ECO 2302: NETWORKS IN TRADE AND MACROECONOMICS

UNIVERSITY OF TORONTO

WINTER 2021

Instructor Contact Information

Kevin Lim

Max Gluskin House (GE), Room 323
150 St. George Street
Toronto, ON M5S 2E9
kvn.lim@utoronto.ca

Office hours: by appointment

Class Schedule

Weekly lectures will be live-streamed and recorded via Zoom every **Thursday, from 9:10 am - 11:00 am**. The Zoom URL and the recording for each class will be posted on the course Quercus website. Students are strongly encouraged to attend the lecture live-stream session. Note that there will be **no in-person lectures**.

Course Overview

This course offers an introduction to the modeling and empirical analysis of networks in economics, with a focus on topics relevant to the fields of international trade and macroeconomics. Topics covered will include: basics of graph theory; random graph models; shock aggregation and propagation in networks; endogenous firm-to-firm production networks; industrial policy in production networks; transportation networks; and learning and information diffusion in networks. By the end of the course, students should have a good understanding of the key topics, issues, and challenges pertaining to current frontier research on networks in trade and macroeconomics, and should be prepared to begin undertaking their own research on related topics.

Important Dates

14 January:	First class
18 February:	Reading week (no class)
8 April:	Last class

Grading Scheme

The grading scheme for the course will be as follows:

Problem Sets:	40%
Referee Reports OR Research Proposal:	20%
In-class Presentation (via Zoom):	10%
Take-home Final Examination:	30%

Problem Sets

I will assign four problem sets throughout the course. Each of these will be worth 10% of the total course score. The tentative problem set schedule is as follows, but may be subject to change throughout the term.

Problem Set No.	*Assignment Date*	*Due Date*
1	21 January	4 February
2	4 January	25 February
3	25 February	11 March
4	11 March	25 March

Assignments will be due by 5:00 PM on the respective due dates and can be submitted either by uploading your submission to Quercus or by emailing it to me directly.

Referee Reports and Research Proposal

Each student will be required to complete either (a) two referee reports, or (b) a research proposal. These will be due on the last day of class (8 April).

For each referee report, you should choose an academic paper that we did not discuss in detail in class and that is related to any of the course topics. The referee report should then:

- summarize the main research question(s) and methodology used in the paper;
- identify the main findings of the paper;
- discuss whether the conclusions are credible given the assumptions of the paper;
- suggest improvements for the paper (if any).

Each referee report should be at least 3-4 pages in length.

For the research proposal, you should do the following:

- identify a research question related to any of the course topics that has not yet been addressed in the literature;
- propose a methodology for studying the research question;
- discuss the data requirements and theoretical assumptions that will be needed;
- outline the hypothetical conclusions that you might expect to find from the analysis.

The research proposal should be at least 5-6 pages in length.

In-Class Presentation

Each student will be required to give a short (approximately 15-20 minute) in-class presentation. If you choose to do the referee reports above, your presentation will be on one of the papers that you have chosen for the referee report. If you choose to do the research proposal, your presentation will be about the research proposal. In short, the presentation will be a verbal delivery of the written assignment, but you should also be prepared to discuss the paper/proposal with the rest of the class and answer any questions that might arise.

Take-home Final Examination

A take-home final examination will be assigned during the final examination period (exact date TBD). You will have 24 hours to complete the exam.

Lecture Notes and Textbooks

Detailed lecture notes will be posted on the course website (Quercus) for each lecture session. The content of these lecture notes, together with the assigned problem sets, will constitute the core material that students are responsible for learning throughout the course. As such, there is no required textbook for the course.

Course Outline and Reading List

The course outline below is tentative and may be subject to change throughout the term. The readings for each lecture are ordered roughly in terms of priority (i.e. you should begin by reading the items that are listed first). Readings marked with a ✓ will be discussed in class.

14 January — <u>Lecture 1 – Introduction: Graphs and Random Networks</u>

- ✓ Atalay, Enghin, Ali Hortaçsu, James Roberts, and Chad Syverson. 2011. "Network Structure of Production," *Proceedings of the National Academy of Sciences*, 108(13), pp. 5199-5202.

21 January — <u>Lecture 2 –Aggregation and Propagation of Shocks in Networks</u>

- ✓ Hulten, Charles R. 1978. "Growth Accounting with Intermediate Inputs," *Review of Economic Studies*, 45(3), pp. 511-518.
- ✓ Acemoglu, Daron, Vasco M Carvalho, Asuman Ozdaglar, and Alireza Tahbaz-Salehi. 2012. "The Network Origins of Aggregate Fluctuations," *Econometrica*, 80(5), pp. 1977-2016.
- ✓ Barrot, Jean-Noël and Julien Sauvagnat. 2016. "Input Specificity and the Propagation of Idiosyncratic Shocks in Production Networks," *Quarterly Journal of Economics*, 131(3), pp. 1543-1592.
- ✓ Baqaee, David R and Emmanuel Farhi. 2019. "The Macroeconomic Impact of Microeconomic Shocks: Beyond Hulten's Theorem," *Econometrica*, 87(4), pp. 1155-1203.
- Baqaee, David R. 2018. "Cascading Failures in Production Networks," *Econometrica*, 86(5), pp. 1819-1838.
- Boehm, Christoph E, Aaron Flaaen, and Nitya Pandalai-Nayar. 2019. "Input Linkages and the Transmission of Shocks: Firm-level Evidence from the 2011 Tohoku Earthquake," *Review of Economic Statistics*, 101(1), pp. 60-75.
- Carvalho, Vasco M, Makoto Nirei, Yukiko U Saito, and Alireza Tahbaz-Salehi. 2016. "Supply Chain Disruptions: Evidence from the Great East Japan Earthquake." Working paper (QJE R&R).

28 January Lecture 3 –Buyer-Seller Relationships (Bipartite Networks)

- ✓ Bernard, Andrew B, Andreas Moxnes, and Karen H Ulltveit-Moe. 2018. "Two-sided Heterogeneity and Trade," *Review of Economic Statistics*, 100(3), pp. 424-439.
- ✓ Bernard, Andrew B, Andreas Moxnes, and Yukiko U Saito. 2017. "Production Networks, Geography, and Firm Performance." Working paper (JPE forthcoming).
- ✓ Heise, Sebastian. 2019. "Firm-to-firm Relationships and the Pass-Through of Shocks." Working paper.
- ✓ Monarch, Ryan. 2019. "'It's Not You, It's Me': Prices, Quality, and Switching in U.S.-China Trade Relationships." Working paper (ReStat R&R).
- Benguria, Felipe. 2015. "The Matching and Sorting of Exporting and Importing Firms: Theory and Evidence." Working paper.
- Eaton, Jonathan, Marcela Eslava, David Jinkins, C J Krizan, and James Tybout. 2014. "A Search and Learning Model of Export Dynamics." Working paper.
- Kranton, Rachel E, and Deborah F Minehart. 2001. "A Theory of Buyer-Seller Networks," *American Economic Review*, 91(3), pp. 485-508.
- Spray, John. 2019. "Search Externalities in Firm-to-firm Trade." Working paper.
- Sugita, Yoichi, Kensuke Teshima, and Enrique Siera. 2018. "Assortative Matching of Exporters and Importers. Working paper.

4 February Lecture 4 –Firms and Production Networks

- ✓ Bernard, Andrew B, Emmanuel Dhyne, Glenn Magerman, Kalina Manova, and Andreas Moxnes. 2019. "The Origins of Firm Heterogeneity: A Production Network Approach." Working paper (JPE R&R).
- ✓ Lim, Kevin. 2019. "Endogenous Production Networks and the Business Cycle." Working paper (Ecma R&R).
- ✓ Oberfield, Ezra. 2018. "A Theory of Input-Output Architecture," *Econometrica*, 86(2), pp. 559-589.
- Eaton, Jonathan, Samuel Kortum, and Francis Kramarz. 2018. "Firm-to-firm Trade: Imports, Exports, and the Labor Market." Working paper.
- Magerman, Glenn, Karolien De Bruyne, Emmanuel Dhyne, Jan Van Hove. 2018. "Heterogeneous Firms and the Micro Origins of Aggregate Fluctuations." Working paper.

- Miyauchi, Yuhei. 2019. "Matching and Agglomeration: Theory and Evidence from Japanese Firm-to-firm Trade." Working paper.
- Taschereau-Dumouchel, Mathieu. 2018. "Cascades and Fluctuations in an Economy with an Endogenous Production Network." Working paper (Ecma R&R).

11 February Lecture 5: Networks and International Trade

- ✓ Tintelnot, Felix, Ayumu Ken Kikkawa, Magne Mogstad, and Emmanuel Dhyne. 2019. "Trade and Domestic Production Networks." Working paper (QJE R&R).
- ✓ Chaney, Thomas. 2014. "The Network Structure of International Trade," *American Economic Review*, 104(11), pp. 3600-3634.
- ✓ Rauch, James E. 1999. "Networks versus Markets in International Trade," *Journal of International Economics*, 48, pp. 7-35.
- Chaney, Thomas. 2018. "The Gravity Equation in International Trade: An Explanation," *Journal of Political Economy*, 126(1), pp. 150-177.
- Huneeus, Federico. 2019. "Production Network Dynamics and the Propagation of Shocks." Working paper.
- Kikkawa, Ayumu Ken, Emmanuel Dhyne, and Glenn Magerman. 2019. "Imperfect Competition in Firm-to-firm Trade." Working paper.

18 February --- Reading week (no class) ---

25 February Lecture 6: Networks and Multinational Production

- ✓ Antras, Pol and Alonso de Gortari. 2019. "On the Geography of Global Value Chains." Working paper.
- ✓ Alfaro-Urena, Alonso, Isabela Manelici, and Jose P Vasquez. 2019. "The Effects of Joining Multinational Supply Chains: New Evidence from Firm-to-Firm Linkages." Working paper.

4 March Lecture 7: Networks and Labor Markets

- ✓ Huneeus, Federico, Kory Kroft, Kevin Lim, and David Price. 2019. "Earnings Inequality in Production Networks." Working paper.
- ✓ Alfaro-Urena, Alonso, Isabela Manelici, and Jose P Vasquez. 2019. "The Effects of Multinationals on Workers: Evidence from Costa Rica." Working paper.

- Demir, Banu, Cecília Fieler, Daniel Yi Xu, and Kelly Kaili Yang. 2019. "Production Networks and Skill-biased Technology." Working paper.

11 March Lecture 8: Networks and Policy

- ✓ Liu, Ernest. 2019. "Industrial Policies in Production Networks." *Quarterly Journal of Economics*, 134(4), pp. 1883-1948.
- Huang, Jingong. 2018. "Technology Network, Innovation, and Growth." Working paper.

18 March Lecture 9: Transportation Networks

- ✓ Allen, Treb and Costas Arkolakis. 2019. "The Welfare Effects of Transportation Infrastructure Improvements." Working paper (ReStud R&R).
- ✓ Fajgelbaum, Pablo D, and Edouard Schaal. 2019. "Optimal Transport Networks in Spatial Equilibrium." Working paper (Ecma forthcoming).
- Easley and Kleinberg, Ch. 8

25 March Lecture 10: Learning and Diffusion in Networks

- ✓ Monarch, Ryan and Tim Schmidt-Eisenlohr. 2018. "Longevity and the Value of Trade Relationships." Working paper.
- ✓ Alatas, Vivi, Abhijit Banerjee, Arun G Chandrasekhar, Rema Hanna, and Benjamin A Olken. 2016. "Network Structure and the Aggregation of Information: Theory and Evidence from Indonesia." *American Economic Review*, 106(7), pp. 1663-1704.
- ✓ Hak, Nir. 2019. "Estimation of Learning, Adoption and Diffusion over a Network." Working paper.
- Eaton, Jonathan, Marcela Eslava, David Jinkins, C J Krizan, and James Tybout. 2014. "A Search and Learning Model of Export Dynamics." Working paper.
- Jackson Ch. 7-8
- Easley and Kleinberg, Ch. 19

1 April Lecture 11: Student Presentations I

8 April Lecture 12: Student Presentations II

Policy for Late Problem Sets and Extension Requests

Late problem sets will not be accepted and will receive a score of zero. If you wish to request for an extension of a problem set deadline, you must do so at least 48 hours prior to the deadline. Extensions will be granted only for legitimate reasons supported by appropriate documentation, and the granting of extensions will be at the discretion of the course instructor. Please note that each student will be granted no more than one problem set extension throughout the course.

Policy for Documentation of Absences

For verification of illness, injury, or other relevant personal issues that may cause you to miss problem set deadlines, only the following documents will be accepted: (i) U of T Verification of Illness or Injury Form; (ii) Student Health or Disability Related Certificate; (iii) a College Registrar's Letter; or (iv) an Accessibility Services Letter. You must provide original documentation and not photocopies. Please be reminded that submitting false medical notes is a serious academic offence.

Policy for Regrading Requests

If you would like to make a case for receiving a different grade on a problem set, please note that you have *one week* from the date the assignment is returned to you to submit a regrade request. Absolutely no assignments will be regraded beyond this time limit. Material submitted for regrading must be accompanied by a brief written explanation detailing your reasons for receiving a different grade. Be as specific as possible (e.g. correction of addition errors in calculating a grade, a specific point or step that the grader missed, etc.). Note that in agreeing to resubmit your work for remarking, you are agreeing to a re-evaluation of your work that may see your grade go up, go down, or stay the same.

Policy for Email Communication

In all email communication, please include the course number (ECO2302) in the subject line. Please also note that the majority of course-related email communication will be directed to your utoronto email address, and hence you are expected to check this address on a regular basis.

Academic Integrity

All students, faculty, and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, citing and using source material appropriately, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism – representing someone else's words as your own – or submitting work that you have previously submitted for marks in another class or program is a serious offence that can result in sanctions. Speak to the course instructor or TAs for advice on anything that you find unclear. Also, see the U of T writing support website at www.utoronto.ca/writing. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations.

Ongoing Learning Disability or Accommodation Requirement

Students with diverse learning styles and needs are welcome in this course. If you have an ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) (accessibility.utoronto.ca) at the beginning of the academic year. Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs. AS will then assess your medical situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your condition with any instructor, and your instructors will not reveal that you are registered with AS.

Religious accommodation

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of backgrounds, cultural traditions, and spiritual beliefs. The course instructor will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity due to a religious observance, please let the course instructor know as early in the course as possible, and with sufficient notice (at least two weeks), so that alternate arrangements can be made.

Quercus Information

This course uses the University's learning management system, Quercus, to post information about the course. This includes posting readings and course assignments, as well as sharing important announcements and updates. The site is dynamic and new information and resources will be posted regularly as we move through the term, so please make it a habit to log in to the site on a regular, even daily, basis. To access the course website, go to the U of T Quercus log-in page at https://q.utoronto.ca. Once you have logged in to Quercus using your UTORid and password, you should see the link for ECO2302. Click on this link to open the course area, view the latest announcements, and access your course resources.

Please also note that any grades posted are for your information only, so you can view and track your progress through the course. No grades are considered official, including any posted in Quercus at any point in the term, until they have been formally approved and posted on ACORN at the end of the course. Please contact the course instructor as soon as possible if you think there is an error in any grade posted on Quercus.