



Statistics
Canada

Analysis of Rural Business Performance

Tingwen Hua | Bowen Yang | Yilin Sun | Song(Alice) Zhang

June 21, 2022

Roadmap



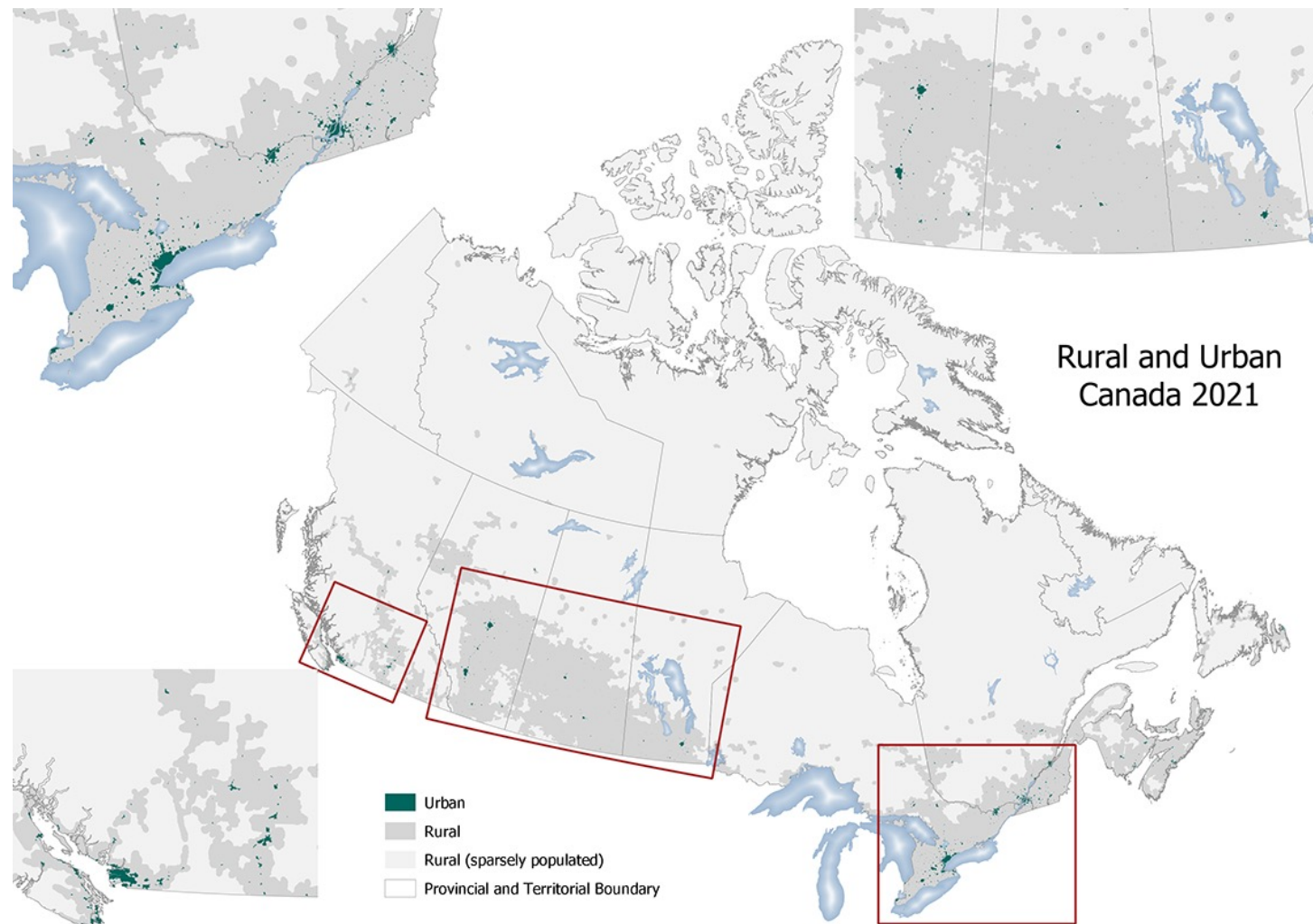
- 1 Motivation
- 2 Datasets
- 3 Research Questions
- 4 Approaches & Achievements
- 5 Conclusions
- 6 Future Directions



Rural areas comprise the vast majority of Canada's landmass



Help Canadians understand businesses performance in rural areas of their country



Reference:

Rural and urban areas in Canada, 2021

<https://www12.statcan.gc.ca/census-recensement/2021/as-sa/98-200-x/2021002/fig/m-c01-eng.png>



Rural Canada Business Profile (RCBP) from 2017 to 2019

- Financial Information: Small Business and Medium Business
 - Abbreviation: RCBP
 - Public availability: On Statistic Canada Website
-



Location:
Rural/Urban

Geography:
Provinces

Incorporation Status:
Incorporated/Unincorporated

Year:
2017 to 2019

Industries:
North American Industry Classification System, NAICS

RCBP Industries:

- Agriculture, forestry, fishing and hunting
- Mining, quarrying, and oil and gas extraction
- Utilities
- Construction
- Manufacturing
- Wholesale trade
- Retail trade
- Transportation and warehousing
- Information and cultural industries
- Real estate and rental and leasing
- Professional, scientific and technical services
- Management of companies and enterprises
- Administrative and support
- Educational services
- Health care and social assistance
- Arts, entertainment and recreation
- Accommodation and food services
- Other services (except public administration)





Annual employment and unemployment rate from 2011 to 2021

- Unemployment rate
 - Public availability: On Statistic Canada Website
-



Geography: Provinces

Year: 2011 to 2021

Q1: What characteristics can be explored from RCBP database?

Q2: What variables have more significant influence on the net profit of rural businesses ?

Datasets - Rural Canada Business Profile (RCBP) from 2017 to 2019

Q3: Is there a relationship between the unemployment rate and business performance?

Datasets - Annual employment and unemployment rate from 2011 to 2021



Approaches & Achievements



Research Question 1:

What characteristics can be explored from RCBP database?



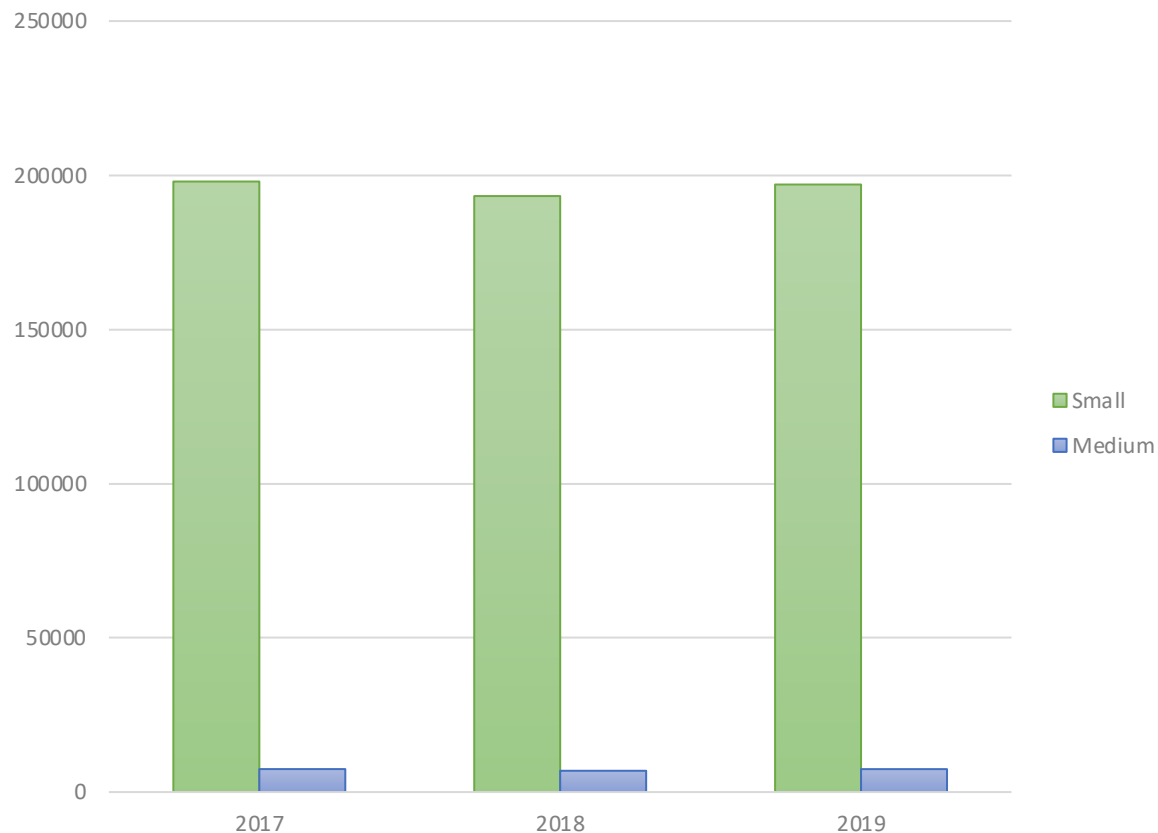
Exploratory Data Analysis

Medium & Small
Businesses in Rural Areas
Count:

Small: 200,000

Medium: 7,000

More Small than Medium



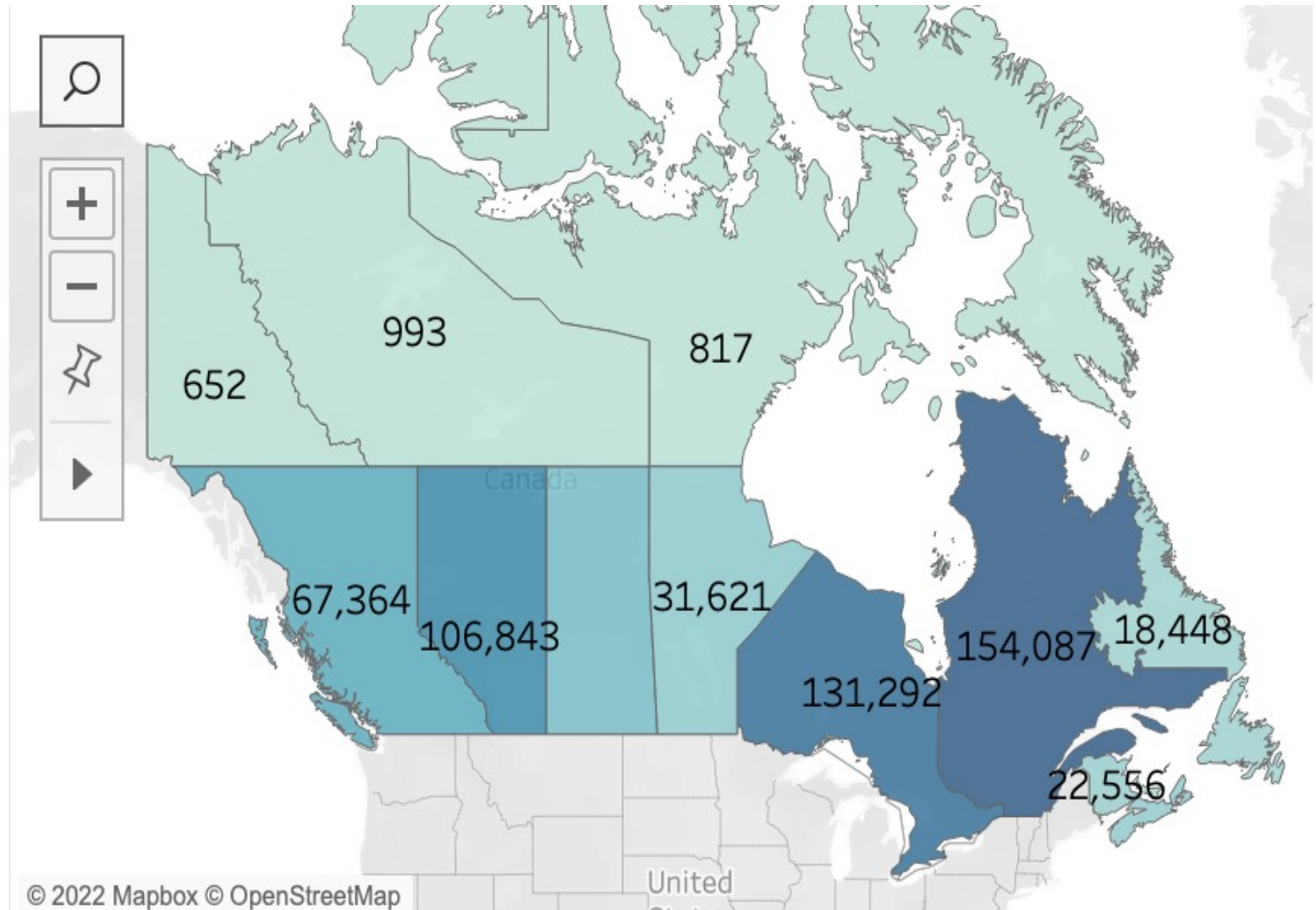
Small Rural Business Count*:

Quebec - 154,097

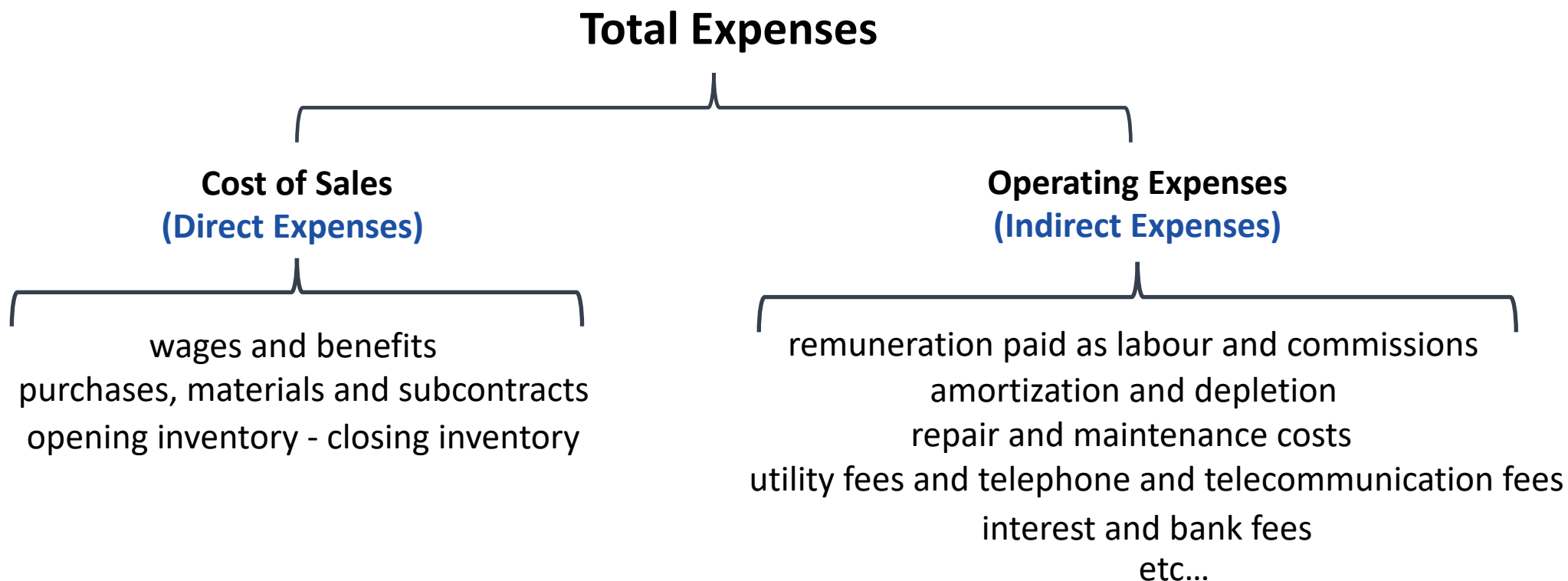
Ontario - 131,292

Alberta - 106,843

*Average from 2017 to 2019



Expense In the Canada Rural Business Profile (RCBP) database, there are three levels of expense categories



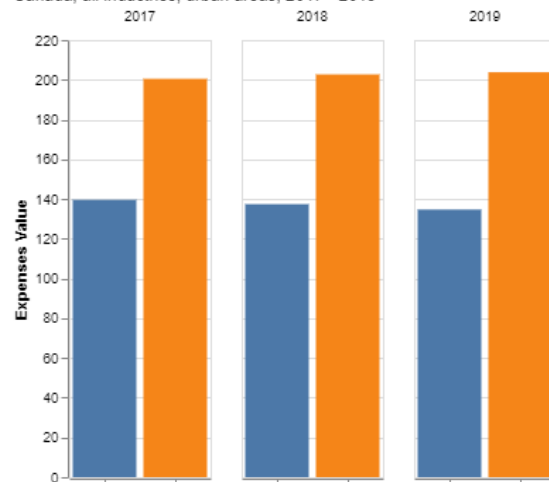
Medium businesses and small businesses had the opposite distributions for their expenses

Small businesses

Average direct/indirect expenses of small businesses
Canada, all industries, rural areas, 2017 - 2019

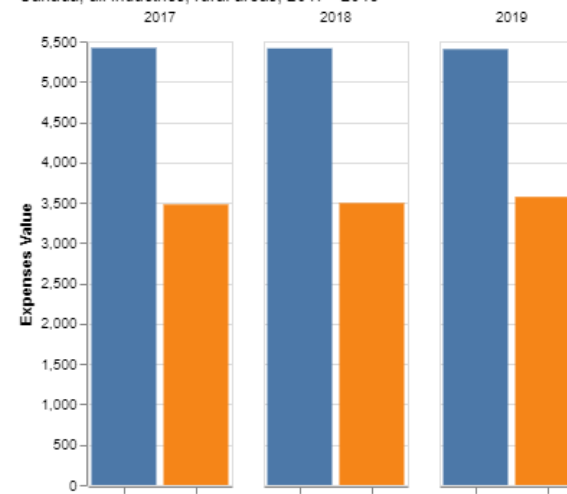


Average direct/indirect expenses of small businesses
Canada, all industries, urban areas, 2017 - 2019

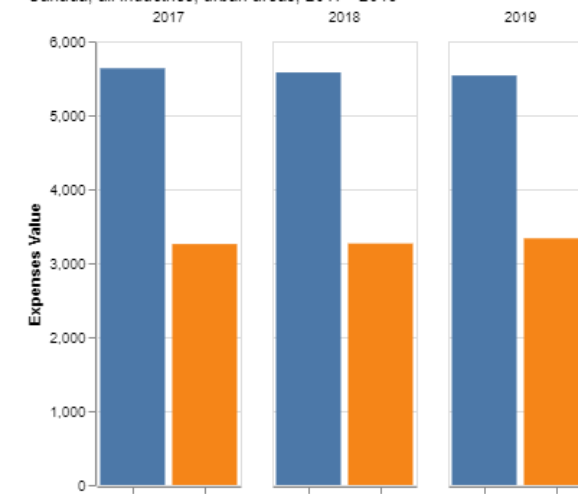


Medium businesses

Average direct/indirect expenses of medium businesses
Canada, all industries, rural areas, 2017 - 2019



Average direct/indirect expenses of medium businesses
Canada, all industries, urban areas, 2017 - 2019

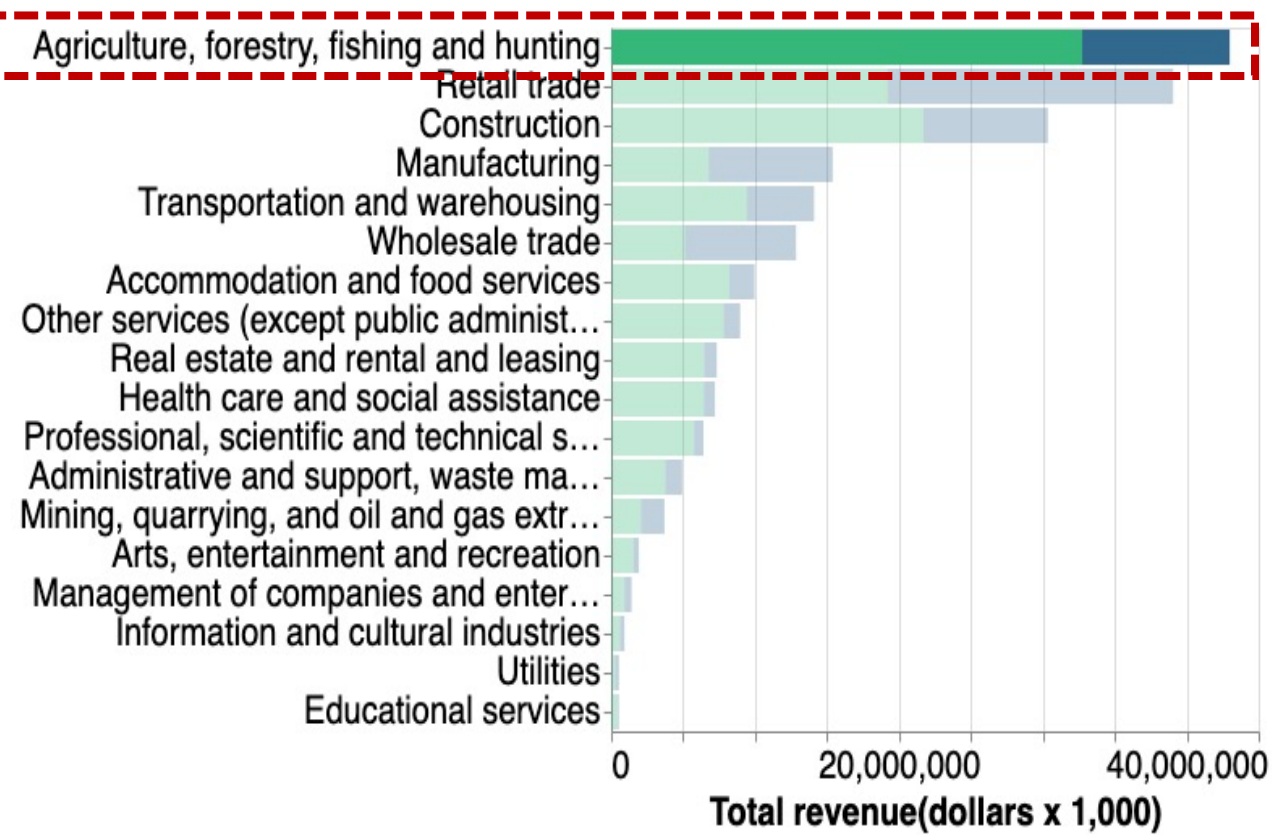
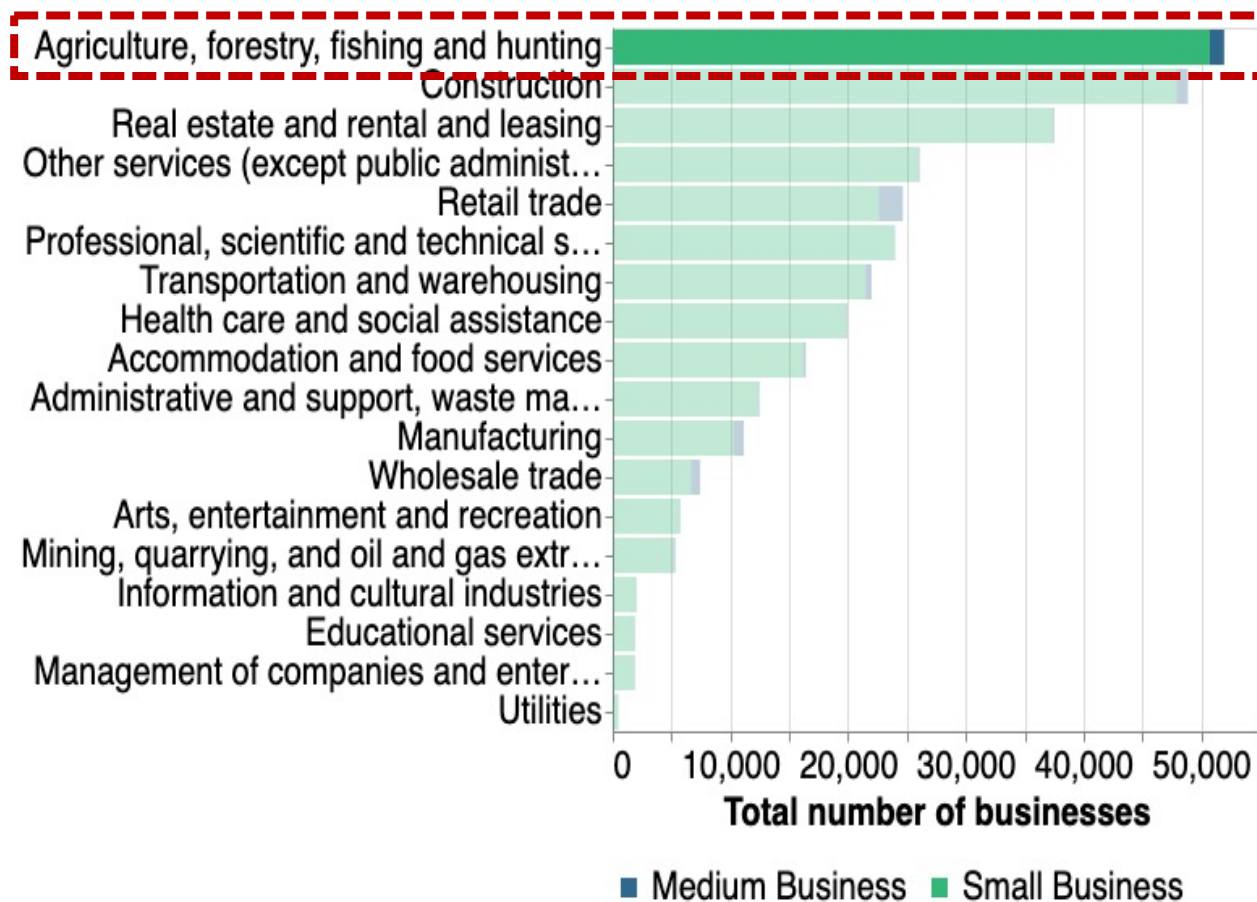


 cost of sales (direct expenses)

 operating expenses (indirect expenses)

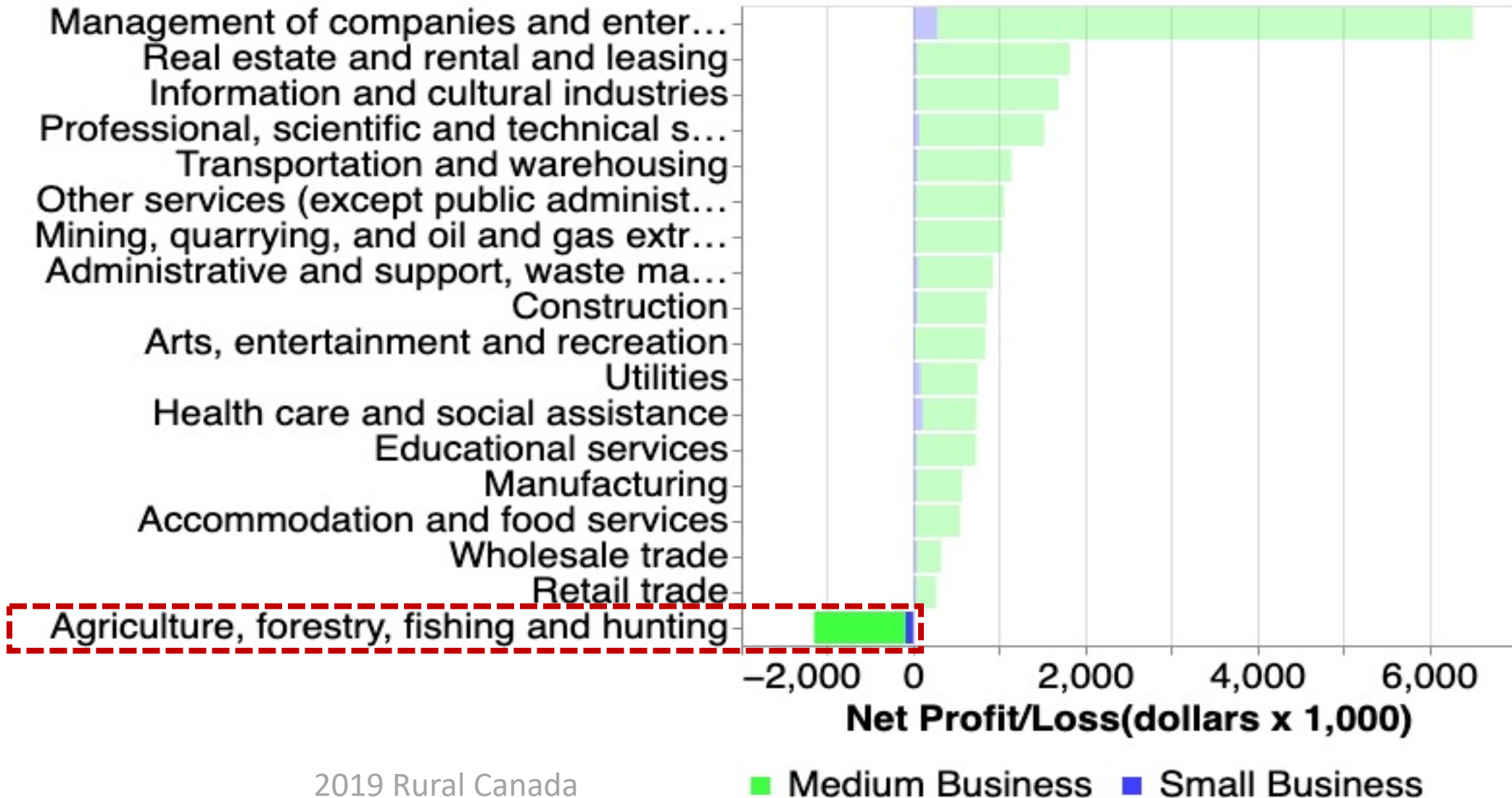
Agriculture, forestry, fishing and hunting industry

Had the greatest amount in rural areas



Agriculture, forestry, fishing and hunting industry

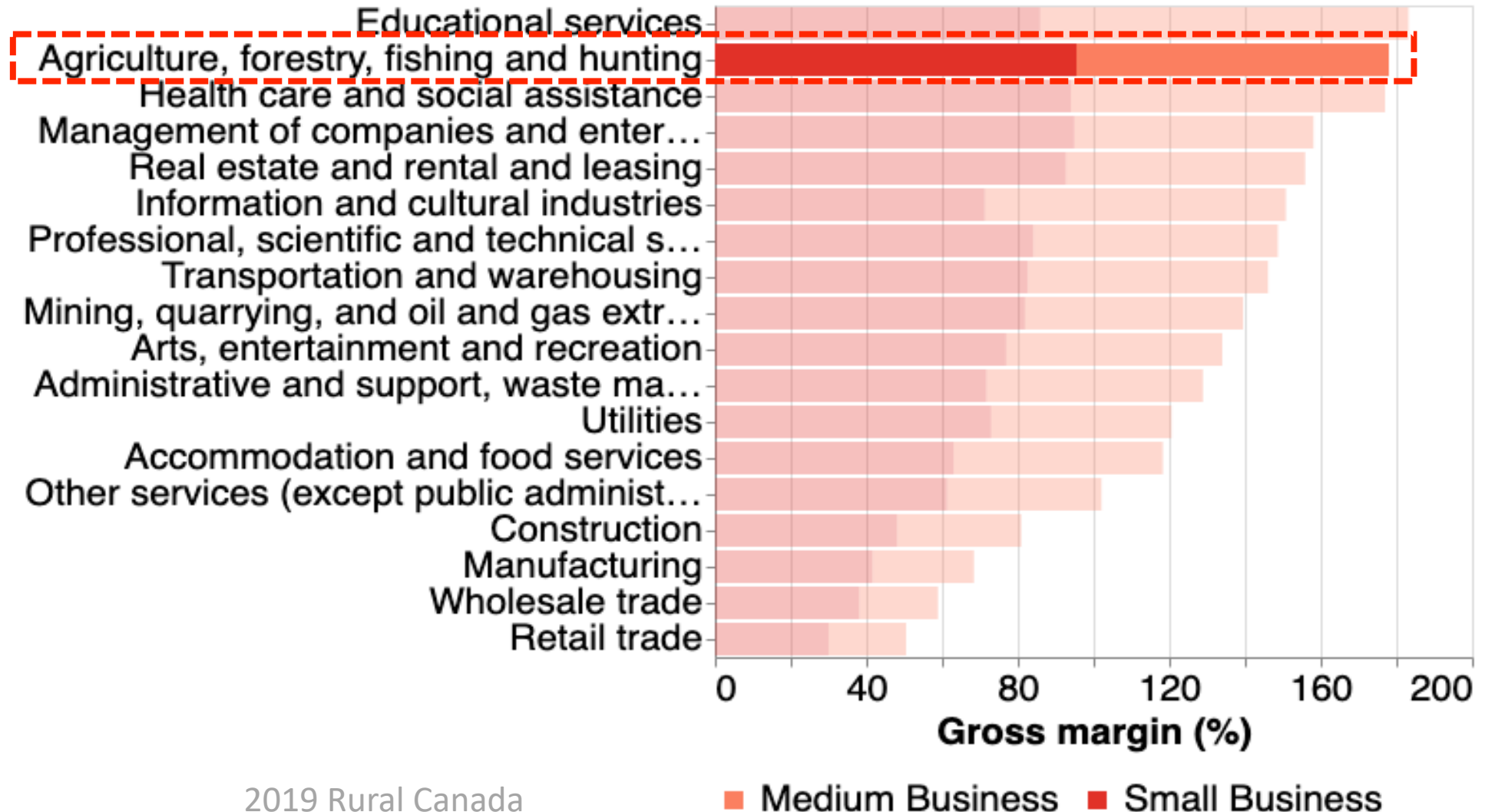
But had the worst profit in rural areas



Agriculture, forestry, fishing and hunting industry

Gross margin was not that bad. **Then why it lost money?**

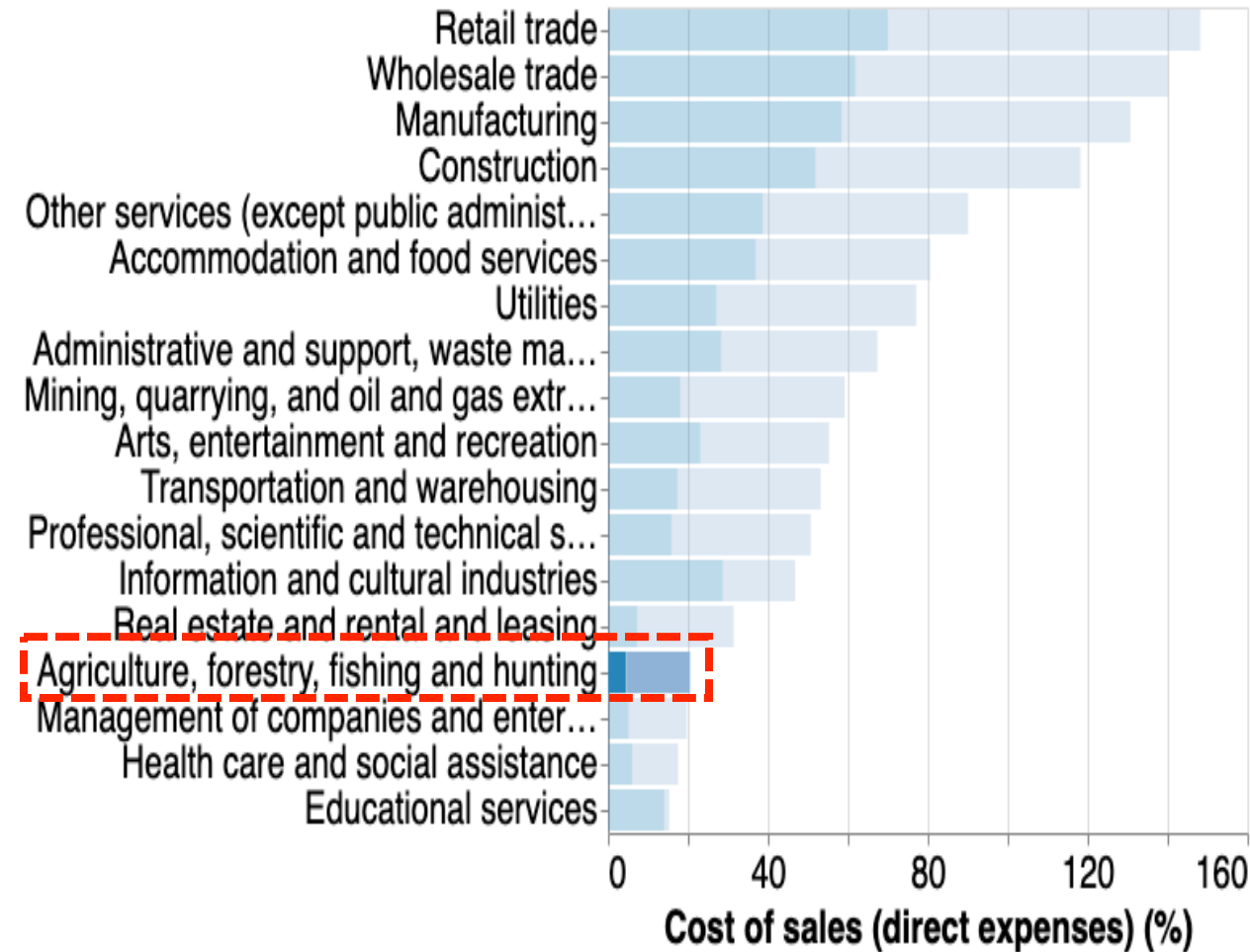
Gross margin = (sales of goods and services - costs of sales) * 100 / (sales of goods and services)



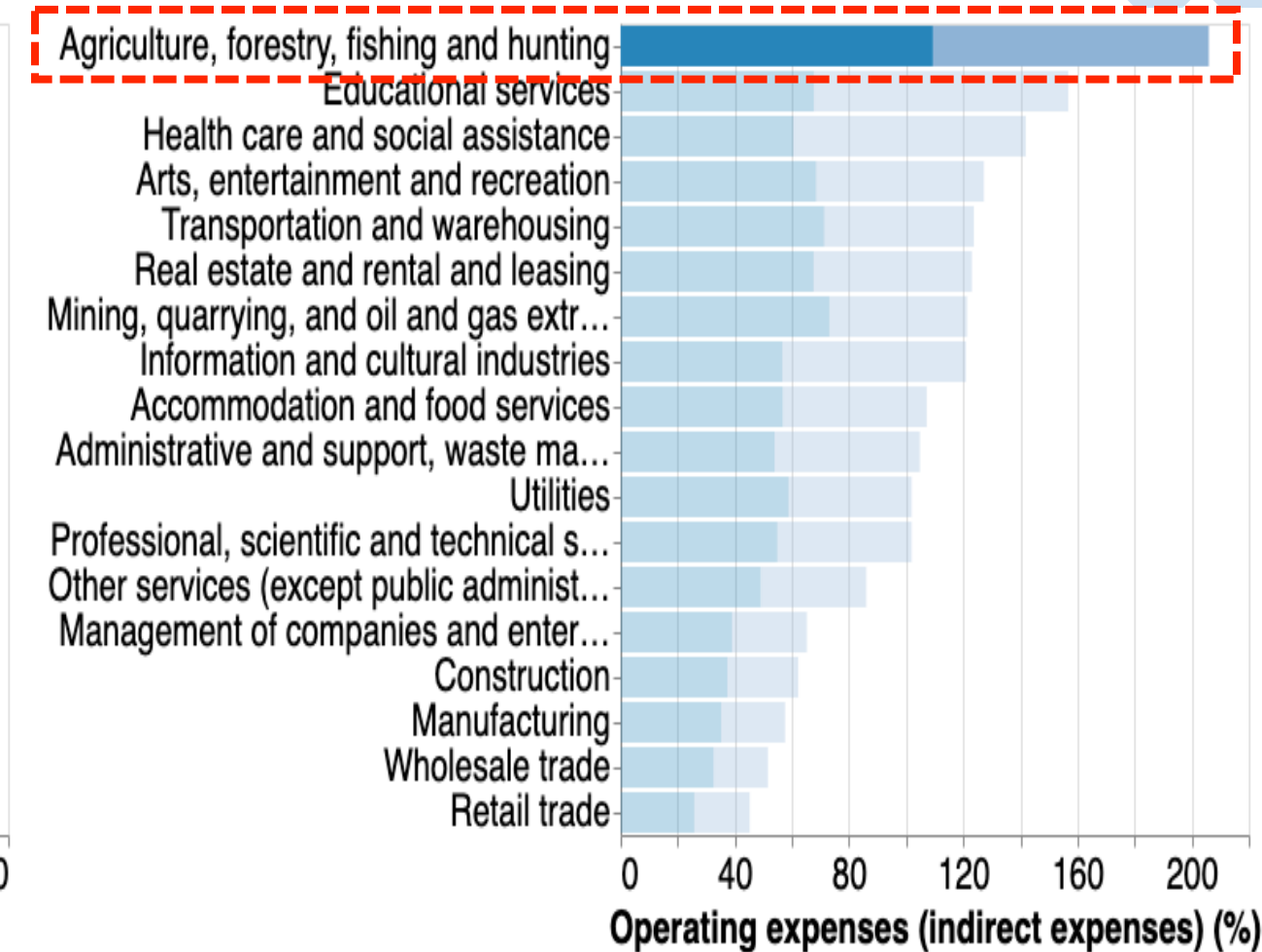
Agriculture, forestry, fishing and hunting industry

Operating expenses percentage of revenue was the highest!

= Running this business was the most **EXPENSIVE!**



■ Medium Business ■ Small Business





% of revenue

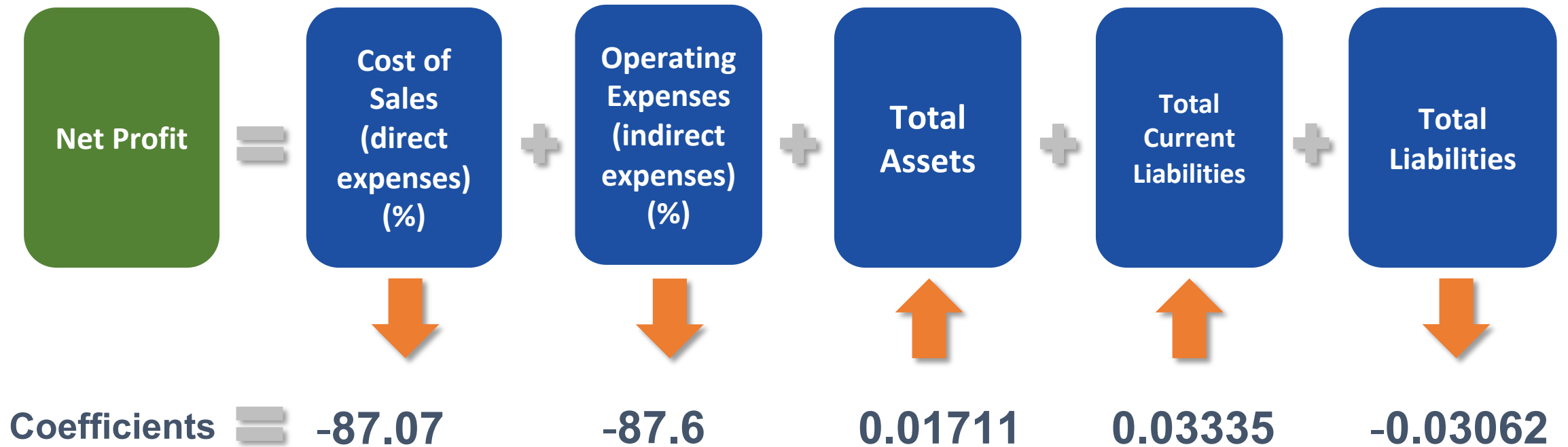
2019 Rural Canada

Research Question 2:

What variables have more significant influence on the net profit of rural businesses ?

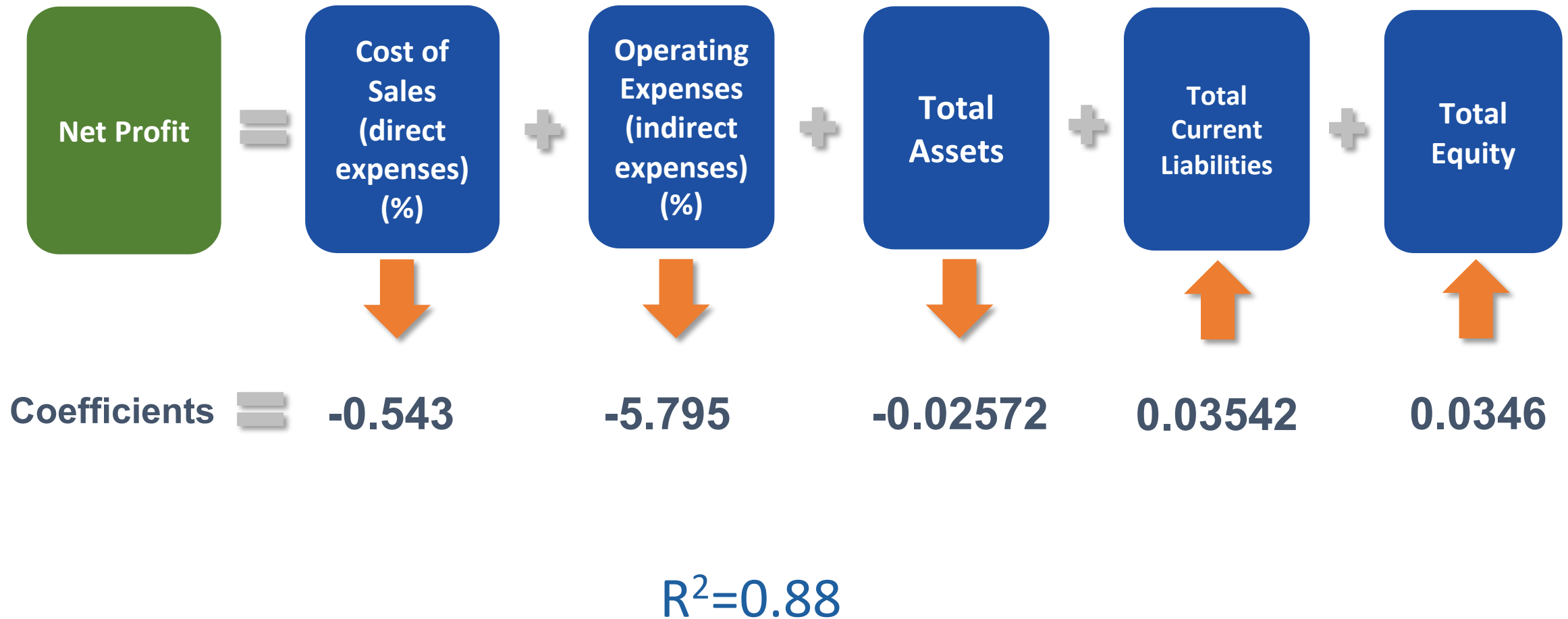
-  Supervised Multi-linear Regression (MLR)
-  Backward Selection

Net Profit Model - Medium Rural Business



$$R^2=0.99$$

Net Profit Model - Small Rural Business



Research Question 3 :

Is there a relationship between the unemployment rate and business performance?



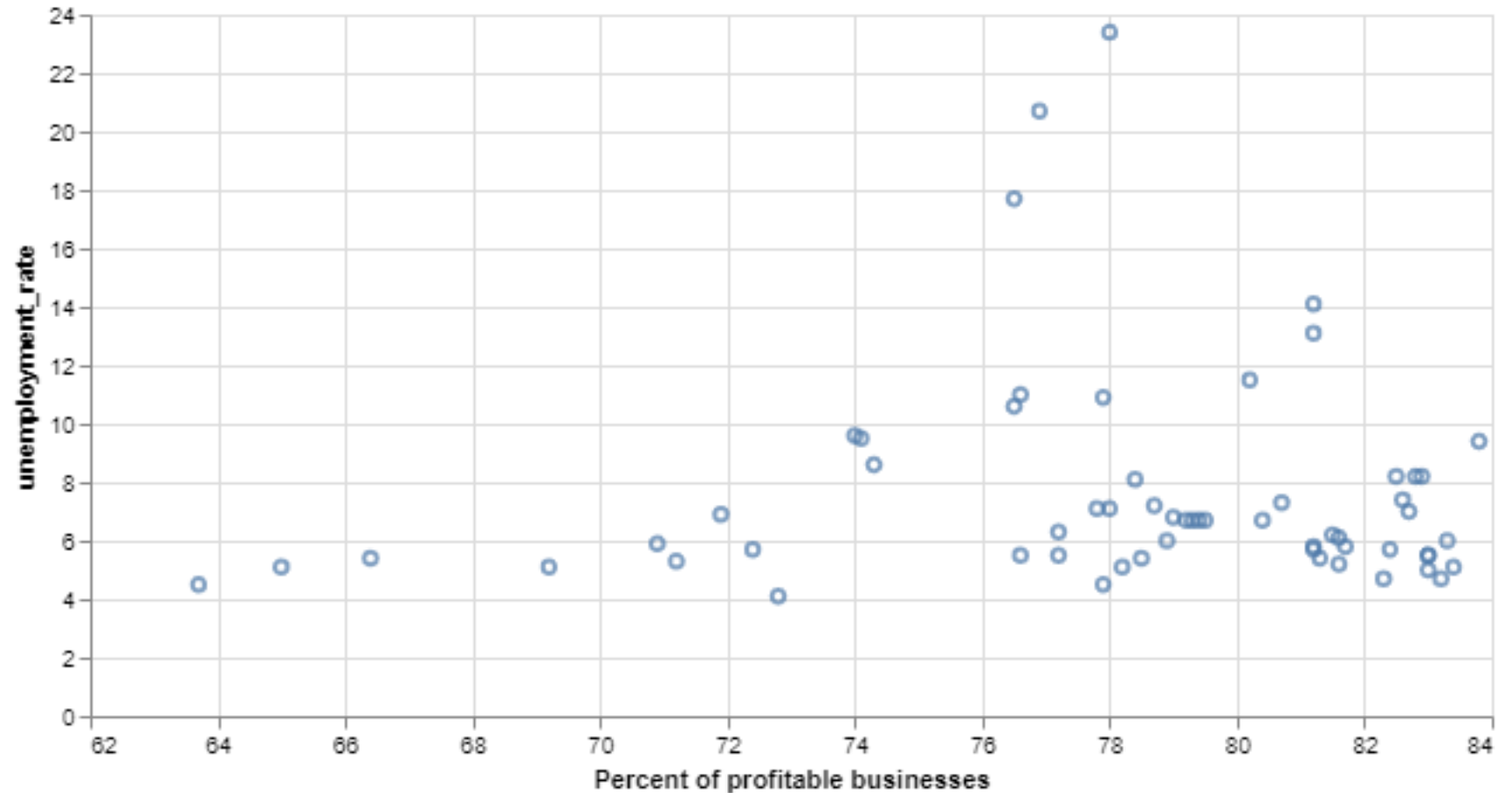
Data wrangling and visualization



Linear Regression Model

Scatter plot and outliers

Unemployment rate higher than 10.5% came from the rural area of "Newfoundland and Labrador", "Prince Edward Island" and "New Brunswick" over 3 years.

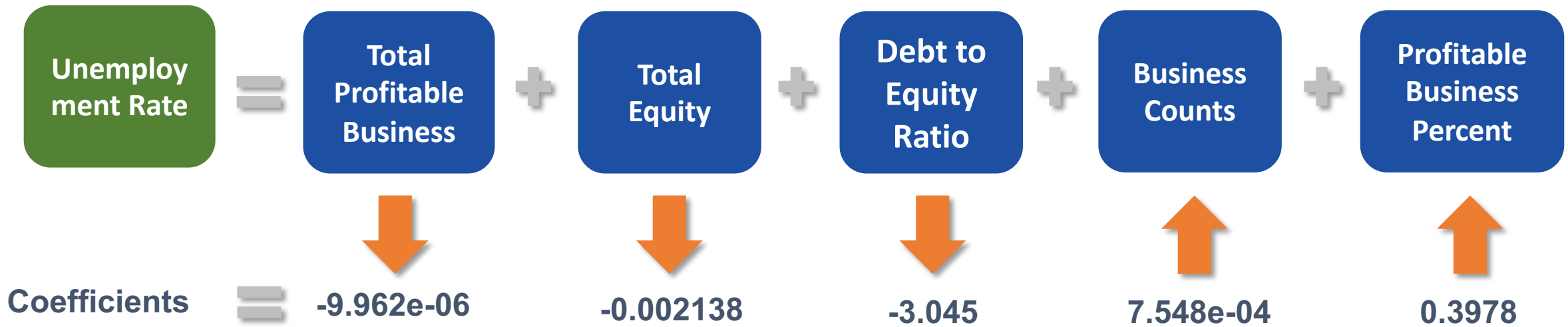


Outlier investigation

"Newfoundland and Labrador" and "New Brunswick" had highest population / number of businesses rate. This result partially implied the lack of job opportunities.

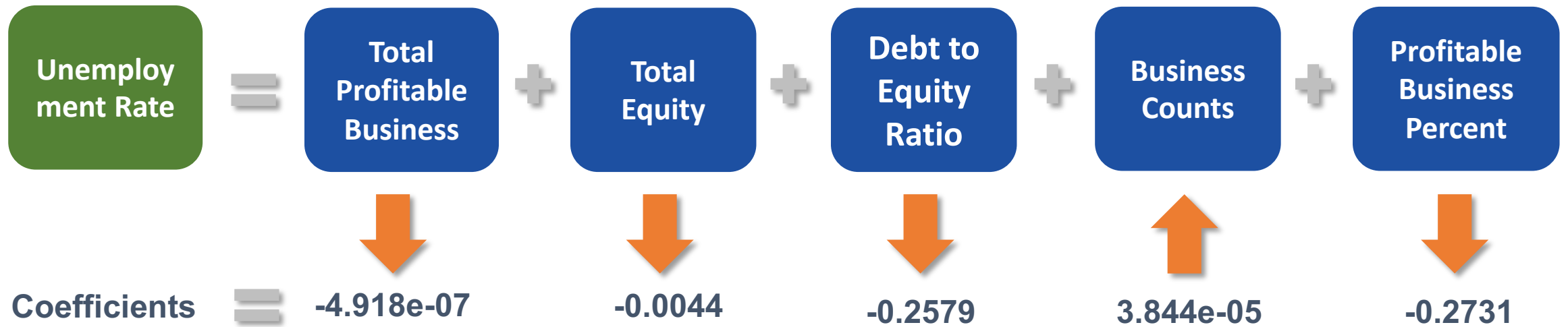
	Geography	Reference year	population	Total number of businesses	rate
0	Newfoundland and Labrador	2017	240942	9082	26.529619
1	Newfoundland and Labrador	2018	240942	9305	25.893821
2	Newfoundland and Labrador	2019	240942	9356	25.752672
9	New Brunswick	2017	285560	11163	25.580937
10	New Brunswick	2018	285560	11310	25.248453
11	New Brunswick	2019	285560	11327	25.210559
18	Manitoba	2017	376441	15648	24.056812
20	Manitoba	2019	376441	15779	23.857089
19	Manitoba	2018	376441	15871	23.718795
15	Ontario	2017	1424102	64260	22.161562

Unemployment Model - Small Rural Business



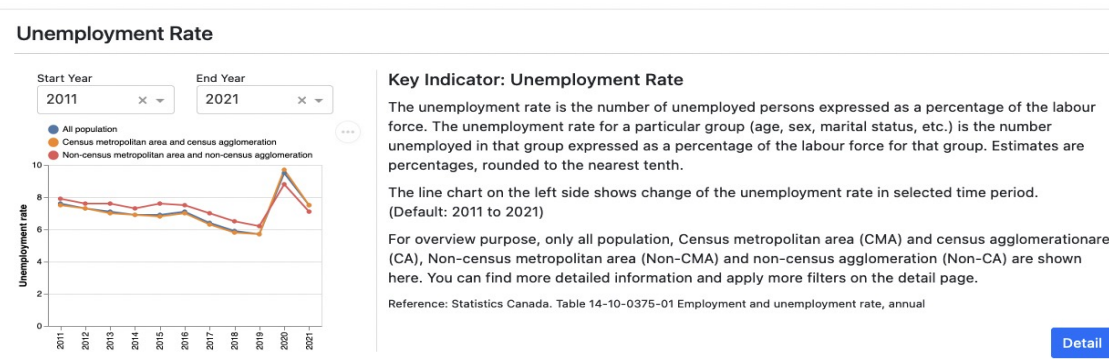
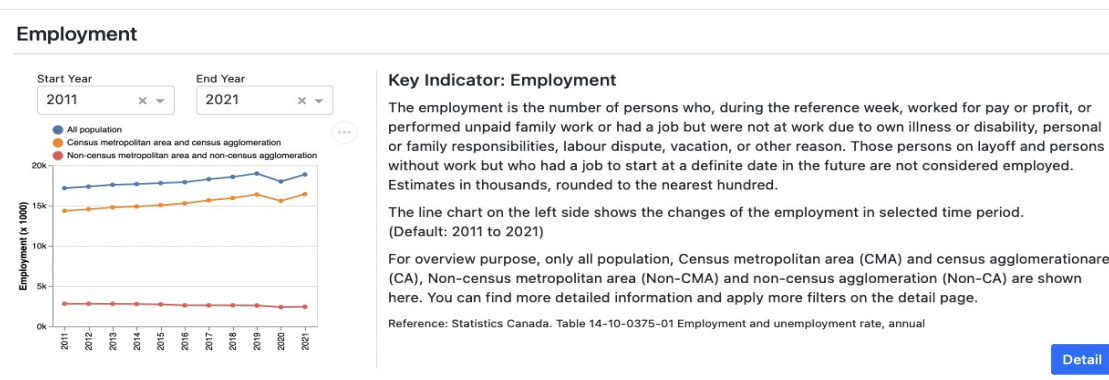
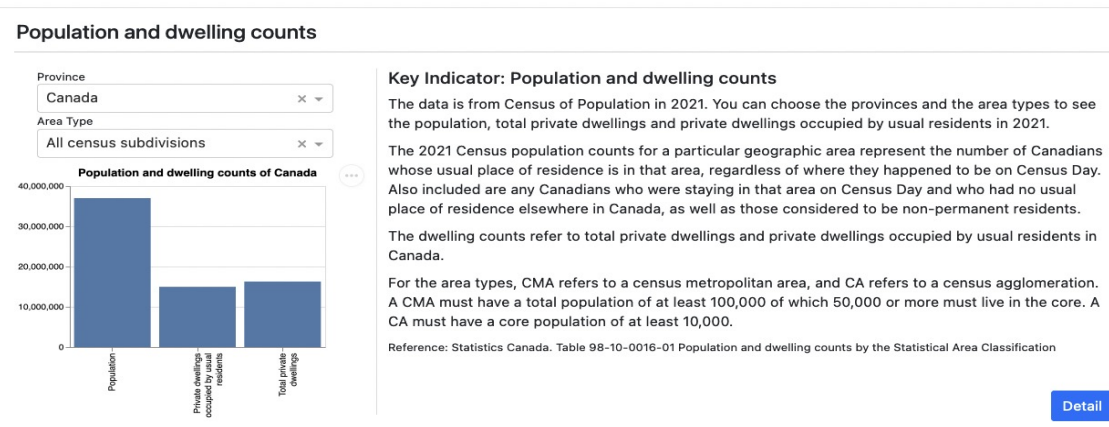
$R^2=0.77$

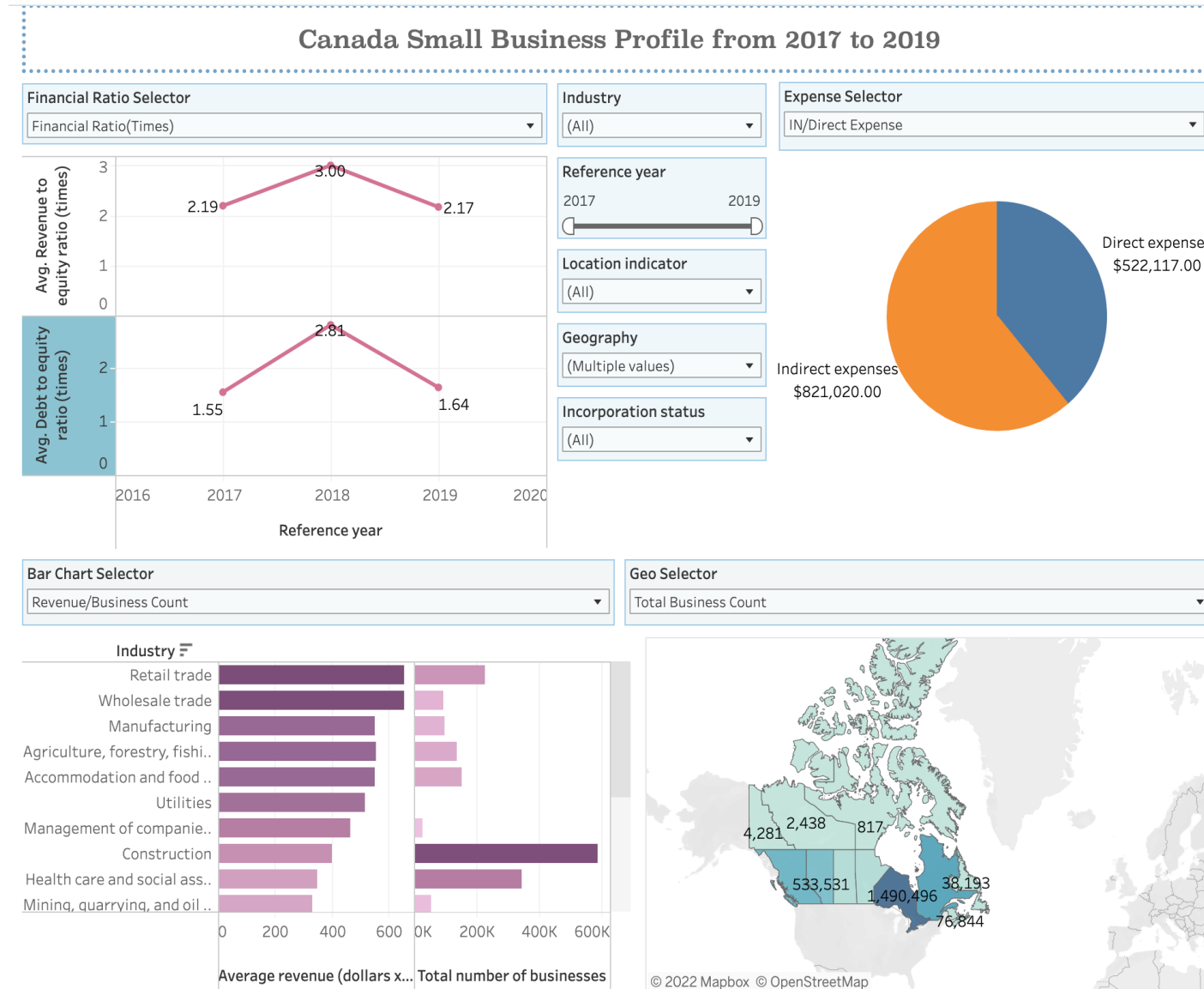
Unemployment Model - Small Urban Business

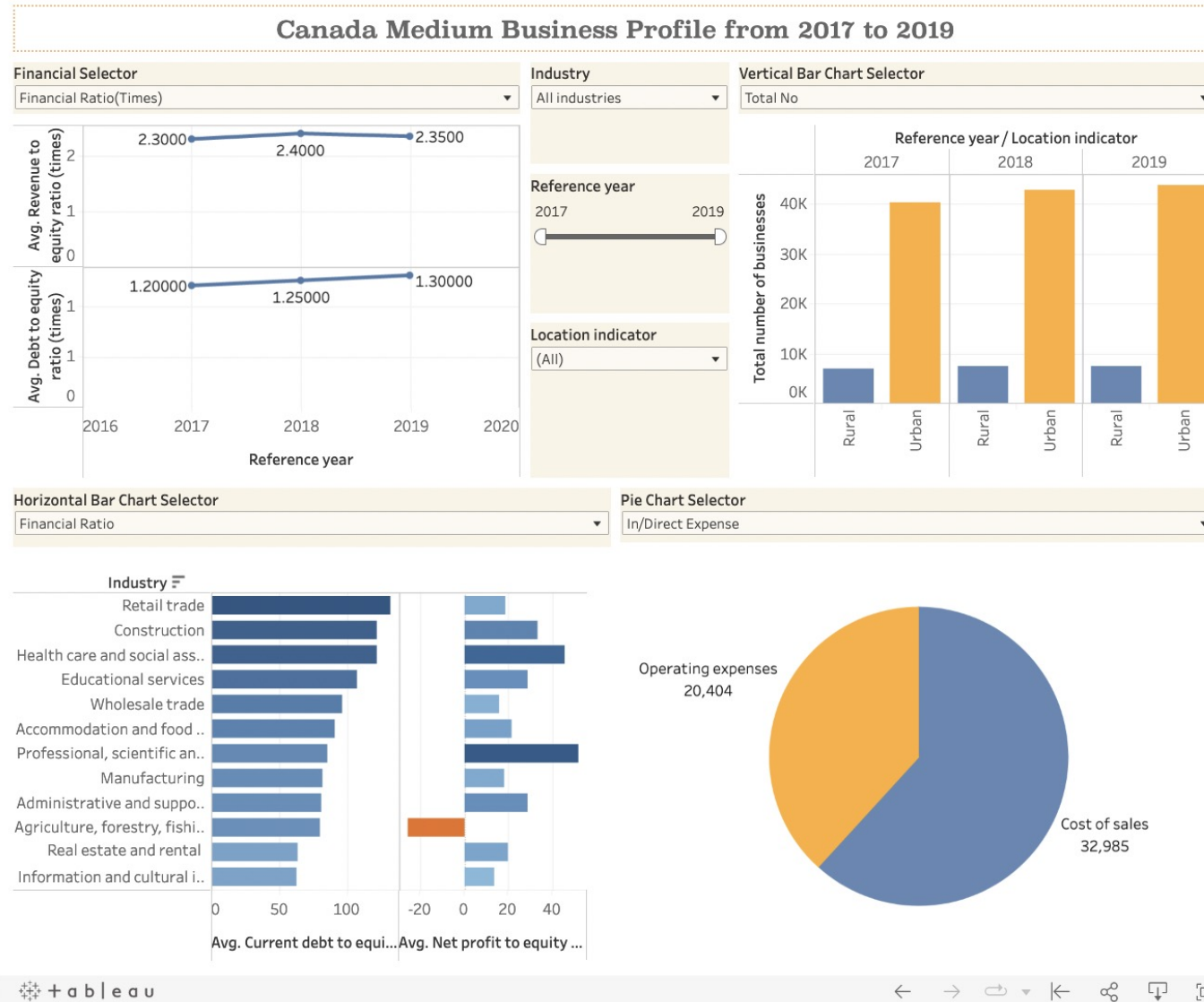


$$R^2=0.71$$

Dashboards - Overview Page









Demo

<https://rural-overview-dashboard.herokuapp.com/>



Conclusions

01

There were much more small businesses than medium businesses in rural Canada, and Quebec, Ontario and Alberta were the top 3 provinces with the largest number of small rural businesses.

02

The distribution of direct and indirect expenses in small and medium businesses had the opposite structures

03

Agriculture, forestry, fishing and hunting industry had the greatest amount while the worst profit in rural areas

04

According to variable selection, cost of sales to revenue, operating expenses to revenue, total assets, and total current liabilities have the significant influence on the net profit of both small and medium rural businesses

05

The Cross-analysis model indicates that as the total number of profitable businesses increases, the unemployment rate will decrease and if the debt-to-equity ratio is higher, the unemployment rate will be lower



Why did small and medium businesses have the opposite distribution structures for their expenses?



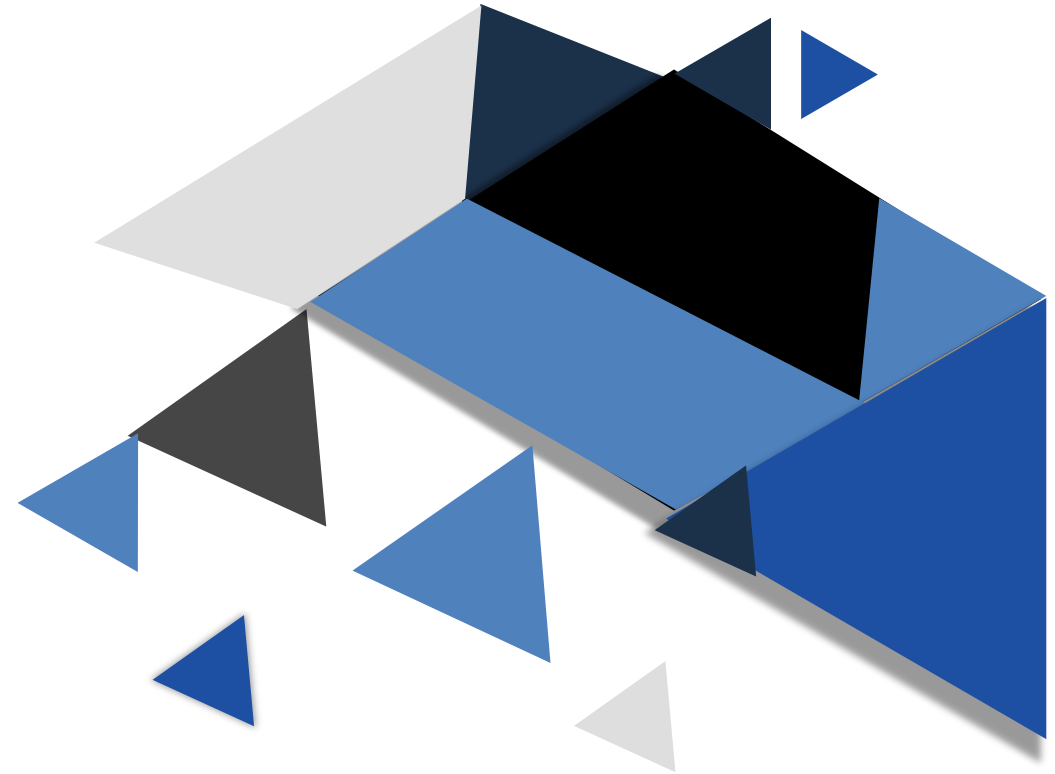
More data can be added to the unemployment model to improve training and testing results.



How did Agriculture, forestry, fishing and hunting industry keep running as it was not profitable?



Thank You!





Questions?

