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Okanagan Campus

Canada Emergency Wage Subsidy

An Analysis

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Outline

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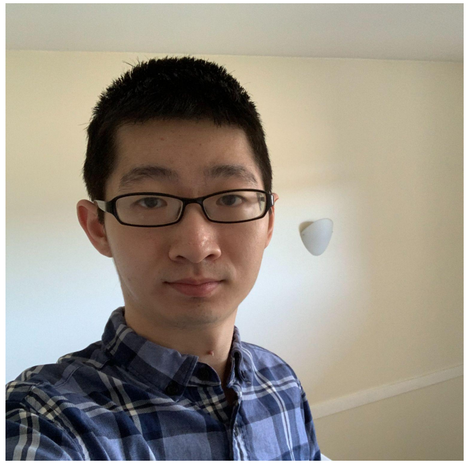
Team



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B.Sc. Computer Science | UBCO (2020)

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B.Sc. Mathematics | University of Ottawa (2020)

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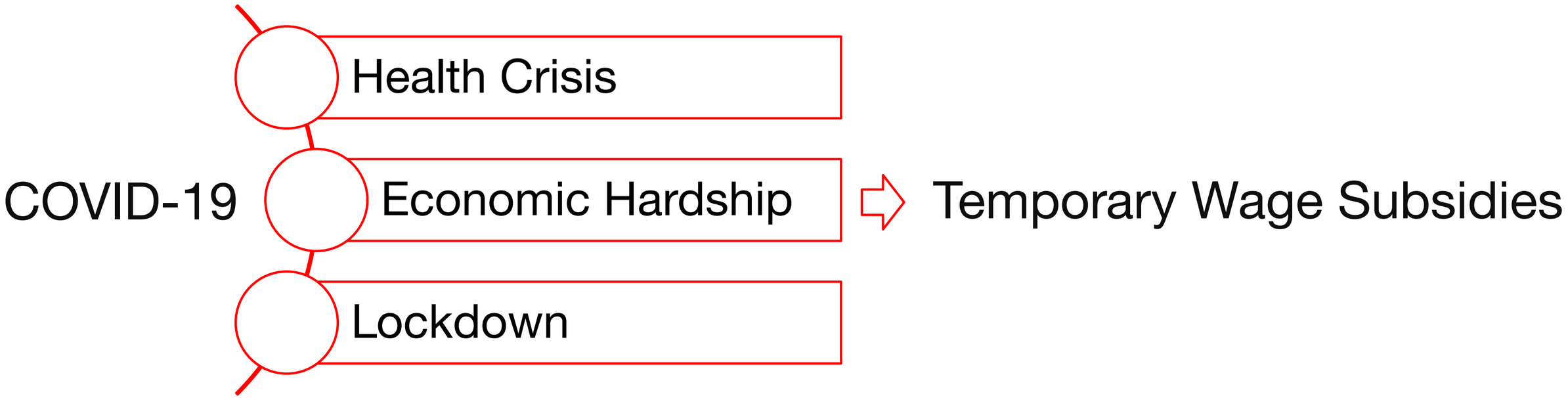
Introduction



Background

Canada's COVID-19 Economic Response Plan

Canada Revenue Agency

Français

Government of Canada | Gouvernement du Canada

Search CRA

MENU

Canada.ca > Business and industry > Canada Emergency Wage Subsidy (CEWS)

Claims to date - Canada emergency wage subsidy (CEWS)

CEWS summary [1] [2] data since launch, as of **June 06, 2021** [5]

Expanded information about CEWS claims

Detailed data about overall CEWS claims is also available. You may download the data in PDF or CSV format.

Total approved applications

3,599,850

▶ Breakdown by claim period

All approved applications by value

Under $100K	3,483,510
$100K to $1M	110,560
$1M to $5M	5,250
Over $5M	540

Applications received [3]

3,628,940

Unique applicants with approved claims

447,190

Dollar value of subsidies approved

$81.52 billion

Data Sources

Français

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Canada Emergency Wage Subsidy Regional and Community-level Database

Tables: 11-26-0003

Description:

The Canada Emergency Wage Subsidy Regional and Community-level Database (the database) is a custom dataset constructed with Canada Revenue Agency (CRA) Canada Emergency Wage Subsidy (CEWS) microdata and other administrative data sources available within Statistics Canada. The database contains variables on the amount of approved CEWS claims, number of CEWS supported employees, among other variables of interest. Data are available at sub-provincial levels of geography, notably rural and urban breakdowns, and by industry sectors and subsectors.

Frequency: Occasional

Available formats: HTML

Filter items | Showing 1 to 1 of 1 entries | **Show** 10 **entries**

Titles	Release date	More Information
Canada Emergency Wage Subsidy Regional and Community-level Database, 2021001	March 18, 2021	More information

Data Sources

2016 Standard Geographic Classification

- 1-digit: Canada
- 2-digit: Provinces and Territories
- 5-digit: Census Agglomeration or Census Metropolitan Areas
- 7-digit: Census Subdivision

North American Industry Classification System

- All industries
- 2-digit: Industry sector
- 3-digit: Industry subsector

	Start_date_of_CEWS_period	RegionCode	RegionName	RuralUrbanFlag	CMACAFlag	IndustryCode	IndustryName	Number_business_locations	Subsidy_amount	Supported_employees	CEWS_rehire_count
558824	2020-09-27	5941019	Cariboo A	URBAN	Not applicable	237	Heavy and civil engineering construction	0	X	X	0
116146	2020-04-12	3546024	Dysart et al	RURAL	Not applicable	62	Health care and social assistance	5	83,000	37	0
558469	2020-09-27	5939011	Columbia-Shuswap A	RURAL	Not applicable	21	Mining, quarrying, and oil and gas extraction	0	X	X	0
236806	2020-06-07	2402028	Chandler	RURAL	Not applicable	711	Performing arts, spectator sports and related ...	5	X	X	0
422108	2020-08-02	4806014	Rocky View County	URBAN	Not applicable	419	Business-to-business electronic markets, and a...	5	X	23	0

```
cl_cews.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 562491 entries, 0 to 562490
Data columns (total 11 columns):
 #   Column                  Non-Null Count   Dtype
---  ------                  --------------   -----
 0   Period                  562491 non-null  datetime64[ns]
 1   RegionCode              562491 non-null  object
 2   Region                  562491 non-null  object
 3   GeographicClassification  562491 non-null  object
 4   CensusLevel             562491 non-null  object
 5   IndustryCode            562491 non-null  object
 6   Industry                562491 non-null  object
 7   BusinessLocations       562491 non-null  float64
 8   Subsidy                 182793 non-null  float64
 9   SupportedEmployees      188423 non-null  float64
 10  RehiredEmployees        562491 non-null  float64
dtypes: datetime64[ns](1), float64(4), object(6)
memory usage: 47.2+ MB
```

```
cews['Subsidy_amount'].value_counts(normalize=True)
```

```
X              0.675029
0              0.010516
17,000         0.001916
20,000         0.001888
22,000         0.001865
                 ...
6,824,000      0.000002
17,151,000     0.000002
89,020,000     0.000002
12,221,000     0.000002
149,094,000    0.000002
Name: Subsidy_amount, Length: 16468, dtype: float64
```

```
cews['Supported_employees'].value_counts(normalize=True)
```

```
X          0.665020
0          0.010779
12         0.003127
13         0.003095
14         0.003052
             ...
6,385      0.000002
11,659     0.000002
235,392    0.000002
8,469      0.000002
7,270      0.000002
Name: Supported_employees, Length: 12991, dtype: float64
```

Data Wrangling

Typical Wrangling

- Change null ‘X’ to np.nan
- Alter data types
- Rename columns and factor levels

Hierarchical Solution

- Develop queryable “subsetting columns”

Data Augmentation

- Province name column with regex
- Worker count data through merging additional datasets

```
cews.query("IndustryAggregation == 'All industries' and GeoAggregation == 'Province'").sample(20)
```

	Period	RegionCode	Region	GeographicClassification	CensusLevel	IndustryCode	Industry	BusinessLocations	Subsidy	SupportedEmployees	RehiredEmployees	GeoAggregation	IndustryAggregation	ProvinceCode	Province	TotalEmployees
70292	2020-03-15	61	Northwest Territories	Not applicable	Not applicable	TOTAL	All Industries	330.0	1.320100e+07	4992.0	15.0	Province	All industries	61	Northwest Territories	21415.0
6736	2020-03-15	13	New Brunswick	Not applicable	Not applicable	TOTAL	All Industries	5865.0	1.050720e+08	52785.0	540.0	Province	All industries	13	New Brunswick	339050.0
437670	2020-08-02	62	Nunavut	Not applicable	Not applicable	TOTAL	All Industries	110.0	3.958000e+06	2475.0	0.0	Province	All industries	62	Nunavut	12820.0
225432	2020-06-07	10	Newfoundland and Labrador	Not applicable	Not applicable	TOTAL	All Industries	3770.0	9.497700e+07	40189.0	470.0	Province	All industries	10	Newfoundland and Labrador	216705.0
296085	2020-06-07	61	Northwest Territories	Not applicable	Not applicable	TOTAL	All Industries	290.0	1.162400e+07	4157.0	25.0	Province	All industries	61	Northwest Territories	21415.0
223973	2020-05-10	60	Yukon	Not applicable	Not applicable	TOTAL	All Industries	400.0	7.737000e+06	3398.0	55.0	Province	All industries	60	Yukon	19785.0
502262	2020-08-30	60	Yukon	Not applicable	Not applicable	TOTAL	All Industries	290.0	3.967000e+06	3317.0	20.0	Province	All industries	60	Yukon	19785.0
182266	2020-05-10	35	Ontario	Not applicable	Not applicable	TOTAL	All Industries	121905.0	3.771701e+09	1546311.0	16115.0	Province	All industries	35	Ontario	6612150.0
224787	2020-05-10	62	Nunavut	Not applicable	Not applicable	TOTAL	All Industries	110.0	8.045000e+06	2812.0	10.0	Province	All industries	62	Nunavut	12820.0
295676	2020-06-07	60	Yukon	Not applicable	Not applicable	TOTAL	All Industries	345.0	7.162000e+06	3383.0	35.0	Province	All industries	60	Yukon	19785.0
368828	2020-08-02	10	Newfoundland and Labrador	Not applicable	Not applicable	TOTAL	All Industries	3735.0	7.404200e+07	46923.0	210.0	Province	All industries	10	Newfoundland and Labrador	216705.0
232415	2020-06-07	13	New Brunswick	Not applicable	Not applicable	TOTAL	All Industries	5865.0	1.494840e+08	65954.0	550.0	Province	All industries	13	New Brunswick	339050.0
507102	2020-09-27	12	Nova Scotia	Not applicable	Not applicable	TOTAL	All Industries	4670.0	4.541000e+07	61689.0	275.0	Province	All industries	12	Nova Scotia	427315.0
48040	2020-03-15	47	Saskatchewan	Not applicable	Not applicable	TOTAL	All Industries	8275.0	1.691640e+08	80726.0	745.0	Province	All industries	47	Saskatchewan	544095.0
367816	2020-07-05	61	Northwest Territories	Not applicable	Not applicable	TOTAL	All Industries	270.0	1.196300e+07	4513.0	20.0	Province	All industries	61	Northwest Territories	21415.0
416708	2020-08-02	47	Saskatchewan	Not applicable	Not applicable	TOTAL	All Industries	7165.0	1.387490e+08	89138.0	445.0	Province	All industries	47	Saskatchewan	544095.0
562011	2020-09-27	62	Nunavut	Not applicable	Not applicable	TOTAL	All Industries	65.0	1.311000e+06	1369.0	0.0	Province	All industries	62	Nunavut	12820.0
371582	2020-08-02	11	Prince Edward Island	Not applicable	Not applicable	TOTAL	All Industries	1395.0	2.711900e+07	17798.0	95.0	Province	All industries	11	Prince Edward Island	68120.0
29723	2020-03-15	35	Ontario	Not applicable	Not applicable	TOTAL	All Industries	112875.0	3.080925e+09	1437847.0	10915.0	Province	All industries	35	Ontario	6612150.0
69888	2020-03-15	60	Yukon	Not applicable	Not applicable	TOTAL	All Industries	360.0	7.492000e+06	3535.0	40.0	Province	All industries	60	Yukon	19785.0

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Part 1:

CEWS Report

Motivation and Purpose

Examine the data across all available dimensions. Report on interesting trends, especially within rural Canada.

1

CEWS Report

Insights into the effects of the program on rural Canada

Tools

Programming Language

Python

Data Structures and Wrangling

Pandas, NumPy and RE

Data Visualization

Altair and Matplotlib

Sample Analysis

1

Overview

What are the high level trends?

2

Most Subsidized Rural Census Subdivisions

How much did they receive, and where are they located?

3

Industry Breakdown

Why did these CSDs need so much subsidy money? Which industries did the money go to?

Analysis and Interpretation

High level overview of the CEWS program, March 15 through Oct 24, 2020

Total value of subsidies approved

$55,604,123,000

Average value of subsidies approved per claim period

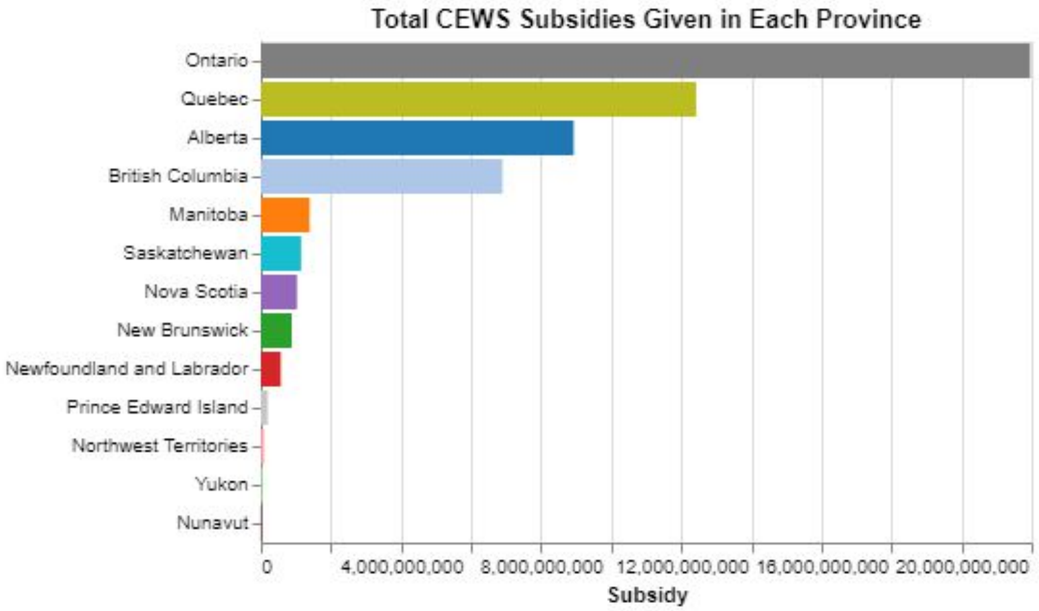
$6,950,515,375

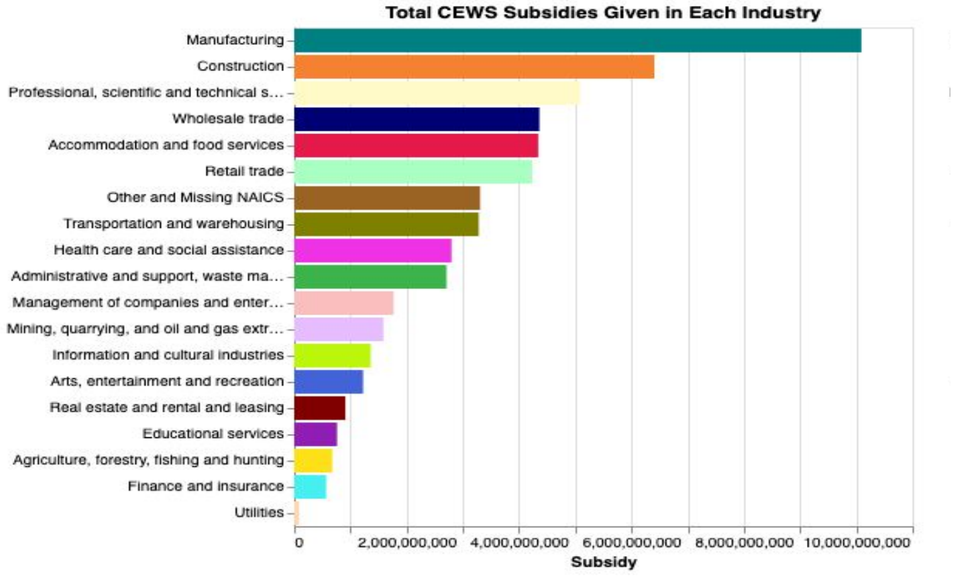
CEWS average employees supported per claim period

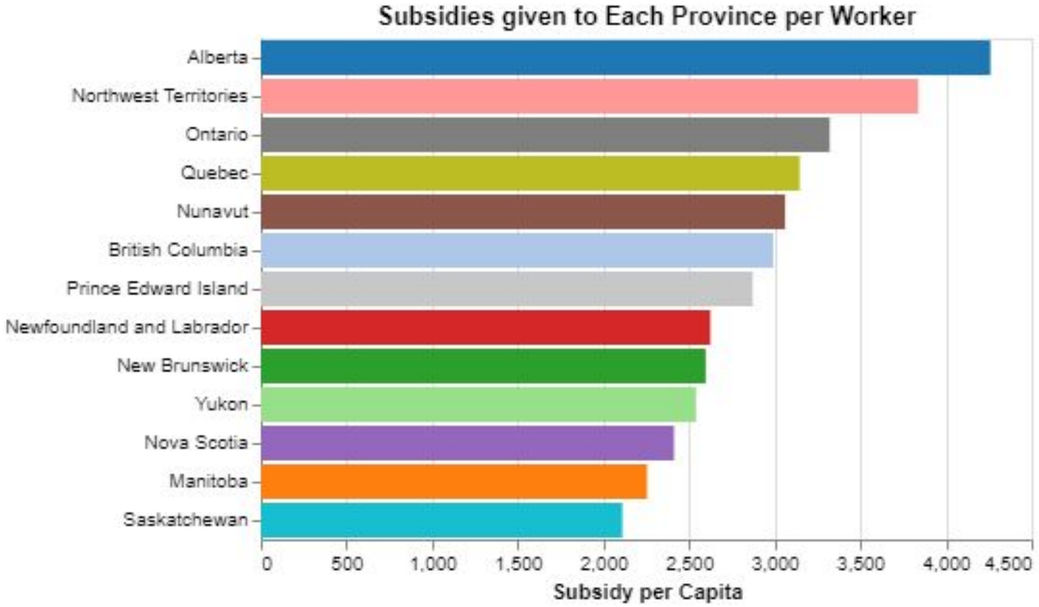
3,811,173

Average businesses supported per claim period

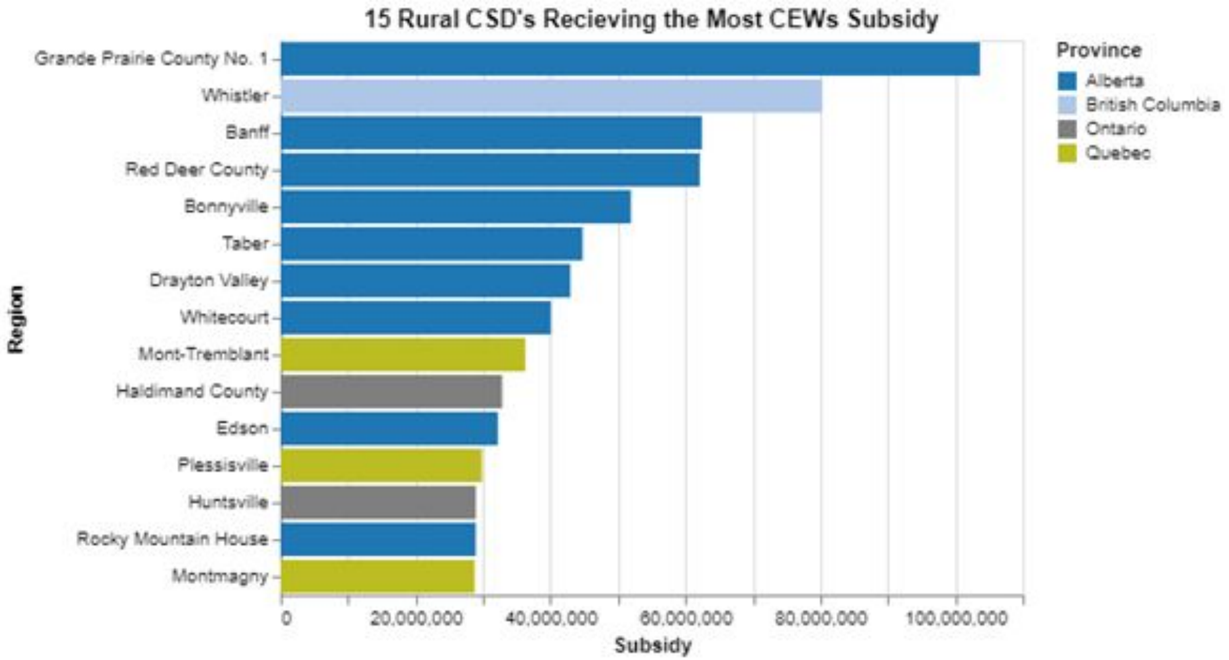
282,326

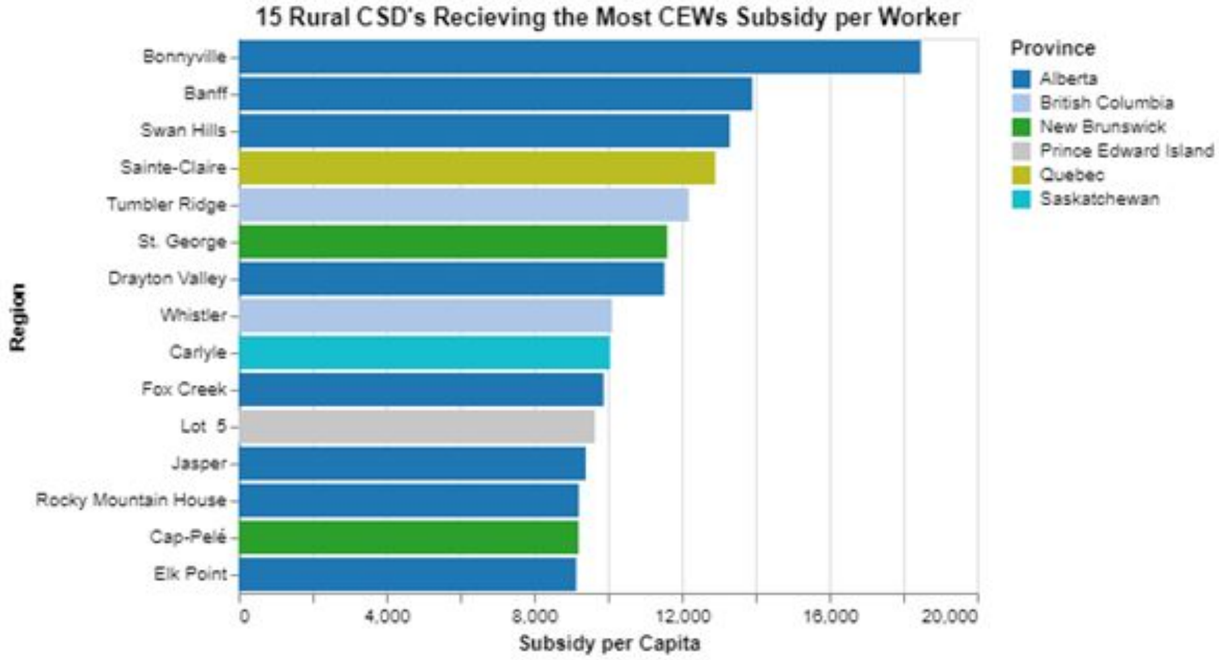




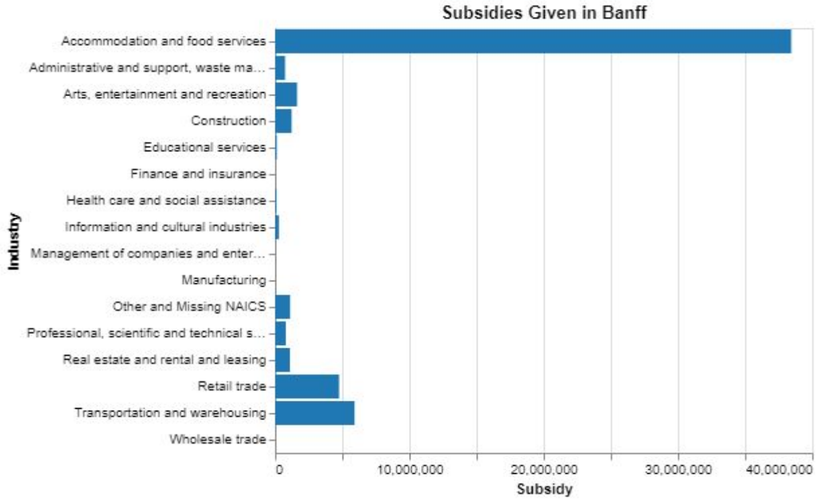


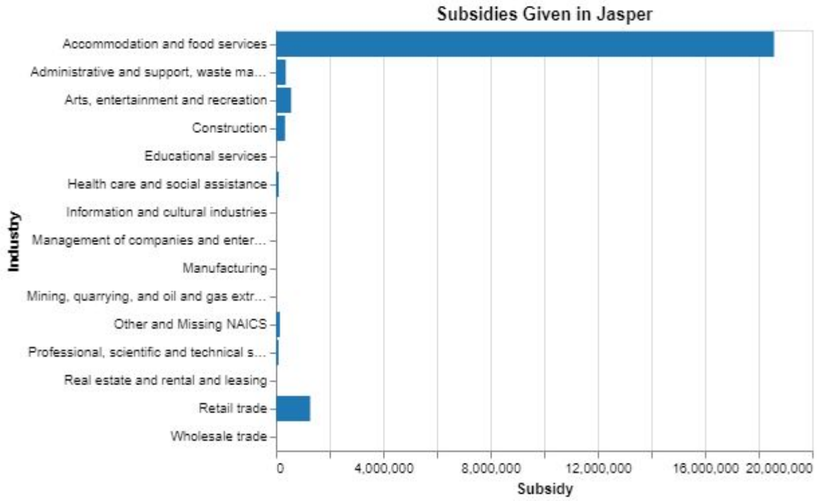
Analysis and Interpretation

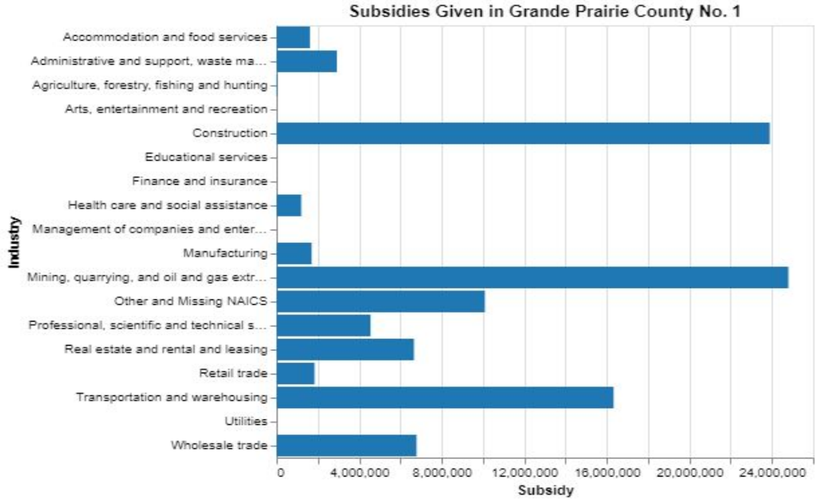


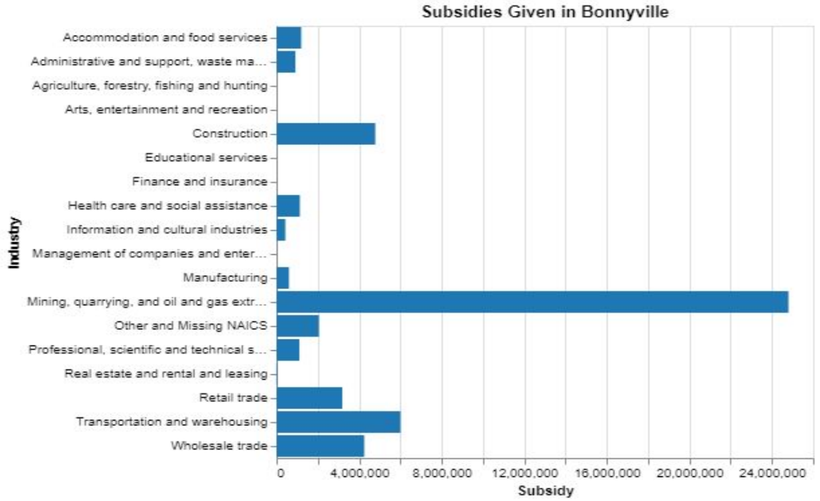


Analysis and Interpretation









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Part 2:

CEWS Dashboard

Motivation and Purpose

Allow user to visually explore the CEWS database

1

CEWS Report

Insights into the effects of the program on rural Canada

2

CEWS Dashboard

Tool for database exploration

Tools

Dashboard

Microsoft PowerBI

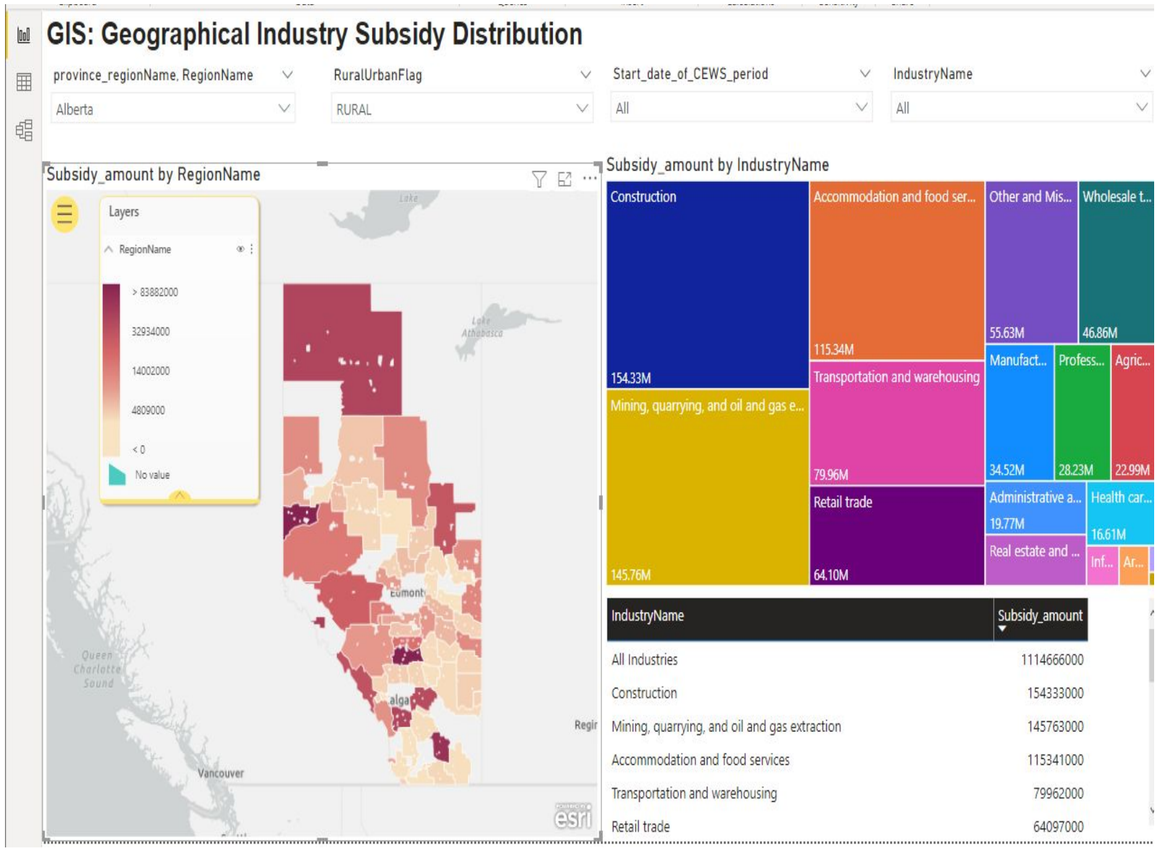
Interactive Maps

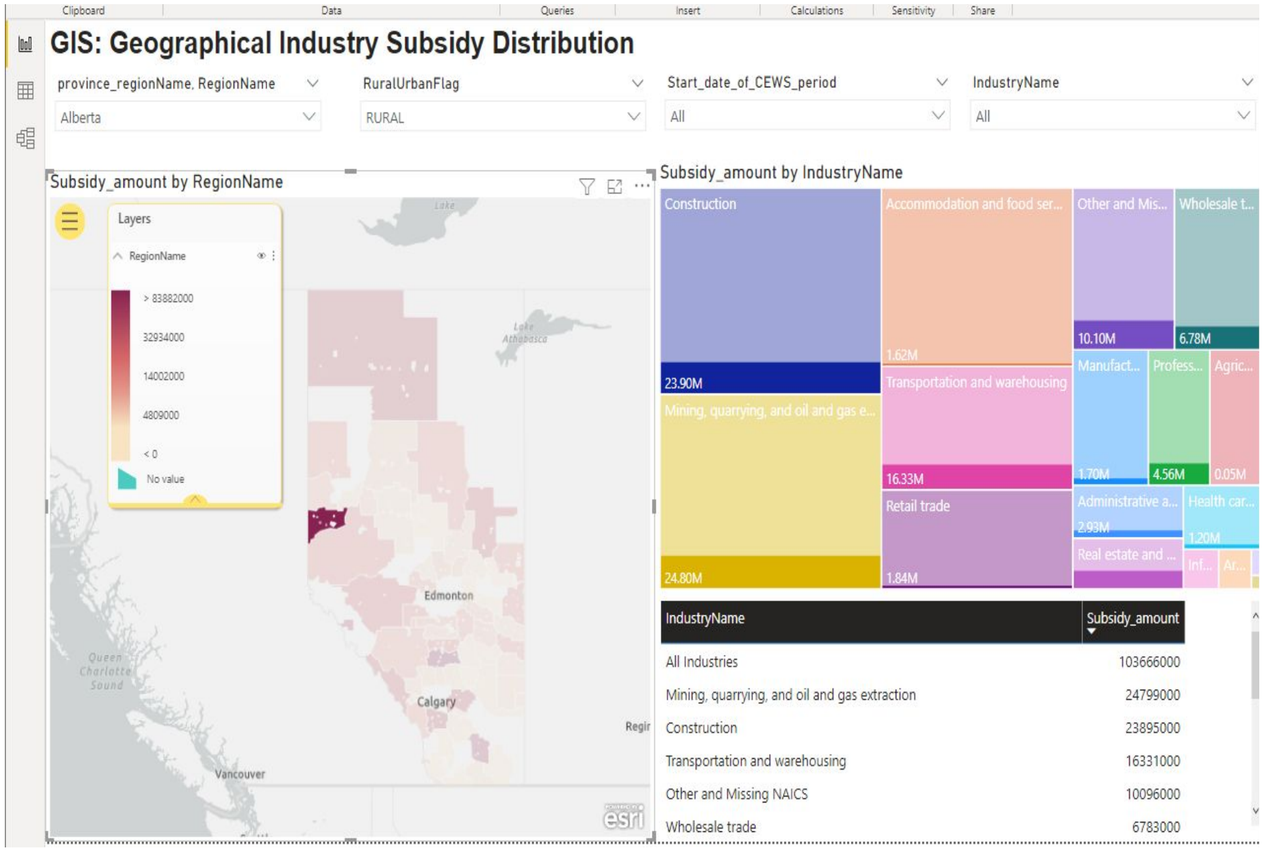
ArcGIS and ShapeMap

Methodologies and Techniques

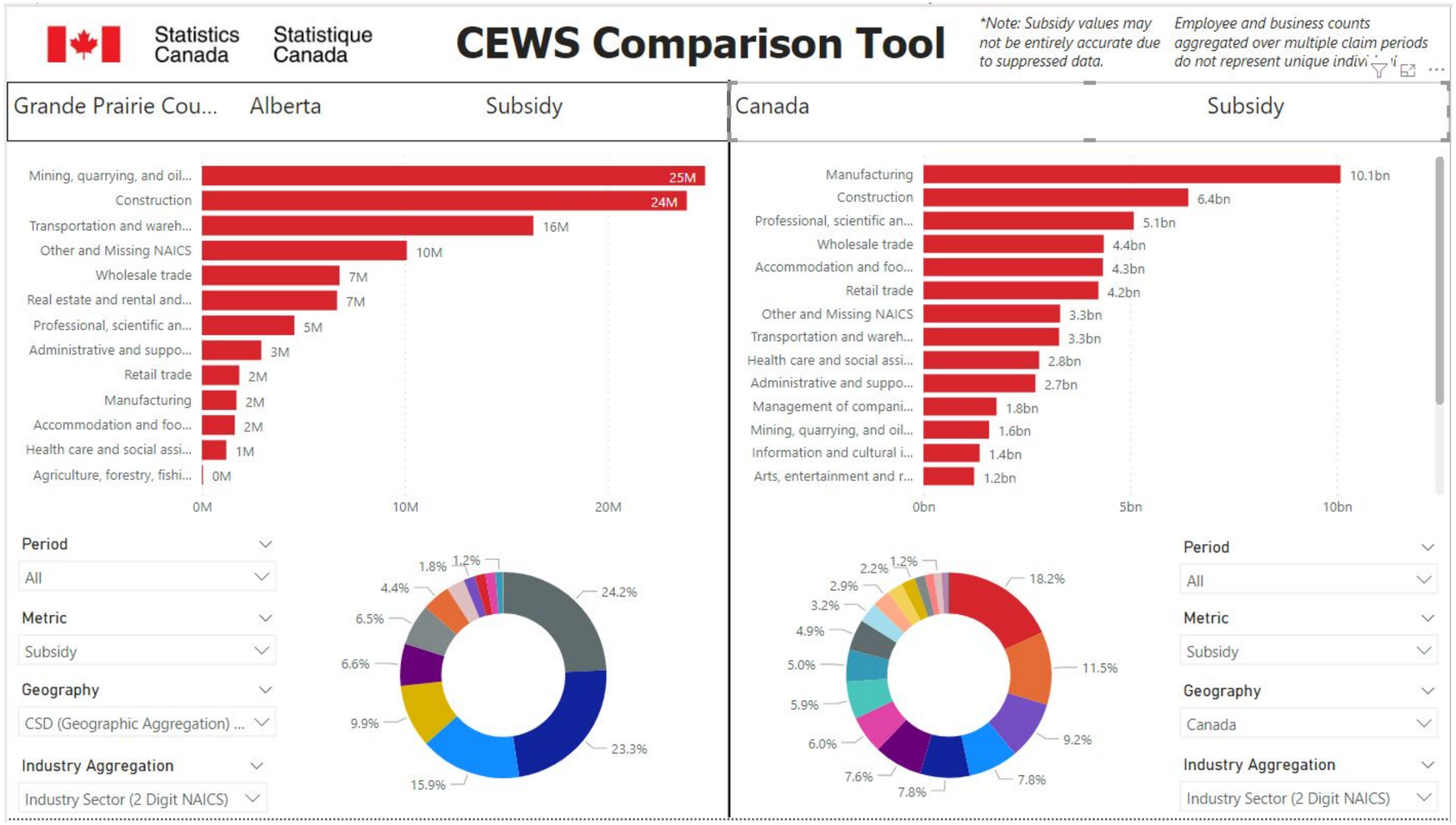
1	**Interactive Visualizations** Base PowerBI and ArcGIS Extensions
2	**Deployment** PowerBI website

Analysis and Interpretation





Analysis and Interpretation



Other Pages

Link to dashboard in chat

1

Overview

Canada wide numbers and Province-level heatmap

2

Flexible Breakdown Tool

Split data across any dimension of interest to explore regions and industries of interest

3

Claim Period Breakdown Graphs

Compare subsidies given to regions or industries in each claim period

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Part 3:

CEWS Analysis with APIs

Motivation and Purpose

Employ data that is not available from traditional survey and administrative sources to measure economic activity and study social behavior at high-frequency and in real time

1

CEWS Report

Insights into the effects of the program on rural Canada

2

CEWS Dashboard

Tool for database exploration

3

CEWS Analysis with APIs

Focus on natural language processing (NLP)

Tools

Programming Language

Python

Data Structures and Wrangling

Pandas and RE

Data Visualization

Altair and Matplotlib

API Access

Tweepy

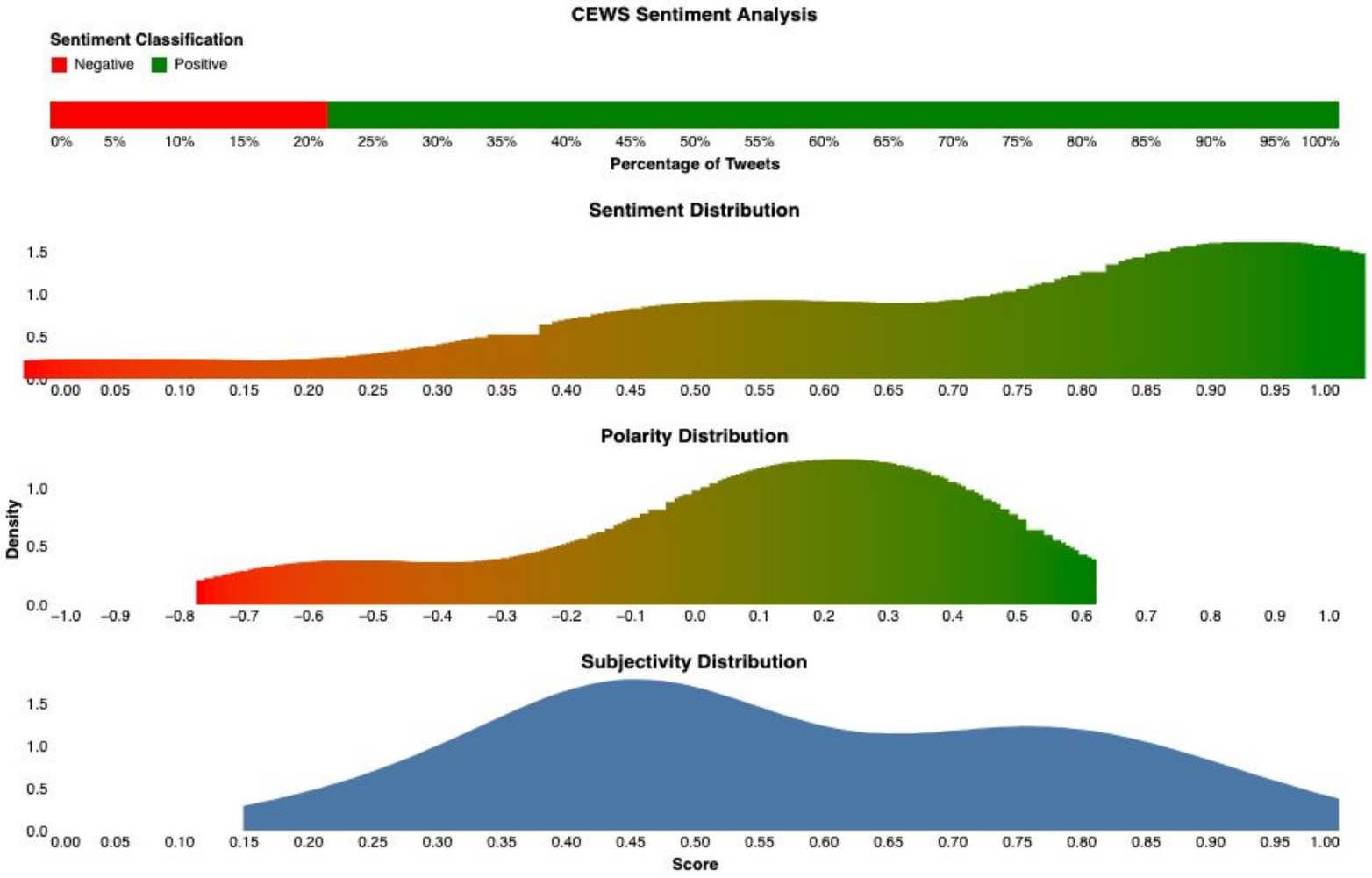
Sentiment Analysis

String, NLTK and TextBlob

Methodologies and Techniques

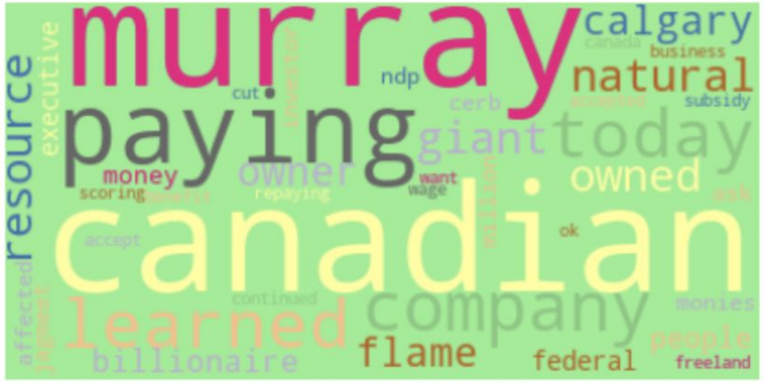
1	**API Inventory** 18 APIs researched and reported
2	**API Access** Twitter API developer account
3	**Data Wrangling** Removing URLs, usernames, stop-words, tokenizing and lemmatizing
4	**Sentiment Analysis** Naïve Bayes analyzer and semantic relation
5	**Data Visualization** Analyzing results

Analysis and Interpretation

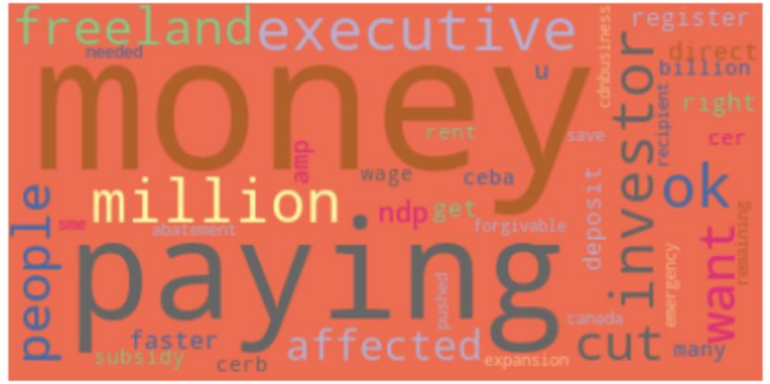


Most frequent words related to CEWS

Most frequent words with postive sentiment



Most frequent words with negative sentiment



Conclusions

Report

Insights into the effects of the program on rural Canada

Dashboard

Interactive visualization dashboard

API Analysis

Inventory of APIs and demo software

Future Work:

- Extend the data claim periods up until the end of the CEWS program
- Source additional data
- Develop indicators

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Thank you!