



**cmd** CENTRE FOR  
MARKET DESIGN

# BUILDING CAPABILITY IN ECONOMIC DESIGN

APPLICATIONS TO PUBLIC POLICY

A CONSORTIUM OF



Australian Government  
The Treasury



Department of  
Treasury and Finance



FACULTY OF  
BUSINESS &  
ECONOMICS

# PURPOSE

The Centre for Market Design – a collaboration between the University of Melbourne, the Department of Treasury and Finance, and the Commonwealth Treasury, is delivering a 12-week course to build capability in economic design. Economic design provides a valuable skillset for public policy professionals as they diagnose and explore a range of policy problems, as well as potential solutions.

Economic design provides a framework to understand the strategic interactions between parties in a given environment. The design and maintenance of markets and other economic institutions draws upon game theory, information economics, auction theory, and incentive design.

The course will consist of six topics, over 12 weekly modules, delivered by experts in economic design:

- Introduction to Economic Design
- Understanding strategic behaviour
- Auctions (one-sided allocation mechanisms)
- Secondary markets/Two-sided auctions
- Contracting frameworks
- Matching mechanisms

At the end of the course, participants should:

- Have a basic understanding of the key theories and tools that form part of the economic design discipline
- Be able to diagnose policy problems using an economic design framework
- Identify potential mechanisms that could be used to solve problems and be able to explore some basic advantages/disadvantages of mechanisms

## INFORMATION ABOUT THE COURSE STRUCTURE

Participants should prepare for the sessions by completing the background reading. In addition, an 'assessment' at the conclusion of each session will help to reinforce learnings and provide information for the participant and the course coordinators about session delivery.

Each session will include:

- An introduction to the theory
- Use of practical examples and case studies
- Implementation considerations, including laboratory techniques and field pilots

Prior economics training is helpful, but not a prerequisite to the course.

# BROAD OVERVIEW

	Summary	Modules	Delivered by	Background reading
Introduction to Economic Design	<ul style="list-style-type: none"> <li>- Introduce the economic design process and its relevance to policy development</li> <li>- Identify policy complexities that have implications for efficient policy design and highlight the importance of tailoring policy interventions to address the specific characteristics of the particular policy problem</li> <li>- Relay key framework concepts to a non-technical audience</li> <li>- Apply economic design principles in assessing proposed policy interventions.</li> </ul>	Module 1: 18 September 2014, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)	Tom Wilkening	Roth, Alvin E 2002 "The Economist as Engineer: Game Theory, Experimentation and Computation as Tools for Design Economics". <i>Econometrica</i> , 7(4), 1341-1378
Understanding strategic behaviour	<ul style="list-style-type: none"> <li>- Outline the framework for understanding and describing the incentives of different agents in a system, and the way in which these influence how they interact or transact</li> <li>- Introduce basic concepts from game theory, the field of study analysing strategic behaviour</li> <li>- Outline the ways in which problems can be framed, including: Nash equilibrium               <ul style="list-style-type: none"> <li>o Dominant strategies/hold-up problems</li> <li>o Imperfect information</li> </ul> </li> </ul>	Module 1: 25 September 2014, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)  Module 2: 2 October 2014, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)  Module 3: 3 October, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)	Tom Wilkening (module 1)  David Byrne (modules 2 & 3)	Gibbons, Robert 1997, "An Introduction to Applicable Game Theory", <i>Journal of Economic Perspectives</i> , 11(1), 127-149. TRIM Reference: D14/2778
Auctions (one-sided allocation mechanisms)	<ul style="list-style-type: none"> <li>- Introduce auctions as a concept, and why they are important.</li> <li>- Introduce the key auction formats available, and:               <ul style="list-style-type: none"> <li>o their major markets</li> <li>o their characteristics and properties</li> <li>o how they compare and why one would be chosen over another</li> </ul> </li> <li>- Outline potential issues in practice, such as collusion and winner's curse</li> </ul>	Module 1: 14 October 2014, 10am-12pm  Module 2: 21 October 2014, 10am-12pm	Jun Xiao	Munoz-Garcia, Felix 2012, "An Introduction to Auction Theory for Undergraduate Students", Washington State University, unpublished working paper.  Klemperer, Paul 2004, "Chapter 1: A Survey of Auction Theory", Auctions: Theory and Practice, Princeton University Press, Princeton.  Klemperer, Paul 2002, "How (not) to run auctions: The European 3G telecom auctions", <i>European Economic Review</i> , 46, 829-845.
Secondary markets/Two-sided auctions	<ul style="list-style-type: none"> <li>- Introduce the concept of secondary markets - where there are two parties making a transaction.</li> <li>- Highlight the key differences between primary and secondary markets, and the additional complexities when dealing in secondary markets – in particular, information, strategic behavior</li> <li>- Discuss the impossibility of efficiency without incurring a</li> </ul>	Module 1: 30 October 2014, 10am-12pm  Module 2: 6 November 2014, 10am-12pm	Tom Wilkening	Coase (1960): "The Problem of Social Cost", <i>The Journal of Law and Economics</i> , 3, 1-44  Loertscher, Marx, Wilkening (2014): A Long Way Coming: Designing Centralized Markets with Privately Informed Buyers and Sellers. Working Paper.

	Summary	Modules	Delivered by	Background reading
	<ul style="list-style-type: none"> <li>deficit</li> <li>- Discuss market thinness as an impediment to efficiency</li> <li>- Draw from case studies/examples (e.g. the National Disability Insurance Scheme and Victoria's Vocational Education and Training scheme)</li> </ul>			Bleakley and Ferrie (2014): Land Openings on the Georgia Frontier and the Coase Theorem in the Short- and Long Run. Working Paper.
Contracting frameworks	<ul style="list-style-type: none"> <li>- Introduce the economic theory behind contracts through the principal agent framework</li> <li>- Explain the concept of asymmetric information between contracting parties and strategies for addressing this</li> <li>- Discuss alternative approaches to regulation which incorporate features of contract design - this extends on risk-based regulatory approaches. This includes incentives for regulated entities to voluntarily identify their type, or level of risk, and encourage them to behave in ways that meet government objectives.</li> <li>- Examine some practical applications – e.g. the current CMD project analysing incentives in biosecurity inspections</li> </ul>	<p>Module 1: 13 November 2014, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)</p> <p>Module 2: 20 November 2014, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)</p>	Guillaume Roger	<p>Martimort, David, "Contract Theory", unpublished paper. TRIM Reference: <a href="#">D14/2792</a></p> <p>Cooter, Robert and Ulen, Thomas 2003, "Chapter 6: An Economic Theory of Contract", Law and Economics, 4th edition, Addison Wesley. TRIM Reference: <a href="#">D14/2799</a></p>
Matching mechanisms	<ul style="list-style-type: none"> <li>- Explain the benefits of centralised matching over other forms of allocation, drawing from the experience of the US medical resident matching program;</li> <li>- Discuss different types of matching mechanisms: random priority, immediate acceptance, deferred acceptance and top trading cycle mechanisms – example: school assignment in Boston and Chicago;</li> <li>- Discuss desirable properties of mechanisms: stability/fairness, efficiency, strategy-proofness and transparency;</li> <li>- Discuss dynamic matching problems and the allocation of public housing;</li> <li>- Highlight some applications in Australia: Allocation of kindergarten and school places, Victorian government DTF job transfer, University admission, Commonwealth graduate program.</li> </ul>	<p>Module 1: 27 November 2014, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)</p> <p>Module 2: 4 December 2014, 10am-12pm (Level 1, 1 MacArthur St, East Melbourne)</p>	Georgy Artemov David Delacrétaz	<p>Gale, David and Shapley, Lloyd S. 1962, "College Admissions and the Stability of Marriage", <i>The American Mathematical Monthly</i>, 69(1): 9-15.</p> <p>Abdulkadiroğlu, Atila, and Sönmez, Tayfun 2003, "School Choice: A Mechanism Design Approach", <i>American Economic Review</i>, 93(3): 729-747.</p> <p>Roth, Alvin E. 2008, "What Have We Learned from Market Design?" <i>The Economic Journal</i>, 118: 285-310.</p> <p>Artemov, Georgy, Loertscher, Simon and Feldmann, Sven 2012, "Matching and Economic Design", <i>Australian Economic Review</i>, 45(1): 347-354.</p>

# PROGRAM

## SESSION 1: INTRODUCTION TO ECONOMIC DESIGN: FRAMING POLICY ISSUES AS ECONOMIC DESIGN PROBLEMS

Incorporating economic analysis into the policy development process allows policymakers to address key questions including:

- What is the problem to be addressed and what are the government's objectives?
- Why is government intervention required?

If a clear rationale for some form of government intervention can be established, then economists have a role in designing an intervention or mechanism to achieve the policy objectives efficiently or in ways which:

- provide the best outcome for the least cost;
- minimise regulatory burden/transaction costs;
- where possible, harness competition; and/or
- create the most value for society.

The economic design framework provides an approach where policymakers can gain a detailed understanding of policy issues at an individual interaction or transaction level, and frame how government should intervene to best achieve its objectives.

This session will introduce the economic design process and its relevance to policy development. It will also identify policy complexities that have implications for efficient policy design and highlight the importance of tailoring policy interventions to address the specific characteristics of the particular policy problem. This session seeks to enable participants to relay key framework concepts to a non-technical audience and apply economic design principles in assessing proposed policy interventions.

### PRESENTER: TOM WILKENING

Tom Wilkening is a senior lecturer at the Department of Economics at the University of Melbourne. He received his PhD from MIT in 2008. His main research interests are in the field of mechanism design, experimental economics, and organizations.

### BACKGROUND READING:

Roth, Alvin 2002, "The Economist as Engineer: Game Theory, Experimentation, and Computation as Tools for Design Economics", *Econometrica*, 70(4), 1341-1378. TRIM Reference: [D10/421534](#)

## SESSION 2: UNDERSTANDING STRATEGIC BEHAVIOUR

This session will introduce the framework for understanding and describing the incentives of different agents in a system, and the way in which these influence how they interact or transact.

The session will incorporate basic concepts from game theory, the field of study analysing strategic behaviour, outline the ways in which problems can be framed and discuss some common solution concepts. This includes the concepts of:

- Nash Equilibrium
- dominant strategies/hold-up problems
- imperfect information

### PRESENTER – MODULE 1: TOM WILKENING

Tom Wilkening is a senior lecturer at the Department of Economics at the University of Melbourne. He received his PhD from MIT in 2008. His main research interests are in the field of mechanism design, experimental economics, and organizations.

### PRESENTER – MODULES 2 & 3: DAVID BYRNE

David Byrne is a lecturer at the University of Melbourne and a Deputy Director of Research at the Centre for Market Design. He received his PhD in Economics from Queen's University. He has particular interests in Industrial Organization, Energy Economics and Applied Econometrics.

### BACKGROUND READING:

Gibbons, Robert 1997, "An Introduction to Applicable Game Theory", *Journal of Economic Perspectives*, 11(1), 127-149.  
TRIM Reference: [D14/2778](#)

# SESSION 3: AUCTIONS: ONE-SIDED ALLOCATION MECHANISMS

Often the interest of policymakers is to establish a set of rules or protocols so that interactions between parties yield particular outcomes. This approach has been studied in the field of mechanism design. This session will introduce major concepts from this area of economic theory in the context of examples of public policy problems.

Mechanisms such as auctions can be used to reveal low-cost service providers or high-value users of a right or resource. Governments can use auctions to efficiently procure services or allocate rights to undertake an activity or use a (common) resource. In certain situations, such as providing public goods, governments can achieve specific objectives by procuring goods and services directly, reducing the need for prescriptive regulation. If executed effectively, this can lower compliance costs on individuals and lower monitoring and enforcement costs for government.

The design of auction rules and processes will have a significant influence on auction outcomes, including which party or parties win the auction and the price they pay. Ultimately, these design aspects will determine whether the auction achieves the government's policy objectives.

This session will focus on theoretical and practical issues relating to designing and implementing auctions. It will cover the range of different auction mechanisms, their characteristics and properties. Potential issues in practice, such as winner's curse and collusion will be illustrated through case studies.

## PRESENTER: JUN XIAO

Jun Xiao is a lecturer at the University of Melbourne, whose main interests are Microeconomic Theory and Industrial Organization. Jun received his PhD in Economics at Pennsylvania State University in 2012.

## BACKGROUND READING:

Munoz-Garcia, Felix 2012, "An Introduction to Auction Theory for Undergraduate Students", Washington State University, unpublished working paper.

Klemperer, Paul 2004, "Chapter 1: A Survey of Auction Theory", *Auctions: Theory and Practice*, Princeton University Press, Princeton.

Klemperer, Paul 2002, "How (not) to run auctions: The European 3G telecom auctions", *European Economic Review*, 46, 829-845.

# SESSION 4: SECONDARY MARKETS/TWO-SIDED AUCTIONS

Primary auctions focus on transactions where there is one party with hidden information. Secondary markets focus on the situation where there are two parties making a transaction, each with hidden information and private incentives. In the public policy context, this focuses on the Government's role as the rule-maker, market designer and facilitator, and markets between private buyers and sellers for various goods and services.

In these markets, concepts such as information and strategic behaviour become increasingly important. To achieve efficiency in these markets, attention must be paid to the rules, processes, penalties and rewards, as these are needed to incentivise participants in the market to work to achieve the market objectives. In this way, the efficiency trade-offs of different types of rules need to be examined.

This session will also consider market characteristics that can be an impediment to efficiency – such as the thickness of the market.

Current policies will be examined as case studies to demonstrate the above concepts, such as the National Disability Insurance Scheme and the CMD's preliminary work on student transport, and Victoria's Vocational Education and Training market.

## PRESENTER: TOM WILKENING

Tom Wilkening is a senior lecturer at the Department of Economics at the University of Melbourne. He received his PhD from MIT in 2008. His main research interests are in the field of mechanism design, experimental economics, and organizations.

## BACKGROUND READING:

Coase, Roland, *The Problem of Social Cost*, 1960.

Loertscher, Simon, Marx, Leslie, Wilkening Tom (2014): A Long Way Coming: Designing Centralized Markets with Privately Informed Buyers and Sellers. D14/192312

# SESSION 5: CONTRACTING FRAMEWORKS

Contracts are a common part of specifying arrangements between two or more parties to complete specified tasks. For example, the relationship between regulators and regulated parties establishes responsibilities, rewards and penalties based on specific actions or outcomes and can be seen as a contractual relationship.

This session introduces the economic theory behind contracts through the principal-agent framework. It gives particular focus to areas where there is asymmetric information between contracting parties and outlines strategies for addressing these issues.

The session will outline alternative approaches to regulation which incorporate features of contract design. These extend on concepts which underpin risk-based regulatory approaches, which tailor regulatory interventions using information on regulated entities' risk levels. For instance, principal-agent theory can be used to design regulatory frameworks which provide incentives for regulated entities to voluntarily identify their type, or level of risk, and encourage them to behave in ways that meet government objectives.

Practical applications of the principal-agent framework will be illustrated through a current Centre for Market Design project analysing incentives in the biosecurity inspection system.

## PRESENTER: GUILLAUME ROGER

Guillaume Roger is a senior lecturer at the University of Sydney, with research interest in moral hazard, dynamic moral hazard, two-sided markets and finance. He was previously held positions at the University of New South Wales, Deloitte, and ANZ. He received his PhD in Economics from the University of Southern California.

## BACKGROUND READING:

Martimort, David, "Contract Theory", unpublished paper. TRIM Reference: [D14/2792](#)

Cooter, Robert and Ulen, Thomas 2003, "Chapter 6: An Economic Theory of Contract", *Law and Economics*, 4<sup>th</sup> edition, Addison Wesley. TRIM Reference: [D14/2799](#)

# SESSION 6: MATCHING MECHANISMS

Matching markets are relevant where Government specifically wishes to allocate goods and services through non-monetary preferences. Without stable matching markets, there can be a number of inefficient outcomes that impose costs on society.

There are numerous public policy applications for matching markets that could make a material difference to the welfare of many Australians. This session will explain some situations where matching markets may be useful or preferable to incorporate into a system, some of the complexities that matching markets can resolve and how modern matching algorithms are preferable to existing tools often used to resolve allocation problems.

Specific Australian matching problems will be considered, including an allocation of kindergarten places and a job transfer project within the Department of Treasury and Finance, Victoria.

## PRESENTERS: GEORGY ARTEMOV & DAVID DELACRÉTAZ

Georgy Artemov joined the University of Melbourne as a lecturer in 2007 after completing his Ph.D. in Economics at Brown University. Georgy's primary areas of research are mechanism design, matching theory and microeconomic theory.

David Delacrétaz is a PhD student at the University of Melbourne, focusing on Microeconomics Theory, Mechanism Design and Matching Theory. David has been working on the Centre for Market Design projects relating to childcare and kindergarten matching allocation, and recently designed a new matching mechanism to facilitate the efficient allocation of Commonwealth Treasury graduates.

## BACKGROUND READING:

Gale, David and Shapley, Lloyd S. 1962, "College Admissions and the Stability of Marriage", *The American Mathematical Monthly*, 69(1): 9-15.

Abdulkadiroğlu, Atila, and Sönmez, Tayfun 2003, "School Choice: A Mechanism Design Approach", *American Economic Review*, 93(3): 729-747.

Roth, Alvin E. 2008, "What Have We Learned from Market Design?" *The Economic Journal*, 118: 285-310.

Artemov, Georgy, Loertscher, Simon and Feldmann, Sven 2012, "Matching and Economic Design", *Australian Economic Review*, 45(1): 347-354.