Online Data Appendix

Are Government Spending Multipliers Greater During Periods of Slack?

Evidence from 20th Century Historical Data

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United States Data Appendix

<u>**GDP and GDP deflator:**</u>

1947 – 2010: Quarterly data on chain-weighted real GDP, nominal GDP, and GDP deflator from BEA NIPA (downloaded from FRED, December 20, 2012 revision.)

1889 – 1946: Annual data from 1929 – 1946 from BEA NIPA (downloaded from FRED, December 20, 2012 version). For 1889 – 1928, series Ca9 and Ca13 from Table Ca9-19 in *Historical Statistics of the United States, Earliest Times to the Present: Millennial Edition,* edited by Susan B. Carter, Scott Sigmund Gartner, Michael R. Haines, Alan L. Olmstead, Richard Sutch, and Gavin Wright. New York: Cambridge University Press, 2006. http://dx.doi.org/10.1017/ISBN-9780511132971.Ca1-2610.1017/ISBN-9780511132971.

1939 – 1946: We used seasonally adjusted quarterly nominal data on GNP from *National Income, 1954 Edition, A Supplement to the Survey of Current Business* and seasonally unadjusted CPI (all items, all urban consumers) from FRED.

1889 – 1938: Quarterly data on real GNP and GNP deflator.
Source: Nathan Balke and Robert J. Gordon, "The Estimation of Prewar Gross National Product: Methodology and New Evidence," *Journal of Political Economy*, 97, February 1989. Data available at: http://www.nber.org/data/abc/

Data adjustment: For 1939-1946, we used a simplified version of the procedure used by Valerie Ramey, "Identifying Government Spending Shocks: It's All in the Timing", *Quarterly Journal of Economics,* February 2011. We used the quarterly nominal GNP series published in 1954 to interpolate the most recent NIPA annual nominal GDP series and the quarterly averages of the CPI to interpolate the NIPA annual GDP price deflator using the proportional Denton method. We took the ratio to construct real GDP to use as a second round interpolator. We spliced this real GDP series to the Balke-Gordon real GNP series from 1889 – 1938 and used the combined series to interpolate the annual real GDP series using the proportional Denton method. This method insures that all quarterly real GDP series average to the annual series. We used the Balke-Gordon deflator to interpolate the annual deflator series from 1889 – 1938 and combined it with the CPI-interpolated series from 1939-1946. Finally, we linked the earlier series to the modern quarterly NIPA series from 1947 to the present.

<u>**Government Spending:**</u>

1947 – 2010: Quarterly data on nominal "Government Consumption Expenditures and Gross Investment," BEA Table 1.1.5, line 21, December 20, 2012 version.

1889 – 1946: NIPA annual data from 1929 – 1946 (BEA Table 1.1.5, line 21) is spliced to annual data from 1889-1928, *Source:* John Kendrick, *Productivity Trends in the United States*, 1961, Table A-II.

1939 - 1946: Quarterly data on nominal government spending *National Income, 1954 Edition, A Supplement to the Survey of Current Business* is used to interpolate the modern annual NIPA values.

1889 - 1938: Monthly data on federal budget expenditures. *Source:* NBER MacroHistory Database http://www.nber.org/databases/macrohistory/contents/chapter15.html

m15005a U.S. Federal Budget Expenditures, Total 01/1879-09/1915
m15005b U.S. Federal Budget Expenditures, Total 11/1914-06/1933
m15005c U.S. Federal Budget Expenditures, Total 01/1932-12/1938

Data adjustment: The monthly series are spliced together (using a 12-month average at the overlap year) and seasonally adjusted in Eviews using X-12. This series includes not just government expenditures but also transfer payments, and so the monthly interpolator series is distorted by large transfer payments in different quarters. Thus, rather than using the series directly, we use it as a monthly interpolator for the annual series which excludes transfers. Following Gordon and Krenn (2010), to find these quarters, we calculated the monthly log change in the interpolator, and whenever a monthly change of +40 percent or more was followed by a monthly change of approximately the same amount with a negative sign (and also symmetrically negative followed by positive), we replaced that particular observation by the average of the preceding and succeeding months. These instances occurred for the following months: 1904:5, 1922:11, 1931:2, 1931:12, 1932:7, 1934:01, 1936:06, and 1937:06. In addition, the first quarter of 1917 was adjusted. The jump in spending was so dramatic in 1917q2 that the interpolated series showed a decline in spending in 1917q1 even though the underlying expenditure series showed an increase of 16 percent in that quarter relative to the previous one. Thus, we replaced the value of 1917q1 with a value 16 percent higher than the previous quarter. Note that our use of the proportional Denton method creates a bumpier series than an alternative that uses the additive Denton method. However, the additive Denton method leads to series that behave very strangely around large buildups and builddowns of government spending, so we did not use it for the U.S. On the other hand, the alternative series gave very similar results for the multiplier.

Population:

1890-2010:
Annual population data, based on July of each year, were taken from *Historical Statistics of the United States Millennial Edition Online*, Carter et al (2006). We used total population, including armed forces overseas for all periods where available (during WWI and 1930 and after); otherwise we used the resident population. For 1952 through the present we used the monthly series available on the Federal Reserve Bank of St. Louis FRED database, "POP."

Data adjustment: For 1890 through 1951, we linearly interpolated the annual data to obtain monthly series so that the annual value was assigned to July. We then took the averages of monthly values to obtain quarterly series. We did the same to convert the monthly FRED data from 1952 to the present.

Unemployment rate:

1930-2010: Monthly civilian unemployment rate (including emergency workers).
Source: Valerie Ramey, "Government Spending and Private Activity," forthcoming *Fiscal Policy after the Financial Crisis,* Alberto Alesina and Francesco Giavazzi, eds., University of Chicago Press.

1890-1929:
Annual civilian unemployment rate.
Source: David R. Weir, "A Century of U.S. Unemployment, 1890-1990: Revised Estimates and Evidence for Stabilization." In *Research in Economic History*, edited by Roger L. Ransom, pp. 301–346. JAI Press, 1992.

NBER-based recession indicators. Source: Federal Reserve Bank of St. Louis FRED database, USREC
http://research.stlouisfed.org/fred2/series/USREC.

Data adjustment: Monthly NBER recession data are used to interpolate annual data using the Denton interpolation.

Canada Data Appendix

These data should be considered preliminary since we have not had the opportunity to explore a number of issues with the data construction. For example, we realized only at the last minute that the Canadian data had been interpolated using the *additive* Denton procedure but that the U.S. data had been interpolated using the *proportional* Denton procedure. In the U.S. data, we explored the effect of the two methods on the results and found that there was little difference. We have not had an opportunity to do this for the Canadian data.

GDP:

1961-2011: Quarterly data available in National Accounts. *Source:* Statistics Canada, Real GDP: v1992067.

1919-1960:
Monthly Industrial production index data, (Index, 1961=100). *Source:* Statistics Canada Archives, v462.

Annual data on real GNP. *Source:* Historical Canadian Macroeconomic dataset, compiled by Marvin McInnis at Queen's University. The major source for data for the early years is Malcolm C. Urquhart, *Gross National Product, Canada 1870-1926: The Derivation of the Estimates*. McGill-Queen's University Press, 1993.

Data adjustment: Monthly industrial production data is seasonally adjusted in Eviews using X-12. Quarterly data is obtained from the average of the interpolation of the annual data on the monthly interpolator data, using the additive Denton procedure, through 1961. The pre-1960 data were multiplied by the ratio of the National Accounts data in 1961 to the historical data in 1961.

GDP deflator:

1961-2011: Quarterly data available in National Accounts. *Source:* Statistics Canada, Real GDP: v1992067, nominal GDP: v498086, GDP deflator =nominal GDP/real GDP

1919-1960:
Monthly CPI, 2009 basket (2002=100). *Source:* Statistics Canada, v41690973.

Annual data on GNP deflator. *Source:* Historical Canadian Macroeconomic dataset.

Data adjustment: Quarterly data obtained from average of the interpolation of the annual data on the monthly interpolator data, using additive Denton procedure, through 1961. The pre-1960 data were multiplied by the ratio of the National Accounts data in 1961 to the historical data in 1961.

Population:

1946-2011: Quarterly data on total population, Canada, provinces and territories, quarterly. *Source:* Statistics Canada, v1.

1919-1945:
Annual data for population. *Source:* Historical Canadian Macroeconomic dataset.
Data adjustment: Linearly interpolated.

Government spending:

1961-2011: Quarterly data available in National Accounts. *Source:* Statistics Canada, Nominal government current expenditures on goods and services, v498092

1919-1960:

Monthly government spending series, detailed categories. *Source: Canada Gazette* and *Monthly Review of Business Statistics.* Constructed a series which splices together the following:
Expenditure on Account of Consolidated Fund: 01/1912- 12/1919
Ordinary Expenditures: 02/1920- 12/1923
Total Expenditures: 01/1924- 02/1932
Total Expenditures: 04/1932- 02/1946 (where Ordinary + Special + Capital =Total)
Total Expenditures: 04/1946- 12/1949 (where Ordinary + Special + Capital + Demobilization and Reconversion Expenditure =Total)
Total Expenditures: 02/1950- 08/1987

Annual data on government expenditures on goods and services. *Source:* [Historical Canadian Macroeconomic dataset](#).

Data adjustment: Some missing values for the monthly series are replaced using the no-change rule. It is seasonally adjusted in Eviews using X-12. Since the series accounts for transfers and interest on public debt, the series is smoothed before using it for interpolation. If there is an increase of 20% followed by a decrease of greater than 10%, and vice versa for a decrease, the value is substituted with the average of the preceding and following values. Quarterly data obtained from average of the interpolation of the annual data on the monthly series, using the additive Denton procedure, through 1961. The pre-1960 data were multiplied by the ratio of the National Accounts data in 1961 to the historical data in 1961.

Unemployment rate:

1976-2011: Monthly data on unemployment rate: both sexes, 15 years and over. *Source:* Statistics Canada, Labor Force Survey estimates (LFS), v2062815

1954-1975: Monthly data on unemployment rate: both sexes, 15 years and over. *Source:* Data provided by contact at Statistics Canada. This is based on additional work done by Statistics Canada to create a monthly series from 1954-1975. The adjusted data were created using the relationship between the old and new questionnaires in 1975. In the creation of the historical series, the assumption was made that the 1975 relationship holds for all years from 1954 to 1974. While 1966 onwards estimates apply to both sexes, 15 years and over, pre-1966 estimates are based on 14 years and over.

Data adjustment: Quarterly series is constructed as the average of the three months.

1921-1953:
1926-1953, Monthly Business Cycle turning points. *Source:* Phillip Cross, "Tracking the business cycle: monthly analysis of the economy at Statistics Canada, 1926-2001." *Canadian Economic Observer*, December 2001.
1921-1925, Monthly Business Cycle turning points. *Source:* Edward Chambers, "Canadian Business Cycles since 1919, A Progress Report.*" Canadian Journal of Economics and Political Science*, 24(2), 1958.

1946-1953: Annual data on unemployment rate: both sexes, 14 years and over. *Source:* Data provided by contact at Statistics Canada.
1921-1945: Annual data on unemployment rate constructed as ratio of persons without job and seeking work and total civilian labor force. *Source:* Statistics Canada Archives, Table D124-133.

Data adjustment: Quarterly data obtained from average of the interpolation of the annual unemployment rate on the monthly business cycle turning points, using the additive Denton procedure, through 1954. The pre-1953 data were multiplied by the ratio of the Statistics Canada data in 1954 to the historical data in 1954.