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Class Objective:

This class focuses on how to build and use computable general equilibrium (CGE) models to do both research and policy advising. This class is an opportunity for students to develop an additional *tool* to do economic analysis. Students will develop better data management skills and attempt to maximize its use in economic analysis.

Each student will choose a region in Colorado or a country (that has sufficient data) and your responsibility is to collect data that describes that region in sufficient detail to construct a social accounting matrix (SAM). A SAM is a method to organize data for the firm or sector's decision to purchase intermediate inputs, land, labor, capital and also pays an array of taxes to the local, state and federal governments. Data is collected to represent the expenditure patterns for multiple household groups distinguished by annual income. We also collect data on taxes collected by various levels of government and the services (transportation, justice, education, etc.) that are supplied by government. All of this data is organized in the SAM which is consistent with a general equilibrium model.

After the data has been put into the SAM, the SAM is merged with the equations of a CGE model. When the CGE model can exactly reproduce the data in the SAM, the model is calibrated the model. The CGE model can be used to examine the impact on the level and distribution of economic activity on issues such as:

- 1) The expansion or contraction of export sectors.
- 2) Tax policy such as changing income, sales or property tax rates.
- 3) Changes in total factor productivity and the marginal productivity of labor or capital.
- 4) The transition to wind power or natural gas in supplying electricity to a state.
- 5) The impact of fracking.
- 6) The impact of natural disasters such as the flood in Colorado that occurred several months ago.
- 7) A wide range of agricultural issues.

There are many other issues that can be analyzed.

## **Grading**

There will be quite a bit of data gathering for the class. Two primary websites everyone will be using are

- <http://www.bls.gov/>
- [http://www.census.gov/acs/www/data\\_documentation/public\\_use\\_microdata\\_sample/](http://www.census.gov/acs/www/data_documentation/public_use_microdata_sample/)

### **Problem Set 1 – 20%**

- Use the supplied CGE model and run a range of simulations to understand how a CGE model works. Excel file and word document required. Due date to be determined.

### **Problem Set 2 – 20%**

- Choose a state and start constructing a social accounting matrix. Due date to be determined.
- Master Stata program to organize the data

### **Problem Set 3 – 20%**

- Each student is required to present two CGE papers on a specific topic along with at least one econometric paper on the same topic. The student will also run simulations with their model that either supports or rejects the findings of the other papers.

### **Problem Set 4 - 20%**

- Calibrated CGE model completed.

All simulations will take into account the following paper.

Dixon, Peter B., and Maureen T. Rimmer. "Validation in computable general equilibrium modeling." *Handbook of Computable General Equilibrium Modeling* 1 (2013): 1271-1330.

## Readings

### I. Surveys of Computable General Equilibrium Models

Partridge, Mark and Dan Rickman, (1998) Regional computable general equilibrium modeling: a survey and critical appraisal, International Regional Science Review 21, 205–248.

\_\_\_\_\_, (2010) “Computable General Equilibrium (CGE) Modeling for Regional Economic Development Analysis,” Regional Studies. Vol. 44.10, pp. 1311–1328, December.

Wing, Ian Sue (2004) “Computable General Equilibrium Models and Their Use in Economy-Wide Policy Analysis,” Science and Policy of Global Change, MIT.

### II. Economic Resilience of Natural Hazards

Rose, Adam, and Shu-Yi Liao. "Modeling regional economic resilience to disasters: A computable general equilibrium analysis of water service disruptions\*." *Journal of Regional Science* 45.1 (2005): 75-112.

Cutter, Susan L., et al. "A place-based model for understanding community resilience to natural disasters." *Global environmental change* 18.4 (2008): 598-606.

Chang, Stephanie E., and Masanobu Shinozuka. "Measuring improvements in the disaster resilience of communities." *Earthquake Spectra* 20.3 (2004): 739-755.

Okuyama, Yasuhide. "Economic modeling for disaster impact analysis: past, present, and future." *Economic Systems Research* 19.2 (2007): 115-124.

Rose, Adam Z. "A framework for analyzing the total economic impacts of terrorist attacks and natural disasters." *Journal of Homeland Security and Emergency Management* 6.1 (2009).

Meyer, Volker, et al. "Review article: Assessing the costs of natural hazards—state of the art and knowledge gaps." *Natural Hazards and Earth System Science* 13.5 (2013): 1351-1373.

### III. Tax Policy

Altig, D., A. Auerbach, L. Kotlikoff, K. Smetters, and J. Walliser (2001), “Simulating Fundamental Tax Reform in the United States,” The American Economic Review, 91(3): 574–595. Mike

Ballard, Charles L., John B. Shoven and John Whalley (1985), "General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States," American Economic Review Vol. 75 No. 1 (March): 128-138. Bryanna

Conroy, Tessa, Harvey Cutler and Stephan Weiler (2016) "The State-Level Impacts of Enforcing Sales Taxes for E-retail Purchases," Growth and Change Volume 47 No 2 June 276-95.

Cutler, Harvey, Stephen Davies and Martin Shields, (2017) "Can State Fiscal Policy Increase Growth and Reduce Inequality?" (Forthcoming Growth and Change).

### **III. Promoting Economic Growth**

Giesecke, James (2002) "Explaining regional economic performance: An historical application of a dynamic multi-regional CGE Model," *Papers in Regional Science*, 81: 247-278.

Cutler, Harvey and Stephen Davies (2010) "The Economic Consequences of Productivity Changes: A CGE Analysis" Regional Studies, volume 44 No. 10 Dec.: pp. 1414-26.

Cutler, Harvey and Stephen Davies (2007) "The Impact of Specific-Sector Changes in Employment on Economic Growth, Labor Market Performance and Migration," Journal of Regional Science Vol. 47 Issue 5 December: 935-63.

Hoffman, Sandra, Sherman Robinson and Shankar Subramanian (1996), "The Role of Defense Cuts in the Californian Recession Computable General Equilibrium Models and Interstate Factor Mobility" Journal of Regional Science Volume 36, Issue 4, pages 571-595, November 1996

### **V. Environmental**

Eboli, Fabio, Ramiro Parrado, and Roberto Roson (2010) "Climate-change feedback on economic growth: explorations with a dynamic general equilibrium model," Environmental and Development Economics (Oct): 515-533. Ana

Goulder H. Lawrence and marc Hafstead and Michael Dworsky (2010), "Impacts of alternative emissions allowance allocation methods under a federal cap-and-trade program," Journal of Environmental Economics and Management Vol. 60 Issue 3 November: 161 -181. Russ

Hannum, Christopher, Harvey Cutler, Terry Iverson and David Keyser "Estimating the Implied Cost of Carbon in Future Scenarios Using a CGE model: The Case of Colorado" (Forthcoming Energy and Policy).

Hurlbut, D., Haase, S., Barrows, C., Bird, L., Brinkman, G., Cook, J., Day, M., Diakov, V., Hale, E., Keyser, D., Lopez, A and Cutler H., (2016). "Navajo Generating Station & Federal Resource Planning." National Renewable Energy Laboratory.