postsecondary education in Alberta and Ontario is in the Labour Issues topic. Within the topic analysis, we found labour issues coverage was primarily driven by labour disputes and strikes at Ontario universities and colleges. In contrast, teaching assistants are not unionized in Alberta, and university instructors only gained the right to strike in Alberta in 2016 (Sale, 2016).

Approximately four times as many articles about labour issues appeared in Ontario as in Alberta over the time period studied.

On the other hand, Research Discussion is more frequently represented in articles from Alberta. Alberta universities have pursued a branding strategy emphasizing their world-class research capacity since the 1980s (D'Aleisio, 2004). The Alberta media appears to report more frequently on news releases of local discoveries than does the Ontario media.

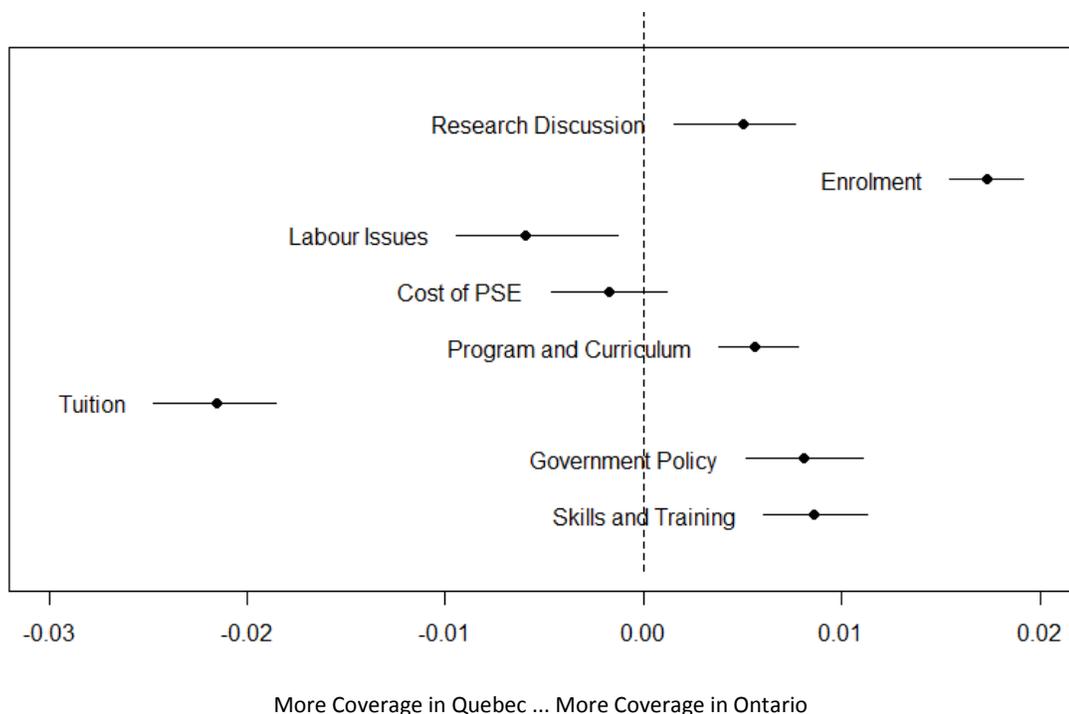
Figure 32: PSE Topic Coverage in Alberta versus Ontario



This figure shows the average difference in topic proportion by province of article publication of the eight major PSE coverage topics studied. That is, given two randomly selected articles from our PSE corpus, one of which was published by an Alberta newspaper and one by an Ontario newspaper, the value along the X axis represents the difference between the proportion of words in each article about that given topic, on average.

The double cohort in Ontario is the main reason why coverage of the Enrolment topic is more likely in Ontario than in Quebec, as shown in Figure 33. As described in our topic analysis, the disproportionate spike in media coverage caused by Ontario's double cohort in 2003–2004 was the most significant event in Canadian coverage of postsecondary enrolment over the last 15 years. On the other hand, the frequency, duration and aggression of student protests against proposed tuition increases in Quebec led to a greater volume of media coverage of tuition issues in that province.

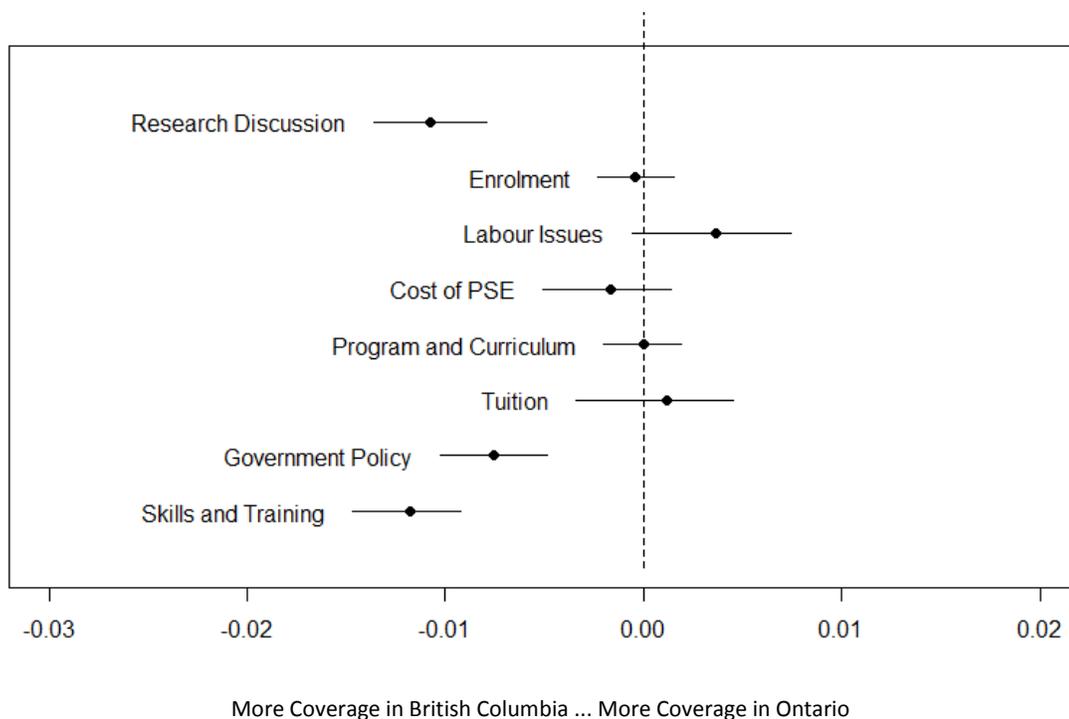
Figure 33: PSE Topic Coverage in Quebec versus Ontario



This figure shows the average difference in topic proportion by province of article publication of the eight major PSE coverage topics studied. That is, given two randomly selected articles from our PSE corpus, one of which was published by a Quebec newspaper and one by an Ontario newspaper, the value along the X axis represents the difference between the proportion of words in each article about that given topic, on average.

Finally, British Columbia and Ontario form a relatively similar pair in terms of media coverage of postsecondary education topics. Nearly all key issues are clustered around the centre line, showing no difference in likelihood of coverage when error bars are taken into account. Coverage of Skills and Training shows the greatest difference between the two provinces by a small margin. However, an examination of the content of this coverage provided no clear clues as to why this difference exists.

Figure 34: PSE Topic Coverage in British Columbia versus Ontario



This figure shows the average difference in topic proportion by province of article publication of the eight major PSE coverage topics studied. That is, given two randomly selected articles from our PSE corpus, one of which was published by a BC newspaper and one by an Ontario newspaper, the value along the X axis represents the difference between the proportion of words in each article about that given topic, on average.

Conclusion

In this study, we investigated how coverage of Canadian postsecondary education in the Canadian media has changed over the last 15 years. We used computerized text-analysis techniques to analyze a dataset of approximately 500,000 news articles related to postsecondary education drawn from 15 Canadian news sources, both regional and national. We studied eight key topics of coverage: cost, enrolment, skills and training, research, labour issues, programs and curriculum, government policy, and tuition. We also investigated the importance of tone and region in shaping media coverage.

Our main findings are as follows:

General

- Coverage of postsecondary education in the Canadian media has been trending downward since the mid-2000s.

- Coverage fluctuates in a seasonal pattern that coincides with the academic year: highest in fall and spring, and lowest over the summer months.
- In addition to the eight key issues studied, our analysis uncovered four additional clusters of interest: scholarships and awards; plagiarism and legal issues; the societal and community role of PSE; and campus safety and security.

Key Issues

- Government policy is the central topic of coverage.
- Policy changes, budgets and elections on both provincial and federal levels prompt increased coverage of postsecondary education.
- Coverage of skills and training has increased since 1999, the sole topic of the eight we studied to do so.
- Tuition experienced the strongest decrease in coverage over this time span, except for a brief period during the Quebec student strikes of 2012–2013.
- Media coverage of labour issues and tuition is consistently negative in tone.
- Coverage of skills and training is consistently positive.

Regional Differences

- Labour issues are more likely to be covered by the media in Ontario.
- Coverage of tuition is more likely in Quebec.
- Significant provincial events, such as the Ontario double cohort and the Quebec student strike, affect coverage trends across Canada as a whole.

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