The impact of minimum wage on youth employment: A difference-in-differences analysis of Saskatchewan vs. Alberta

Course: Data 602 Statistical Data Analysis

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1. Purpose

1.1. Domain

Labor economics and public policy analysis

1.2. Investigation Goal

To determine the causal effect of Saskatchewan's October 2024 minimum wage increase (from $14.00 to $15.00) on youth employment rates, using Alberta as a control group where minimum wage remained frozen at $15.00.

1.3. Practical Implications and motivation

This research provides evidence-based insights for Canadian provincial labor policy, particularly regarding youth employment effects of minimum wage changes.

Standard economic theory predicts minimum wage increases have negative employment effects and that young workers, for being relatively less experienced and having less skills, are disproportionately affected by minimum wage changes. But many politicians and the population at large believe minimum wage increases alleviates poverty and improves income distribution. So the question is og great interest to both social scientists and the public in general.

But testing minimum wage effects on employment (youth or not) with cross-sectional analysis is challenging. This type of analysis cannot adequately control for unobserved differences across

regions or individuals that also affect employment. All these differences, when uncontrolled for, become confounding factors may bias estimates, making it hard to isolate the impact of minimum wage changes. For a clean causal analysis, ideally, we would need a natural experiment that exploits a clear, exogenous policy change and uses a comparable control group, allowing cleaner causal inference by comparing outcomes before and after the policy in treated versus control areas. But natural experiments like this are hard to find.[1]

Recent policy variation between Saskatchewan and Alberta, however, provides such an ideal natural experiment: Saskatchewan implemented a significant minimum wage increase in October 2024 (from $14.00 to $15.00) while Alberta maintained its wage frozen at $15.00 throughout the same period. This policy divergence between economically similar prairie provinces creates clean treatment and control conditions rarely available in observational data. That is why we will focus on two provinces – to trade external validity for more statistical precision in causal inference.

From a policy perspective, the findings of this research can help informing future minimum wage policy decisions, provincial policy coordination strategies, and help policymakers understand employment consequences of active wage adjustment versus wage freezes during inflationary periods.

From a statistical viewpoint, we hope to showcase how careful research design can extract credible causal estimates (and not only associational results) from observational data – a core skill for data science applications across industries.

1.4. Population(s) of Interest

Workers aged 15-24 (youth) in Saskatchewan and Alberta, Canada, during the period April 2024 to March 2025.

1.5. Variables of Interest

- **Primary outcome:** Employment rate (employed/population)
- **Secondary outcomes:** Labor force participation rate, unemployment rate, full-time vs. part-time employment shares
- **Treatment variables:** Province indicator, post-treatment period indicator
- **Control variables:** Age, gender, education level, student status, urban/rural location, previous working experience, provincial unemployment rate, provincial economic growth and commodity price index (or other measures of inflation).

1.6. Data Collection Method

Survey data collection through Statistics Canada's Labour Force Survey (LFS), which uses probability sampling methods to collect monthly employment statistics from Canadian households.

[1] For a seminal work on this topic using causal inference methods, see Card and Krueger, 2000.

2. Data

2.1. Source of Data

Statistics Canada Labour Force Survey (LFS) microdata accessed via ODESI (Ontario Data Documentation, Extraction Service and Infrastructure).[2]

2.2. Permission/Accessibility

Publicly available through Statistics Canada via ODESI for academic use. Additional policy data sourced from provincial government websites and official gazette records.

2.3. Time Frame of Data Collection

Monthly data from July 2023 to June 2025 (12-month window before and after Saskatchewan's minimum wage increase announcement), providing approximately 65,000-70,000 person-month observations.[3][4]

3. Topic(s) to Investigate

3.1. Focus of Statistical Investigation

Using difference-in-differences methodology to estimate the causal effect of minimum wage policy changes on youth employment, specifically testing whether Saskatchewan's wage increase had measurable impact compared to Alberta's wage freeze.

3.2. Background/Context

The relationship between minimum wage and youth employment is highly debated in labor economics.[5] Traditional economic theory predicts negative employment effects from wage increases, but modern theories suggest more nuanced outcomes. Recent policy divergence between Saskatchewan and Alberta creates an ideal natural experiment, as these economically similar prairie provinces implemented different wage strategies during the same period, allowing for clean causal identification rarely available in observational studies.

[2] See Canada, 2024.

[3] This is a rough estimate based on partial monthly datasets that we have been exploring.

[4] We use the policy announcement date rather than the implementation date because once a policy is announced with sufficient reliability, firms and individuals may begin altering decisions in anticipation, well before the formal implementation occurs.

[5] For a non-technical overview of this literature, see Manning, 2021

4. Statistical Methods

4.1. Planned Methods

Method 1: Difference-in-Differences (DiD) Estimation

Fixed effects regression model comparing treatment (Saskatchewan) and control (Alberta) groups before and after the October 2024 policy implementation.

The basic DiD model specification is:

$$Y_{ipt} = \alpha + \beta \cdot \text{Treat}_p \times \text{Post}_t + \gamma_p + \delta_t + X'_{ipt}\theta + \epsilon_{ipt} \tag{1}$$

Where:

- Y_{ipt}: Employment outcome for individual i in province p at time t
- Treat_p: Indicator for Saskatchewan (treatment province)
- Post_t: Indicator for October 2024 onwards (post-treatment period)
- γ_p: Province fixed effects
- δ_t: Time fixed effects (month-year)
- X_{ipt}: Individual and time-varying controls
- β: Difference-in-differences treatment effect (parameter of interest)

Method 2: Simple OLS Regression

A simple Ordinary Least Squares (OLS) regression estimates the association between the treatment and the employment outcome without explicitly controlling for differences over time or unobserved heterogeneity. The model can be specified as:

$$Y_{ipt} = \alpha + \beta \cdot \text{Treat}_p + \gamma \cdot \text{Post}_t + \delta \cdot \text{Treat}_p \times \text{Post}_t + X'_{ipt}\theta + \epsilon_{ipt} \tag{2}$$

Where:

- Y_{ipt}: Employment outcome for individual i in province p at time t
- Treat_p: Indicator for Saskatchewan (treatment province)
- Post_t: Indicator for October 2024 onwards (post-treatment period)
- $\text{Treat}_p \times \text{Post}_t$: Interaction term capturing the treatment effect
- X_{ipt}: Vector of individual and time-varying controls
- β, γ, δ: Coefficients to be estimated, with δ representing the differential post-treatment effect for Saskatchewan relative to Alberta

This model does not control for fixed effects and thus may be biased due to unobserved confounding factors differing over time or across provinces.

Method 3: Two-Sample t-Test

A simple two-sample t-test compares the mean employment outcomes of youth in Saskatchewan before and after the minimum wage increase to test whether the change is statistically significant. Similarly, a comparison can be made for Alberta as a control group. The procedure to implement this test can be decomposed into four steps:

Procedure:

- We will calculate the mean employment rate for youth aged 15-24 in Saskatchewan during the pre-treatment period (July 2023-June 2024).
- Then we will do the same in Saskatchewan during the post-treatment period (from July 2024 onwards until June 2025).
- We then conduct an independent two-sample t-test to assess whether the difference in means before and after the policy change is statistically significant.
- We then repeat the test similarly for Alberta to assess natural trends in the absence of treatment.

It is worthy noting that this method explores what we have seen so fat in the course, but does not control for confounding variables or account for time trends and may conflate treatment effects with other temporal changes in the economy/job market of the two provinces.

4.2. Data visualization tools

Given the richness of our dataset, we will have abundant opportunities to showcase data visualization techniques that have explored in this course when performing an initial exploratory analysis. These visualizations can effectively illustrate pre- and post-treatment differences in employment outcomes between Saskatchewan and Alberta, which provides a first ´´eyeball" analysis of our central hypothesis. Moreover, they can reveal potentially heterogeneous effects of the minimum wage increase across different sociodemographic groups, such as variations by age and gender. Such graphical summaries will help identify patterns and disparities that might not be immediately apparent from summary statistics alone, thus enriching the understanding of the policy's impact early in the analytical process.

References

Canada, S. (2024). Labour force survey (lfs) [Statistics Canada. Labour Force Survey, 2024. Available from: https://www.statcan.gc.ca/en/survey/household/3701]. https://www.statcan.gc.ca/en/survey/household/3701

Card, D., & Krueger, A. B. (2000). Minimum wages and employment: A case study of the fast-food industry in new jersey and pennsylvania: Reply. *American Economic Review*, *90*(5), 1397–1420. https://doi.org/10.1257/aer.90.5.1397

Manning, A. (2021). The elusive employment effect of the minimum wage. *Journal of Economic Perspectives*, *35*(1), 3–26.