AGEC 620 Syllabus
Quantitative Analysis of Markets and Policy

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Course Information: 3 credits, Fall Term, Tuesday & Thursday, 10:30am – 11:45pm, Rawls 1071. Office hours: Hertel = Tuesday & Thursday, 11:45 – 12:30pm; Ahmed and Mirza = Wednesday & Friday. 3:00 – 4:30pm. Other meetings by arrangement.

Course Objective: The goal of this course is to give students practical, hands-on experience conducting quantitative economic analysis of markets and policy. This will be done through a series of homework assignments which will combine analytics with computation in order to help students to bridge the gap between theory and application.

Prerequisites*:* ECON 607 and AGEC 652 required.

Policies and Grading: Grades will be based on performance on the homework assignments as well as the exams. Students are encouraged to work in teams of two and discuss the assignments with one another. Each team must submit a write-up. This should not be done in collaboration with other groups. Together these assignments will comprise 50% of the grade. The midterm will be worth 25% of the grade and the final exam will be worth 25% of the grade. Class participation is also strongly encouraged and can play a role in borderline cases.

Software: We will use the GEMPACK software suite in all homework assignments.

Academic Integrity: University policy on academic misconduct is clear - academic dishonesty in any form is strictly prohibited. Instances of academic dishonesty will be referred to the Dean of Students for disciplinary action. Penalties are severe and may include failure on the exam, assignment, failure in the course, and/or expulsion from the University. The risks associated with academic dishonesty far outweigh the perceived benefits. Academic dishonesty includes citing someone else's work as your own, using unauthorized "crib sheets" during exams, or sharing your answers with someone else. If you are unsure whether an action you are considering constitutes academic dishonesty, seek clarification from your instructor.

***Organization**:*

Part I of the course focuses on quantitative analysis of marketing linkages from the farm gate to consumers in the presence of multi-stage oligopolies and oligopsonies. Here, we build on the work of Richard Sexton and others who have emphasized the importance of market structure for the distribution of consumer and producer surplus in the food marketing system.

In Part II of the course, students will construct, calibrate, and use a simple economic model of the agricultural household in a developing country which encompasses both production and consumption decisions. The question of separability between these two areas of household activity will also be explored.

In Part III, we will turn to agricultural sector activity in OECD countries – focusing specifically on the impact of different types of agricultural policies on farm incomes, input demands, domestic and world prices. Particular emphasis will be placed on evaluating recent reforms in the European Union's Common Agricultural Policy.

Part IV moves on to general equilibrium and welfare economics. We begin with a computational analysis of the Pareto optimality of competitive equilibrium. Here, we systematically explore a series of market- and policy-induced departures from this benchmark, as well as possible Pareto improvements from a distorted point of departure. In this context we will develop a theoretical and computational approach to the decomposition of aggregate welfare which is extremely useful in the analysis of policy impacts, using this to explore second-best policy outcomes. Finally, we explore two important types of market failure: public goods and externalities. We formally explore how to model externalities in an applied general equilibrium model.

Part I. Analysis of food marketing channels in the presence of oligopoly and oligopsony (3 weeks: six lectures and one problem set)

Policy Problem: Activities undertaken by the food manufacturing, wholesale and retail sectors now account for the bulk of the consumers' food dollar, and the food marketing system's share of total consumer expenditures continues to rise. Part of this reflects the demand for increasing convenience, but part of it is due to the increasing concentration, and hence market power, of this sector. This section of the course will examine the impact of market power on the distribution of economic surplus between farm producers, consumers, and firms at various stages in the marketing channel. After an overview of the food marketing system, we will turn to a theoretical model of oligopoly and oligopsony in the food sector. This will be followed by implementation of a model aimed at assessing the implications of market power for distribution and efficiency in various sub-sectors of the US food industry. We then turn to the application of this same framework in the context of developing country agricultural exports, asking the question: When trade liberalization occurs, how much of the benefits will accrue to farmers in the developing country when there is oligopoly and oligopsony market power in the international food marketing system?

Lecture I.1: Overview of the food marketing system, consolidation, market power and implications for competition and welfare.

Readings:

Rogers, R.T. "Structural Changes in U.S. Food Manufacturing, 1958-1997," *Agribusiness*, Vol 17, 2001.

Sexton, R. 2000. "Industrialization and Consolidation in the US Food Sector: Implications for Competition and Welfare", *American Journal of Agricultural Economics* 82(5):1087-1104.

Topics:

a. New empirical industrial organization
b. Vertical integration
c. Four-firm concentration ratio
d. Herfindahl index
e. Lerner index
f. Sunk costs
g. Cost efficiency trade-off
h. Distributional implications of market power

Lectures I.2 and I. 3: Quantitative Analysis of Concentration in the Food Marketing System

Reading:

Sexton, R.J. and Zhang, M., 2001. "An assessment of the impact of food industry market power on U.S. consumers", *Agribusiness* 17, 59-79.

Sexton, R.J., I. Sheldon, S. McCorriston, and H. Wang, 2007. "Agricultural trade liberalization and economic development: The role of downstream market power", *Agricultural Economics* 36:253-270.

Topics:

a. Successive Oligopolies
b. Successive Oligopoly/Oligopsony
c. Deadweight loss from market power

Lecture I.4: Computational Analysis of Concentration in the Food Marketing System: Introduction to GEMPACK software suite and programming the Sexton model

Grant, J. and T.W. Hertel, "An Introduction to GEMPACK: What you need to know to do the first assignment!", mimeo, Dept. Agr. Economics, Purdue University, August 2006.

Homework I.1: Analyzing the implications of market power in the US food system

Lectures I.5 - I.7: Imperfect Competition in the Food Marketing System: Empirical Evidence

Readings:

Schroeter, J. R., A. Azzam, and M. Zhang, "Measuring Market Power in Bilateral Oligopoly: The Wholesale Market for Beef." *Southern Economic Journal* 66(2000): 526-47.

Topics:

a. Market conduct parameter
b. Identification of market power
c. Comparative statics in demand and supply
d. Bilateral oligopoly

Part II. Economic Analysis of Agricultural Households in Developing Countries (4.5 weeks = 9 lectures and 3 assignments)

Policy Problem: Assessing the impact of a food price increase on agricultural households in a developing country. We begin by looking at the qualitative impact of this on supply and demand decisions. From here we move into computational analysis. We begin by modeling the impact of this price increase on the farm firm, in isolation from consumption. We then turn to modeling the impact on consumption, in isolation from production. Next, we conduct analysis of the impact on the entire farm household, first assuming separability between production and consumption decisions, and then in the presence of market failure – and hence non-separability. Then, we explore how to compute and decompose the welfare effects of this price shock. We also evaluate whether the findings are robust to econometrically estimated variation in the underlying parameters. Finally, we cover one particular case study in which the author tests for separability of production and consumption decisions.

Lecture II.1: A Separable Household Model with Household Production

Reading: Sadoulet, E. and A. de Janvry (1995) *Quantitative Development Policy Analysis*, Baltimore: Johns Hopkins Press, sections 6.1 – 6.4.

Topics:

a. Introduction of the basic model and qualitative analysis of behavior
b. Motivation for the problems of model estimation, calibration and simulation.
c. Model calibration, linear and non-linear solutions

Lecture II.2: Introduction to model linearization and implementation in GEMPACK, as well as use of AnalyseGE to decompose results.

Reading: Keeney, R. (2003) GEMPACK Notes for Homework II-1.

Lecture II.3: The Cobb-Douglas, Restricted Profit Function

Reading:
Yotopoulus, P.A ., L.J. Lau and W. Lin (1976). “Microeconomic Output Supply and Factor Demand Functions in the Agriculture of the Province of Taiwan”, *American Journal of Agricultural Economics*, (May): 333-340.

Topics:

a. Brief review of duality, including self-duality of the Cobb Douglas functional form (see also AGEC 619)
b. Empirical specification of a restricted profit function
c. Analysis of results
d. Limitations

Homework II.1: Programming the restricted Cobb Douglas functional form in GEMPACK and simulation of a food price shock.

Lecture II.4: The Translog, Indirect Utility Function

Reading: Lau, L.J., P.A. Yotopoulus, and W. Lin (1978). "The Linear Logarithmic Expenditure System: An Application to Consumption-Leisure Choice", *Econometrica,* (July): pp. 843-860.

Topics:

a. Brief discussion of flexible functional forms (see also AGEC 619)
b. Brief review of indirect utility functions and duality in consumer demand
c. Introduction to the translog indirect utility function
d. Empirical specification and discussion of results

Lecture I.5: The Household Model Revisited: Implications for Marketed Surplus in the Presence of Separability

Reading: Lau, L.J., P.A. Yotopoulus, and W. Lin (1978). "The Linear Logarithmic Expenditure System: An Application to Consumption-Leisure Choice", *Econometrica,* (July): pp. 860-866.

Topics:

a. Impacts of a change in wages on labor supply and marketed surplus
b. Analysis of the impact of a food price change on marketed surplus
c. Implications of changes in household expenditure
d. Calibration of the translog function

Homework II.2: Programming the translog, indirect utility function into GEMPACK. Empirical analysis of the impact of a food price shock under separability and implications for marketed surplus.

Lectures II.6 and II.7: Computational analysis of welfare. Non-separability in household consumption and production.

Readings:

Sadoulet, E. and A. de Janvry (1995) *Quantitative Development Policy Analysis,* Baltimore: Johns Hopkins Press, pp. 10-16 and sections 6.5-6.6.

De Janvry, A., M. Fafchamps and E. Sadoulet (1991) " Peasant Household Behaviour with Missing Markets: Some Paradoxes Explained", *Economic Journal*, (November): 1400-1417.

Ravallion, M. (1990) “Rural Welfare Effects of Food Price Changes Under Induced Wage Responses: Theory and Evidence for Bangladesh”, *Oxford Economic Papers* (42):574-585.

Topics:

a. Consumer surplus, Compensating and Equivalent Variations
b. Local approximations to the change in household welfare
c. Two examples of computational welfare analysis
d. Sources of market failure
e. Theoretical implications
f. An example

Lecture II.8: Systematic Sensitivity Analysis

Reading:

DeVuyst, E.A. and P.V. Preckel, 1997, Sensitivity Analysis Revisited: A Quadrature-Based Approach, *Journal of Policy Modeling* 19(2):175-85.

Pearson, K.R. (2000). “SSA – What it is and what it is not”, RunGTAP help file.

Homework II.3: Analysis of the behavioral implications of a food price shock in the presence of a missing labor market failure. Computational analysis of the welfare impacts of a food price change with and without market failure.

Lecture II.9: Testing for Separation in Household Production and Consumption

Reading: Benjanmin, D. (1992). “Household Composition, Labor Markets and Labor Demand: Testing for Separation in Agricultural Household Models”, *Econometrica*, (March): pp. 287-322.

In Class Midterm covering Modules 1 and 2

Part III. Analysis of domestic agricultural support policies in the OECD (3 weeks: 1 homework)

Policy Problem: Assess the differential impact of alternative methods of farm support in the EU in the context of uncertain parameter estimates. Contrast the impacts on trade with those on farm income.

Lecture III.1: Introduction and overview of the farm support in the OECD

Reading: OECD. 2001. *Market Effects of Crop Support Measures*, Paris: OECD.

Lectures III.2 and III.3: Qualitative analysis of the impacts of farm policies

Hertel, T.W. 1989. "Negotiating Reductions in Agricultural Support: Implications of Technology and Factor Mobility" *American Journal of Agricultural Economics* 71(3):559-573.

Topics:

a. Preliminaries on the use of equilibrium displacement models
b. Impacts of alternative methods of support for a single agricultural sector (equal PSE comparisons)
c. Factor mobility, length of run and incidence

Homework III.1: Analysis of alternative types of farm support; qualitative analysis and back-of-the envelope calculations; computational analysis and SSA.

Lectures III.4 and III.5: Computational analysis of the impacts of farm policies

Gohin, A. and T.W. Hertel, T.W. 2003. "A Note on the CES Functional Form and Its Use in the GTAP Model", Research Memorandum #2, Center for Global Trade Analysis, Purdue University, http://www.gtap.agecon.purdue.edu/resources/res_display.asp?RecordID=1370

OECD. 2001. *Market Effects of Crop Support Measures*, Paris: OECD, pp. 19-35, Annex 3: "Elasticities of Substitution and Factor Supply Elasticities in European Agriculture: A Review of Past Studies" by Klaus Salhofer. (Annex 2 is optional: "Elasticities of Substitution and Factor Supply in Canadian, Mexican and United States Agriculture" by David Abler).

Topics:

a. The nested Constant Elasticity of Substitution (CES) production function and its implications for partial equilibrium modeling
b. Calibration of nested CES functions to econometric evidence
c. Modeling factor markets and factor subsidies

Lecture III.7: Comparison of farm policy impacts of alternative instruments in the EU.

Reading:

Dewbre, J., J. Anton, and W. Thompson. 2001. "The Transfer Efficiency and Trade Effects of Direct Payments", *American Journal of Agricultural Economics* 83:1204-1214.

Topics:

a. Transfer efficiency and market distortions of alternative policies
b. Comparing producer support across instruments, time and countries
c. Synthesis of parameter distributions from the literature
d. Systematic sensitivity analysis using Gaussian Quadrature

Lecture III.8: The debate over yield response to subsidies: Guest lecture by Roman Keeney.

Reading:

Gohin, Alexandre, and Jean-Christophe Bureau, 2006. "Analysis of the aggregate yield response for the main arable crops in Europe", report prepared for the OECD, Paris.

Part IV. General Equilibrium and Welfare Economics (4 weeks: 2 problem sets)

Policy Problem: Analyze the incidence of a policy interventions in general equilibrium and the implications for welfare, including the measurement of second-best interactions and externalities.

Lectures IV.1: Review of basic concepts of Welfare Economics

Reading:
Just, R.E., D.L. Hueth and A. Schmitz. *Applied Welfare Economics*. Prentice Hall, Chapters 1-2.

Supplementary Reading:
Myles, G.D. 1995. *Public Economics*. Cambridge University Press, Chapter 2, pp. 18-51.

Lecture IV.2: Specification of a simple computational general equilibrium model and Analytical Decomposition of Welfare in the Presence of Pre-existing Distortions

Lecture IV.3: Analytical Decomposition of Welfare in the Presence of Pre-existing Distortions

Reading:

Huff, K. and T.W. Hertel, 2000. "Decomposing Welfare Changes in the GTAP Model", GTAP Technical Paper No. 5, (sections 1 and 2 only) Center for Global Trade Analysis, Purdue University, http://www.gtap.agecon.purdue.edu/resources/download/786.pdf

Homework IV.1: Development of a general equilibrium model and evaluation of the conditions for Pareto Optimality. Second-best outcomes and interactions with existing distortions.

Topics:

a. General equilibrium with competitive markets
b. Walras' Law
c. Pareto Optimality and the First Theorem of Welfare Economics
d. Lump sum transfers and the Second Theorem of Welfare Economics
e. Limitations of Welfare Economics

Lectures IV.4 and IV.5: Externalities

Reading:

Myles, G.D. 1995. *Public Economics*. Cambridge University Press, Chapter 10.

Topics:

a. Equilibrium and inefficiency
b. The Coase Theorem
c. Markets for Externalities
d. Corrective Taxation

Homework IV.2: Welfare Analysis of an Environmental Externality in General Equilibrium.

Lecture IV.6: Public Goods

Reading:

Myles, G.D. 1995. *Public Economics*. Cambridge University Press, Chapter 9.

Topics:

a. Pure public goods: non-excludability and non-rivalry
b. Impure public goods and congestion

Lecture IV.7: Course wrap-up and review

Final Exam

Appendix: Quantitative Analysis of Markets and Policies
concepts covered:
Applications of duality with a brief discussion of testing and estimation
Flexible functional forms
Marketed surplus
Leisure demand/labor supply
Separation of household and firm decisions: implications for supply response
Market failure and empirical tests of separability
Consumer Surplus, Compensating and Equivalent Variations
Producer Subsidy Equivalent
Transfer efficiency and farm-income support
Factor mobility, technology and supply response
Imperfect competition
Distributional consequences of market power
Econometric identification of market power
Sunk costs
Increasing returns to scale
Vertical integration
Welfare and distributional effects of oligopoly and oligopsony in food marketing
Pareto Optimality
Competitive Equilibrium
Walras Law
Two Theorems of Welfare Economics
Second Best Outcomes
Analytical decomposition of welfare
Public goods
Externalities
Marginal Cost and Benefit of Abatement
Coase Theorem
Transactions costs
Pigouvian taxes

Applied economics tools covered:
Cobb Douglas Production and Profit Functions
Translog Indirect Utility Function
CES Production and Cost Functions
Nested-CES Production Functions
Calibration to econometric estimates from the literature: consumer demand, production/cost functions, factor supply and market power
Computation of market power and the distribution of surplus in a linear model
Modeling multistage oligopoly/oligopsony
Econometric identification of market power
Systematic sensitivity analysis using Gaussian Quadrature
Approaches to computing and decomposing Equivalent Variation
A variety of approaches to computable partial and general equilibrium analysis