14.04 INTERMEDIATE MICROECONOMIC THEORY

Instructor: Robert Townsend, rtownsen@mit.edu

Grading TA: Laura Zhang, lyz@mit.edu

Recitation TA: Michael B. Wong, mbwong@mit.edu

Hours
Lecture: Tuesday and Thursday 2:30-4:00pm, https://mit.zoom.us/j/91169427116
Recitation: Fridays 3-4:00pm, https://mit.zoom.us/j/92187134066
Prof. Townsend office hours: Thursday after class, 4:10-5:00pm, https://mit.zoom.us/j/98824047517
Laura Zhang office hours: Monday from 4-5:00pm, https://mit.zoom.us/j/93615383485
Michael Wong office hours: Tuesday after class 4-5:00pm, https://mit.zoom.us/j/92745099412

Overview
This course provides an introduction to theory and data designed to meet the needs of students interested in economic science. It provides an introduction to consumer choice, the theory of the firm and general equilibrium models, with an overview of the main results and tools used in these subjects, both directly and indirectly as used in a variety of fields. This includes analysis of consumer and producer decisions, partial and general equilibrium analysis, insurance, the welfare theorems and failures of these theorems as with externalities but with resolutions, contract theory and mechanism design, policy analysis, the content of theory for data, and the design of media of exchange as with Bitcoin and markets made possible by distributed ledgers.

If you've had an economics class before, you're probably used to the following drill: learn some theory; if time permits, consider some stylized evidence that may or may not test the theory; repeat. That's not what we'll be doing in 14.04. The purpose of theory is to help us to think about how the world actually works. We're going to test them and learn from these tests, both when the data confirm the theory and when they reject it. John Maynard Keynes wrote, "Economics is a science of thinking in terms of models, joined to the art of choosing models which are relevant."

The Econometric Society and the Cowles Foundation framed economics as a science running in the laboratory of model economies. So, we are interested in inference, how do we measure, how do we estimate models, how to make welfare statements for actual policies as implemented and counter factual policies which might be undertaken.

In sum the class is organized around two intertwined themes:
1. Economic theory: what does it predict, and in what ways is it useful?
2. Empirical applications: Economic theory is a way of organizing facts and interpreting and patterns in the world. This class will use data to test theory and use theory to interpret data.

Prerequisites
This is an intermediate course in microeconomic theory and its application to real world phenomena and policy problems. The class assumes proficiency with economic theory at the 14.01 level as well as multivariate calculus. It is also quite helpful if you have taken some linear algebra, statistics or econometrics and are somewhat familiar with basic notions algorithms and computing, but for those who are not familiar with these additional tools, the TAs will provide a

primer or fill in gaps for this material.

Textbooks
All class readings including relevant textbook chapters will be available on the class website. The four books listed at the top of the reading list will also be on reserve in the MIT library.

Required readings
Each lecture has an associated set of readings listed on the class schedule. These readings will be featured in lectures, exams and problem sets. If a reading is marked required, with *, you are responsible for it. For professional papers as opposed to textbook chapters, here are some guidelines:

a)   What is the paper's research question?
b)   What methodology is used to answer the question (e.g., an experiment, a quasi-experiment, a set of correlations, etc.)?
c)   What are the key findings?
d)   What is the economic interpretation of these findings?

Recommended readings
You will find a number of recommended readings on the syllabus for your education and entertainment. These papers should be useful—and in many cases fun— and can be raised for discussion on Piazza -- but if the papers are not marked with a *, then you will not be tested on their content.

Class attendance
14.04 is not a by-the-book micro-theory class. A significant portion of the class will focus on applications from empirical and theoretical papers, often combined. It will be difficult to master this material unless you attend both the lectures and recitations either synchronously or asynchronously.

Laptop/tablet/phone use during class
I strongly discourage you against texting, tweeting, emailing, blogging, posting, browsing, Instagramming, Googling, shopping, etc., during class. It wastes your class-time—since you won't learn anything during lecture if you're distracted. I'm sympathetic to your desire to use your laptop or tablet to view the online lecture notes and take notes of your own. I would encourage you instead to print out the online lecture notes the night before class, and to write your notes directly on the paper lecture notes. In my experience, it's still faster and more accurate to take notes in class using paper and pen than to mark up a PDF file on your device.

Piazza
We will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, we encourage you to post your questions. We also encourage you to help other students on Piazza. However, **do not** post any problem set solutions on Piazza.

Find our class signup link at: https://piazza.com/mit/fall2020/1404 (Access code: mit1404)

Study groups

You are encouraged to form study groups. Discussing the course materials with other students is helpful in your learning process. If you are looking for a study group, please post here: https://piazza.com/class/kdgehg6srmc65z?cid=5

Grading
The class is not graded on a curve. It's possible for everyone to do well, and I'd be happy to have a reason to assign mostly A's. Under Emergency grading, letter grades will be at the levels of A, B, or C, and grades of D/NE or F/NE will not appear on any external records. If I assess that your performance in the class is of concern (C or lower), I will try to warn you before the drop date.

Here are the grading mechanics:
- Best four out of five problem set grades: 30%
- Three exams: 60%
- Course participation: 10%

Problem sets (30%):
I will assign five problem sets. Problem sets typically include a set of pure theory questions and a set of application questions, often based on readings. You must submit your problem sets in PDF form using Canvas. Late problem sets will not be accepted. No exceptions. In order to accommodate unanticipated events, illness, or conflicts in your schedule, I will automatically drop the problem set with the lowest score (for example, the one that you don't hand in). You may collaborate with other students on problem sets, but you must write up all solutions independently and in your own words. If you submit a problem set that is a direct copy of another student's, this will be considered academic dishonesty and will be dealt with accordingly. If you are stuck on a question, feel free to come to either of the TA's office hours. We will do our best to point you in the right direction, but we will not fully answer the question for you. This is to ensure that you have adequate opportunity to master the material. After the problem set has been graded and handed back we are happy to go over solutions with you if they are still unclear.

Three exams (20% each, 60% total)
There will be two exams of 80 minutes in length. There will also be a final exam during the finals period. You will have 120 minutes to complete the final. You should have extra time to help you to relax. It will count the same as each of the prior two exams, so in terms of overall scores, it is counted as a third midterm. The date of the final exam is set by the MIT Registrar's office, which strategically withholds announcing the exam dates until late in the semester so that you cannot pick your classes based on final exam schedules. Each exam will tend to focus on the new material since the previous exam, although of course you will need to understand the older material to apply the new material. The final will be comprehensive, from the beginning of the class, as the material is cumulative. This is a good time to review the course material. The exams will be based on the lecture notes, problem sets, assigned readings, classroom discussion and TA sessions.

Performance on exams is highly correlated with performance on problem sets. If you miss an exam for an excused reason, I will offer a written makeup or an oral exam on a whiteboard online. Students typically find oral exams painful. But, I will not write a new exam for only a few students—so, an oral exam is likely.

Exam Logistics

All exams will be administered through Gradescope. To register for Gradescope, go to gradescope.com and create a student account using your MIT email. Use the entry code: 92XJNG to add 14.04 as a course. You should also be able to enter the Gradescope tab in Canvas from the course sidebar. If you experience any difficulties, please email the grading TA.

You will be given 15 additional minutes on top of the normal exam length to upload your submission to the site. If you experience difficulties with the submission process, please inform the grading TA immediately. Exams are open book, but you should not anticipate there being enough time to look up many questions on the exam.

The exam will start at the regularly scheduled time, and if you would like to request an alternative time (because of time zone, internet access, or home environment), you must email the grading TA at least one week prior to the exam date to reschedule. Alternative exam times will fall within a preset 24-hour block that includes the regularly scheduled time. This will allow the grading TA to be present to answer exam questions if needed. You should not select a time that conflicts with another scheduled class session or exam.

Course participation (10%)

You are encouraged to participate in this course actively, either in class or on Piazza, ideally both. Please ask questions to make sure you understand the lecture materials. Piazza participation is encouraged for all students. Piazza participation will be especially important for students who are unable to participate in class live due to time zone differences or other obstacles to class participation. You will not be penalized if you are unable to attend class live because of these obstacles. You are strongly encouraged to not only ask questions on Piazza, but also to provide helpful answers to the questions of your classmates. If you participate regularly in one way or another, I will learn your name and count your participation towards your grade. Though course participation counts only 10%, from past experience this component has a lot of variation across students and matters significantly for final grades.

Questions regarding grading

Questions on grading should go first to the grading TA. Your grading TA must receive questions on exam or p-set grades no more than one week after the assignment/p-set has been handed back. To have the grading reconsidered, take the following steps:

1) Email the material to the grading TA along with a note describing specifically what you believe the problem to be. (Make a copy of your note and the problem set/exam for your own safekeeping.)
2) After the TA has contacted you by email, schedule a Zoom meeting to discuss the question.

This procedure is designed to facilitate fair and consistent grading. Please note that regrade requests for problem sets and exams should be submitted only for obvious grading errors (e.g. adding up points incorrectly, failing to see a correctly answered question, etc.) We are very unlikely to honor requests of the form "I think I deserve more points on this question because..." Furthermore, note that if you do request a regrade, we reserve the right to regrade your entire problem set or exam. Therefore, your final grade may increase or decrease as a result of the regrade request.

Getting help outside of class
If you have questions on the class material or problem sets, there are four ways to get help:

1. Use Piazza. We'll have threaded discussions there (monitored by TAs and professor as needed) for all problem sets and class topics. You should get a pretty quick response—and a good answer.
2. Drop in during TA office hours.
3. Drop in during Prof. Townsend's office hours.
4. Ask question during recitation (and in class as appropriate).

Please do not send us your class-related questions by email (except for personal class-related matters). Piazza is a more efficient way for us to communicate with you, and it is also benefits your classmates. If you email class related questions to us, we may respond, but we will be irritated.

Schedule
Class topics and readings are subject to revision. It is possible that some topics and readings will be dropped if time runs short.

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14.04 INTERMEDIATE MICROECONOMIC THEORY

FALL 2020

READING LIST AND LECTURE CONTENT

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A Brief Guide to this Reading List

Required readings are marked by an asterisk (*). Most readings can be found on the Stellar course website. We use the following acronyms and shorthand:

Kreps: Kreps, David M. 1990. *A Course in Microeconomic Theory.* Princeton: Princeton University Press

Medville: Townsend, Robert M. 1993. *The Medieval Village Economy: A Study of the Pareto Mapping in General Equilibrium Models.* Princeton: Princeton University Press.

MWG: Mas-Colell, A., Whinston, M. D., & Green, J. R. (1995). *Microeconomic theory.*

NS: Nicholson, W., and C.M. Snyder. 2016. *Microeconomic Theory: Basic Principles and Extensions.* Boston: Cengage Learning.

Varian: Varian, Hal. 1992. *Microeconomic Analysis.* Third Edition. New York: Norton.

DLT: Townsend, Robert. 2019. *Distributed Ledgers: Design and Regulation of Financial Infrastructure and Payment Systems.* Cambridge: MIT Press.

Lectures 1 Introduction: Motivation for the Course

Lecture 1 – Economics Science: Motivation and Objectives of the Course: Economics as Experiments, Models as Fully Articulated Systems or Labs, RCT's versus Natural Experiments, Prediction and Validation, Actual and Counterfactual Policy and Welfare, Theory and Measurement Unified, Big Data, Computation, Villages Economies Real and as Metaphors for Modern Systems, Bitcoin/Blockchain/Distributed Ledgers, A list of Economies to be Studied and Economies in the Language of General Equilibrium Environments,   Review of the Reading List

*Koopmans, T., 1947. "Measurement without theory." *The Review of Economics and Statistics*, 29(3): 161-172.

*Medville, Chapter 1 "Introduction"

*Emerging Thailand: The Spirit of Small Enterprise
https://www.youtube.com/watch?v=b_rEmiu71Pk
Varian, H., 2014. "Big data: new tricks for econometrics." *Journal of Economic Perspectives*, 28(2): 3-28.

Lucas Jr, R.E., 1980. "Methods and problems in business cycle theory." *Journal of Money, Credit, and Banking*, 12(4): 696-715.

Angrist, Joshua D., and Jörn-Steffen Pischke. 2010. "The Credibility Revolution in Empirical Economics: How Better Research Design Is Taking the Con out of Econometrics." *Journal of Economic Perspectives*, 24 (2): 3-30.

Matzkin, Rosa L., 2007. "Nonparametric Identification, "Handbook of Econometrics,in: J.J. Heckman & E.E. Leamer (ed.), *Handbook of Econometrics*, edition 1, volume 6, chapter 73 Elsevier.

Ragnar Frisch (1926) "On a Problem in Pure Economics: Translated by JS Chipman." Preferences, Utility, and Demand: A Minnesota Symposium. 1926."

Townsend, R.M., 1988. "Models as Economies." *The Economic Journal*, 98(390): 1-24.

Bank for International Settlements (BIS). 2017. "Distributed ledger technology in payment, clearing and settlement: An analytical framework." Committee on Payments and Market Infrastructures Papers No. 157 (February, 2017).

Iansiti, Marco and Karim R. Lakhani. 2017. "The Truth about Blockchain." *Harvard Business Review* 95 (1): 118-127.

Denison, Erin, Michael Lee, and Antoine Martin. 2016. "What do cryptocurrencies do?" Federal Reserve Bank of New York Paper.

Townsend R. 1995. "Financial Systems Northern Thai Villages." *Quarterly Journal of Economics*. Vol. 110, No. 4: 1011 -1046

Autor DH, Dorn D, Hanson GH. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *Am. Econ. Rev.* 103(6):2121–68

Malinowski, Bronisław. *Argonauts of the Western Pacific: An Account of Native Enterprise and Adventure in the Archipelagoes of Melanesian New Guinea.* London: Routledge and Kegan Paul.

Ralph L. Beals. 1975. *Peasant Marketing System of Oaxaca, Mexico.*

Lecture 2-4, Building Blocks for Constructing Economies: Preferences, Endowments, and Technology, with Partial Equilibrium Applications

Lecture 2 – Consumer Choice: Consumption Set, Rational Preferences, Utility Functions, Some Properties of Preferences, Indifference Curves, Marginal Rates of Substitution, Example Indifference Curves and Functions; Application: Utility Maximization subject to Budget , first order conditions, Major Method: General Constrained Optimization and Lagrangian Programs.

*Kreps Appendix A "Constrained Optimization"

*NS Chapter 3 "Preferences and Utility"

*NS Chapter 4 "Utility Maximization"

Lecture 3 – Consumer Behavior: Demand Functions, Homogeneity, Income and Substitution Effects, Engle Curves and Giffin Goods, Major Application: expenditure shares, Giffen Goods and Expenditures shares in China, in the US for rich and poor. Compensated (Hicks) and Uncompensated (Marshall) Demands, a first look at the Slutsky Equation, indirect utility and the expenditure function, Duality of Utility Maximization and Expenditure Minimization, properties of the expenditure function and Hicksian demand, putting restrictions on data.

*NS Chapter 5 "Income and Substitution Effects"

*Jensen, Robert T., and Nolan H. Miller. 2008. "Giffen Behavior and Subsistence Consumption." *American Economic Review*, 98 (4): 1553-77.

MWG 3.D-F "The Utility Maximization Problem," "The Expenditure Minimization Problem," "Duality: A Mathematical Introduction"

Lecture 4 – Production: Inputs and Outputs, Production Possibilities Sets and Properties, Returns to Scale, Aggregation over Production Sets; Major Application: Profit Maximization, Properties of Profit function, Hotelling Lemma, Isoquants, Cost Minimization and Properties of Cost Curves, Input Mix at Factor Prices; Method: Envelope Theorem. Illustrative example of basics onto modern systems: Robinson Crusoe (one person economy with preferences and production), International Trade (two country example), Leontief Input/Output Matrix, with applications to Google Search and Page Rank, Supply Chains and Great East Japan Earthquake

*Kreps 7 "The Neoclassical Firm"

Carvalho, Vasco M. and Nirei, Makoto and Saito, Yukiko and Tahbaz-Salehi, Alireza, Supply Chain Disruptions: Evidence from the Great East Japan Earthquake (December 11, 2016). Columbia Business School Research Paper No. 17-5.

Lecture 5-6, Decision Making Under Uncertainty, Linear Programs, Dynamic Programs

Lecture 5 – Uncertainty: Discrete commodity space and choice with lotteries, expected utility theory, risk and concave utility, Arrow Pratt measures of risk aversion, Uncertainty and states of the world. Application, Medieval Village Economy (risk and its magnitude, land fragmentation as diversification, cross village spatial correlations). Method: Linear Programs, in a variety of applications (location, activity analysis and profit max, utility max and budget)

*NS Chapter 8 "Expected Utility and Risk Aversion"

Lecture 6 – Dynamics and Programming: Application: Storage, Seed and Starvation in Medieval Villages; Method: Dynamic Programming, Value Functions

*Varian 19.1-3 "Time"

*Medville Chapter 3 "Storage as Risk Reduction"

Lectures 7-9, Pareto Optimality; Risk Sharing and Dynamics; Application to Village Economies; Social Networks and Supply Chains in Villages, Impact of Health Shocks and Covid-19

Lecture 7 – Pareto Optimality: Pareto Optimality, Pareto Dominance and Pareto Set, Edgeworth Box Economy, Utility Possibilities Frontier, Welfare function and a Programming Problem for determination of Optimal Allocations; Method: Separating Hyperplanes and theorems; Leading Example: Uncertainty and the state space of the optimal allocation of risk with implications for data, parametric examples to rejectable restrictions

*Kreps 5.1-4 (up to and including "the production and allocation of private goods")

Lecture 8 – Risk Sharing Applications I: Village India with ex post consumption and income data, ex ante Land Division in the Medieval Village Economy

*Townsend, R.M. "Risk and insurance in village India." *Econometrica*, 62(3), 539-591

*Medville, Chapter 2 "Uncertainty and Land-holding Patterns"

Lecture 9 – Risk Sharing Applications II: in Thai Villages, Risk and Return in Production Choice, using data on production and consumption, Idiosyncratic and aggregate risk; the Role of Gifts, Social Networks and the Transmission of Shocks in Villages:

*Samphantharak, K., and Townsend, R.M. 2018, "Risk and return in village economies." *American Economic Journal: Microeconomics* 10 (1): 1–40, 2018.

*Kinnan, Cynthia, Krislert Samphantharak, Robert M. Townsend, and Diego Vera-Cossio. 2020." Insurance and Propagation in Village Networks." Working paper, MIT.

Kinnan, C., and Townsend, R.M., 2012. "Kinship and financial networks, formal financial access, and risk reduction." *The American Economic Review*, 102(3): 289-293.

Lectures 10, Household Financial Accounts, Life Cycle and Cash Mgmt Programming, Bitcoin and Payments on Distributed Ledgers

Lecture 10 – Ledgers and Management: Household Financial Accounts (income statement and balance sheet), household profiles with Life Cycle Maximization and a Wealth Planner for Thai Villages, bitcoin, statement of cash flow and distributed ledgers, cash management through the

lens of dynamic models in Thailand, Sweden as a cashless economy and Kenya e-money, Trusted Third Party and the Decentralization issue of Ledgers

Alvarez, Fernando, Anan Pawasutipaisit and Robert M. Townsend. 2018. "Cash Management in Village Thailand: Positive and Normative Implications." Working Paper.

* Samphantharak, K. and Townsend, R.M., 2009. *Households as corporate firms: an analysis of household finance using integrated household surveys and corporate financial accounting.* Econometric Society Monographs (Book 46). Cambridge University Press, Chs 2, 4.

Townsend, R and Narapong Srivisal. "The extraordinary financial lives of Ordinary People: Huge Variation in Financial Situations.

Jack, William, Tavneet Suri, and Robert Townsend. 2010. "Monetary Theory and Electronic Money: Reflections on the Kenyan Experience." *Economic Quarterly* 96 (1): 83–122

Jack, William, and Tavneet Suri. 2014. "Risk Sharing and Transactions Costs: Evidence from Kenya's Mobile Money Revolution." *American Economic Review*, 104 (1): 183-223.

DLT: Section on "e-Payments and e-messages"

Lectures 11-12, Private Information, Contracts, Mechanism Design

Lecture 11 – Contracts and Mechanism Design: Motivation from rents and spatially scattered Medieval estates; the Revelation Principle, Optimal Multi-period Contracts and Inter-temporal Tie-ins, Costly State Verification and Audits; the Space of Lotteries, Incentives and Protocols, Smart Contracts, Implementation of Mechanism Design

*Medville, Chapter 5 "Rentals with Unobserved Outputs"

DLT: Section on "Contract theory and smart contracts: Mechanism design"

Lecture 12 – Contract Applications, Obstacles: occupation choice and business starts, distinguishing obstacles (limited commitment versus moral hazard) , rural versus urban Thailand and a battery of tests across information/financial regimes, linear programs to compute solutions to models and maximum likelihood for estimation in data

*Karaivanov Alex, Anna L. Pauson, and Robert M. Townsend. 2006 "Distinguishing Limited Liability from Moral Hazard in a Model of Entrepreneurship." *Journal of Political Economy* 114 (1): 100-144.

*Karaivanov, Alexander. 2001. "Computing Moral Hazard Programs with Lotteries Using Matlab." Mimeo.

Karaivanov, Saurina, Townsend. "Family Firms, Bank Relationships and Financial Constraints: A Comprehensive Score Card", International Economic Review, Vol.-60, Issue-2, May 2019

Lectures 13-15, Walrasian Equilibrium As Prediction; Application to International Trade, Tariffs, Real and Financial Liberalization

Lecture 13 – Walrasian Equilibrium and Trade: Application to International Trade, Commodity Price Differences across Countries, The Gains from Trade, Pricing Capital and Labor as Factors of Production, Who Wins and Who Losses from Tariffs, the Factor Price Equalization Theorem

*Kreps 6.1 "Pure Exchange and Price Equilibrium"

*MWG 15.D, "The 2 X 2 Production Model"

Lecture 14 – Real and Financial Flows: Thailand: Creating village, regional and national income and product accounts, GDP, NIPA; Flow of funds and balance of payments; Openness and prices in regional Thailand; Model of a small open economy with obstacles to trade, Calibration of the Model, Model-predicted and actual data compared at both village-level and individual-level;

*Paweenawat, Archawa and Robert M. Townsend. 2019. "The Impact of Regional Isolationism: Disentangling Real and Financial Factors." Working paper.

*Dawkins, C., T.N. Srinivasan and J Whalley, 2001. Chapter 58 - calibration. In Heckman, James J., and Edward E. Leamer (Eds) *Handbook of econometrics. Vol. 5.* Amsterdam: North Holland, pp. 3653-3703

Moll, B. R. M., Townsend and V. Zhorin. 2017. "Economic development, flow of funds, and the equilibrium interaction of financial frictions." *Proceedings of the National Academy of Sciences* 114(24): 6176-6184.

Lecture 15 – Data and Policy US: China Shock, State Level Current Accounts, Measuring Wealth and Income, US Household Surveys are not Integrated Financial Accounts, Integrated Macro Accounts, Inequality and the top 1%, Distributional Accounts, the Difficulty of Gauging the Impact of Covid-19

*Chetty, Raj, John N. Friedman, Nathaniel Hendren, Michael Stepner, and the Opportunity Insights Team. 2020. "How Did COVID-19 and Stabilization Policies Affect

Spending and Employment? A New Real-Time Economic Tracker Based on Private Sector Data." Working paper

*Baker, Scott R. R.A. Farrokhnia, Steffen Meyer, Michaela Pagel, Constantine Yannelis. 2020. "Income, Liquidity, and the Consumption Response to the 2020 Economic Stimulus Payments." Working paper.

Batty, Michael, Jesse Bricker, Joseph Briggs, Elizabeth Holmquist, Susan McIntosh, Kevin Moore, Eric Nielsen, Sarah Reber, Molly Shatto, Kamila Sommer, Tom Sweeney, and Alice Henriques Volz (2019). "Introducing the Distributional Financial Accounts of the United States," *Finance and Economics Discussion Series* 2019-017. Washington: Board of Governors of the Federal Reserve System.

Autor DH, Dorn D, Hanson GH. 2013. "The China Syndrome: Local Labor Market Effects of Import Competition in the United States." *Am. Econ. Rev.* 103(6):2121–68

Krislert Samphantharak, Scott Schuh and Robert M. Townsend. 2018. "Integrated Household Surveys: An Assessment of U.S. Methods and an Innovation". *Economic Inquiry*, 56 (1), 2018: 50–80.

Piketty, Thomas, Emmanuel Saez, Gabriel Zucman, Distributional National Accounts: Methods and Estimates for the United States, The Quarterly Journal of Economics, Volume 133, Issue 2, May 2018, Pages 553–609, https://doi.org/10.1093/qje/qjx043

Smith, Matthew, Owen Zidar, Eric Zwick. 2020. "Top Wealth in America: New Estimates and Implications for Taxing the Rich." Working paper.

Bond, Philip and Robert M. Townsend. 1996. "Formal and Informal Financing in a Chicago Ethnic Neighborhood." Economic Perspectives, July/August 1996, Federal Reserve Bank of Chicago.

Lectures 16-17 Optimality of Competitive Equilibria, and Existence of Competitive and Nash Equilibria

Lecture 16 – Optimality of Competitive Equilibrium: Competitive equilibria are Pareto optimal; any Pareto Optimum can be supported as equilibrium with Transfers; Sufficient Assumption and proofs, with first order conditions and with supporting hyperplanes; finite dimensional Euclidean Space and extension to Valuation Equilibria in more general spaces

*Kreps 6.3 "The Efficiency of a General Equilibrium"

Debreu, G., 1954. "Valuation equilibrium and Pareto optimum." *Proceedings of the National Academy of Sciences* 40 (7): 588-592.

Prescott, E., and R.M. Townsend. 1984. "General competitive analysis in an economy with private information." *International Economic Review* 25 (1): 1-20

Lecture 17 – Existence: Fixed Point Theorems, Existence of Walrasian Equilibiria with Negishi Algorithm Using second welfare theorem, Recent Computer Science Contributions, Nash equilibria in Mixed Strategies; Existence, Application to Financial Markets ,trade fails and penalties in limit order pricing

*Kreps 6.4 "Existence and The Number of Equilibria"

Scarf, H.E., 1982. "The computation of equilibrium prices: an exposition." In Arrow, Kenneth J., and Michael D. Intriligator (Eds.) *Handbook of mathematical economics. Volume 2*. Amsterdam: North-Holland, pp. 1007-1061.

Negishi, T., 1960. "Welfare economics and existence of an equilibrium for a competitive economy." *Metroeconomica*, 12 (2-3): 92-97.

Echenique, F.; and Wierman, A. Finding a Walrasian Equilibrium is Easy for a Fixed Number of Agents. In Proceedings of the 13th ACM Conference on Electronic Commerce, of EC '12, pages 495-495, New York, NY, USA, 2012. ACM

Paes Leme and Chiu-wai Wong (2016) "Computing Walrasian Equilibria: Fast Algorithms and Structural Properties"

Jehle, Geoffrey A. and Philip J. Reny. 2011. *Advanced Microeconomic Theory*. Third Edition. New York: Financial Times/Prentice Hall. Chs. 7.1-7.2.2 "Strategic Decision Making", "Dominant Strategies", "Nash Equilibrium"

*Asu Ozdaglar's Lecture material from Course 6.254. "Existence of a Nash equilibrium"

Fleming, Michael J. and Kenneth D. Garbade. "Explaining Settlement Fails." Federal Reserve Bank of New York: Current Issues in Economics and Finance. Volume 11, Number 9 September 2005

Dubey, Pradeep. (1982) "Price-quantity Strategic Market Games" EconometricaVol. 50, No. 1 (Jan., 1982), pp. 111-126

Lectures 18-19, Microeconomics and Macro Aggregation: Theory and Data from Two Perspectives, Imposed Structure from Above vs Identification and Falsification with Minimal Assumptions from Below

Lecture 18 – Aggregation, the positive and normative representative consumer for prediction and welfare respectively, indirect utility and properties, Roy's identity, Gorman Polar forms, Linear expansion paths and data, critical review of traditional and new foundations of macroeconomics, Application: The Representative Consumer in Aggregated Models

*Daron Acemoglu. Introduction to Modern Economic Growth. Princeton: Princeton University Press. Chapter 5.2. "The Representative Household", 218-226

Lecture 19 – Identification and Falsification, as applied to Consumer Optimization and to General Equilibrium theory, A Unified Approach—Infinite Data and the Slutsky Matrix, Finite data and Reveled preference, Convexity not testable, computational considerations, Falsifiability, income data alone is not enough to test

*Varian 8.1-3 on Slutsky matrix

*Varian 8.5 "Integrability"

*Varian 8.7 "Revealed Preference"

Lectures 20-21, Failures of the Welfare Theorems and Some Market Structure Remedies; Cryptocurrency Values, Monetary Theory and Some Policy Remedies

Lecture 20 – Failures of the Welfare Theorems: Failure of the Second Welfare Theorem – Nonconvexity; Failure of the First Welfare Theorem - Local Satiation, Pollution but Fixed with Markets in Rights, Externalities generally, rights for assignment to others, Infinite Horizon and Infinite wealth, Economics of Platforms in a Walrasian Framework: Platform and Payment externalities, Internalizing Externalities with Market Design; Application: Competition in Cryptocurrencies

*Arrow, K.J., 1969. "The organization of economic activity: Issues pertinent to the choice of market versus nonmarket allocation." In *The analysis and evaluation of public expenditure: the PPB-system*. Washington DC: Joint Economic Committee, 91st Cong., 1st sess 1, pp. 59-73.

*Jain, Anil and Robert M. Townsend. 2019. "The economics of platforms in a Walrasian setting." Working paper.

Lecture 21 – Bubbles: Bitcoin Values, Overlapping Generations and Bubbles, Lessons from Monetary Theory, Efficiency questions, is the bubble large enough in actual economies, the value of money as from cash-in-advance, removing indeterminacy in practice, a fin tech application in Southeast Asia, Commitment and a Digital Reserve Bank, activist monetary and token policy

*Townsend, Robert M. 1980. "Models of Money with Spatially Separated Agents." In *Models of Monetary Economies*, edited by John Kareken and Neil Wallace. Minneapolis: Federal Reserve Bank of Minneapolis, pp. 265-303

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