Empirical Exercise 11: Quantifying the effects of NAFTA

October 2, 2021

Instructor:	Marc-Andreas Muendler	muendler@ucsd.edu
Teaching Assistant:	Jacob Orchard	jdorchard@ucsd.edu

Due date and time: **November 12, 5pm**
Recommended hand-in: **November 5**

Inputs and products

Please use Stata (any version) for your work. You may call any other software from within Stata (including Python, R, Perl, and system-level commands). Please base your analysis on the following files

Yotov et al. (2016, p. 111-118)	`Chapter2Application2.dta`
Ready code	`ee11.do`

in the online data folder at `https://econweb.ucsd.edu/muendler/teach/21f/435/gen`.

This exercise is a replication of Exercise 2.2 (*Calculating the general equilibrium impacts of a regional trade agreement*) in Yotov et al. (2016, p. 118) using the guidebook's data.

You can use and run the ready data preparation, estimation and general-equilibrium (GE) simulation code in `ee11.do` from the online lecture folder.

If you wish to proceed with data preparation on your own, you may find the code file *RTAImpacts.do* accompanying the textbook Yotov et al. (2016) a useful reference, see `https://vi.unctad.org/tpa/web/zips/vol2/Advanced%20Guide%20to%20TPA.zip`, as well as `lec04.do` in the online lecture folder `https://econweb.ucsd.edu/muendler/teach/21f/435/lec04`, showing the construction of numeric source and destination IDs. If you wish to proceed with estimation and simulation on your own, you may find your own code from empirical exercises 1 and 10 as well as code from lecture 12 useful references (`lec12.do` in `https://econweb.ucsd.edu/muendler/teach/21f/435/lec12`).

This exercise (and the ready code in *ee11.do*) implements estimation and simulation using the package `ppmlhdfe`, which efficiently handles high-dimensional fixed effects and their extraction after estimation (more efficiently than the code in the guidebook which uses the package `ppml` instead).

Please submit three products to `canvas.ucsd.edu` by the due time: (i) a file with results titled *ee11.pdf*, (ii) a log file titled *ee11.log*, and (iii) a Stata code file titled *ee11.do* (which may call other software). **Your log file must exhaustively document the steps from the above input files to the output of results.**

Tasks

1. Preliminaries (data construction to match Exercise 2.2 *Calculating the general equilibrium impacts of a regional trade agreement* in Yotov et al. (2016, p. 111-118)).
   Hint: The entire data preparation is ready for execution in `ee11.do`.

   (a) Use the guidebook's data file *Chapter2Application2.dta* and keep the years 1986, 1990, 1994, 1998, 2002 and 2006. (You can drop the variable with the source-destination pair IDs because the `ppmlhdfe` package can handle pair fixed effects more efficiently.) Standardize bilateral trade of goods to current US$ billion. In addition to the bilateral geographic and trade policy variables, construct an indicator for NAFTA that takes the value of one for any trade flow between Canada, Mexico and the United States in 1994 or after (1994 is the start year of NAFTA). Reset the indicator for a regional trade

agreement to zero for all NAFTA trade flows in 1994 or after so that the two regressors are mutually exclusive.

(b) Compute production as $Y_s = \sum_d X_{sd} = X_{s\cdot}$, including self trade ($s = d$ in the sum), for every source country. Compute market size as $X_d = \sum_s X_{sd} = X_{\cdot d}$, including self trade ($d = s$ in the sum), for every destination country. Compute self trade ($d = s$).

(c) For later estimation and general-equilibrium simulation, make the United States the reference country as a destinations country.

(d) Construct numeric source and destination IDs as in Lecture 4 (see `lec04.do`).

2. Estimation and GE simulation (replicating Application 2.2 and Exercise 2.2 in Yotov et al. (2016, p. 111-118)).
   Hint: The entire estimation and GE simulation is ready for execution in `ee11.do`.

   (a) For the full sample including self trade, specify PPML estimation for trade (not log trade) on an indicator for RTAs (except NAFTA) and an indicator for NAFTA. Condition on source-year, destination-year, and source-destination pair fixed effects. Make sure your sample includes zero trade flows. Note that the inclusion of source-destination pair fixed effects makes time-invariant bilateral geography and policy variables redundant. Cluster the standard errors at the level of source-destination pairs. This is your benchmark regression, measuring the direct effect of NAFTA conditional on other trade agreements.
   Hint: Consider the command `ppmlhdfe trade rta nafta` with the options `absorb(src#year dst#year src#dst, savefe) noconst d cluster(src#dst)` and keep these benchmark results in memory for later use with `estimate store benchmark`.

   (b) For your baseline ("bln"), use the exponentiated fixed effects to compute outward multilateral resistance, inward multilateral resistance, and the time-invariant part of bilateral resistance.
   Hint: Use the command-based fixed effects estimates similar to the code from empirical exercise 10 `ee10.do`:

   ```
   qui summ __hdfe2__ if dest_iso3=="ZZZ"
   local dst_fe_zzz = `r(mean)'
   gen double exp_srcfe_bln = exp(__hdfe1__ + `dst_fe_zzz' + _b[_cons])
   gen double exp_dstfe_bln = exp(__hdfe2__ - `dst_fe_zzz')
   gen double tau_sd_bar = exp(__hdfe3__)
   replace tau_sd_bar = exp(0) if __hdfe3__==. & sorc_iso3==dest_iso3
   gen double tau_sd_bln = tau_sd_bar * exp(_b[rta]*rta + _b[nafta]*nafta)
   ```

   where "zzz" stands for the reference country.

   (c) Choose 1994 as the reference year for your baseline and follow the procedure in Yotov et al. (2016, p. 112-113), called "stage 2," to fill in missing pair fixed effects using the time-invariant bilateral variables in the data as predictors.

   (d) Follow the code from Lecture 12, or the code *RTAImpacts.do* accompanying the textbook Yotov et al. (2016), to conduct a full GE simulation. For efficiency use the command `ppmlhdfe` (instead of `ppml`) and the extraction steps under 2(b).

3. Graph.
   Hint: This is the only step not included in `ee11.do`

   (a) Extract the change in real GDP (from the output Excel file) for each country, representing simulated general-equilibrium changes in real GDP that would result from a counterfactual world without NAFTA.
   Hint: Use `import excel using trade-fullge.xls, firstrow`.

(b) Plot two world maps of positive and negative simulated real GDP changes (in percent), one in reds for all countries with counterfactual real GDP losses and one in greens for countries with counterfactual real GDP increases.

Hint: Similar to the very first Empirical Exercise 1, use the Stata `spmap` package as shown in *lec01.do*. Set the options to `fcolor(Reds)` or `fcolor(Greens)` and consider logarithmic break points for the legend, marking `0 .1 1 10` in `clbreaks(·)`.

4. Interpretation.

- In two sentences, briefly comment on the counterfactual real GDP impacts of a world without NAFTA on the NAFTA members and on NAFTA non-members.

References

Yotov, Yoto V., Roberta Piermartini, José-Antonio Monteiro, and Mario Larch. 2016. *An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model.* Geneva: World Trade Organization.