

Global to Subnational Data Framework for Agriculture

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Overview

- Objectives
 - Provide a data base and general equilibrium model that link global change at the world level to economic impacts at the subnational U.S. level through international trade.
 - This project links a global economic data set maintained by the Global Trade Analysis Project (GTAP) at Purdue University with subnational data collected and formatted at the Wisconsin National Data Consortium (WiNDC).
 - The data base is model-independent to maintain separation between data and models.
- GTAP-WiNDC data base
 - Links GTAP data set with WiNDC data set
 - Up to 160 world regions
 - Up to 50 U.S. States
- GTAP-WiNDC canonical model
 - 11 world regions
 - Up to 50 U.S. States
 - **Public distribution on github**
 - **Sample application to multi-breadbasket food shocks**



GTAP data base and models that use it

- GTAP data base
 - Provides a snapshot of the world economy for a given reference year (2004, 2007, 2011, 2014, 2017)
 - **Model-independent data set**
 - Used as a benchmark data set for general equilibrium models
 - Data sources: national input-output (I-O) tables, trade, macroeconomic, energy, and protection data
 - **Utilized by thousands worldwide** as a key input into most applied general equilibrium analyses of global economic issues
- GTAP model
 - Educational tool
 - Used by MTED for analysis of contemporary trade policy
 - Limitations
 - Comparative static (no time steps)
 - Written in GEMPACK: few modelers have knowledge to modify code
- Future Agricultural Resources Model
 - Starts with GTAP data base and Tom Rutherford's GTAP-in-GAMS code
 - Runs in five-year time steps from 2011 through 2101
 - Extensions for analysis of energy or climate policy (e.g., matching values to quantities for energy, calories, and hectares)
- Other models
 - ENVISAGE (Purdue University)
 - MAGNET (Netherlands)
 - AIM (Japan)
 - GTEM (Australia)

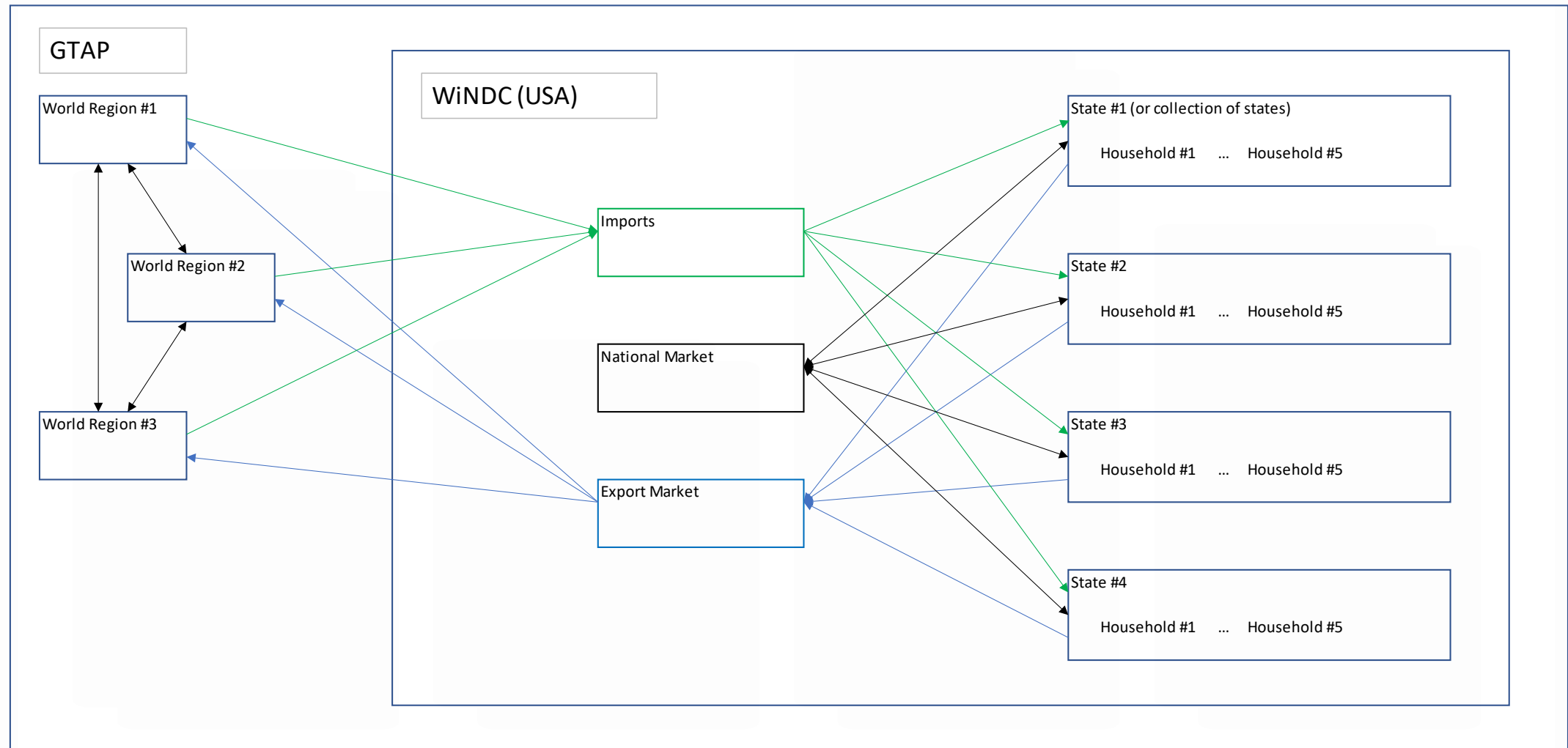


GTAP-WiNDC data base and models that can use it

- GTAP-WiNDC data base
 - Extension of core WiNDC data base (50 U.S. States)
 - Uses publicly available data for core WiNDC data base
 - Bureau of Economic Analysis (BEA) input-output tables
 - Current Population Survey (CPS)
 - Statistics of Income (SOI)
 - NASS for agricultural sectors
 - Core WiNDC data base is nested within global GTAP data base
 - Available for download on WiNDC web site (<https://windc.wisc.edu/downloads.html>)
 - **Model-independent data set**
 - **Documentation and build stream to generate data base is on github**
- GTAP-WiNDC canonical model
 - Educational tool
 - Publicly available on github (https://github.com/uw-windc/windc_build/tree/WiNDC3.2)
 - Can be extended by other modeling teams
- GTAP-SR (subregion)
 - Developed at Purdue University
- Future Agricultural Resources Model
 - Next version (FARM 5) will be built upon GTAP-WiNDC data base
 - Developed by USDA's Economic Research Service
- Other potential users
 - EPA SAGE model for analysis of environmental regulations and policies
 - MIT U.S. Regional Energy Policy model (USREP)



GTAP-WiNDC model










	GTAP 11 data base	GTAP-WiNDC data base
Geographical coverage	World (160 regions)	World (up to 160 regions) + U.S. (up to 50 states)
Benchmark year	2017	2017
Household types	1	5
Production sectors	65	43
Agricultural sectors	Rice Wheat Coarse grains Oil crops Vegetables, fruits, tree nuts Sugar crops Plant-based fibers (cotton) Other crops (hay) Ruminant meat (beef, lamb) Other animal products (pork, poultry, eggs) Milk production + 8 Food processing sectors	Rice Wheat Coarse grains Oil crops Vegetables, fruits, tree nuts Sugar crops Plant-based fibers (cotton) Other crops (hay) Ruminant meat (beef, lamb) Other animal products (pork, poultry, eggs) Milk production
Next steps		1. Expand to all 65 GTAP production sectors 2. Match monetary flows with quantities (production levels, land use)

Screen shots of WiNDC github site (publicly available at https://github.com/uw-windc/windc_build/tree/WiNDC3.2)

WiNDC3.2 6 branches 9 tags Go to file Code

This branch is 104 commits ahead of master.

 mitchphillipson	Small changes to gdx2gdx.gms	5f9aa34 18 hours ago	🕒 145 commits
 GTAPWiNDC	Small changes to gdx2gdx.gms		18 hours ago
 bluenote	Revert "Merge branch 'WiNDC3.2' into TFR"		last week
 core	Default to run the entire script		19 hours ago
 household	Updating data directory pointers		last week
 .gitignore	Update gitignore		19 hours ago
 README.md	Update README		19 hours ago

☰ README.md

WiNDC Build Stream

Primary repository for the Wisconsin National Data Consortium (WiNDC) dataset generation environment.

Before running any methods in this package, you first need to download the datasets and locate them in the correct directories. The [Data](#) section details this process.

This repository contains 4 primary methods

1. [Core](#)
2. [Households](#)
3. [Bluenote](#)
4. [GTAPWiNDC](#)

GTAPWiNDC

The GTAPWiNDC buildstream incorporates data from either the publicly available GTAP 9 release or proprietary GTAP 11 release. To inquire about obtaining a license for the GTAP 11 database, visit the [GTAP website](#). The GTAP version 9 database is included in our data distribution.

First, the file `GTAPWiNDC/gtapingams.gms` controls which version of the GTAP database you'll be using. By default this file specifies gtap9. To switch to gtap11, change this file to read:

```
$setglobal gtapingams gtap11\  
*$setglobal gtapingams gtap9\  
📄
```

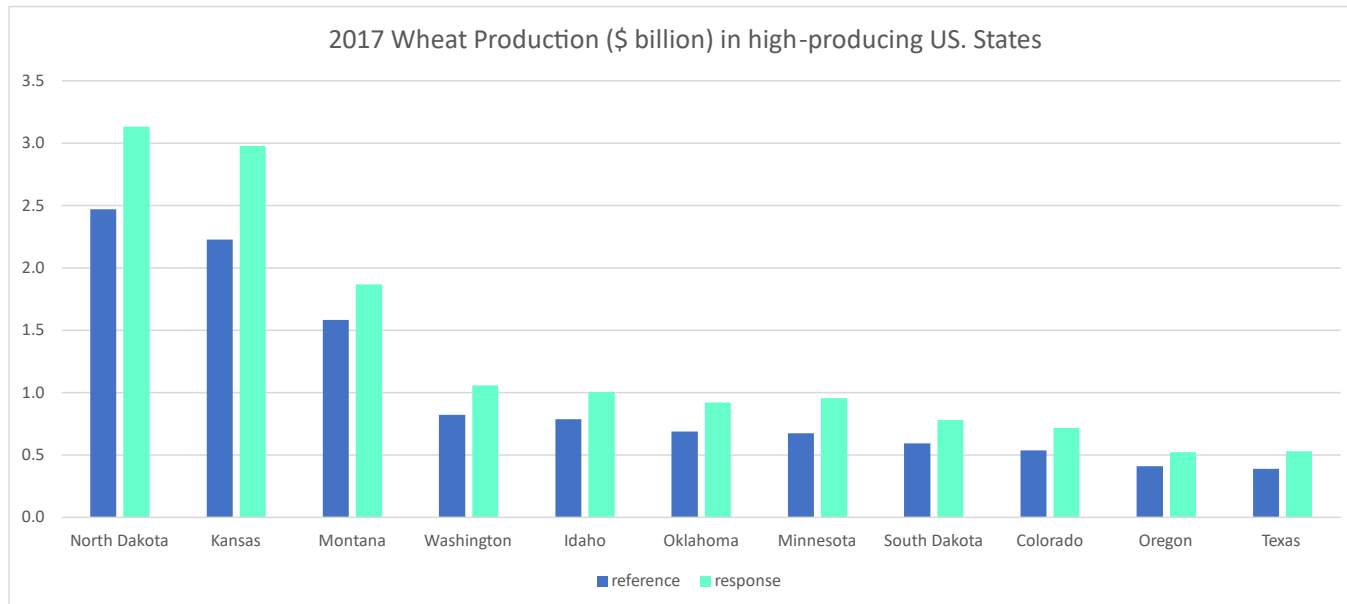
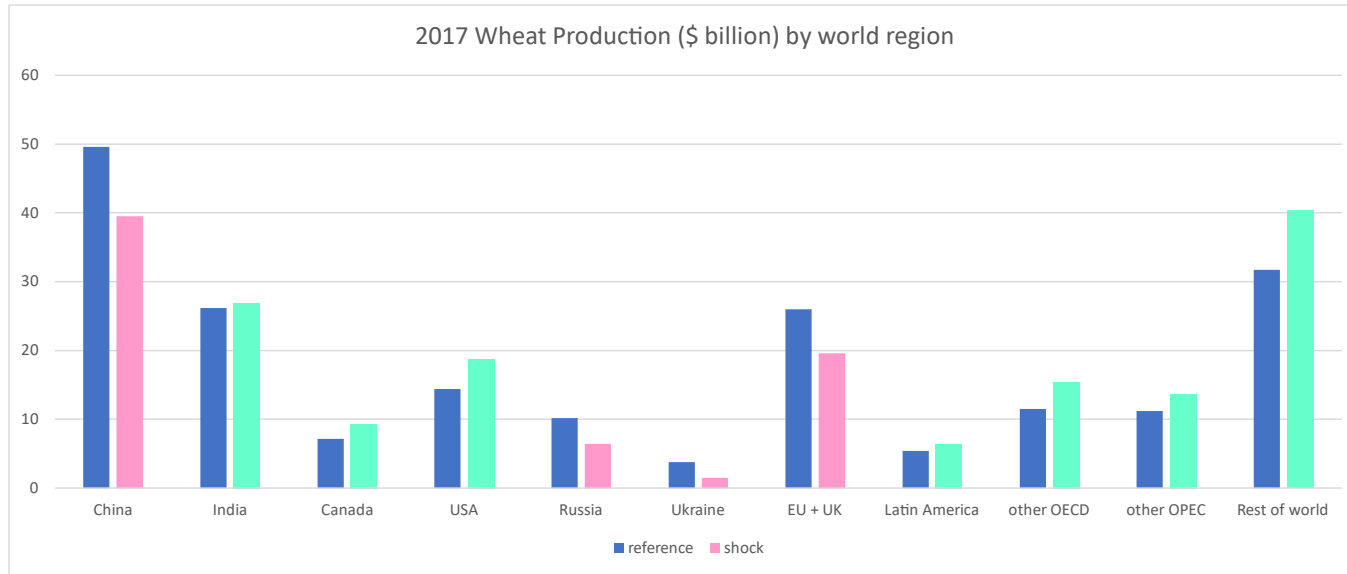
In words, delete the `*` from the beginning of line 3 and add a `*` to the beginning of line 4.

Second, navigate to the subdirectory `GTAPWiNDC/gtapN` where N is either 9 or 11, depending on the version of the data you wish to build. Run the command:

```
gms build.gms 📄
```

You must run both `core` and `household` before running this command. This will build the GTAP in WiNDC dataset.

GTAP-WiNDC sample application to multi-breadbasket food shocks



- Shock to wheat production in selected world regions
 - Decline in wheat productivity in four regions
 - Other world regions respond with increase in wheat production
- Response in USA across States (ranked by value of wheat production)

Conclusion

- Status
 - Subnational CGE model for USA **nested within** global GTAP model
 - **Full simultaneity** in GTAP-WiNDC model solution
 - Model framework provides flexibility for any country to be the subnational model (e.g., Canada, Mexico, India, China, Japan)
 - **Opportunity for collaborative model development**
 - GTAP-WiNDC 3.2 is publicly available on github
 - Requires GAMS license
 - Large models require GTAP subscription
- Potential applications
 - Multi-breadbasket food shocks
 - Land competition at subnational level (between cropland, rangeland, forests)
- Next steps
 - Expand number of food processing sectors
 - Consumer food demand by income quintile
 - Match monetary and quantity flows for analysis of climate change adaptation, mitigation, and food security
 - Calories for food production and demand
 - Cubic meters of forestry products
 - Hectares of land in crops, rangeland, forests
 - Joules of energy produced and consumed

