

Trade, Quality Upgrading, and Input Linkages: Theory and Evidence from Colombia

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Explanations for program package “model simulations”

Programs are written in Fortran 90. They use parallel processing and IMSL library. The programs will run without parallel processing but adjustments are needed if the user does not have IMSL library. Functions from IMSL used are the cumulative distribution of a normal and sorting of arrays.

Listed below are 6 program packages “sln” files and the corresponding tasks performed. Packages run with all f90 files in their folder unless specified below. To perform each task, the corresponding command in _main.f90 must be activated. If the user does not want to run optimization files (for estimation or counterfactuals) the correct input .txt or .dat file in read_files.f90 must be activated.

Output is written in a fortran window and in .txt files (estimation results). Some folders also generate .csv files that always read by a stata program “master.do” that compiles tables and graphs to qualitatively analyze results.

1. Mar17_main.sln

- Estimation of the general model.
- Standard errors of estimates
- Counterfactuals with combinations of
 - o Elastic labor
 - o Inelastic labor
 - o Endogenous quality
 - o Exogenous quality
 - o baseline
 - o Free entry
 - o Export expansion
 - o Autarky
- The estimation of the main model was redone in section 7 with several different parametrizations. These results correspond to different txt files read in read_filesn.f90. They are:
 - i. ‘may17l.txt’ for the benchmark
 - ii. ‘may17_alpha05.txt’ for the model with $\alpha = 0.5$
 - iii. ‘may17l_sigmaL11’ and ‘may17l_sigmaL18’ for the model with $\sigma_L = 1.1$ and 1.8 respectively
 - iv. ‘may17_sigma3fxd.txt’ for the model with $\sigma = 3$, (iv) ‘may17_sigma7fxd.txt’ for the model with $\sigma = 7$
 - v. ‘mar 17W.txt’ for the model with optimal weighting matrix.

Each of these experiments requires changing one of the pre-set parameters of the model. These parameters are set in lines of 9-32 of the program's port of entry '`_main_1p23.f90`'. Experiment iv-v were done with only 5000 firms and so the number of firms should be changed in line 16, '`sizef = 100000`' should be '`sizef = 5000`'

- The file `firmout2_othersk.f90` is the only one that should **not** be included in the main program package. In estimating other specifications for skills in appendix C2, this file should substitute `firmout2.f90`.

2. **Mar17_nu0.sln**

- Estimation of the model and counterfactuals for the special case of $\nu = 0$.

3. **Mar17_qtilde.sln**

- Estimation of the model and counterfactuals in appendix D1 where we target moments on q -tilde instead of skills and wages.

Packages for appendix D4

4. **mar17_MC.sln**

The program has two applications. For each, the port of entry needs to be changed.

- The program generates moments using the parameter estimates. It then runs the optimization algorithm to recover these parameters starting with random initial guesses of parameters. These are the main Monte Carlo results and the port of entry for them is `_mc_identify.f90`. To keep the random draws determining firm-specific variables unchanged during these Monte Carlo simulations, one needs to deactivate line 402 in `_mc_identify.f90`, "`call get_random`"
- In a separate exercise, the program may also be used to check that estimation results do not change with random draws that determine firm-specific variables, $f_1(\omega)$, $f_2(\omega)$, $f_M(\omega)$, $f_X(\omega)$, and measurement errors in skills. For this application, the port of entry must change from `_mc_identify.f90` to `_mc_noopt.f90`

5. **mar17_MCunique.sln**

The program checks that the equilibrium is unique given the parameter estimates. Following appendix D4, the program makes a draw from a uniform distribution over each firm's 801 discrete choices of quality (200 choices in the quality grid), exiting, importing and/or exporting. It then simulates the economy as described in section 4.2 until no firm changes its choice. It repeats the exercise 1000 times.

6. **Mar17_MCcounter.sln**

The program checks that endogenous functions P and χ are continuous in the parameters that change in the baseline counterfactuals. When labor is elastic, y^* , p^* and tariffs change, and when labor is inelastic, wages also change. The check is performed for the vector of parameters that link the estimated model to the baseline counterfactual with the general model.