

LABOR ECONOMICS 250C, SPRING 2013  
PROFESSORS KATE ANTONOVICS AND JULIAN BETTS  
COURSE OUTLINE

The course will provide a blend of theoretical labor economics and applied research.

We will cover five broad themes:

***I. Race and Gender Inequality, Discrimination***

***II. Wage and Employment Dynamics***

***III. The Supply Side of the Labor Market***

***1) The Quantity of Labor Supplied***

***2) The Quality of Labor Supplied: Human Capital***

***a) The Economics of Education***

***b) On-the-Job Training and Government Training Programs***

Professor Antonovics will teach topics I and II during weeks 1-4.5 (April 2-April 30). Professor Betts will teach Topic III during weeks 5.5-9 (May 2-23). Betts will need to reschedule the May 23 class, and will do so by email once we know for certain who is enrolling in the class. Student presentations will take place during class time in week 10.

**Requirements for the Course/Schedule**

To do well in this course you should have completed the microeconomics and econometrics (A-C) courses. It would be helpful if you have already taken Labor Economics 250A/B, because there we covered many of the empirical methods that we will use in this course. Of these 250A is the most important. If you are unsure, please consult one of the past 250A course syllabi, at [http://www.econ.ucsd.edu/~jbetts/Grad%20Courses/250A\\_syllabus\\_fall\\_2012FINAL.pdf](http://www.econ.ucsd.edu/~jbetts/Grad%20Courses/250A_syllabus_fall_2012FINAL.pdf) and discuss with either of us if there are holes in your knowledge of the relevant empirical methods.

You are required to: write your own original term paper, on a subject in labor economics of your choosing; and complete one final. In addition, we will ask you to present and critique two recent papers in an informal setting; You are also expected to attend and participate actively in all classes.

Here is some advice on finding a topic for your term paper. Perusing recent issues of the Journal of Labor Economics, the Journal of Human Resources, or general interest journals such as the AER, JPE, Econometrica, R.E.Stat etc. may give you some ideas on topics. NBER working papers provide another source. The reading list for this course might also help you. Second, if you already have a general area in mind (immigration, labor supply, economics of education etc.) but not a specific topic, then one of the more difficult challenges is to whittle your interest down to something more specific. The Handbook of Labor Economics provides literature reviews that may help you see which areas are overly well-trodden and which are relatively sparsely researched. A third approach is to flip through the Statistical Abstract of the United States or related government publications such as the Digest of Education Statistics – sometimes seeing

what sorts of data the government collects and patterns in data can get your creative juices flowing. Fourth, *talk to both of us about your ideas. This is why we are here!*

## **Evaluation**

**5% A paper proposal.** Please email both of us a one to three page proposal with a few references by Thursday of Week 2 (April 11). (Feel free to consult either of us informally before that time.) We offer you three options for this paper. Consider in weeks 1 and 2 which of these options will be most helpful to you as you seek to complete your Ph.D.

1) Come up with a *proposal* for an original empirical paper. In week 2 please submit to us one or two ideas for original papers. We will work with you to decide which to pursue. The final paper should be a *proposal* for an original empirical paper, which states how this paper would contribute to the literature, devises an empirical strategy that is (ideally) based in theory, and discusses data sources that you could use. Ideally, your proposal would be of sufficient quality that you could submit it as a grant proposal to an outside organization. (We do not require submitting a grant application, but encourage you to think along these lines. We will work with you if you decide to follow this route.)

2) Alternatively you could initiate or continue an applied (or a theoretical) project. Some of you may have initiated more empirically (or theoretically) oriented projects in 250A, 250B, 220F, or other graduate courses. You are welcome to continue that work in this course, but you must clear this with us and provide us with the final version you prepared for those classes, along with a clear statement of how you will extend that analysis. Note that if the empirical project is limited in scope it may be conceivable for you to start from scratch, develop a plan, acquire and clean data, and perform the empirical analysis. (This goes beyond option 1 above.) We certainly would welcome this but do talk to us first so that we can help judge whether this sounds feasible over the 10 weeks of quarter.

3) Alternatively write a 10-15 page literature review of a topic in labor economics. This literature review **MUST** also include thoughtful suggestions for future research. This latter statement is particularly true if you would like to extend a lit review from an earlier course. You would want to come up with a more detailed and focused lit review that builds upon the original paper and which discusses new paper ideas in detail.

**35% A final draft of your paper.** Due in class on Thursday of week 10 (June 6). Please bring two copies. We also would appreciate receiving a copy by email. There will be no extensions beyond the end of quarter, and papers submitted after June 6 will lose 5 percentage points (out of 35) per day late.

**10% A presentation of your paper:** A 15-minute presentation of your paper in the last week of class (Tuesday June 4 and Thursday, June 6). You should present your question, the motivation for your question, the theoretical model and/or econometric technique you will use to answer this question, the data you will use (if you're doing an empirical project), any preliminary results, and how you expect your results to shed light on the question you initially posed. After your presentation, there will be 10 minutes for discussion.

**10% Two informal presentations of other research.** One will be during Professor Antonovics' section of the course and one during Professor Betts' section of the course.

For Antonovics' section, presentations will take place in class on April 25 and April 30. Please email Kate by Thursday, April 11 with the title of the paper you would like to present. You can choose from the following papers:

"The Dynamics of Collective Reputation", by Jonathan Levin, *BE Journal of Theoretical Economics*, 9(1), August 2009.

"The Theory of Collective Reputations (with Applications to the Persistence of Corruption and to Firm Quality)," by Jean Tirole, *The Review of Economic Studies*, 63(1), Jan 1996.

"Understanding the Black-White Test Score Gap in the First Two Years of School," by Roland Fryer and Steven Levitt, *Review of Economics and Statistics*, 86(2) May 2004.

"Beyond Signaling and Human Capital: Education and the Revelation of Ability," by Peter Arcidiacono, Patrick Bayer and Aurel Hizmo, *American Economic Journal: Applied Economics*, 2(4) October 2010.

"Credit Constraints in Education," by Lance Lochner and Alexander Monge-Naranjo, *Annual Review of Economics* 4(1) 2012.

"Early and Late Human Capital Investments, Borrowing Constraints and the Family," by Elizabeth Caucutt Lance Lochner, NBER Working Paper 18493.

"Statistical Discrimination and the Early Career Evolution of the Black-White Wage Gap", by Gerald Oettinger, *Journal of Labor Economics*, 14(1) January 1996.

"Empirical Implications of Statistical Discrimination on the Returns to Measures of Skill", by Andrea Moro and Peter Norman, *Annales d'Economie et de Statistique*, issue 71-72, 2003. [Don't worry, it's in English]

"College Performance Predictions and the SAT," by Jesse Rothstein, *Journal of Econometrics*, 121(1-2), July-August 2004.

"Law School Admissions Under the UC Affirmative Action Ban," by Danny Yagan, working paper. [Google it]

For Betts' section, you will present a recent NBER working paper of your choice (**but in the area of the economics of education or labor supply**). *Given the large number of students taking 250C, please pick a partner with whom you will co-present the paper.* Please send Julian

email by Monday, April 29 with the titles and WP numbers of a few papers you would like to present in class, and the name of your partner. Feel free to consult with Professor Betts in advance. Rank order the papers if you select more than two, and we can jointly decide which might be the most appropriate. We will do the presentations during week 9 at a time to be determined.

One week before the scheduled presentations, please email the paper to all classmates and to either Antonovics or Betts (depending on who's teaching), or give all of us a paper copy. In your presentation, you should plan to present the paper as if it were "yours" and offer constructive criticism and ideas for how you might extend the work. A few pages of handouts would be useful. A rough guideline for the talk might be 15 minutes for presentation of the paper, and a 5-minute discussion of your "referee comments", and 5 minutes for questions. These are meant to be informal presentations, and there may be tea and coffee and/or lunch involved.

**40%** A final on Antonovics' and Betts' section during finals week.

**Textbook:**

There is no required text. Students looking for a starting point or background material may wish to use Cahuc P. and Zylberberg A. *Labor Economics* (MIT press, 2004) [C&Z]. For a clear, accessible summary of much of the empirical literature try Ehrenberg, Ronald G. and Robert S. Smith (2006) *Modern Labor Economics, Theory and Public Policy*, (9th edition), HarperCollins, New York. Good writing is important. For an entertaining style manual, see Becker, Howard S. (1986) *Writing For Social Scientists*, U. of Chicago.

**Office Hours:** Julian will have office hours Wednesdays 2-3:30 in weeks 6-10. Any other time is fine as well, including weeks 1-5, although it is best to set up something by email to make sure he is around and not in a meeting. For weeks 1-5 Julian will not hold regular office hours but feel free to set up meetings with him by email during this time. Kate's office hours will be on Wednesdays 3:30-4:30pm. If you'd like to meet at a different time, just send Kate an email.

**Reading List:** The list is subject to negotiation. The (\*) means priority reading. We will also try to give you some guidance as to which papers are the most important.

## ***I. Race and Gender Inequality***

### ***Basic Facts About Race and Gender Inequality***

\* Altonji, Joseph and Rebecca Blank. "Race and Gender in the Labor Market," in O. Ashenfelter and D. Card (ed.) *Handbook of Labor Economics*, Vol 3C, Chapter 48. New York, NY: Elsevier, 1999.

\* Altonji, Joseph, P. Bharadwaj and F. Lange. "Changes in the Characteristics of American Youth: Implications for Adult Outcomes" *Journal of Labor Economics*, 2012, 30(4).

Blau, F. and L. Kahn, "Swimming Upstream: Trends in the Gender Wage Differential in the 1980s." *Journal of Labor Economics*, 15 (1997), 1-42.

Bound, John and Richard B. Freeman. "What Went Wrong? The Erosion of Relative Earnings and Employment Among Young Black Men in the 1980s." *Quarterly Journal of Economics*, February 1992, 107(1), pp. 201-32.

Brown, Charles. "Black-White Earnings Ratios Since the Civil Rights Act of 1964: The Importance of Labor Market Dropouts." *Quarterly Journal of Economics*, February 1984, 99(1), pp. 31-44.

Card, D. and Lemieux, T. "Wage Dispersion, Returns to Skill, and Black-White Wage Differentials", *Journal of Econometrics*, 1996, 74, 319-361.

Card, David and Alan Krueger. "School Quality and Black-White Relative Earnings: A Direct Assessment." *Quarterly Journal of Economics*, February 1992, 107(1), pp. 151-200.

Chandra, Amitabh. "Is the Convergence of the Racial Wage Gap Illusory?" NBER Working Paper No. 9476, February 2003

Donohue, John J III and James J. Heckman. "Continuous Versus Episodic Change: The Impact of Civil Rights Policy on the Economic Status of Blacks." *Journal of Economic Literature*, December 1991, 29(4), pp. 1603-43. [JS]

Neal, Derek. "Why Has Black-White Skill Convergence Stopped?" NBER Working Paper No. 11090, January 2005.

Smith, James P. "Affirmative Action and the Racial Wage Gap." *American Economic Review Papers and Proceedings*, May 1993, 83(2), pp. 79-84.

### ***Discrimination--Theory***

\* Aigner, Dennis J. and Glen C. Cain. "Statistical Theories of Discrimination in the Labor Market." *Industrial and Labor Relations Review*, January 1977, 30(2), pp. 175-87.

Antonovics, Kate. "Statistical Discrimination and Intergenerational Income Mobility." *mimeo*, 2004.

Arrow, Kenneth, "Models of Job Discrimination" and "Some Mathematical Models of Race in the Labor Market", in A. Pascal (ed.) *Racial Discrimination in Economic Life*. Lexington, MA: Lexington Books, 1972.

Becker, Gary S., *The Economics of Discrimination*, Chicago, IL: The University of Chicago Press, 1957

- Borjas, George and Matthew Goldberg. "Biased Screening and Discrimination in Labor Markets." *American Economic Review*, December 1978, 68(5), pp. 918-922.
- \* Coate, S. and Loury G. "Will Affirmative Action Eliminate Negative Stereotypes?" *American Economic Review*, December 1993, 83(5), pp. 1220-1240.
- Lundberg, S. and Startz, R. "Private Discrimination and Social Intervention in a Competitive Labor Market." *American Economic Review*, June 1983, 73(3), pp. 340-347.
- Lundberg, Shelly J. "The Enforcement of Equal Opportunity Laws Under Imperfect Information: Affirmative Actions and Alternatives." *Quarterly Journal of Economics*, February 1991, 106(1), pp. 309-326. [JS]
- Mailath, George J., Larry Samuelson and Avner Shaked. "Endogenous Inequality in Integrated Labor Markets with Two-Sided Search." *American Economic Review*, March 2000, 90(1), pp. 46-72.
- McCall, J. "The Simple Mathematics of Information, Job Search and Prejudice," in A. Pascal (ed.), *Racial Discrimination in Economic Life*. Lexington, MA: Lexington Books, 1972.
- Milgrom, Paul and Sharon Oster, "Job Discrimination, Market Forces, and the Invisibility Hypothesis." *Quarterly Journal of Economics*, 1987, 102(3), pp. 453-476.
- Schwab, Stewart, "Is Statistical Discrimination Efficient?" *American Economic Review*, March 1986, 76(1), pp. 228-234.
- Discrimination--Empirical Evidence***
- \* Antonovics, Kate and Brian Knight. "A New Look at Racial Profiling: Evidence from the Boston Police Department." *Review of Economics and Statistics*, February 2009, 91(1), pp 163-177.
- \* Bertrand, Marianne and Sendhil Mullainathan. "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment in Labor Market Discrimination," *American Economic Review*, September 2004, 94(4), pp. 991-1013.
- \* Black, Sandra E. and Philip E. Strahan, "The Division of Spoils: Rent-Sharing and Discrimination in a Regulated Industry." *American Economic Review*, September 2001, 814-831.
- Hamermesh, Daniel and Jeff Biddle. "Beauty and the Labor Market," *American Economic Review*, December 1994.
- Hellerstein, Judith K. and David Neumark. "Wages, Productivity, and Worker Characteristics: Evidence from Plant- Level Production Functions and Wage Equations." *International Economic Review*, February 1999, 40(1), pp. 95-123.
- Hernández-Murillo, Rubén and John Knowles. "Racial Profiling or Racist Policing? Bounds Tests in Aggregate Data," *International Economic Review*, August 2004, 45(3). pp. 959-89.
- Knowles, John and Persico, Nicola. "Racial Bias in Motor Vehicle Searches: Theory and Evidence." *Journal of Political Economy*, 2001, 109(1), pp. 203-229.

Oettinger, Gerald. "Statistical Discrimination and the Early Career Evolution of the Black- White Wage Gap," *Journal of Labor Economics*, January 1996, 14(1), pp. 52-78.

\* Persico, Nicola. "Racial Profiling? Detecting Bias Using Statistical Evidence" Annual Review of Economics, September 2009, 1, pp. 229-254, <http://nicolapersico.com/files/ARoEPersico27.pdf>

## **II. Wage and Employment Dynamics**

\* Neal, Derek and Sherwin Rosen. "Theories of the Distribution of Earnings." In *Handbook of Income Distribution*, 2000.

### **Human Capital Models**

Ben-Porath, Yoram. "The Production of Human Capital and the Life Cycle of Earnings." *Journal of Political Economy*, August 1967, 75(4), Part I, pp. 352-365.

### **Models of Learning and Sorting**

Farber, H., and R. Gibbons. "Learning and Wage Dynamics." *Quarterly Journal of Economics*, November 1996, 111(4), pp. 1007-1047.

Gibbons, Robert and Michael Waldman. "A Theory of Wage and Promotion Dynamics Inside Firms." *Quarterly Journal of Economics*, November 1999, 114 (4), pp. 1321-58.

MacDonald, Glenn M. "A Market Equilibrium Theory of Job Assignment and Sequential Accumulation of Information," *American Economic Review*, December 1982, 72(5), pp. 1038-1055.

### **Matching Models**

\* Jovanovic, Boyan. "Job Matching and the Theory of Turnover." *Journal of Political Economy*, October 1979, 87(5), pp. 972-990.

\* Jovanovic, Boyan. "Firm Specific Capital and Turnover." *Journal of Political Economy*, December 1979, 87(6), pp. 1246-1260.

Gittins, J.C. "Multi-Armed Bandit Allocation Indices." John Wiley and Sons (1989).

Miller, Robert. "Job Matching and Occupational Choice." *Journal of Political Economy*, December 1984, 92(6), pp. 1086-1120.

\* Sargent, Thomas J. Dynamic Macroeconomic Theory. Cambridge, MA: Harvard University Press, 1987, pp. 71-83.

### **Insurance, Agency & Tournaments**

\* Harris, Milton and Bengt Holmstrom. "A Theory of Wage Dynamics." *Review of Economic Studies*, July 1982, 49, pp. 315-33 [JS]

Johnson, William. "A Theory of Job Shopping." *Quarterly Journal of Economics*, May 1978, 92(2), pp. 261-77.

Lazear, E and S. Rosen, "Rank-Order Tournaments as Optimum Labor Contracts." *Journal of Political Economy*, October 1981, 89(5), pp. 841-864. [JS]

Murphy, Kevin “Incentives, Learning and Compensation: A Theoretical and Empirical Investigation of Managerial Labor Contracts.,” *Rand Journal of Economics*, Spring 1986, 17(1), pp. 59-76. [JS]

Prendergrast, Canice. “The Provision of Incentives in Firms,” *Journal of Economic Literature*, March 1999, 37(1), pp. 7-63.

### ***Empirical Work on Wage & Employment Dynamics***

Abraham, K. and H. Farber. “Job Duration, Seniority, and Earnings,” *American Economic Review*, June 1987, 77(3), pp. 278-297.

\* Altonji, J. and Pierret, C. “Employer Learning and Statistical Discrimination”, *Quarterly Journal of Economics*, February 2001, 116(1), pp. 313-350.

Baker, George, Michael Gibbs and Bengt Holmstrom. “The Internal Economics of the Firm.” *Quarterly Journal of Economics*, November 1994, 109(4), pp. 881-919.

Baker, George, Michael Gibbs and Bengt Holmstrom. “The Wage Policy of a Firm.” *Quarterly Journal of Economics*, November 1994, 109(4), pp. 921-55.

Nagypal, Eva, “Learning-by-Doing Versus Learning About Match Quality: Can We Tell Them Apart?” Northwestern University, *mimeo*.

Neal, Derek. “Industry-Specific Human Capital: Evidence from Displaced Workers.” *Journal of Labor Economics*, October 1995, 13(4), pp. 653-677.

\* Topel, Robert. “Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority.” *Journal of Political Economy*, February 1991, 99(1), pp. 145-176.

## **III. The Supply Side of the Labor Market**

### **III.1) The Quantity of Labor Supplied**

\* Blundell, Richard and Thomas MaCurdy (1999) “Labor Supply: A Review of Alternative Approaches”, in *Handbook of Labor Economics*, Volume 3A, eds O. Ashenfelter and D. Card, Amsterdam: Elsevier Science.

Killingsworth, Mark (1983), *Labor Supply*, (Cambridge: Cambridge University Press) Chapters 1 and 2.

\* Ben-Porath, Yoram (1973), "Labor Force Participation Rates and the Supply of Labor", *Journal of Political Economy* (May/June).

#### i) Static Labor Supply -- Theory and Estimation

\* Heckman, James (1974), "Shadow Prices, Market Wages and Labor Supply", *Econometrica* (July).

\* Heckman, James (1979), “Sample Selection Bias as a Specification Error With an Application to the Estimation of Labor Supply Functions”, in James Smith (Ed.) *Female Labor Supply*, (Princeton: Princeton University Press).



Moffitt, Robert (1984), "The Estimation of a Joint Wage-Hours Labor Supply Model", *Journal of Labor Economics*, (October).

Mroz, Thomas (1987), "The Sensitivity of an Empirical Model of Married Women's Hours of Work to Economic and Statistical Assumptions", *Econometrica*, (July).

#### ii) Dynamic Labor Supply -- Theory and Basic Estimation

Altonji, Joseph (1986), "Intertemporal Substitution in Labor Supply: Evidence from Micro Data", *Journal of Political Economy*, (June), Supplement.

Camerer C, Babcock L, Loewenstein G, et al., (1997), "Labor supply of New York City cabdrivers: One day at a time," *Quarterly Journal of Economics*, 112 (2): 407-441 May.

Carrington, William J., (1996) "The Alaskan Labor Market during the Pipeline Era," *The Journal of Political Economy*, Vol. 104, No. 1. (Feb.), pp. 186-218.

\* Heckman, James (1974), "Life Cycle Consumption and Labor Supply: An Explanation of the Relationship between Income and Consumption Over the Life Cycle", *American Economic Review* (March).

Heckman, James and Thomas MaCurdy (1980), "A Life Cycle Model of Female Labor Supply", *Review of Economic Studies*, (January).

Lucas. Robert E. and Leonard Rapping (1969), "Real Wages, Employment, and Inflation", *Journal of Political Economy*, (October).

\* MaCurdy, Thomas (1981), "An Empirical Model of Labor Supply in a Life Cycle Setting", *Journal of Political Economy* (December).

\* Oettinger, Gerald S (1999), "An empirical analysis of the daily labor supply of stadium vendors," *Journal of Political Economy* 107 (2): 360-392 April.

Connolly, Maria (2008), "Here Comes the Rain Again: Weather and the Intertemporal Substitution of Leisure," *Journal of Labor Economics*, 26 (1), January 73-100.

#### iii) Using Non-linear Budget Constraints Induced by Taxes and Subsidies to

##### Estimate Labor Supply Responses

\*Richard Blundell, Alan Duncan, and Costas Meghir (1998), "Estimating Labor Supply Responses Using Tax Reforms," *Econometrica*, July, 827-61.

\* Imbens, Guido W., Donald B. Rubin and Bruce I. Sacerdote (2001), "Estimating The Effect Of Unearned Income On Labor Earnings, Savings, And Consumption: Evidence From A Survey Of Lottery Players," *American Economic Review*, 2001, v91(4,Sep), 778-794.

Ziliak, James and Thomas Kneisner (1999), "Estimating Life Cycle Labor Supply Tax Effects," *Journal of Political Economy*, April, 326-59.

Eissa, Nada and Jeffrey Liebman (1996), "Labor supply response to the earned income tax credit" *Quarterly Journal of Economic*, May (111:2).

Moffitt, Robert (1986), "The Econometrics of Piecewise-Linear Budget Constraints," *Journal of Business and Economic Statistics*, 4:3, 317-328.

iv) Pensions and Retirement

Coile, Courtney and Jonathan Gruber (2000), "Social Security and Retirement," NBER Working Paper No. 7830, August.

Samwick, Andrew (1998) "New Evidence on Pensions, Social Security, and the Timing of Retirement," *Journal of Public Economics*, November 1998, 207-36.

Gruber, Jonathan and Peter Orszag (2000), "Does the Social Security Earnings Test Affect Labor Supply and Benefits Receipt?" NBER Working Paper No. 7923, September.

v) Health Insurance and Labor Supply

Madrian, Brigitte (1994), "Employment-Based Health Insurance and Job Mobility: Is There Evidence of Job Lock?" *Quarterly Journal of Economics*, February, 27-54.

Gruber, Jonathan and Madrian, Brigitte C (1997) "Employment separation and health insurance coverage", *Journal of Public Economics*; December.

I will distribute notes on these topics to supplement what you may have studied in public economics. We may discuss briefly in class, but this will not be on the final.

**III.2) The Quality of Labor Supplied: Human Capital**  
**a) The Economics of Education**

**i) Human Capital Theory**

Becker, Gary (1975), **Human Capital**, 2nd edition, Chicago: University of Chicago Press.

\* Ben-Porath, Y, "The Production of Human Capital and the Life Cycle of Earnings," *Journal of Political Economy*, August 1967, pp. 352-65.

**ii) Econometric Techniques For Estimating The Returns To Education**

**a) Standard Approach**

**b) Heckman Selectivity Correction**

Mincer, Jacob (1974), *Schooling, Experience and Earnings*, New York: Columbia University Press for NBER.

\* Griliches, Zvi (1977), "Estimating the Returns to Schooling: Some Econometric Problems", *Econometrica*, **45**, Jan. pp. 1-22.

\* Heckman, James (1979), "Sample Selection Bias as a Specification Error", *Econometrica*, **47**, pp. 153-161.

\* Willis, R.J. and S. Rosen (1979), "Education and Self-Selection", *Journal of Political Economy*, **87**, (Supplement, October), pp. S7-S36.

**c) IV Methods**

\* Angrist, Joshua D. and Alan B. Krueger (1991), "Does Compulsory School Attendance Affect Schooling and Earnings?", *Quarterly Journal of Economics*, **56**, #4, pp. 979-1014.

Angrist, Joshua D. and Alan B. Krueger (1991), "The Effect of Age at School Entry on Educational Attainment: An Application of Instrumental Variables with Moments from Two Samples", *Journal of the American Statistical Association*, **87**, #418, June, pp. 328-336.

Angrist, Joshua D. and Alan B. Krueger (1994), "Why do World War II Veterans Earn More than Nonveterans?", *Journal of Labor Economics*, **12**, #1, Jan., pp. 74-97.

\* Ashenfelter, Orley and Alan Krueger (1994), "Estimates of the Economic Return to Schooling from a New Sample of Twins", *American Economic Review*, December.

\* Bound, John, David A. Jaeger and Regina M. Baker (1995), "The Cure Can be Worse than the Disease: A Cautionary Tale Regarding Instrumental Variables", *Journal of the American Statistical Association*, June.

Card, David (1999), "The Causal Effect of Education on Earnings", in Orley Ashenfelter and David Card (eds.), *Handbook of Labor Economics Volume 3A*.

Card, David (1993), "Using Geographic Variation in College Proximity to Estimate the Return to Schooling", NBER Working Paper 4483. Published in 1995 in *Aspects of Labour Market Behaviour: Essays in Honour of John Vanderkamp*, Louis Christofides et al. (eds.), Toronto: University of Toronto Press.

Kane, Thomas J. and Cecilia E. Rouse (1995), "Labor Market Returns to Two- and Four-Year College", *American Economic Review*, June.

Staiger, Douglas and James H. Stock (1997), "Instrumental variables regression with weak instruments", *Econometrica* v65, n3 (May 1997).

Harmon, Colm and Ian Walker (1995), "Estimates of the Economic Return to Schooling for the United Kingdom", *American Economic Review*:1278-1286.

#### d) Fixed Effect Methods

Altonji, Joseph and Thomas Dunn, (1996), "The Effects of Family Characteristics on the Return to Education", *Review of Economics and Statistics*, (November).

Angrist, Joshua and Whitney Newey (1991), "Over-identification Tests in Earnings Functions with Fixed Effects", *Journal of Business and Economic Statistics* (July).

Ashenfelter, Orley and David Zimmerman (1997), "Estimates of the Returns to Schooling from Sibling Data: Fathers, Sons and Brothers", *Review of Economics & Statistics* v79, n1 (Feb.).

\* Ashenfelter, Orley and Alan Krueger (1994), "Estimates of the Economic Return to Schooling from a New Sample of Twins", *American Economic Review* (December). (Note: This paper uses both instrumental variables and fixed effects.)

\* Light, Audrey (1995), "The Effects of Interrupted Schooling on Wages", *Journal of Human Resources* (Summer).

#### iii) Human Capital Versus Signaling

##### a) A Review of the Signaling Model

\* Spence, Michael (1973), "Job Market Signalling", *Quarterly Journal of Economics*.

Stiglitz, Joseph (1975), "The Theory of Screening, Education, and the Distribution of Income", *American Economic Review*.

##### b) Empirical Evidence

Altonji, Joseph (1995), "The Effects of High School Curriculum on Education and Labor Market Outcomes", *Journal of Human Resources*, (Summer).

Altonji, Joseph and Charles R. Pierret (2001), "Employer learning and statistical discrimination", *Quarterly Journal of Economics*, Feb. 116:1 313-350.

\* Bedard, Kelly (2001), "Human capital versus signaling models: University access and high school dropouts", *Journal of Political Economy*, Aug., (109:4), 749-775.

Farber, Henry S. and Robert Gibbons (1995), "Learning and Wage Dynamics", *Quarterly Journal of Economics* (November).

Gibbons, Robert and Lawrence F. Katz (1991), "Layoffs and Lemons", *Journal of Labor Economics*, **9**, #4, pp. 351-380.

\* Lang, Kevin and David Kropp (1986), "Human Capital versus Sorting: The Effects of Compulsory Attendance Laws", *Quarterly Journal of Economics*, **101**, #3, pp. 609-624.

Rose, Heather and Julian R. Betts (2004), "The Effect of High School Courses on Earnings", *Review of Economics and Statistics*, May (**86**:2), pp. 497-513.

Weiss, Andrew (1988), "High School Graduation, Performance, and Wages", *Journal of Political Economy* (**96**:4).

#### iv) The Social Returns to Education and Education Externalities

Currie, J. and Moretti, E. "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings." *Quarterly Journal Of Economics*, 2003, 118(4), pp. 1495-532.

Lochner, L. and Moretti, E. "The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports." *American Economic Review*, 2004, 94(1), pp. 155-89.

Milligan, K.; Moretti, E. and Oreopoulos, P. "Does Education Improve Citizenship? Evidence from the United States and the United Kingdom." *Journal Of Public Economics*, 2004, 88(9-10), pp. 1667-95.

\* Moretti, Enrico, (2003) "Human Capital Externalities in Cities", available at <http://www.econ.berkeley.edu/~moretti/papers.html>.

Moretti, E. "Estimating the Social Return to Higher Education: Evidence from Longitudinal and Repeated Cross-Sectional Data." *Journal Of Econometrics*, 2004a, 121(1-2), pp. 175-212.

\_\_\_\_\_. "Workers' Education, Spillovers, and Productivity: Evidence from Plant-Level Production Functions." *American Economic Review*, 2004b, 94(3), pp. 656-90.

Rauch, J. E. "Productivity Gains from Geographic Concentration of Human-Capital - Evidence from the Cities." *Journal of Urban Economics*, 1993, 34(3), pp. 380-400.

#### v) The Determinants Of School Quality

##### a) Literature Review on School Inputs and Student Outcomes

###### *Basic Literature Review*

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