PPHA58102: Economic Analysis II, Introduction to Cost Benefit Analysis
Winter 2024

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Course Description

Cost-benefit analysis (CBA) is the primary tool used to provide objective and transparent quantitative evidence to inform public policy decisions. Ideally, the use of CBA will improve the efficiency of public policy by identifying public policies/projects that create the most "value" for society. The concept of CBA is easily understood. For any project/policy under consideration (versus current state of the world), do the following: add up all of the current and future monetary costs of the project/policy; add up all of the current and future monetary benefits of the project/policy; and then compare the benefits to costs. If benefits are greater than costs, then the project/policy makes society better off and is candidate to be implemented. Seems straightforward, right? Conceptually it is, although there are a few theoretical and philosophical issues that arise that complicate the analysis. The conceptual difficulties, while important, are few in comparison, however, to the practical difficulties associated with conducting a CBA. Cost-benefit analysis is an activity that is aptly characterized by the phrase the "the devil is in the details." In this course, we will review the theoretical/conceptual foundations of CBA as applied in the public sector—mainly the executive branch of the federal government. The course will also present the basic structure of CBA and review the major tools of analysis used in CBA.

Ideally, the course will provide a foundation to be an astute consumer of CBA and a beginner producer of CBAs.

Course Objectives:

- Describe the intuition, purpose, and structure of cost-benefit analysis (CBA)
- Identify important, practical guides to conducting cost-benefit analysis that encapsulate best practices in conducting CBA
- Review the microeconomic foundations of cost-benefit analysis including measuring consumer willingness-to-pay, opportunity cost of providing goods, and the Kaldor-Hicks Criteria
- Present the philosophical objections and criticism of Kaldor-Hicks Criteria and alternative approaches whether a public policy increases social welfare
- Develop student's skill to use supply and demand analysis to examine effects of public policies and to assess changes in social welfare of public policies—i.e., conduct simple cost-benefit analyses using supply and demand
- Review the major market failures that justify government intervention in the market and the appropriate government approaches to addressing these market failures
- Illustrate and describe common techniques to value impacts of public policies when markets do not exist or when the use of supply and demand is not feasible.
- Present empirical evidence of important "prices" used in CBA, such as the value of a statistical life, the social cost of carbon, the value of time, and the appropriate discount rate to use
- Analyze several examples of cost-benefit analyses

Course Format

The class will meet in-person.

It is expected that students will complete the assigned readings prior to class. There are almost weekly in-class activities (assignments) that are intended to be student directed. For each activity, I expect students to be ready to engage with me and each other. The in-class activities are intended to allow students to articulate course content in their own words, deepen their understanding of the course content and to provide an opportunity for students to learn from one another. Everyone is expected to participate and everyone should feel comfortable expressing their view. I understand that it may be difficult for some students to speak publicly, but the class is a welcoming, respectful community. The class discussions are an active learning process and by definition learning means not knowing already. So, feel free to think creatively and openly even though sometimes it will be a miss hit.

Relationship to Curriculum

This is a course in applied economic analysis focused on assessing whether programs and policies increase social welfare.

This course is intended to build on the foundation of microeconomics provided in the core economics classes. Accordingly, there will be some overlap with the material presented in microeconomics course because cost benefit analysis is based largely on microeconomic analysis of markets. To the extent that there is overlap and review, this will serve to strengthen your understanding of microeconomic analysis. However, this course will focus more on welfare economics (market surplus, market failure and government intervention). Cost-benefit analysis also depends on empirical estimates of costs and benefits, and this aspect of the course will build on your training in statistics and empirical methods (e.g., program evaluation). Finally, applications of cost-benefit analysis span several areas of public policy, including health, education and the environment.

Course Policies:

Use of Web and Email: I will post course materials to the university's CANVAS web-based course management system: the URL is http://courses.uchicago.edu/. Students are responsible for any and all material posted there. I encourage the use of email and I try to respond in a timely fashion. My email address is kaestner@uchicago.edu. Please be sure to set your notifications on CANVAS so that you receive all communications from me sent through this platform.

Attendance is required. I understand that circumstances may sometimes require you to miss a class, although with a 10-session schedule, any absence represents a significant loss of time. Students who need to miss class because of sixkness (or other reasons) shall notify me in a timely manner as to when they will be absent.

Late Assignments: Unless explicitly agreed upon in advance, late assignments will not be accepted.

Disability Accommodation:

The University of Chicago seeks to provide an environment conducive to learning, teaching, working, and conducting research that values the diversity of its community. The University strives to be supportive of the academic, personal, and work-related needs of each individual and is committed to facilitating the full participation of students with a disability in the life of the University. Students with a disability, particularly those that require an accommodation, should contact Student Disability Services (https://disabilities.uchicago.edu/).

Course Materials

Books:

- Anthony E. Boardman, David H. Greenberg, Aidan R. Vining, and David L. Weimer, *Cost- Benefit Analysis: Concepts and Practice*, 5th ed. 2018, (Cambridge University Press) ISBN: 9781108415996 (Cheaper 4th edition is available, cheaper and very similar—but if you go this route it is at your own risk)

Readings: Posted on canvas.

Assignments and Grading

- There are several (to be added) short (1-page), take-home assignments that relate to material that will be covered in class. Assignments and the due dates (by beginning of relevant class) are listed in the course outline below. Please make sure you identify the due dates.
- **All assignments are to be completed independently without assistance except from TAs or Professor.**

- There will be a final, take-home exam

- Grades for final version of assignments are: 4=excellent (professional preparation, provided clear, direct and well-reasoned answers that reflect full understanding of the course material), 3=good (professional preparation, provided clear, direct and well-reasoned answers that reflect a good but not full understanding of the course material), 2=average (professional preparation, provided answers that were adequate but lacked clarity or an adequate understanding of the course material). 1=unacceptable (unprofessional preparation, incomplete and/or incoherent answers).

- Final grades will be calculated as follows:
  Total Points = sum of points on assignments
  Maximum Points = 32 (8*4=32)
  Numeric Grade = Total Points/Maximum Points

Academic Integrity: (https://studentmanual.uchicago.edu/Policies)

“It is contrary to justice, to academic integrity, and to the spirit of intellectual inquiry to submit the statements or ideas of work of others as one's own. To do so is plagiarism or cheating, offenses punishable under the University's disciplinary system. Because these offenses undercut the distinctive moral and intellectual character of the University, we take them very seriously and punishments for them may include expulsion from the University.”

“Proper acknowledgment of another's ideas, whether by direct quotation or paraphrase, is expected. In particular, if any written or electronic source is consulted and material is used from that source, directly or indirectly, the source should be identified by author, title, and page number. Any doubts about what constitutes "use" should be addressed to the instructor.”

Detailed Course Outline

January 6	**Week 1: Introduction to Cost Benefit Analysis** Objectives: 1. Provide some historical context and origins of cost-benefit analysis 2. Describe the intuition, and purpose of cost-benefit analysis 3. Describe the structure of a cost-benefit analysis 4. Review some of the major concepts of cost-benefit analysis 5. Present an example of a cost benefit analysis Takeaways: 1. Cost-benefit analysis is intuitively simple, but difficult to implement in practice 2. Cost-benefit analysis has a fairly standard structure with specific steps that are widely recognized as best practice 3. Conducting a cost-benefit analysis requires the analyst to make many choices about various inputs into the analysis that need to be justified and transparently communicated 4. Cost-benefit analysis is a tool to help policymakers make a decision by providing a set of facts about the costs and benefits of a policy 5. Cost-benefit analysis is imperfect, but arguably better than the alternative of making policy without access to evidence-based, non-partisan evidence 6. Cost-benefit analysis ideally leads to adoption of policies that make society better off Topics: 1. Origins and history of cost-benefit analysis 2. Notable documents that provide guidance on how to conduct a cost-benefit analysis 3. Boardman's 10 steps of cost-benefit analysis 4. Cost-benefit analysis as practiced in other countries with reference to several important methodological choices 5. Example: A cost-benefit analysis of a child allowance Readings: 1. Boardman et al. Chapter 1 2. Office of Management and Budget. Circular A-4. 2003. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf 3. (Skim Table of Contents and Skim—Look Briefly at Chapters) EPA, Guidelines for Preparing Economic Analyses, https://www.epa.gov/environmental-economics/guidelines-preparing-economic-analyses 4. Abelson, Peter. "A partial review of seven official guidelines for cost-benefit analysis." *Journal of Benefit-Cost Analysis* 11, no. 2 (2020): 272-293. 5. Garfinkel, Irwin, Laurel Sariscsany, Elizabeth Ananat, Sophie M. Collyer, Robert Paul Hartley, Buyi Wang, and Christopher Wimer. *The Benefits and Costs of a US Child Allowance*. No. w29854. National Bureau of Economic Research, 2022.

January 9	**Week 2: Kaldor-Hicks Criteria and Using Supply and Demand to Conduct Cost-benefit Analysis** Objectives: 1. Describe the Kaldor-Hicks Criteria, which is the basic rule that determines the recommendation of a cost-benefit analysis 2. Identify the limitations and criticism of Kaldor-Hicks Criteria 3. Demonstrate the use of supply and demand analysis and market surplus 4. Link supply and demand analysis to Boardman's 10 steps and the conduct of a cost-benefit analysis 5. Conduct simple cost-benefit analysis using supply and demand Takeaways: 1. Cost-benefit analysis is based on microeconomic theory and, specifically, what is referred to as welfare analysis—measuring the benefits of a policy using consumer, producer and government surpluses 2. Consumer surplus measures the monetary benefits of a policy for consumer 3. Producer surplus measures the monetary benefits of a policy for producers 4. The government sector is included in cost-benefit analysis and changes in government surplus (revenues, expenditures) measure the monetary benefits for government 5. Supply and demand analysis is a useful conceptual framework to guide a cost-benefit analysis following Boardman's 10 Steps of cost-benefit analysis. 6. Supply and demand analysis can sometimes be used to conduct a cost-benefit analysis, and can be useful even if purely at an analytical level (i.e., without actual numbers or values) Topics: 1. Pareto efficiency, Pareto improvements, and Kaldor Hicks Criteria 2. Demand and consumer surplus 3. Supply and producer surplus 4. Supply and demand equilibrium and measuring total market surplus 6. Examples: Supply and demand analysis to conduct a cost-benefit analyses of minimum wage and rent control Readings: 1. Boardman et al. Chapters 3 and 6 2. World Bank, "Cost-Benefit Analysis: Evaluation Criteria (Or: "Stay away from the IRR")", Knowledge Brief, 2008. 3. Rent Control: Diamond et al., 2019. "The Effects of Rent Control Expansion on Tenants, Landlords, and Inequality: Evidence from San Francisco," American Economic Review, 109:3365-94 4. Lordan, G., Neumark, D., 2018. People versus machines: The impact of minimum wages on automatable jobs. Labour Economics 52, 40–53.

January 16, 23	**Week 3-4: In-depth Review of Demand and how it is Used in Cost-benefit Analysis** Objectives: 1. Present microeconomic theory of demand and how it relates to willingness-to-pay, willingness-to-accept and consumer surplus 2. Demonstrate the use of the elasticity of demand in cost-benefit analysis 3. Describe externalities and internalities related to demand and how these concepts underlie government intervention in market and the feasibility of using demand curve in cost-benefit analysis 4. Present examples of cost-benefit analyses of taxes and subsidies with and without internalities or externalities 5. Review principles from behavioral economics that bear on the role of government to intervene in the market and the validity of using the demand curve in cost-benefit analysis Takeaways: 1. The demand curve is derived from the theory of the consumer (indifference curve and budget constraint) 2. Willingness-to-pay (WTP) for a good and willingness-to-accept (WTA) the loss of a good are measured by the demand curve, which theoretically reflects all aspects/features of a good or service that are valued by the consumer 3. Consumer surplus is measured using the demand curve and measures the monetary benefits to the consumer of a policy that alters price, for example, by subsidizing a good 4. Consumer surplus can also be used to measure the monetary benefits to the consumer of policies that change the quantity of a good 5. The elasticity of demand is a handy value (input into cost-benefit analysis) that can be used to estimate changes in consumer surplus of a policy that changes price of a good 6. The demand curve does not always reflect the full value of a good or service because of the presence of internalities or externalities, and if so, then the demand curve may not be useful to measure impacts of a policy 7. Internalities and externalities are an aspect of a good or service that is not recognized or understood by consumer, which means demand curve does not accurately reflect WTP 8. The difference between an internality and an externality is that the unrecognized value of the good affects the consumer themselves in the case of an internality and affects others (third party) in the case of an externality 9. The presence of internalities, like externalities, suggest that government intervention may improve social welfare—increase market surplus 10. Behavioral economics provides some explanations for internalities Topics: 1. Essential Aspects of Demand for Cost-Benefit Analysis: willingness-to-pay; willingness-to-accept; equivalent variation; compensating variation; consumer surplus 2. Elasticity of demand and its use in cost-benefit analysis 3. A cost-benefit application using elasticity of demand: Mexico City Subway 4. Internalities and externalities related to demand and welfare improving government intervention 5. Cost-benefit analysis of sugar-sweetened beverages 6. Behavioral economics or when do we trust the consumer? Readings: 1. Boardman et al. Chapter 3 and Chapter 3, Appendix A 2. Tuncel, Tuba and James K Hammitt. “A new meta-analysis on the WTP/WTA disparity.” Journal of Environmental Economics and Management, 175-187. 3. Davis, Lucas, Estimating the Price Elasticity of Demand for Subways: Evidence from Mexico (December 2020). NBER Working Paper No. w28244, Available at SSRN: https://ssrn.com/abstract=3753153 4. Sunstein, C. (2020). Behavioral Welfare Economics. Journal of Benefit-Cost Analysis, 11(2), 196-220. doi:10.1017/bca.2020.14 5. Hunt Allcott & Benjamin B. Lockwood & Dmitry Taubinsky, 2019. "Should We Tax Sugar-Sweetened Beverages? An Overview of Theory and Evidence," Journal of Economic Perspectives, vol 33(3), pages 202-227 6. Reem Alsukait, Parke Wilde, Sara N. Bleich, Gitanjali Singh, Sara C. Folta, Evaluating Saudi Arabia’s 50% carbonated drink excise tax: Changes in prices and volume sales, Economics & Human Biology, Volume 38, 2020

January 23	**Week 4: Supply and Opportunity Cost** Objectives: 1. Review microeconomic theory of supply, marginal cost and opportunity cost 2. Demonstrate the use of the elasticity of supply in cost-benefit analysis 3. Describe externalities related to production and how the presence of externalities relates to government intervention in market and the use of supply in cost-benefit analysis 4. Present an examples of cost benefit analyses of the effect of taxes and subsidies on producers with and without an externality 5. Describe the conceptual foundation of long run supply curve and the consequences of assuming an infinitely elastic supply curve in a cost-benefit analysis Takeaways: 1. The supply curve is derived from the theory of the firm (marginal and average costs) 2. Opportunity cost is the next best use of resources and therefore the supply curve measures the opportunity cost of resources used in production 3. Producer surplus is measured using the supply curve and measures the monetary benefits to producers of a policy that alters the price or quantity of a good 4. The elasticity of supply is a handy value (input into cost-benefit analysis) that can be used to estimate changes in producer surplus of a policy that changes price of a good 5. The supply curve does not always reflect the full opportunity cost of a good or service because of the presence of externalities, and if so, then the supply curve may not be useful to measure impacts of a policy 6. Externalities are an aspect of producing a good or service that is not considered by the firm in making its choice of quantity to produce 7. The presence of externalities suggest that government intervention may improve social welfare—increase market surplus Topics: 1. Essential Aspects of Supply: costs of resources, marginal costs, and opportunity costs 2. Elasticity of supply and its use in cost-benefit analysis 3. Production externalities and welfare-improving government intervention Readings: 1. Boardman et al. Chapters 3 and 6

January 30	**Week 5: An Overview of Valuing Costs and Benefits in Cost-benefit Analysis** Objectives: 1. Clarify the distinction between primary and secondary markets in cost-benefit analysis 2. Present a brief review of how to use supply and demand to measure benefits in primary markets with and without price changes 3. Define types of market failures 4. Present analyses of government interventions in the presence of market failures: taxes, subsidies and government direct provision 5. Present methods to measure costs in primary market with and without market failures 6. Discuss approaches to measuring impacts in secondary markets Takeaways: 1. Secondary markets are those that are related to the good or service in the primary market, for example, because they are substitutes of complements for the good or service targeted by policy in the primary market 2. Impacts of policies in secondary markets need to be incorporated into cost-benefit analysis 3. In some cases, when there are no market distortions (e.g., externality) in secondary market, the equilibrium demand curve in the primary market can be used to measure benefits in both the primary and secondary markets 4. When secondary markets are characterized by distortions (externality), then the impact of a policy on secondary market needs to be explicitly accounted for in cost-benefit analysis 5. There are several types of market failures: externalities, monopoly and imperfect competition, taxes and subsidies, and public goods 6. In the presence of market failures, government intervention in the market may improve social welfare (i.e., increase total surplus) 7. There is also government failure, which occurs when government intervention to correct market failures does not improve welfare 8. Costs are measured in primary market and are equal to expenditures on resources (e.g., labor) if the markets for resources are free of distortions (e.g., taxes) 9. When markets for resources are characterized by distortions (e.g., taxes), then the (opportunity) costs of those resources need to be calculated excluding costs above opportunity cost Topics: 1. Definitions of primary and secondary markets 2. How to use supply and demand to measure changes in market surplus caused by a policy including secondary markets 3. Cost-benefit analyses of taxes and subsidies with and without market failures 4. Measuring the impacts of a policy that affects an important input (e.g., oil) into production of many goods 5. Derivation of equilibrium demand curve and its use to measure benefits in secondary markets 6. Rules to guide when impacts in secondary markets need to be considered Readings: 1. Boardman et al. Chapter 7 2. Rent Control: Diamond et al., 2019. "The Effects of Rent Control Expansion on Tenants, Landlords, and Inequality: Evidence from San Francisco," American Economic Review, 109:3365-94 3. Lordan, G., Neumark, D., 2018. People versus machines: The impact of minimum wages on automatable jobs. Labour Economics 52, 40–53.

February 6	**Week 6: Fundamental Welfare Theorems and Reconsidering the Kaldor-Hicks Criteria** Objectives: 1. Present Fundamental Theorems of Welfare Economics and how they address efficiency and equity concerns 2. Discuss the limitations of the Theorems as applied to Kaldor-Hicks Criteria—the constant marginal utility of income assumption 3. Define distributional weights, discuss their conceptual foundation, and show how they are used in cost-benefit analysis 4. Define the marginal cost of public funds, review the conceptual foundation of it, and present empirical estimates of it 5. Outline of the advantages of using distributional weights versus cash transfers to achieve distributional objectives Takeaways: 1. Theoretically concerns for efficiency and equity can be separated and addressed in different ways 2. Efficiency can be achieved using Kaldor-Hicks criteria and relying on markets to maximize social welfare 3. Equity can be achieved by equalizing incomes—redistributing income 4. There is no feasible, costless method to equalize incomes because the government needs to intervene in markets to raise money and that intervention causes a deadweight loss 5. Distributional weights are theoretically appealing because their use aligns with the notion of diminishing marginal utility of income, but they are difficult to implement in practice 6. The use of distributional weights incurs costs—a loss of efficiency 7. A comparison of the costs of using distributional weights to address equity concerns and the costs of cash transfers to address equity concerns should be explicit in cost-benefit analysis Topics: 1. Fundamental Welfare Theorems 2. Marginal utility of income 3. Efficiency versus equity 4. Distributional weights 5. The cost of public funds 6. Using distributional weights versus making cash transfers Readings: 1. Boardman et al. Chapter 19 2. Boardman, A., Greenberg, D., Vining, A., & Weimer, D. (2020). Efficiency without Apology: Consideration of the Marginal Excess Tax Burden and Distributional Impacts in Benefit–Cost Analysis. Journal of Benefit-Cost Analysis, 11(3), 457-478.

February 6, Time Permitting, May be Skipped	**Week 6: Counting Jobs and Macroeconomic Benefits in Cost-benefit Analysis** Objectives: 1. Present conceptual foundations for whether or not jobs are counted as a benefit in cost-benefit analysis 2. Present evidence of whether the labor market clears—a review of unemployment rates 3. Describe methods of valuing jobs in cost-benefit analysis if jobs are to be included 4. Discuss macroeconomic externalities and the value of government infrastructure projects (e.g., roads) to fight recessions 5. Outline the two opposing approaches to choosing infrastructure: project-based, bottom-up cost-benefit analysis approach versus the top-down, aggregate spending target approach 6. Present theory of the firm underlying declining average costs and its importance to infrastructure projects and government intervention 7. Discuss the advantages of the project-based, bottom-up cost-benefit analysis approach Takeaways: 1. If the labor market clears—is in equilibrium and free of market imperfections (e.g., minimum wages)—then jobs are not counted as a benefit in cost-benefit analysis 2. Evidence that the labor market does not clear is high rates of unemployment—historically unemployment has been relatively low for the country as a whole, but persistently high for some demographic groups 3. Providing a job to an unemployed person can create producer surplus, which is a benefit to be counted 4. In practice, it is difficult to measure the increase in producer surplus from job creation, if it exists, and this is one reason that jobs are not counted as benefits even if it is deemed appropriate 5. The top down approach of the value of infrastructure is based on an assessment of "need", as measured by the difference between existing quantity and quality of infrastructure and some presumed standard quantity and quality 6. The project-based, bottom-up cost-benefit analysis approach to value infrastructure is to use cost-benefit analysis 7. The project-based, bottom-up approach is less commonly used despite several advantages. 8. The goals of expanding the use of cost-benefit analysis to choose infrastructure projects underlies proposals such as the creation of a national infrastructure bank. Topics: 1. Labor market equilibrium 2. Unemployment facts 3. Reservation wage and producer surplus associated with a job 4. Declining average costs and government regulation of infrastructure 5. Macroeconomic effects of infrastructure spending 6. User fees 7. Privatization of infrastructure Readings: 1. Bartik, Timothy J. "Including Jobs in Benefit-Cost Analysis" Annual Review of Resource Economics 4 (2012): 55-73. 2. Glaeser, Edward and James Poterba, "Economic Perspectives on Infrastructure Investment," in Rebuilding the Post-Pandemic Economy, ed. Melissa S. Kearney and Amy Ganz (Washington D.C.: Aspen Institute Press, 2021).

February 13	**Week 7: Discounting** Objectives: 1. Discuss the conceptual foundation for the need to discount costs and benefits in a cost-benefit analysis 2. Define nominal versus real values 3. Identify key inputs used in discounting: measures of inflation and interest rates 4. Describe basic rule for discounting in cost-benefit analysis 5. Review the arguments in Circular A-4 for using specific discount rates 6. Present the conceptual foundation for discounting costs and benefits that occur to future generations (as opposed to within generation costs and benefits) 7. Present the primary issues in the debate over the appropriate discount rate to use for projects that span generations 8. Describe the steps required to estimate the social cost of carbon 9. Analyze how discounting affects the measurement of the social cost of carbon Takeaways: 1. Public policies often have costs and benefits that occur in the future 2. Price inflation erodes the value of money over time and measuring costs and benefits in the future need to incorporate this fact 3. Nominal values are measured in current dollars (e.g., in 2030 for a project that has impacts in that year) while real values are measured in constant (e.g., 2023) dollars 4. Because people are impatient and prefer to consumer today (consumption) rather than in the future (savings), the value of future benefits needs to be "discounted" by a factor that reflects this impatience, or rate of time preference 5. A related reason that future costs and benefits need to be discounted is the time value of money: funds today can be invested and yield a return in the future. Thus, future costs and benefits need to be discounted to assess the current value of these future values. 6. The nominal interest rate reflects both consumer impatience and inflation 7. The real interest rate reflects only consumer impatience, or the premium required to forgo consumption (save), or the discount necessary to equate future values to current values 8. The rule of cost-benefit analysis is to use all nominal values or all real values to calculate costs and benefits 9. Uncertainty with respect to inflation and interest rates suggest that the discount arte should be declining over the life of the project 10. For projects that span generations, the Ramsey Formula provides the conceptual basis for discounting 11. The Ramsey formula consists of three inputs: the rate of time preference (an interest rate reflecting consumer impatience or financial return), the growth rate of the economy, and the elasticity of the marginal utility of income. 12. Much of the debate over the appropriate discount rate to use for projects that span generations revolves around the rate of time preference. Some argue it should be virtually zero (prescriptive approach) while others argue it should reflect long term financial returns on investments (descriptive approach) 13. The social cost of carbon is an extremely important input into cost-benefit analyses because it is the value of changes in greenhouse gases that are associated with many energy and environmental projects 14. The estimation of the social cost of carbon is difficult and characterized by extreme uncertainty 15. The impacts of greenhouse gases last for 100s of years, and thus, use of lower or higher discount rates dramatically change estimates of the social cost of carbon Topics: 1. Inflation 2. Time value of money 3. Consumer's rate of time preference 4. Mechanics of discounting in cost-benefit analysis 5. Circular A-4 (original and revised) rationale for using specific discount rates 6. Uncertainty and the discount rate 7. Ramsey Formula 8. Descriptive versus prescriptive approach 9. Social Cost of Carbon 101

	Readings: 1. Boardman et al. Chapters 9 and 10 2. Arrow, K., M. et al. Cropper, C. Gollier, B. Groom, G. Heal, R. Newell, W. Nordhaus, R. Pindyck, W. Pizer, P. Portnoy, T. Sterner, R.S.J. Tol, and M. Weitzman; "Determining Benefits and Costs for Future Generations," Science 26 July 2013; Vol. 34: 349-350 3. (Read Sections 1-3) Drupp M, Freeman M C, Groom B and Nesje F (2018). 'Discounting Disentangled'. Working paper version: Grantham Research Institute on Climate Change and the Environment Working Paper No. 172 4. Council of Economic Advisers, "Discounting For Public Policy: Theory And Recent Evidence On The Merits Of Updating The Discount Rate," 5. MacAskill, William. "The Case for Longtermism" New York Times August 5, 2022 6. Carleton, Tamma and Greenstone, Michael, Updating the United States Government's Social Cost of Carbon (January 14, 2021). University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2021-04,

February 20, 29	**Week 8-9: Revealed Preference Methods to Value Benefits when it is Infeasible to use Supply and Demand** Objectives: 1. Review approaches for measuring the monetary benefits of a policy for goods that do not have market prices or for which the demand curve is not a valid measure of willingness-to-pay 2. Describe in detail three "revealed preference" approaches for measuring willingness-to-pay: intermediate goods approach; hedonic regression; and zonal travel cost approach 3. Present an example of the intermediate goods approach 4. Show how the value of a statistical life is derived from hedonic regression approach 5. Review empirical evidence of the value of a statistical life 6. Present an alternative approach to measuring the value of a statistical life based on standard theory of the consumer 7. Present an example of the zonal travel cost approach 8. Describe the role of the value of time in cost-benefit analyses 9. Review empirical estimates of the value of time used in cost-benefit analyses Takeaways: 1. In many cost-benefit analyses, the monetary benefits of a policy cannot be measured by market prices (e.g., the demand curve and willingness-to-pay). For example, there is no "price" of crime that can be used to measure the value of policies that reduce crime 2. In these cases, alternative methods have been developed and one class of methods is referred to a revealed preference methods because they measure the benefits of a good "revealed" by consumers' choices 3. Three common revealed preference methods are intermediate goods approach; hedonic regression and zonal travel cost approach 4. The intermediate goods approach measures the benefits of a policy by examining the value of a policy using the monetary value of features of a good that underlie the consumer's demand for that good. For example, the value of preschool is measured by the increased earnings of children who attended high-quality preschool 5. The hedonic regression approach is based on a similar idea—that the value of a good depends on several aspects (features, dimensions) of a good that the consumer values. A regression model is used to obtain the value of these different aspects some of which are the result of public policy. A common example of the use of hedonic regression is the effect of crime on house prices. 6. The value of a statistical life (VSL) is an important "price" used in cost benefit analysis because many policies affect mortality. 7. The VSL is derived from a hedonic regression using wages/earnings and how wages/earnings are affected by the risk of death on a job. 8. The VSL from this approach is extremely high—around $10 million 9. Estimates of the monetary value of a good obtained form the hedonic regression approach are subject to bias because of omitted variable bias 10. An alternative approach to measuring the VSL is to use traditional consumer theory to measure a person's willingness-to-pay for life extension 11. The travel cost approach is used mostly to measure the monetary value of recreational sites (e.g., parks), wildlife and nature areas 12. The travel cost approach is intuitively straightforward: measure the cost of travelling to a site from different places and the number of people from those places that visit the site to estimate the relationship between cost and visits (i.e., demand curve for visits) 13. The travel cost approach ahs several limitations that need to be considered, for example, that travel often involves visits to multiple sites. 14. Time savings is one of the major impacts of transportation and other policies. 15. The value of time is therefore an important price used to measure benefits of projects that save people time. 16. Conceptually a person's wage is a reasonable value of time and is often used to value time with some adjustment for the mode and purpose of travel. Topics: 1. Intermediate goods 2. The Kalamazoo Promise Scholarship 3. Hedonic regression

	4. Value of green spaces in UK 5. Value of school quality in Memphis 6. Value of a Statistical Life 7. Travel Cost Approach 8. Measuring the value of time using Lyft experiment Readings: 1. Cropper, Maureen and Hammitt, James K. and Robinson, Lisa A., Valuing Mortality Risk Reductions: Progress and Challenges (October 2011). Annual Review of Resource Economics, Vol. 3, Issue 1, pp. 313-336, 2011. 2. Aldy, J. E., & Viscusi, W. K. (2008). Adjusting the Value of a Statistical Life for Age and Cohort Effects. Review of Economics and Statistics, 90 (3), 573-581 3. Gibbons, Stephen, Susana Mourato, and Guilherme M. Resende. "The amenity value of English nature: a hedonic price approach." Environmental and Resource Economics 57 (2014): 175-196. 4. Collins, Courtney A., and Erin K. Kaplan. "Capitalization of school quality in housing prices: Evidence from boundary changes in shelby county, tennessee." American Economic Review 107, no. 5 (2017): 628-632. 5. Jaung W, Carrasco LR. Travel cost analysis of an urban protected area and parks in Singapore: a mobile phone data application. J Environ Manage. 2020 May 1;261:110238. doi: 10.1016/j.jenvman.2020.110238. Epub 2020 Mar 2. PMID: 32148308 6. Victoria Transport Institute-value of time summary 7. (Just focus on understanding the field experiments and results of this article) Goldszmidt, Ariel and List, John A and Metcalfe, Robert D and Muir, Ian and Smith, V. Kerry and Wang, Jenny. 2020. “The Value of Time in the United States: Estimates from Nationwide Natural Field Experiments", National Bureau of Economic Research", http://www.nber.org/papers/w28208

February 29	**Week 9: Stated Preference Approach** Objectives: 1. Present and describe the "stated preference" approach, which is also referred to as contingent valuation, for measuring willingness-to-pay for goods that do not have market prices or for which the demand curve is not a valid measure of willingness-to-pay 2. Discuss the best practices and limitations of the contingent valuation approach 3. Present an example of the contingent valuation approach Takeaways: 1. Contingent valuation is a simple idea—ask people what they are willing-to-pay for a good or service 2. The critical aspect of this approach is to implement it in a way that yields reliable and useful information 3. There are several components of a contingent valuation study: design and pilot the survey that will be used to obtain the data (information); select the survey method (e.g., online v. in-person) including the approach for obtaining a representative sample; determine the required sample size; identify an appropriate payment vehicle (e.g., taxes), and choose a method for eliciting the stated willingness-to-pay 4. An important aspect of the contingent value survey is a clear and thorough description of the good being valued. The ultimate goal of the approach is to obtain a willingness-to-pay for a good affected by a policy. Therefore, the respondent (consumer) needs to understand fully what the good in question is so they can consider whay they value it and how much they would be willing-to-pay 5. While other methods of elicitation of the stated willingness-to-pay are sometimes appropriate, the recommended approach is dichotomous referendum approach that asks survey respondents to vote yes or no on whether they would be willing-to-pay a specific amount for the good 6. An often used version of this approach is the double dichotomous referendum where a follow-up question is asked depending on whether the first response is yes or no 7. The primary limitation of a contingent value study is hypothetical bias—respondents do not actually have to pay for the good. This issue highlights the importance of the payment vehicle—how will consumer pay for the good in a realistic context (e.g., through higher taxes) 8. Other problems associated with a contingent value survey is yea- and nay-saying, protest votes and embedding effects, which is failing to understand the scope of the good. 9. Best practice includes follow-up questions about the respondent's certainty of their responses Topics: 1. Contingent valuation method 2. Best practices for contingent valuation 3. Comparison of contingent valuation, or stated preference approach, with revealed preference approach 4. Examples: Contingent valuation of willingness-to-pay for life extension; for crime; and for healthcare services Readings: 1. Boardman et al. Chapters 13, 16 2. Catherine L. Kling, Daniel J. Phaneuf and Jinhua Zhao. 2012. "From Exxon to BP: Has Some Number Become Better Than No Number?" *Journal of Economic Perspectives* Vol. 26, No. 4, pp. 3-26. http://www.aeaweb.org/articles.php?doi=10.1257/jep.26.4 3. Carson, Richard. 2012. "Contingent Valuation: A Practical Alternative When Prices Aren't Available" *Journal of Economic Perspectives* Vol. 26, No. 4, pp. 27-42. http://www.aeaweb.org/articles.php?doi=10.1257/jep.26.4 4. Hausman, Jerry. 2012. "Contingent Valuation: From Dubious to Hopeless" *Journal of Economic Perspectives* Vol. 26, No. 4, pp. 43-56. 5. Alberini, Anna, Maureen Cropper, Alan Krupnick, and Nathalie B. Simon. "Does the value of a statistical life vary with age and health status? Evidence from the US and Canada." In *Distributional Effects of Environmental and Energy Policy*, pp. 365-388. Routledge, 2017. 6. Ludwig, J., Cook, P.J. The Benefits of Reducing Gun Violence: Evidence from Contingent-Valuation Survey Data. *Journal of Risk and Uncertainty* **22,** 207–226 (2001)

7. Al-Hanawi, M., Alsharqi, O., & Vaidya, K. (2020). Willingness to pay for improved public health care services in Saudi Arabia: A contingent valuation study among heads of Saudi households. Health Economics, Policy and Law, 15(1), 72-93.