

## AGRICULTURAL ECONOMICS 608 BENEFIT-COST ANALYSIS

Spring 2016  
Wallace Tyner, Instructor

AGEC 608 is an applied course in economic analysis of investment projects with emphasis on agricultural projects in developing countries. However, the methods we will learn are applicable to projects in industry, education, health, energy, and other sectors. The methods, appropriately modified, can also be used for project analysis in developed economies. Many of the tools also can be used for policy analysis, and we will spend some time on applications to environmental policy.

The basic objective of the course is that by the end of the semester you will be able to do benefit-cost analysis of relatively complex cases. The course is very applied with homework exercises designed to help you learn how to handle the various issues that come up in real world benefit-cost and policy analysis problems. You will learn how to apply all the financial functions in Excel and how to handle risk in benefit-cost analysis.

### Texts and Readings

Our primary texts will be:

Campbell, Harry, and Brown, Richard, *Cost-Benefit Analysis - Financial and Economic Appraisal Using Spreadsheets*, 2<sup>nd</sup> edition, Taylor & Francis, 2015. (required). From Amazon, paper copy is \$73.08 and electronic \$69.43 as of 22 Dec 2015. The electronic version is not well done, in my view.

The previous edition of this book likely would work as well:

Campbell, Harry, and Brown, Richard, *Benefit-Cost Analysis-Financial and Economic Appraisal Using Spreadsheets*, University of Cambridge Press, 2003.

Boardman, A.E., D.H. Greenburg, A.R. Vining and D.L. Weimer, *Cost Benefit Analysis: Concepts and Practice*, 4th. Ed., Prentice Hall, Upper Saddle River, NJ 2011 (optional).

The Boardman, et al. book is on reserve in Krannert Library. The third edition of Boardman, et al. is on reserve, and the reading list uses the 4<sup>th</sup> edition. There are some differences, but not huge. The Boardman book is optional and is used primarily for the specialized methods of hedonic pricing, travel cost, and contingent valuation. It does a good job on those topics, but the new version of Campbell and Brown is improved. Another important resource is from EPA:

U.S. Environmental Protection Agency, *Guidelines for Preparing Economic Analyses*, 2010, updated 2014.

<http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/guidelines.html>.

Some of the material to be introduced in class is not contained in either of the texts. In addition, we will use journal articles for certain topics and for case studies. You will receive a PowerPoint file containing most of the slides that will be used in class.

This set of readings is not intended to be a comprehensive list of materials on each topic. Rather, it is a selection of some of the more important books and articles in each subject area. Many of the papers are possible case studies, and you certainly are not expected to read all of them. Students desiring to pursue any particular subject in more detail should refer to the bibliographies of listed articles and books or consult the instructor for guidance on other sources. The Campbell and Brown text has a WWW site with sample spreadsheets. It is <http://www.ug.edu.au/economics/bca>. Use "other users login" with "user" for user name and password "abc2004."

#### **I. Introduction.**

Campbell and Brown, pp. 1-39.

Boardman, et al., pp. 1-24.

Boardman, et al., pp. 507-510.

#### **II. Measures of project worth and interest calculations.**

Campbell and Brown, pp. 40-98.

Boardman, et al., pp. 133-166.

#### **III. Multiple objectives and multiple purposes.**

Boardman, et al., pp. 489-506.

#### **IV. Identifying and quantifying benefits and costs.**

Campbell and Brown, pp. 99-171.

Campbell and Brown, pp. 292-309.

Boardman, et al., pp. 78-132, and pp. 443-463.

Boardman, et al., pp. 27-77. (Background material)

#### **V. Risk, uncertainty, and sensitivity analysis.**

Campbell and Brown, pp. 253-291.

Boardman, et al., pp. 167-187.

## **VI. Estimating impacts from observed behavior and contingent evaluation.**

Campbell and Brown, pp. 217-252.

Boardman, et al., pp. 320-405.

Boardman, et al., pp. 406-463.

Nganje, W. E., et al, "Regional Economic Impacts of Fusarium Head Blight in Wheat and Barley." *Review of Agricultural Economics* Volume 26, Number 3 (Fall 2004), pp. 332-347.

Roe, B., T.C. Haab, and B. Sohngen, "The Value of Agricultural Economics Extension Programming: An Application of Contingent Valuation." *Review of Agricultural Economics* Volume 26, Number 3 (Fall 2004), pp. 373-390.

Jensen, K.L., et al, "Consumers' Willingness to pay for Eco-Certified Wood Products." *Journal of Agricultural and Applied Economics* Volume 36, Number 3 (December 2004), pp. 617-626.

Shrestha R.K. and J.R.R. Alavalapati, "Effect of Ranchland Attributes on Recreational Hunting in Florida: A Hedonic Price Analysis." *Journal of Agricultural and Applied Economics* Volume 36, Number 3 (December 2004), pp. 763-772.

Ready, Richard C. and Charles W. Abdalla, "The Amenity and Disamenity Impacts of Agriculture: Estimates from a Hedonic Pricing Model." *American Journal of Agricultural Economics* Volume 87, Number 2 (May 2005), pp. 314-26.

Carlsson, Fredrik, Frykblom, Peer, and Carl Johan Lagerkvist. "Consumer Benefits of Labels and Bans on GM Foods-Choice Experiments with Swedish Consumers." *American Journal of Economics* Volume 89, Number 1 (February 2007), pp. 152-161.

Landry, Craig E. and John A. List. "Using *Ex Ante* Approaches to Obtain Credible Signals for Value in Contingent Markets: Evidence from the Field" *American Journal of Agricultural Economics* Volume 89, Number 2 (May 2007), pp. 420-429.

Carlsson, Fredrik and Peter Martinsson. "Willingness to Pay among Swedish Households to Avoid Power Outages: A Random Parameter Tobit Model Approach." *The Energy Journal* Volume 28, Number 1 (2007), pp. 75-90.

Lusk, Jayson L. and Stéphan Marette. "Welfare Effects of Food Labels and Bans with Alternative Willingness to Pay Measures." *Applied Economic Perspectives and Policy* Volume 32, Number 2, Summer 2010, pp 319-337

## **VII. The social discount rate.**

Boardman, et al., pp. 238-273.

Fischer, A.C., and J.V. Krutilla. "Conservation, Environment, and the Rate of Discount." *Quarterly Journal of Economics* (August 1975), pp. 358-371.

Rowse, John. "On Hyperbolic Discounting in Energy Models: An Application to Natural Gas Allocation in Canada." *The Energy Journal* (Special Issue 2008), pp. 135-58.

Moore, Mark A., Boardman, Anthony E. and Vining, Aidan R. (2013). "More appropriate discounting: the rate of social time preference and the value of the social discount rate," *Journal of Benefit-Cost Analysis*, 1-16.

Arnold C. Harberger and Glenn P. Jenkins, (2015). "Musings on the Social Discount Rate." *Journal of Benefit-Cost Analysis*, 6-32.

## **VIII. Other applications of consumer and producer surplus, contingent evaluation, and case studies.**

Campbell and Brown, pp. 182-215.

Norton, George W., Ganoza, Victor G., and Carlos Pomareda. "Potential Benefits of Agricultural Research and Extension in Peru." *American Journal of Agricultural Economics* (May 1987), pp. 247-57.

Rafsnider, Giles T., Skold, Melvin P., and Rajan K. Sampath. "Range Survey Cost Sharing and the Efficiency of Rangeland Use." *Land Economics* (February 1987), pp. 92-101.

Gordon, I.M. and Knetsch, J.L. "Consumer's Surplus Measures and the Evaluation of Resources." *Land Economics* Vol. 55, No. 1 (February 1979), pp. 1-10.

Buchanan, J.M. and Tullock, G. "Polluter's Profits and Political Response: Direct Controls Versus Taxes." *American Economic Review* 65 (March 1975), pp. 139-47.

Bockstael, Nancy E., and McConnell, Kenneth E. "Calculating Equivalent and Compensating Variation for Natural Resource Facilities." *Land Economics* Vol. 56, No. 1 (February 1980), pp. 56-63.

Mendelsohn, Robert. "An Economic Analysis of Air Pollution from Coal-Fired Power Plants." *Journal of Environmental Economics and Management* Vol. 7, No. 1 (March 1980), pp. 30-43.

Raucher, Robert L. "The Benefits and Costs of Policies Related to Groundwater Contamination." *Land Economics* (February 1986), pp. 33-45.

Schwing, Richard C., et al. "Benefit-Cost Analysis of Automotive Emission Reductions." *Journal of Environmental Economics and Management* Vol. 7, No. 1 (March 1980), pp. 44-64.

Rockel, Mark L., and Kealy, Mary Jo. "The Value of Nonconsumptive Wildlife Recreation in the United States." *Land Economics* Vol. 67, No. 4 (November 1991), pp. 422-434.

Stevens, Thomas H.; Echeverria, Jaime; Glass, Ronald J.; Hager, Tim; More, Thomas A. "Measuring the Existence Value of Wildlife: What Do CVM Estimates Really Show?" *Land Economics* Vol. 67, No. 4 (November 1991), pp. 390-400.

Caswell, Julie A.; and Killeinschmit v. L., Jaana K. "Using Benefit-Cost Criteria for Settling Federalism Disputes: An Application to Food Safety Regulation." *American Journal of Agricultural Economics* Vol. 79, No. 1 (February 1997), pp. 24-38.

Costello, Christopher J., Richard M. Adams, and Stephen Polasky. "The Value of El Niño Forecasts in the Management of Salmon: A Stochastic Dynamic Assessment." *American Journal of Agricultural Economics* Vol. 80, No. 4 (November 1998), pp. 765-777.

Nestor, Deborah Vaughn. "Policy Evaluation with Combined Actual and Contingent Response Data." *American Journal of Agricultural Economics* Vol. 80, No. 4 (May 1998), pp. 264-276.

Plantinga, Andrew J., Thomas Mauldin, and Douglas J. Miller. "Costs of Carbon Sequestration in Forests." *American Journal of Agricultural Economics* Vol. 81, No. 4 (November 1999) pp.812-24.

Vogt, Michael L., and Terry I. Kastens, "A Study of the Financial Impact of Dairy Manure Storage Systems in Northeast Kansas." *Review of Agricultural Economics* Volume 27, Number 3 (Fall 2005), pp.336-49.

Mullen, John D., Julian M. Alston, Daniel A. Sumner, Marcia T. Kreith, and Nicolai V. Kuminoff, "The Payoff to Public Investments in Pest-management R&D: General issues and a Case Study Emphasizing Integrated Pest Management in California." *Review of Agricultural Economics* Volume 27, Number 4 (Winter 2005), pp.558-73.

Alfnes, Frode, Atle G.Guttormsen, Gro Steine, and Kari Kolstad. "Consumers' Willingness to Pay for the Color of Salmon: A Choice Experiment with Real Economic Incentives." *American Journal of Agricultural Economics* Volume 88, Number 4 (November 2006), pp.1050-1061.

Fischer, Carolyn, Harrington, Winston and Ian W.H. Parry. "Should Automobile Fuel Economy Standards be Tightened?" *The Energy Journal* Volume 28, Number 4 (2007), pp. 1 – 30.

Babcock, Bruce A. "Distributional Implications of U.S. Ethanol Policy." *Review of Agricultural Economics* Vol. 30, Number 3 (2008), pp. 533-42.

Bollino, Carlo Andrea. "Willingness to Pay for Renewable Energy Sources: The Case of Italy with Socio-demographic Determinants" *The Energy Journal* Vol 30, Number 2 (2009), pp. 81-96.

Morrison, Mark and Craig Nalder. "Willingness to Pay for Improved Quality of Electricity Supply Across Business Type and Location." *The Energy Journal* Vol 30, Number 2 (2009), pp. 117-33.

Grösche, Peter and Colin Vance. "Willingness to Pay for Energy Conservation and Free-Ridership on Subsidization: Evidence from Germany." *The Energy Journal* Vol 30, Number 2 (2009), pp. 135-53.

Corrigan, Jay R., Depositario, Dinah Pura T., Nayga, Jr., Rodolfo M., Wu, Ximing, and Tiffany P. Laude. "Comparing Open-Ended Choice Experiments and Experimental Auctions: An Application to Golden Rice." *American Journal of Agricultural Economics* Vol 91, Number 3, (August 2009), pp 837-53.

Bin, Okmyung, Landry, Craig E. and Gregory F. Meyer. "Riparian Buffers and Hedonic Prices: A Quasi-Experimental Analysis of Residential Property Values in the Neuse River Basin." *American Journal of Agricultural Economics* Vol 91, Number 4, (November 2009), pp 1067-79.

Alston, Julian M. Matthew A. Andersen, Jennifer S. James, and Philip G. Pardey. "The Economic Returns to U.S. Public Agricultural Research." *American Journal of Agricultural Economics* 93(5): 1257-1277 (October 2011).

Kinnucan, Henry W., and Hailong Cai. "A Benefit-Cost Analysis of U.S. Agricultural Trade Promotion." *American Journal of Agricultural Economics* 93(1): 194-208 (January 2011).

Huang, Shisheng, Bri-Mathias S. Hodge, Farzad Taheripour, Joseph F. Pekny, Gintaras V. Reklaitis and Wallace E. Tyner. "The Effects of Electricity Pricing on PHEV Competitiveness," *Energy Policy* 39 (2011) 1552-1561.

Ward, D., C. Clark, K. Jensen, S. Yen, and C. Russell. "Factors Influencing Willingness-to-pay for the ENERGY STAR Label." *Energy Policy* 39 (2011) 1450-1458.

Hessami, M., H. Campbell, and C. Sanguinetti. "A Feasibility Study of Hybrid Wind Power Systems for Remote Communities." *Energy Policy* 39 (2011) 877-886.

Nooij, M. "Social cost-benefit analysis of electricity interconnector investment: A critical appraisal." *Energy Policy* 39 (2011) 3096-3105.

Malla, M., N. Bruce, E. Bates, and E. Rehfuss. "Applying global cost-benefit analysis methods to indoor air pollution mitigation interventions in Nepal, Kenya, and Sudan: Insights and challenges." *Energy Policy* 39 (2011) 7518-7529.

Eyckmans, J., S. De Jaeger, S. Rousseau. "Hedonic Valuation of Odor Nuisance Using Field Measurements." *Land Economics* 89 (2013) 53-75.

Kotchen, M., K. Boyle, and A. Leiserowitz. "Willingness-to-pay and policy-instrument choice for climate-change policy in the United States." *Energy Policy* 55 (2013) 617-625.

Wu, Xing, Jing dong, and Zhenhong Lin. "Cost analysis of plug-in hybrid electric vehicles using GPS-based longitudinal travel data." *Energy Policy* 68 (2014), pp.206-217.

Fera, M., R. Iannone, R. Macchiaroli, S. Miranda, M. M. Schiraldi. "Project appraisal for small and medium size wind energy installation: the Italian wind energy policy effects." *Energy Policy* 74 (2014) pp.621-631.

Bittner, Amanda, Xin Zhao, and Wallace E. Tyner. "Field to Flight: A Techno-Economic Analysis of Corn Stover to Aviation Biofuels Supply Chain." *Biofuels, Bioproducts & Biorefining* 9, 201-210, 2015.

Jung, Jinho, and Wallace E. Tyner. "Economic and policy analysis for solar PV systems in Indiana." *Energy Policy* 74 (2014), 123-33.

O'Rear, Eric G., Kemal Sarica, and Wallace E. Tyner. "Analysis of impacts of alternative policies aimed at increasing US energy independence and reducing GHG emissions." *Transport Policy* 37 (2015), pp. 121-133.

Zhao, Xin, Tristin R. Brown, and Wallace E. Tyner. "Stochastic techno-economic evaluation of cellulosic biofuel pathways." *Bioresource Technology* 198 (2015), pp.755-763.

Simmons, Richard A., Gregory M. Shaver, Wallace E. Tyner, and Suresh V. Garimella. "A benefit-cost assessment of new vehicle technologies and fuel economy in the U.S. market." *Applied Energy* 157 (2015), pp. 940-952.

Kumar, Indraneel, Wallace E. Tyner, Kumares C. Sinha. "Input-output live cycle environmental assessment of greenhouse gas emissions from utility scale wind energy in the United States." *Energy Policy* 89 (2016) 294-301.

Hahn, Robert (2010). "Designing Smarter Regulation with Improved Benefit-Cost Analysis." *Journal of Benefit-Cost Analysis*, 1-19.

De Rus, Ginés (2011). "The BCA of HSR: Should the Government Invest in High Speed Rail Infrastructure?" *Journal of Benefit-Cost Analysis*, 1-28.

Boardman, Anthony E. and Forbes, Diane (2011). "A Benefit-Cost Analysis of Private and Semi-Private Hospital Rooms." *Journal of Benefit-Cost Analysis*, 1-27.

Havet, Natalie, Morelle, Magali, Remonnay, Raphaël and Carrere, Marie-Odile (2011). "Valuing the Benefit for Cancer Patients of Receiving Blood Transfusions at Home." *Journal of Benefit-Cost Analysis*, 1-19.

Brännlund, Runar, Carlén, Ola Lundgren, Tommy and Marklund, Per-Olov (2012). "The Costs and Benefits of Intensive Forest Management." *Journal of Benefit-Cost Analysis*, 1-23.

Jaldell, Henrik (2013). "Cost-benefit analyses of sprinklers in nursing homes for elderly." *Journal of Benefit-Cost Analysis*, 209-235.

Barrett, Steven R.H., Speth, Raymond L., Eastham, Sebastian D., Dedoussi, Irene C., Ashok, Akshay, Malina, Robert and Keith, David W. (2015). "Impact of the Volkswagen emissions control defeat device on US public health." *Environmental Research Letters*, 1-10.

John Weyant (2014). "Integrated assessment of climate change: state of the literature." *Journal of Benefit-Cost Analysis*, 377-409.

James E. Neumann and Kenneth Strzepek (2014). "State of the literature on the economic impacts of climate change in the United States." *Journal of Benefit-Cost Analysis*, 411-443.

Gloria Helfand and Reid Dorsey-Palmateer (2015). "The Energy Efficiency Gap in EPA's Benefit-Cost Analysis of Vehicle Greenhouse Gas Regulations: A Case Study." *Journal of Benefit-Cost Analysis*, 432-454.



Cass R. Sunstein (2013). "The value of a statistical life: some clarifications and puzzles." *Journal of Benefit-Cost Analysis*, 237-261.

## Grading and procedures

Each student will do a class project which will consist of a benefit-cost case study or a class presentation on one or more journal papers related to benefit-cost analysis. Both individual and group cases are available. Contact me to select your case study or journal paper(s). Journal papers that relate to but go beyond what we do in class are particularly welcome. If you have a possible original project related to your research area, that is ideal. The case study may be done as a paper or class presentation. The number of class presentations will be limited and will be allotted on a first come – first served basis.

Grading will be approximately as follows:

homework	50%
case study or literature presentation	20%
final exam take home	15%
in-class final	15%

Homework is due at the beginning of the class period of the due date. We will then review the homework solutions during the class period. You should make two copies of your homework – one to turn in and one to keep for yourself to use as we review the solutions in class. If you have a valid reason for not turning in the homework on time, do not attend the class session in which the homework is being discussed. You are expected to complete the homework on time, and any exceptions should be discussed with me in advance. In addition to the paper copy, please email your homework Excel file to me with the file name **HWx-lastname.xlsx**, where x in HWx is the homework number (1-5). Email the file to [agec608@purdue.edu](mailto:agec608@purdue.edu).

The final exam will have a take-home and in-class component. You will be provided with copies of the previous five in-class final exams.

My phone is 40199, the email is [wtyner@purdue.edu](mailto:wtyner@purdue.edu), and my office is KRAN 591B.

Please note that I will be periodically sending class emails related to the course. The emails will go to your Purdue email address, so make sure you use that address or have it forwarded to an address you use.

Our second class session on Thursday, February 18 will be held in the Learn Lab in Krannert (KRAN 250). The purpose is to acquaint everyone with the economic, financial, and logical functions we will be using in the homework exercises. Then again on March 10, 22, and 24 (if needed), we will hold class in the Learn lab (March 10) and MTHW 301 (March 22 and 24) to learn the @Risk software for doing uncertainty analysis. @Risk is also available in the Krannert 250 computer lab. Also, if you would

like it installed for the course period on your personal computer, you may contact our computer administrator, Carol Wood, at [cwood@purdue.edu](mailto:cwood@purdue.edu). Carol is in Krannert 577.

If I have to miss a class, we will handle that in one of two ways: 1)at the first class meeting, I will ask everyone to complete a schedule conflict form. If we can find a time everyone can meet, we will schedule makeup classes as needed; 2)we can use WebEx to do a class from anywhere.

### **Ground Rules**

The ground rules for homework are that you are allowed to interact, work together, etc., so long as each person has their own spreadsheet and does the spreadsheet entries and calculations independently. You can learn a lot from this interaction.

The ground rules for the take home final are that you must not interact in any way with anyone but me. Absolutely no discussion with classmates is permitted. Thus, it is a good idea to develop over the course of the semester your own independent ability to do the exercises.

### **Special Needs**

If you have a disability that requires academic adjustments, please make an appointment to meet with me during the first week of classes to discuss your needs. Please note that university policy requires all students with disabilities to be registered with [Disability Resource Center](#) in the [Office of the Dean of Students](#) before classroom accommodations can be provided.

### **Academic Integrity**

University policy on academic dishonesty is clear: academic dishonesty in any form is strictly prohibited. Anyone found to be cheating or helping someone else cheat will be referred directly to the Dean of Students for disciplinary action. Penalties are severe and may include dismissal from the University. The risks associated with cheating far outweigh the perceived benefits. Academic dishonesty includes citing someone else's work as your own, using "cheat sheets" or sharing your answers with someone else. If you are unsure whether your planned action constitutes academic dishonesty, seek clarification from your instructor. Other information regarding your rights and responsibilities as a student is contained in the [Purdue University Code of Conduct](#).

### **Campus Emergencies**

In the unusual event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances.

If we hear a fire alarm during class we will immediately suspend class, evacuate the building, and proceed outdoors. Do not use the elevator. If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement. If we are notified during class of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in the classroom, shutting the door and turning off the lights.

Please review the Emergency Preparedness website for additional information.  
[http://www.purdue.edu/ehps/emergency\\_preparedness/index.html](http://www.purdue.edu/ehps/emergency_preparedness/index.html)

#### Correspondence between Boardman, et al. Editions 3 and 4

<b>Edition 4</b>	<b>Edition 3</b>
1-24	1-22
507-510	507-512
133-166	131-164
489-506	488-503
27-77	26-69
78-132	73-128
443-463	441-459
167-187	165-184
320-405	314-395
406-463	403-432
238-273	236-269

#### Correspondence between Campbell and Brown editions 1 and 2

<b>Topic</b>	<b>Edition 2</b>	<b>Edition 1</b>
Introduction	1-39	1-34
Measures of project worth	40-98	36-91
Quantifying benefits and costs	99-171	92-137
Traded vs non-traded goods	292-309	177-193
Risk analysis	253-291	194-220
Consumer and producer surplus	182-215	146-174
Discount rate	Several places	221-236
Non-market valuation	217-252	261-287