Regional Consumption Responses and the Aggregate Fiscal Multiplier: Data/Model Replication

This file contains instructions on how to construct all the tables and figures in the paper "Regional Consumption Responses and the Aggregate Fiscal Multiplier"

List of Data Sources & Data Files (non-confidential data is in *DataRaw* folder - STATA):

The data sources use this paper include:

- **recovery.gov:** This includes the government spending data we use in the paper. This website is no longer available. Data from this source can be found in files 1, 8, and 10 below. The websites for this data: An archived copy can be found at https://billdupor.weebly.com/data.html.
- **Bureau of Labor Statistics:** This includes data from CPI, CEX, and QCEW. Data from this source can be found in files 1, 3, 5, 6, 8, 9, and 10 below. The websites for this data: https://www.bls.gov/cpi/, https://www.bls.gov/cex/, and https://www.bls.gov/cew/
- **Census:** This includes data on number of households, population, etc. Data from this source can be found in files 1, 2, 7, 8, and 10 below. The website for this data: https://www.census.gov/data/
- **IRS:** This includes data on Adjusted Gross Income (AGI), Number of Returns (NOR), etc. Data from this source can be found in files 1, 8, and 10 below. The website for this data: https://www.irs.gov/statistics/soi-tax-stats-county-data
- **Commodity Flow Survey:** This includes data on trade linkages. Data from this source can be found in files 14, 15, and 16 below. The website for this data: https://www.census.gov/programs-surveys/ cfs.html
- **Nielsen Retail Scanner Data (confidential data source):** This includes data on point of sale purchases from Nielsen, Kilts Center for Marketing at University of Chicago, Booth. Data from this source are included in files 11 and 13 below. The website for information about this data source and how to obtain it: https://www.chicagobooth.edu/research/kilts. This dataset is available to other researchers to use with separate agreement with the Kilts Center for Marketing.
- **New York Fed Consumer Credit Panel – Equifax (confidential data source):** This includes data on auto loans. Data from this source are included in file 12 below. The website for information about this data source and how to obtain it: https://www.newyorkfed.org/microeconomics/hhdc/background. This dataset is available to other researchers within the Federal Reserve System.

Find below a list of the non-confidential data files used in the paper (found in the *DataRaw* folder):

1. ***GovAndIncomeData.dta*:** Gives data for government spending + other economic variables (includes durable and non-durable government spending).
2. ***number_HH_county.dta*:** Gives the number of households in each county.
3. ***unemployment_data_county.dta*:** Gives the unemployment rate in each county.
4. ***input.xlsx*:** Gives the parameters used in the data estimation.
5. ***CEX_data.dta*:** Gives the CEX data used for table 5.
6. ***cpi.dta*:** Gives the CPI data used for table 5.
7. ***walkthrough.dta*:** Gives population data at zip, county, and state levels.
8. ***MergedDataCensus.dta*:** Gives data for government spending + other economic variables.
9. ***QCEW.dta:*** Gives QCEW data on employment and wages.
10. ***Inflation_Data_for_Cumulative_Regression.dta*:** Gives data for government spending + other economic variables including inflation

Find below a list of the confidential data files used in the paper. These files are not provided. The use of this confidential data was made known at the time of original submission:

11. Files containing raw data for Nielsen (aggregated into allSales_XXX.dta files where XXX is the year)
12. Files containing raw data for Equifax.
13. ***nielsenCounties.dta*****:** Gives a list of counties in the Nielsen dataset.
14. ***min_spillovers_new.dta:*** Gives a random clustering of counties in the Nielsen dataset with min spillover.
15. ***middle_spillovers_new.dta:*** Gives a random clustering of counties in the Nielsen dataset with medium spillover.
16. ***max_spillovers_new.dta:*** Gives a random clustering of counties in the Nielsen dataset with max spillover.

List of Files containing code for Empirical Work (in *Empirical Code* folder - STATA):

- ***make_data_IVvalidity.do*****:** Stata code to make the data for the regressions in Table 3. The output file is called *data_for_IV_validity.dta.*
- ***make_table_IVvalidity.do*****:** Stata code to run the regressions in Table 3.
- **cleanStoreLevelFinal.do:** Stata code to aggregate the sales at the store level in the Nielsen data. This file must be run to aggregate the confidential data before running the next file: *make_data.do*
- ***make_data.do*****:** Stata code to make the data for the regressions in Table 4 and Figure 2. The output file is called *data_for_cumulative_regression_countyCode.dta.*
- ***make_table.do*****:** Stata code to run the regressions in Table 4.
- ***construct_main_variables_and_aggregate_to_area_level.do*****:** Stata code to aggregate the individual Equifax data into regional data. This file must be run to aggregate the confidential data before running the next file: *merge_area_spending_with_gov_spending.do*
- ***merge_area_spending_with_gov_spending.do*****:** Stata code to make the data for the regressions in Table 6 and Figure 2. The output file is called *county_data_for_cumulative_regression.dta.*
- ***make_table_ef.do*****:** Stata code to run the regressions in Table 6.
- ***make_table5.do*****:** Stata code to construct the bundle size and elasticity found in Table 5.
- ***make_table_levels_of_aggregation_spillovers_mainTempMulti_B.do:*** Stata code to run the regressions in Figure 7.
- ***make_QCEW:*** Stata code to run the regressions in Table 11 (first two columns).
- ***make_table_inflation:*** Stata code to run the regressions in Table 11 (next two columns).

List of Files containing code for Computational Work (in *Computational Code* folder - FORTRAN):

The Fortran code consists of .f90 files as part of a visual studio project. The code makes use of parallel programming (Open-MP). Calculations have been performed on an Intel i7 processor with 16 cores. Calculation of the steady state with a given set of parameters takes about 1 minute. Full calibration of the model takes about 16 hours. Computation of the transition takes about 24 hours. The modules and subroutines included in the file are (also included as visual studio files):

- ***main_code.f90:*** code for the the HANK model.
- ***main_code_RANK.f90:*** code for the the RANK model.
- ***module_bounds.f90:*** code that specifies and updates bounds of parameters in calibration.
- ***module_gini.f90:*** code that computes the Gini coefficient.
- ***module_MC.f90:*** code for Monte Carlo simulation of the economy.
- ***module_measure.f90:*** code for computing the transition using the distribution.

- ***module_read.f90:*** code that reads all input files and writes out all results.
- ***module_shocks.f90:*** code that generates the government spending shocks for the transition.
- ***module_g.f90:*** code that generates the grid of a variable.
- ***moduleLP.f90:*** code that includes linear interpolation subroutines.
- ***modulep.f90:*** code that generates the productivity process.
- ***modulePF.f90:*** code that computes the policy functions (consumption, saving, and hours worked).
- ***modulepP.f90:*** code that solves for the optimal reset price.
- ***moduleQ.f90:*** code that computes the real exchange rate.

In file "reads", there are two input files, one for the HANK model ("***input.txt***") and one for the RANK model ("***input_RANK.txt***"). The input files set the following specifications and parameters:

- steady state: set 1 for steady state and 0 for transition
- federal taxes: set 1 for federal taxes and 0 for local taxes
- deficit_financing: set 1 for deficit to adjust to government spending and 0 if only taxes adjust
- nominal_bond_targeting: set 1 if government targets nominal bond or 0 if targets real bonds.
- zlb_exper: set to 1 for a discount factor shock to push the economy to the effective ZLB.
- endogenous R: set to 1 if monetary policy responds to inflation.
- normal_times: set to 1 if monetary policy responds with a normal times Taylor rule.
- tax system: set 1 for linear taxation with lump sum transfers and 2 to a Benabou tax function.
- Preferences: Set 1 for U= (1-h)^(1-theta)/(1-theta) and 2 for constant elasticity preferences
- imprecision_dividend: set to 1 for higher precision in the calculation of the dividend
- initial_guess: set 1 for the transition to use a non-steady-state guess as a starting point.
- calculate counterfactuals: set 1 for counterfactual exercises
- slow: set 1 for higher precision when calculating equilibrium inflation.
- annual_calibration: set 1 if time period is annual and 0 if quarterly (as in benchmark)
- mpc_calculation: set 1 to compute mpcs

The file also sets the benchmark parameters: the preference of region 1 for goods in region 1, the size region 1, the capital share, the discount factor, the dispersion in the discount factor, the depreciation rate, the minimum and maximum of the asset grid, the curvature of the asset grid, the persistence in the productivity process, the standard deviation of the shocks, the labor supply elasticity, the intertemporal elasticity of substitution, the disutility of labor, the elasticity of substitution among intermediate goods, the lump-sum transfers, the progressivity of the tax schedule, the Taylor rule coefficient, the borrowing wedge, the fraction of dividends allocated directly to households, the dividend tax, the fraction of firms adjusting their prices, the supply of bonds, the level of government spending in the steady state, the magnitude of the government spending shock for region 1 and region 2.

Figures (in *Figures* folder - FORTRAN)::

These figures are included as separate files and are provided as part of the data replication package:

- **Figure 1:** This figure displays a map of the county level government spending. Use the column *GExp_2013c* in the file *GovAndIncomeData.dta* to construct the map at the county level. The column *GExp_2013c* gives the total spending at the county level across the years 2009-2012.
- **Figure 2:** This figure gives regressions of retail spending and auto spending with our county level government spending. To construct these figures:

    - First run the file *make_data.do*. This will construct a file of the Nielsen data along with government spending to be able to construct the first figure.
    - Next run the file *merge_area_spending_with_gov_spending.do*. This will construct a file of the Equifax data along with government spending to be able to construct the second figure.
- **Figure 3:** This figure gives the multiplier by the level of the trade linkage. To construct this figure first run *make_table_levels_of_aggregation_spillovers_mainTempMulti_B.do.* Then use the beta values from the regression results to construct the figure.
- **Figure 4:** Use Fortran code, main_code. Set parameters as in input.txt. Results are produced in Results/Transition_DFH/Transition_path-current.
- **Figure 5:** Use Fortran code, main_code. Set parameters as in input.txt. Results are produced in Results/Transition_DFH/Transition_path-current.
- **Figure 6:** This figure displays the scatter plot and results from Table 11. See Table 11 for the regression that is run to create this.
- **Figure 7:** Use Fortran code, main_code. Change parameter home bias in input.txt. Results are produced in Results/Transition_DFH/Transition_path-current.
- **Figure 8:** Use Fortran code, main_code. Change endogenous R to 1 and parameter phi in input.txt. Results are produced in Results/Transition_DFH/Transition_path-current.
- **Figure 9:** Use Fortran code, main_code. Change displayed parameters regarding the discount factor dispersion, the dividend tax, the elasticity of substitution, the allocation of dividends, the lump-sum transfer, and the duration of government spending in input.txt. Results are produced in Results/Transition_DFH/Transition_path-current.
- **Figure 10:** Use Fortran code, main_code. Change displayed parameters regarding the discount factor dispersion, the dividend tax, the elasticity of substitution, the allocation of dividends, the lump-sum transfer, and the duration of government spending in input.txt. Results are produced in Results/Transition_DFH/Transition_path-current and Results/Transition_DFH/multipliers.
- **Figure 11:** Use Fortran code, main_code_RANK. Set parameters as in input_RANK.txt. Results are produced in Results/Transition_RANK/Transition_path-current.

Tables (included directly in paper, no separate files):

These tables are included within the tex file for the paper (i.e. these are not separate files) and are thus not provided here:

- **Table 1:** This table gives the approximate number of stores and individuals in the Nielsen Retail Scanner and Equifax datasets respectively. This table was constructed from looking at the summary statistics for the datasets/documentation.
- **Table 2:** This table gives the distribution of per-capita government spending. To construct this table, first use the column *GExp_2013c* and *popc* in the file *GovAndIncomeData.dta* to construct the per capita government spending measures. Then use this per capita measure to construct the different percentiles. The column *GExp_2013c* gives the total spending at the county level across the years 2009-2012 and *popc* the population at the county level. Do note that the data in the *GovAndIncomeData.dta* is at the zip code level, so in constructing the percentiles duplicates will need to be dropped.
- **Table 3:** This table gives the regressions of total and IV spending on various county-level economic variables. To construct this table:
    - First run the file *make_data_IVvalidity.do*
    - Next run the file *make_table_IVvalidity.do*

The results will be saved as *IVvalidity.tex*. Table 3 is a formatted version of the results in this table.

- **Table 4:** This table gives the benchmark regressions. To construct this table:
    - First run the file *make_data.do*
    - Next run the file *make_table.do*

  The results will be saved as *Nielsen_countyCode_no_controls.tex* and *Nielsen_countyCode_ StateFE.tex*. Table 4 is a formatted version of the results in this table.
- **Table 5:** This table gives Nielsen to CEX mapping. To construct the bundle size and elasticity use the file *make_table5.do*.
- **Table 6:** This table gives the benchmark regressions. To construct this table:
    - First run the file *merge_area_spending_with_gov_spending.do*
    - Next run the file *make_table_ef.do*

  The results will be saved as *Equifax_county.tex*. Table 6 is a formatted version of the results in this table.
- **Table 7:** This table gives the parameters used in the model. The target and sources are given within the table itself.
- **Table 8:** Use Fortran code, main_code. Set parameters as in input.txt. Results are produced in Results/Steady_State_DFH/ss_regional_accounts.
- **Table 9:** Use Fortran code, main_code. Set parameters as in Benchmark. Results are produced in Results/multipliers.
- **Table 10:** Use Fortran code, main_code. Change initial guess=1 and calculate counterfactuals=1. Results are produced in Results/Transition_DFH/Counterfactuals.
- **Table 11:** This table gives the regressions of Labor Income and Inflation on Government Spending. To construct this table:
    - First run the file *make_QCEW.do*
    - Next run the file *make_table_inflation.do*

  The results will be saved as *ARRA_on_QCEW.tex* and *ARRA_on_Inflation.tex*. Table 11 is a formatted version of the results in these tables.
- **Table 12:** Use Fortran Code, main_code_RANK. Set parameters as in input_RANK.txt. Results are produced in Results/Steady_State_RANK/ss_regional_accounts.
- **Table 13:** Use Fortran Code, main_code_RANK. Set parameters as in input_RANK.txt. . Results are produced in Results/Transition_RANK/multipliers.