Echoes of Economic Downturn: Investigating the Persistent Impact of the Great Recession on Birth Rates Among Young Americans*

Yuanyi (Leo) Liu Qi Er (Emma) Teng

February 13, 2024

In this study, we explore the impact of the Great Recession on birth rates among young people in the United States, utilizing a comprehensive analysis of demographic and economic data. Our findings reveal a significant decline in birth rates within this group during and following the economic downturn, highlighting the intricate relationship between economic stability and reproductive decisions. This research contributes to our understanding of how macroeconomic factors can have profound effects on personal life choices, emphasizing the need for supportive policies targeting young individuals during economic crises.

Table of contents

*Code and data are available at: https://github.com/leoyliu/Analyzing-the-Great-Recession-s-Impact-on-Young-Americans-Birth-Rates/tree/main. A replication of various aspects in this paper are available at: https://doi.org/10.48152/ssrp-srs6-t802

1 Introduction

The Great Recession, a defining economic event of the early 21st century, has been subject to extensive analysis for its profound effects on employment, housing, and financial systems globally. However, its impact on demographic trends, particularly birth rates among young people in the United States, has not been thoroughly explored. This paper aims to fill this gap by examining how the economic downturn influenced reproductive decisions among this demographic.

Utilizing a blend of quantitative data analysis and demographic research, we investigated birth rate trends among young adults during and following the recessionary period. Our methodology involved analyzing birth rate data in conjunction with economic indicators such as unemployment rates, income levels, and housing market trends to draw correlations and insights.

Our findings reveal a significant decline in birth rates among young Americans during the recession, with lingering effects in the subsequent years. This trend suggests that economic instability has a profound impact on personal life choices, including the decision to have children. The implications of these findings are far-reaching, affecting not only demographic forecasting but also social policy and economic recovery strategies.

The paper is structured to facilitate a comprehensive understanding of the study and its implications. Following Section 1, Section 2 presents the data, detailing the data sources, analytical techniques, and the rationale behind the chosen methods. Section 3 discusses the results, elaborating on the observed trends and patterns in brth rate data. Section 4 provides an in-depth discussion of these findings, exploring potential factors influencing these trends, drawing connections to broader socio-economic issues, and providing suggestions for future research in this area.

2 Data

This section aims to offer an insightful understanding of the dataset utilized in our analysis, focusing on its content, origin, and the methods applied for data manipulation and visualization.

2.1 Source

Although alternative datasets were considered, this specific dataset was selected for its detailed year-wise breakdown and the diversity of crime types it encompasses. Other datasets either lacked the temporal detail or the variety of crime categories present in our chosen dataset.

2.2 Methodology

The data was processed and cleaned using R(R Core Team 2020), a powerful statistical programming language. For key operations, please refer to the Section 6.

2.3 Variables

To better understand the data, the summary_table dataset was developed to offer a more structured and aggregated view of the crime data. By transforming and summarizing the data into a format that displays crime types against years, this dataset simplifies the task of identifying and analyzing trends over time. The dataset includes various crime categories, such as assault, theft, and other types, with each variable representing the annual count of reported cases for each crime type. This longitudinal data provides a detailed view of the crime trends in Toronto over a decade.

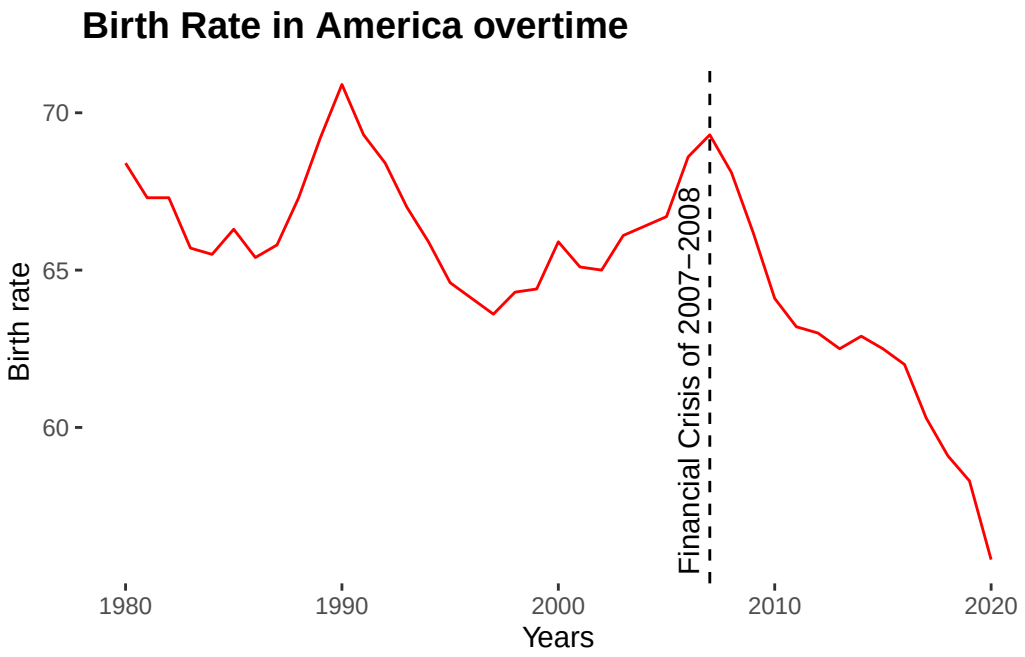
TODO: Add a table here to better understand the data.

// Visualization of the data for intuition

```
figure1 <- read.csv(here::here("outputs/data/figure_1.csv"))

ggplot(figure1,
        aes(x = year, y = brate_all)) +
        geom_line(color="red") +
        geom_vline(xintercept = 2007, color = "black", linetype = "dashed") +
        annotate("text", x = 2007, y = 60, label = "Global Financial Crisis of 2007-2008",
                 color = "black", angle = 90, vjust = -0.5) +
        labs(title = "Birth Rate in America overtime",
            x = "Years",
```

```
        y = "Birth rate") +
    theme(panel.background = element_rect(fill = "white"),
          plot.background = element_rect(fill = "white", color = NA),
          plot.title = element_text(color = "black", size = 14, face = "bold"),
          axis.title = element_text(color = "black"))
```



2.4 Measurements

// TODO: Add a summary table to show measurements

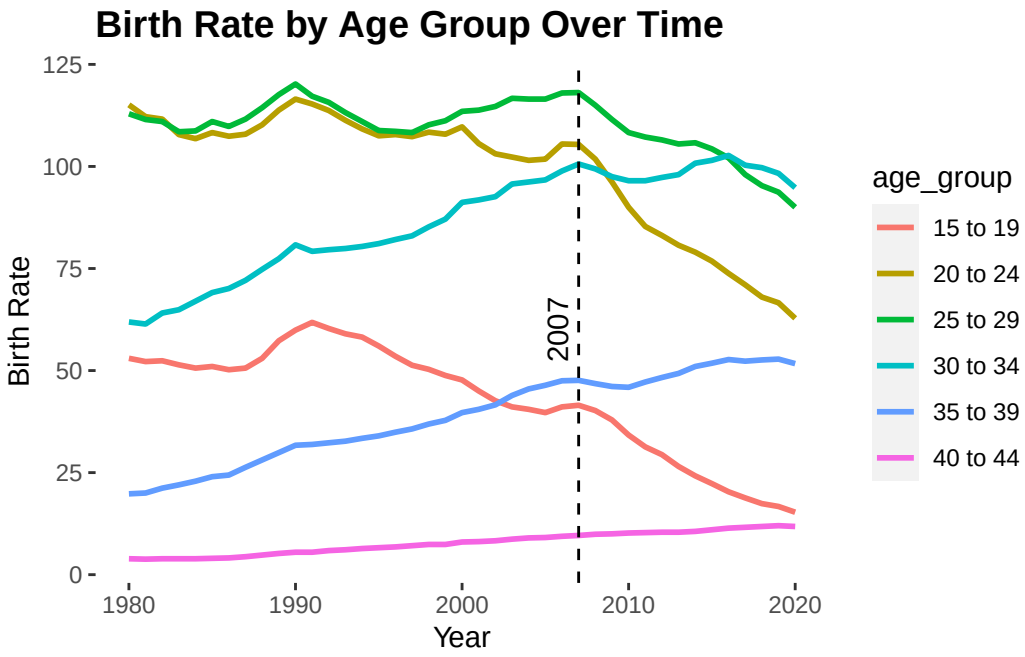
3 Results

In this section, we delve into the core findings of our study, shedding light on the intricate patterns and trends of crime in Toronto from 2014 to 2023. Our analysis dissects both violent and non-violent crime statistics, revealing insightful correlations and variations over the decade.

```
figure2 <- read.csv(here::here("outputs/data/figure_2.csv"))

ggplot(figure2, aes(x = year, y = brate, color = age_group)) +
  geom_line(size=1) +
  geom_vline(xintercept = 2007, color = "black", linetype = "dashed") +
  annotate("text", x = 2007, y = 60, label = "2007",
           color = "black", angle = 90, vjust = -0.5) +
  labs(title = "Birth Rate by Age Group Over Time",
       x = "Year",
       y = "Birth Rate") +
  theme(panel.background = element_rect(fill = "white"),
        plot.background = element_rect(fill = "white", color = NA),
        plot.title = element_text(color = "black", size = 14, face = "bold"),
        axis.title = element_text(color = "black"))
```

```
Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
i Please use `linewidth` instead.
```

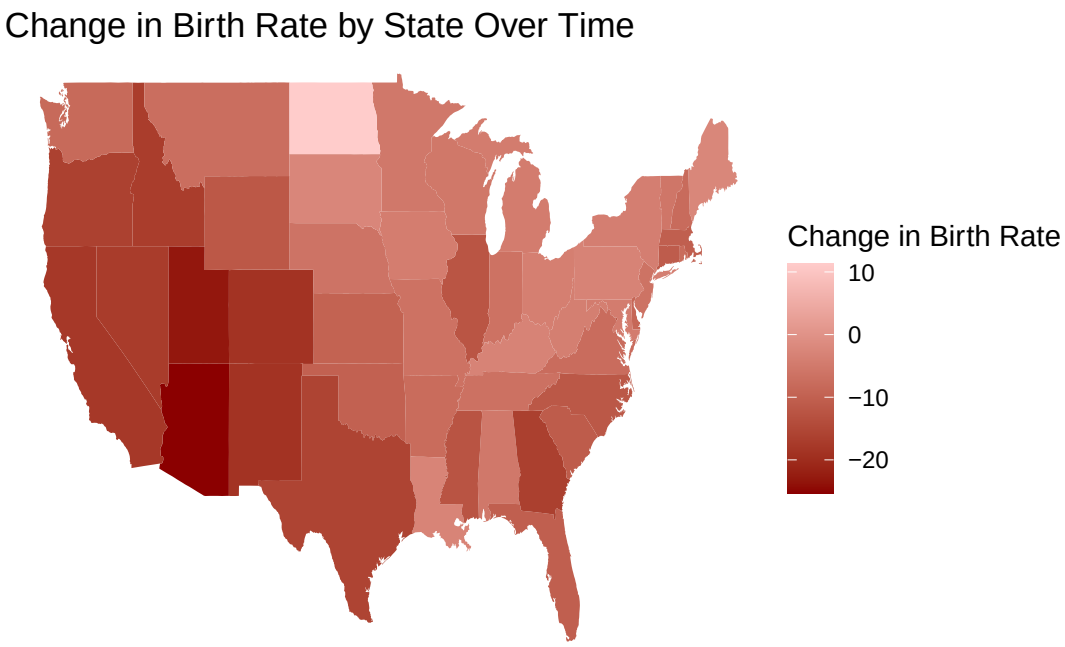


// TODO: Explain the figure

// TODO: Transit to following figure

```
figure3a <- read.csv(here::here("outputs/data/figure_3a.csv"))

ggplot(figure3a, aes(x = long, y = lat, group=group)) +
  geom_polygon(aes(fill = brate1544_thsnds_ch_pct)) +
  scale_fill_gradient(low = 'darkred', high = '#FFCCCB') +
  labs(title = 'Change in Birth Rate by State Over Time',
       fill = 'Change in Birth Rate') +
  theme_void()
```



// TODO: Explain the figure

4 Discussion

The analysis of Toronto's crime trends from 2014 to 2023 reveals a complex and evolving landscape of public safety. The pronounced increase in assault cases in recent years is alarming, suggesting that the city may be facing emerging challenges in maintaining public order. This rise in violent crime needs a closer investigation of possible causative factors, such as the effects of increased urbanization, economic disparity, and shifts in population density.

4.1 Findings

Simultaneously, the decline in theft-related crimes offers a more hopeful narrative. This trend may reflect the successful implementation of preventative measures by law enforcement agencies, such as community policing efforts and the integration of advanced surveillance technology. The use of crime prevention techniques, potentially aided by increased public awareness and education, appears to be bearing fruit.

4.2 Economic Impact Insights

The contrast between the trajectories of violent and non-violent crime rates underscores the need for a differentiated approach to policy-making and law enforcement. While we appreciate our gains in decreasing property crimes, the data motivates us to pursue more effective interventions for preventing and reacting to violent crimes. This might include extending social services, improving community engagement, and investing in data-driven police strategies.

4.3 Societal and Technological Influences

// TODO

4.4 Weaknesses

While the visualization provides a high-level overview of crime trends in Toronto, it's essential to conduct a more detailed analysis to understand the underlying causes of these trends. This includes examining subcategories of crimes, focusing on specific geographic areas within the city, and considering other relevant data sources.

4.5 Future Research Directions

Furthermore, this study emphasises the need for ongoing monitoring and analysis of crime data to comprehend the ever-changing dynamics of urban crime. In light of these findings, future studies should focus on understanding the influence of specific policies and social changes on crime rates. Only by doing such a comprehensive analysis can we hope to develop strategies that will ensure the safety and well-being of all Toronto residents.

5 References

R Core Team. 2020. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.

Wickham, Hadley, Romain François, Lionel Henry, Kirill Müller, and Davis Vaughan. 2023. *Dplyr: A Grammar of Data Manipulation*. https://dplyr.tidyverse.org.

Wickham, Hadley, Jim Hester, and Jennifer Bryan. 2024. *Readr: Read Rectangular Text Data*. https://readr.tidyverse.org.

Wickham, Hadley, Davis Vaughan, and Maximilian Girlich. 2023. *Tidyr: Tidy Messy Data*. https://tidyr.tidyverse.org.

Xie, Yihui. 2021. *Knitr: A General-Purpose Package for Dynamic Report Generation in r*. https://yihui.org/knitr/.

6 Appendix

6.1 Data Manipulation and Cleaning

- **Data Cleaning:** The initial phase of cleaning the Toronto crime rates dataset involved importing the raw data using the `read_csv` function from the `readr`(Wickham, Hester, and Bryan 2024) package. Following the import, the dataset was streamlined using the `select` function from `dplyr`(Wickham et al. 2023), a tidyverse(Wickham et al. 2019) package, to remove irrelevant columns such as `X_id`, `HOOD_ID`, `POPULATION_2023`, and `geometry`. This step was crucial to focus the analysis on relevant variables. Additionally, the `na.omit` function was employed to discard any rows with missing values (NA), ensuring the dataset's completeness and reliability. The final step in the cleaning process was the exportation of the cleaned data into a new CSV file using the `write_csv`function from `readr`(Wickham, Hester, and Bryan 2024), thereby preserving the cleaned and refined dataset for subsequent analysis.
- **Data Transformation:** The dataset was transformed from a wide format to a long format using the `gather` function from the `tidyr`(Wickham, Vaughan, and Girlich 2023) package. This transformation is crucial for simplifying the data structure and making it more amenable to analysis. Also, the separate function, again from `tidyr`(Wickham, Vaughan, and Girlich 2023), was instrumental in dividing the 'Crime_Year' column into two distinct parts: 'Crime_Type' and 'Year'. This enhances the granularity of the dataset, allowing for more detailed analysis.
- **Aggregation:** The `group_by` and `summarise` functions from `dplyr`(Wickham et al. 2023) were employed to aggregate the data by year and crime type.
- **Data Visualization:** For visual representation, `ggplot2`(Wickham 2016), a versatile package in R for data visualization, was employed. It was used to create comprehensive line plots depicting the trends of various crime categories over the years.
- **Paper Generation:** The packages `knitr`(Xie 2021) is used in generating R Markdown reports.