

# ECO 423 H1S L0101: Economics and Biosocial Data

Department of Economics, University of Toronto

**Instructor:** Prof. Jonathan Beauchamp  
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**Lectures:** Friday 9:00am – 11:00am, LA214  
**Office hours:** Friday 11:00am – 11:45am (drop-in), GE306  
Friday 11:45am – 12:30am (by appointment), GE306

**TA (tutorials):** William Gaelan MacKenzie  
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**Tutorials:** Friday 11:00am – 12:00pm, LA214 (only a few tutorials will be held)

## Course Description

The course introduces and critically assesses economic research that uses genetic, neuroscientific, and other biosocial data. We will address questions such as: What are the effects of brain neurochemistry on economic decision-making? What role do nature and nurture play in economic behaviour and outcomes? Are there genetic variants that influence economic preferences and outcomes? And what are the policy implications (or lack thereof) of related findings?

## Previous Training

*Prerequisites:* (i) ECO200Y1 / ECO204Y1 / ECO206Y1  
(ii) ECO220Y1 / ECO227Y1 / (STA220H1, STA255H1) / (STA237H1, STA238H1) / (STA257H1, STA261H1)  
(iii) At least one FCE in ECO at the 300 level or higher  
*Recommended:* ECO375H1  
*Exclusion:* ECO422H1S (winter 2017)

The course will involve thorough discussions of empirical papers. You should thus have a good understanding of linear regressions, omitted variable bias, and other introductory-level econometrics concepts. Some key econometrics concepts will be reviewed in three scheduled tutorials.

## Course Website

The course website on **Quercus** is accessible through <https://q.utoronto.ca>. Lecture slides will be posted on the Quercus site. The Quercus site will also be used to distribute assignments, manage class communications, etc.

## Evaluation

Task	Weight	Due date
Midterm	30%	March 15, 2019
Four written assignments (only the three best grades will count)	60% (20% for each of the three best grades)	January 31, 2019 February 14, 2019 March 7, 2019 April 4, 2019
Class participation and attendance	10 %	N/A

The **midterm** will be held on **Friday March 15** from 9am to 11am (during class time) in room [TBA].

- The midterm will have 110 minutes' duration.
- Students who do not write the test will be given a grade of zero, unless I receive:
  - (1) an email from the student to indicate that they are not able to write the midterm, on the day of the midterm, and
  - (2) an appropriate medical note explaining why the test was missed, to be provided before the scheduled make-up midterm.
    - The medical note must be provided using the UofT Verification of Illness or Injury Form or one of the other types of medical documentation deemed "official" by the Faculty of Arts and Science; no other documentation will be accepted.
    - If you submit a UofT Verification of Illness or Injury Form, it must have been completed by a recognized medical practitioner and must clearly indicate the practitioner's licensing body and number.
    - Only original notes will be accepted. The note must clearly state that on the date of the test, the student was too sick to write the test; illness before the test is not sufficient grounds for missing the test. Nor will I accept notes that indicate that the student would have performed "sub-optimally." To comply with these requirements, it is expected that the student will have met with the doctor on the date of the test.
    - I will review each medical note to determine whether there are sufficient grounds for a student to be excused from a test. Part of this review process may include meeting with the student, and/or following up with the medical practitioner.
    - It is an academic offence to feign illness to avoid a test.
- If a student has been excused from a test on medical grounds, he or she will be permitted to write a **make-up test** to be held on Friday March 22 from 1pm to 3pm in room [TBA].
  - The make-up test will be worth the value of the midterm.
  - Consistent with university policy, there will be no "make-up" test for the make-up test. A grade of zero will be applied if the make-up test is requested but missed.
- If students wish to appeal a grade, they must provide a written explanation of why they believe their grade is mistaken, and submit it to the instructor within one week of the midterm being returned to the class.

There will be four **written assignments**.

- Only the three assignments on which the student obtains the best grades will count toward the final course grade (thus, if the student only submits three of the four assignments, those three assignments will count toward the final course grade).
- Written assignments must be submitted through Quercus in a Portable Document Format (PDF). Neither paper nor email submissions will be counted. Assignments are due by 11:59pm on their due date.
- Late assignments will not be accepted and will receive a grade of zero, unless I receive:
  - (1) an email from the student to indicate that he/she will not be able to submit the assignment on time, by 11:59pm on the assignment due date, and

(2) an appropriate medical note explaining why the assignment could not be submitted on time, within the week following the assignment due date; the medical note must satisfy requirements that are analogous to the midterm's (see above).

- University disclaimer regarding Turnitin.com:  
“Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.”

Students will be evaluated on **class participation and attendance**. It is expected that students will have read the required articles prior to class and will be prepared to engage in meaningful discussion of these articles during class. Evaluation will also be based on class attendance and on whether students adhere to the class rules below.

### **Class rules**

- All students must arrive on time and be prepared to participate in class discussion.
- The use of laptops, iPads, etc, is allowed only for the purpose of taking class notes and viewing relevant lecture materials. The use of the internet, Facebook, emails, and all other computer applications that are not essential for the current lecture or discussion, is strictly prohibited. The use of phones, iPods, etc, is strictly prohibited.
- No food is permitted in class.
- Students who do not abide by these rules may be asked to leave the class.

### **Name tags**

Students must prepare name tags and bring these to class and put these on their desks each lecture.

### **Academic Misconduct**

Copying, plagiarizing, or other forms of academic misconduct will not be tolerated. Any student caught engaging in such activities will be subject to academic discipline ranging from a mark of zero on the assignment, test or examination to dismissal from the university as outlined in the academic handbook. Any student abetting or otherwise assisting in such misconduct will also be subject to academic penalties. As a student it is your responsibility to ensure the integrity of your work and to understand what constitutes an academic offence. If you have any concerns that you may be crossing the line, always ask your instructor. **Ignorance of the rules does not excuse cheating or plagiarism.** For more information regarding the Code of Behaviour on Academic Matters please visit <http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>.

For accessibility accommodation see <http://studentlife.utoronto.ca/accessibility>.

## Optional class presentations

Interested students can form pairs and email me to volunteer to do one of four optional class presentations. To incentivize pairs of students to volunteer for the four optional presentations, I will use the following scheme to determine the “market-clearing price” (i.e., the market-clearing bonus mark) of an optional presentation:

- The four presentation slots will be granted on a “first-come, first-served” basis, based on the time when I receive emails from both students in a pair to request a presentation slot.
- If four pairs of students volunteer by Friday, January 18, all volunteer presenters will get a bonus of up to 1% on their final course grade, with the precise bonus depending on the quality of each presentation; if four pairs volunteer by Friday, January 25, the bonus will be up to 2% for all presenters (the maximum bonus will be the same for all presenters, regardless of when they volunteered); if four pairs volunteer after that, the bonus will be up to 3%.

Pairs of presenters will be required to choose an empirical academic paper, with my guidance and prior approval, and to present the paper in class during Lecture 11 or Lecture 12. The total length of each pair’s presentation will be around 20-25 minutes, including time for questions and discussion. You should be prepared to discuss the following:

- What is the main question of the paper?
- How does the paper contribute to the academic literature?
- What is the research design and empirical strategy?
- What are the main results of the paper?
- What are some of the drawbacks of the research design?
- Are there alternative explanations for the empirical results?

Each pair of presenters must book an appointment with me during my office hours at least one week prior to its presentation. Presenters must bring an advanced draft of their slides at the appointment, so that I can review the slides and provide feedback.

Students cannot withdraw from presenting without penalty after having volunteered. A penalty of 5% will be applied to the final course grade for students who volunteer for an optional presentation but fail to deliver a presentation, unless I receive:

- (1) an email from the student to indicate that he/she will not be able to deliver the presentation, on the day of the presentation, and
- (2) an appropriate medical note explaining why the student could not deliver the presentation, within the week following the scheduled presentation time; the medical note must satisfy requirements that are analogous to the midterm’s (see above).

If a student in a pair cannot deliver his/her part of the presentation due to medical factors, the student will get no bonus marks, and the other student in the pair must deliver the entire presentation alone.

## Tentative course schedule

Course week	Date	Lecture topic / event
1	Jan. 11	Syllabus; Introduction and motivation; Econometrics review
2	Jan. 18 Jan. 18	Neuroeconomics, brain chemistry, and decision making Tutorial: Econometrics review 1
3	Jan. 25 Jan. 25	Nature and nurture I: Heritability and the ACE model Tutorial: Econometrics review 2
4	Jan. 31 Feb. 1	<i>Problem set 1 due</i> Nature and nurture II: Limitations and extensions of the ACE model
5	Feb. 8	Nature and nurture III: Interpretation and implications
6	Feb. 14 Feb. 15	<i>Problem set 2 due</i> Molecular genetics and economics I: Introduction, candidate-gene studies, and statistical power
	Feb. 18-22	<i>[No lecture this week (reading week)]</i>
7	Mar. 1	Molecular genetics and economics II: GWAS and polygenic scores
8	Mar. 7 Mar. 8 Mar. 8	<i>Problem set 3 due</i> Molecular genetics and economics III: Gene-environment interactions Tutorial: Econometrics review 3
9	Mar. 15	<i>In-class midterm</i>
10	Mar. 22 Mar. 22	Molecular genetics and economics IV: Mendelian Randomization <i>Make-up midterm</i>
11	Mar. 29	Molecular genetics and economics V: SNP heritability; Two optional student presentations
12	Apr. 4 Apr. 5	<i>Problem set 4 due</i> Other uses of genetic data in economics; Two optional student presentations

Additional tutorial sessions may be scheduled as required.

## Reading list

(\*\* indicates required readings that will be covered in class; \* indicates required readings; other readings are optional; all readings will be posted on Quercus.)

### Week 1: Introduction and motivation

\*Robson, A. J. (2001). The biological basis of economic behavior. *Journal of Economic Literature*, 39(1), 11-33.

### Week 2: Neuroeconomics, brain chemistry, and economic decision making

\*\*Kosfeld, M., Heinrichs, M., Zak, P. J., Fischbacher, U., & Fehr, E. (2005). Oxytocin increases trust in humans. *Nature*, 435(7042), 673-676.

Fehr, E., & Rangel, A. (2011). Neuroeconomic foundations of economic choice—recent advances. *The Journal of Economic Perspectives*, 25(4), 3-30.

Crockett, M. J., & Fehr, E. (2013). Pharmacology of economic and social decision making. In *Neuroeconomics: Decision making and the brain* (pp. 259-82). San Diego: Academic Press.

Camerer, C., Loewenstein, G., & Prelec, D. (2005). Neuroeconomics: How neuroscience can inform economics. *Journal of economic Literature*, 43(1), 9-64.

### Week 3: The nature and nurture of economic preferences and outcomes I: Heritability and the ACE model

\*\*Cronqvist, H., & Siegel, S. (2015). The origins of savings behavior. *Journal of Political Economy*, 123(1), 123-169.

\*Turkheimer, E. "Three laws of behavior genetics and what they mean." *Current Directions in Psychological Science* 9.5 (2000): 160-164.

Behrman, J. R., & Taubman, P. (1989). Is schooling "mostly in the genes"? Nature-nurture decomposition using data on relatives. *The Journal of Political Economy*, 1425-1446.

Taubman, P. (1976). The determinants of earnings: Genetics, family, and other environments: A study of white male twins. *The American Economic Review*, 66(5), 858-870.

Cesarini D, CT Dawes, M Johannesson, P Lichtenstein & B Wallace (2009). Genetic variation in preferences for giving and risk-taking. *Quarterly Journal of Economics*, 124(2): 809–842.

### Week 4: The nature and nurture of economic preferences and outcomes II: Limitations and extensions of the ACE model

\*\*Björklund, A., Lindahl, M., & Plug, E. (2006). The origins of intergenerational associations: Lessons from Swedish adoption data. *The Quarterly Journal of Economics*, 121(3), 999-1028.

Sacerdote, B. (2010). Nature and nurture effects on children's outcomes: What have we learned from studies of twins and adoptees. *Handbook of social economics*, 1, 1-30.

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2005). Why the apple doesn't fall far: Understanding intergenerational transmission of human capital. *American economic review*, 95(1), 437-449.

### Week 5: The nature and nurture of economic preferences and outcomes III: Interpretation and implications

\*\*Sacerdote, B. (2007). How large are the effects from changes in family environment? A study of Korean American adoptees. *The Quarterly Journal of Economics*, 119-157.

\*Bowles, S., & Gintis, H. (2002). The inheritance of inequality. *The Journal of Economic Perspectives*, 16(3), 3-30.

\*Goldberger, Arthur S. (1979). "Heritability." *Economica*, 46(184): 327–47.

Dobzhansky, T. (1973). Is genetic diversity compatible with human equality? *Social biology*, 20(3), 280-288.

Jencks, Christopher. (1980). "Heredity, environment, and public policy reconsidered." *American Sociological Review*, 45(5): 723–36.

Pinker, S. (2004). Why nature & nurture won't go away. *Daedalus*, 133(4), 5-17.

### Week 6: Molecular genetics and economics I: Introduction, candidate-gene studies, and statistical power

\*Dreber, A., Apicella, C.L., Eisenberg, D.T., Garcia, J.R., Zamore, R.S., Lum, J.K. and Campbell, B. (2009). The 7R polymorphism in the dopamine receptor D4 gene (DRD4) is associated with financial risk taking in men. *Evolution and Human Behavior*, 30(2), 85-92.

\*\*Kuhnen, C.M., & Chiao, J.Y. (2009). Genetic determinants of financial risk taking. *PloS ONE*, 4(2), e4362.

\*\*Chabris, C. F., Hebert, B. M., Benjamin, D. J., Beauchamp, J., Cesarini, D., van der Loos, M., ... & Freese, J. (2012). Most reported genetic associations with general intelligence are probably false positives. *Psychological Science*, 0956797611435528.

\*Beauchamp, J. P., Cesarini, D., Johannesson, M., van der Loos, M. J., Koellinger, P. D., Groenen, P. J., ... & Christakis, N. A. (2011). Molecular genetics and economics. *The Journal of Economic Perspectives*, 25(4), 57-82.

Benjamin, D. J., Cesarini, D., Chabris, C. F., Glaeser, E. L., Laibson, D. I., Guðnason, V., ... & Johannesson, M. (2012). The promises and pitfalls of genoconomics. *Annual Review of Economics*, 4, 627.

Israel, S., Lerer, E., Shalev, I., Uzefovsky, F., Riebold, M., Laiba, E., ... & Ebstein, R. P. (2009). The oxytocin receptor (OXTR) contributes to prosocial fund allocations in the dictator game and the social value orientations task. *PLoS one*, 4(5), e5535.

Apicella, C. L., Cesarini, D., Johannesson, M., Dawes, C. T., Lichtenstein, P., Wallace, B., ... & Westberg, L. (2010). No association between oxytocin receptor (OXTR) gene polymorphisms and experimentally elicited social preferences. *PLoS one*, 5(6), e11153.

### **Week 7: Molecular genetics and economics II: GWAS and polygenic scores**

\*\*Barth, D., Papageorge, N.W., & Thom, K. (2018). Genetic Endowments and Wealth Inequality (No. w24642). National Bureau of Economic Research.

Karlsson Linnér, R., Biroli, P., Kong, E., Meddens, S.F.W., Wedow, R., ... & Beauchamp, J. (2019). Genome-wide association analyses of risk tolerance and risky behaviors in over one million individuals identify hundreds of loci and shared genetic influences. *Nature Genetics*.

Lee, J.J., Wedow, R., Okbay, A., Kong, E., Maghzian, O., ... & Cesarini, D. (2018). Gene discovery and polygenic prediction from a genome-wide association study of educational attainment in 1.1 million individuals. *Nature Genetics*, 50(8), 1112–1121.

Belsky, D.W., Moffitt, T.E., Corcoran, D.L., Domingue, B., Harrington, H., ... & Caspi, A. (2016). The genetics of success: How single-nucleotide polymorphisms associated with educational attainment relate to life-course development. *Psychological science*, 27(7), 957-972.

### **Week 8: Molecular genetics and economics III: Gene-environment interactions**

\*\*Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Martin, J., Craig, I. W., ... & Poulton, R. (2002). Role of genotype in the cycle of violence in maltreated children. *Science*, 297(5582), 851-854.

\*\*Schmitz, L. L., & Conley, D. (2017). The effect of Vietnam-era conscription and genetic potential for educational attainment on schooling outcomes. *Economics of Education Review*, 61, 85-97.

\*Caspi, A., Sugden, K., Moffitt, T. E., Taylor, A., Craig, I. W., Harrington, H., ... & Poulton, R. (2003). Influence of life stress on depression: moderation by a polymorphism in the 5-HTT gene. *Science*, 301(5631), 386-389.

Dick, D. M., Agrawal, A., Keller, M. C., Adkins, A., Aliev, F., Monroe, S., ... & Sher, K. J. (2015). Candidate gene-environment interaction research reflections and recommendations. *Perspectives on Psychological Science*, 10(1), 37-59.

### **Week 10: Molecular genetics and economics IV: Mendelian randomization**

\*\*Tyrrell, J., Jones, S. E., Beaumont, R., Astley, C. M., Lovell, R., Yaghootkar, H., ... & Wood, A. R. (2016). Height, body mass index, and socioeconomic status: Mendelian randomisation study in UK Biobank. *BMJ*, 352, i582.

Ding, W., Lehrer, S. F., Rosenquist, J. N., & Audrain-McGovern, J. (2009). The impact of poor health on academic performance: New evidence using genetic markers. *Journal of health economics*, 28(3), 578-597.

### **Week 11: Molecular genetics and economics V: SNP heritability**

\*Benjamin, D. J., Cesarini, D., van der Loos, M. J., Dawes, C. T., Koellinger, P. D., Magnusson, P. K., ... & Visscher, P. M. (2012). The genetic architecture of economic and political preferences. *Proceedings of the National Academy of Sciences*, 109(21), 8026-8031.

\*Yang, J., Benyamin, B., McEvoy, B. P., Gordon, S., Henders, A. K., Nyholt, D. R., ... & Goddard, M. E. (2010). Common SNPs explain a large proportion of the heritability for human height. *Nature genetics*, 42(7), 565-569.

### **Week 12: Other uses of genetic data in economics**

\*Spolaore, E., & Wacziarg, R. (2009). The diffusion of development. *The Quarterly Journal of Economics*, 124(2): 469-529.

\*Giuliano, P., Spilimbergo, A., & Tonon, G. (2014). Genetic distance, transportation costs, and trade. *Journal of Economic Geography*, 14(1), 179-198.

Cook, C. J. (2015). The natural selection of infectious disease resistance and its effect on contemporary health. *Review of Economics and Statistics*, 97(4), 742-757.

### **Weeks 11 and 12: Optional student presentations**

[The four papers that will be presented are still to be selected. Students do not need to read all four papers in detail, but they must have a good look at the papers (i.e., read the abstracts and skim the papers, look at the key tables and results) ahead of the optional presentations and come to class prepared to discuss each paper.]

### **Other optional readings**

Becker, G. S. (1976). Altruism, egoism, and genetic fitness: Economics and sociobiology. *Journal of Economic Literature*, 14(3), 817-826.

Cox, D. (2007). Biological basics and the economics of the family. *The Journal of Economic Perspectives*, 21(2), 91-108.

Guedes, J. D. A., Bestor, T. C., Carrasco, D., Flad, R., Fosse, E., Herzfeld, M., ... & Patterson, N. (2013). Is poverty in our genes? *Current Anthropology*, 54(1), 71-79.

Hirshleifer, J. (1978). Competition, cooperation, and conflict in economics and biology. *The American Economic Review*, 68(2), 238-243.

Hirshleifer, J. (1977). Economics from a biological viewpoint. *The Journal of Law & Economics*, 20(1), 1-52.

Quamrul, Ashraf, and Galor Oded. (2013). The 'out of Africa' hypothesis, human genetic diversity, and comparative economic development. *American Economic Review*, 103(1): 1-46.

Robson, A. J. (2002). Evolution and human nature. *The journal of economic perspectives*, 16(2), 89-106.

Samuelson, P. A. (1985). Modes of thought in economics and biology. *The American Economic Review*, 75(2), 166-172.

Samuelson, P. A. (1993). Altruism as a problem involving group versus individual selection in economics and biology. *The American Economic Review*, 83(2), 143-148.