Replication Appendix For: The Slaughter of the Bison and Reversal of Fortunes on the Great Plains

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Donn. L. Feir
University of Victoria & IZA

Rob Gillezeau
University of Toronto

Maggie Jones
Emory University & NBER

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I Introduction

This appendix describes the data and code required to replicate "The Slaughter of the Bison and Reversal of Fortunes on the Great Plains," authored by Donn Feir, Rob Gillezeau, and Maggie Jones. The replication package includes twelve datasets that have been constructed from a large number of primary and secondary sources and a single do file that replicates the results throughout the paper. Please contact the authors directly if you have any questions about the data construction process, empirical analysis, or source material used.

The replication appendix includes a total of four sections, inclusive of the introduction. Section II describes the file structure of the replication folder, Section III lists and briefly describes the datasets in the replication package, and Section IV walks users through how to run the code.

II File Structure

The replication package is divided between three folders. The folders are structured as follows:

- Data: there are two subfolders, `reservations`, which includes reservation spatial boundaries and `homelands`, which includes traditional homeland spatial boundaries. In addition, there are 12 individual datasets directly under the data folder:
  - `FGJ_Boas_Heights.dta`
  - `FGJ_ICPSR_1859_1970_ResLevel.dta`
  - `FGJ_ICPSR_1940_2000_ResLevel.dta`
  - `FGJ_Income_Source1915.dta`
  - `FGJ_IPUMS.dta`
  - `FGJ_IPUMS_modern.dta`
  - `FGJ_IPUMS_Whites.dta`
  - `FGJ_Nation_Data.dta`
  - `FGJ_Panel_19452019.dta`
  - `FGJ_ResCoordinates.dta`
  - `FGJ_ResIDs.dta`
  - `FGJ_ValAg.dta`

Note that the datasets `FGJ_ResCoordinates.dta` and `FGJ_ResIDs.dta`, while included in the replication package, are also generated using the `shp2dta` package within the main replication file.

- Do: there is one master do file that replicates all figures and tables in the text, using the aforementioned datasets:
  - `FGJ_Bison_ReStud_Rep.do`
- Output: all figures and tables generated by the do file are stored within this folder.

III Data Sets

The following is a list of the datasets included in the replication package and the primary data sources for each dataset. Most of the datasets listed below include variables from additional sources that are described in detail in the online data appendix.

1. Boas Indigenous heights data (Jantz, 1995):
   (a) `FGJ_Boas_Heights.dta`
2. Reservation-level data from ICPSR Historical, Demographic, Economic, and Social Data: The United States, 1790-2002. (Haines and Inter-University Consortium for Political and Social Research, 2010):
   (a) `FGJ_ICPSR_1859_1970_ResLevel.dta`
   (b) `FGJ_ICPSR_1940_2000_ResLevel.dta`
3. Bureau of Indian Affairs data from 1915-1920:
   (a) `FGJ_Income_Source1915.dta`
4. Historical IPUMS mortality and occupational data (Ruggles et al., 2015):
   (a) `FGJ_IPUMS.dta`
   (b) `FGJ_IPUMS_Whites.dta`
5. Modern IPUMS Data (Ruggles et al., 2015):
   (a) `FGJ_IPUMS_modern.dta`
6. Income from 1945 to 2019 data at the reservation-level plus additional controls from Leonard et al. (2020):

(a) `FGJ_Panel_19452019.dta`

7. Agricultural data (Hornbeck, 2012):

   (a) `FGJ_Panel_19452019.dta`

8. Geographic information, bison dependence, and additional controls. The shape file of traditional territories is in the folder `homelands`:

   (a) `FGJ_ResCoordinates.dta`

   (b) `FGJ_ResIDs.dta`

   (c) `FGJ_Nation_Data.dta`

   (d) `homelands`

IV Running the Code

To replicate the results, the user should change the file path at the top of `FGJ_Bison_ReStud_Rep.do` to the folder location on the user's computer. The user may run either the whole code at once or sections of the code individually, as each table and figure is self-contained within the master do file.

IV.A Stata Packages Required

The user must also ensure that the packages listed at the top of the do file are installed. All packages can be installed via `ssc install`.

Some Stata 17 packages used to replicate the analysis require the use of the `scc install` command. These include `grstyle`, `palette`, `colrspace`, `estout SJ10-4 st0043_2`, `ivreg2`, `ranktest`, `shp2dta`, `Acreg,` and `boottest`.

IV.B Hardware Requirements and Runtime

For a Windows PC, Stata 17 requires 64-bit Windows for x86-64 processors made by Intel® or AMD (Core i3 equivalent or better). For a Mac, it requires either a Mac with Apple Silicon or Intel processor (Core i3 or better) or macOS 11.0 (Big Sur) or newer for Macs with Apple Silicon and macOS 10.12 (Sierra) or newer for Macs with 64-bit Intel processors. For Linux, Any 64-bit (Core i3 equivalent or better) running Linux and includes the GNU C library (glibc) 2.17 or better. Stata/MP needs a memory of 4GB minimum with disk space of 2GB.

The code was run most recently with Stata MP version 17 on a 64-bit Windows machine with a Intel(R) Core(TM) i5-6300U CPU @ 2.40GHz and 16 GB of installed RAM. The runtime was 2 minutes and 55.71 seconds.

V Data Availability Statement

All data necessary to replicate "The Slaughter of the Bison and Reversal of Fortunes on the Great Plains" is available in this replication package. The `readme` file contains information on each dataset and their relevant sources. The online data appendix discusses the details of the data processing and merging. All data were acquired through public sources. In what follows, we provide information on how to access each of the primary sources.

Measuring Bison Reliance

Map of Homelands: We use the map of ancestral tribal territories as of 1600 from Martin and O'Leary (1990). The ancestral territories were digitized using QGIS and the homeland shapefiles are included in the replication package in the folder `homelands`.

Anthropological Measure of Bison-Reliance: Our anthropological measure of bison-reliance is created based on content from the Smithsonian Institute's Handbook of the North American Indian (Sturtevant, 1981) by the authors. We code tribes as bison-reliant if the Smithsonian volumes described them as obtaining a significant portion of their calories from bison or indicated that bison hunting was economically important without specific mention of calories. All of these indicators are provided in the replication file `FGJ_Nation_Data.dta`.

Map of the Bison Range: We use a digital reproduction of William Hornaday's (1889) map of the bison's range at various points in time (Hornaday, 1889). We digitize this version of the map and overlay it with our map of homelands to identify which nations' territories overlapped with the range of the bison and were affected by the rapid slaughter using QGIS. These overlay measures can be found in `FGJ_Nation_Data.dta`.

Heights

The data are provided in the replication package and are in the public domain. The data were digitized by Jantz (1995) and were originally provided to us from Christian Dippel (Dippel, 2014).

Mortality, Sex, Fertility, and Occupation in 1900

These data came from Ruggles et al. (2015). These data can be downloaded from IPUMS USA with a free member log-in: `https://usa.ipums.org/usa/`.

Income (1945-2019) & Potential Mechanisms

We use data on income per capita between 1945 and 2019 at the reservation-level from Leonard et al. (2020). These data are in the public domain and are included in the replication package.

Pre-Slaughter Confounders

War: In addition to the measures included in the Leonard et al. (2020) data, we also consider the number of battles a nation engaged in with the United States as an important pre-slaughter control. We use data compiled by Carlos et al. (2021) on violent conflict merged with our shapefiles of traditional territories to compute the number of battles in a tribe's ancestral territory in the pre-slaughter period. These data are available by request from the authors.

Pre-Settlement Population Density: These data are from the HYDE 3.1 database. They can be downloaded for free from: `https://landuse.sites.uu.nl/datasets/`.

Settler Population: Settler population densities in 1790 and 1870 (as well as other decades) come from Bazzi et al. (2020). These data are in the public domain and can be found here: `https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA16484`

Railways: The railway controls come from Atack (2016). They can be found here: `https://my.vanderbilt.edu/jeremyatack/data-downloads/`

Timing of Land Cessions: The timing of land cessions comes from maps from the Bureau of American Ethnology in 1899, created under the guidance of Charles C. Royce, and digitized by Saunt (2014). These data are in the public domain and can be found here: `https://usg.maps.arcgis.com/apps/webappviewer/index.html?id=eb6ca76e008543a89349ff2517db47e6`

Cost Adjusted Distances: In the online appendix, we provide additional specifications that instrument "Exposure to Slaughter" with a set of cost-adjusted distances to cities that were historically important for the trade in bison hides. We use the transportation costs constructed in Donaldson and Hornbeck (2016) and then rely on the estimates of transportation costs between Buffalo and Montreal, Canada, from Inwood and Keay (2013, 2015). These data can be acquired by contacting the authors.

Possible Confounders and Mechanisms

Historical and Modern Banks: Data for the number of commercial banks in counties that overlap with reservations in 1870 are from Jaremski and Fishback (2018), supplemented with additional counts from the various banker directories of the period courtesy of Matthew Jaremski. These data can be acquired by contacting him. The distance to the closest bank in 1870 was constructed using these data and county shape files from `https://www.nhgis.org/` in QGIS. Banking data from 1920-1936 come from Hornbeck (2012) and the modern (1980-2010) banking data come from Haines, Fishback, and Rhode (2018) both of which are in the public domain.

Net Migration: Yearly births come from the NBER data portal: `https://www.nber.org/research/data/vital-statistics-natality-birth-data`. Yearly deaths also come from the NBER data portal: `https://www.nber.org/data/vital-statistics-mortality-data-multiple-cause-of-death.html`. These data can be used freely by agreeing to the data use terms: `http://www.cdc.gov/nchs/data_access/restrictions.htm`. Population counts come from IPUMS NHGIS, which can be downloaded with a free log in here: `https://www.nhgis.org/`.

Agricultural Production: These values come from Hornbeck (2012) prior to 1997, from the ICPSR United States Agriculture Data 1840-2012 for 2002-2012, and from the USDA National Agricultural Statistics Service for 2017. These data are within the public domain and can be downloaded here: `https://www.icpsr.umich.edu/web/ICPSR/studies/35206`.

Dust Bowl: These data were compiled by Hornbeck (2012) and are in the public domain. The data can be downloaded here: `https://www.aeaweb.org/articles?id=10.1257/aer.102.4.1477`

Sources of Historical Income: The percentage of income from land sales, land leases,

livestock sales, rations, wages, crops raised, native industries, and treaties are gathered from the Indian Affairs Annual Reports (1915-1920), Table 10 for 1915-1919 and Table 11 for 1920, which are in the public domain and can be found here: `https://search.library.wisc.edu/digital/A3YVW4ZRARQT7J8S`.

Self-Governance Measures: In addition to the IRA information from Leonard et al. (2020), we also use a measure of self-governance from Gregg (2018). Both of these datasets are in the public domain and can be acquired by contacting the authors.

Method for Linking County-Level Data to Reservations: We link data sources that are at the county-level to reservations using the U.S. Tigerline Shape 2010 shapefiles for both counties and reservations. Both of these data sets can be downloaded from here: `https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html`.

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