

PhD

Macroeconomics of Economic Growth

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DM 317

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Objectives

In this course we study some important models and ideas in the field of economic growth. The central focus of the course is to consider answers to the question: Why are some countries so much richer than others? Our approach takes in both theoretical and empirical evidence. Where appropriate, we will readily divert ourselves into some microeconomic research.

Meeting Times and Locations

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Grading

1. Homework assignments account for 20% of the grade. You may work in groups and hand in a collective assignment.
2. There will be two short essay requirements. You will be required to select two papers on growth during the semester, and for each of them you will write a "referee report". Each essay should be around 1,500 words. We will talk in class about the expected format and content of these essays. The first of these is due no later than October 30. The second is due no later than November 30. Each essay counts for 20% of the grade.
3. You will be required to present one of these referee reports to the class. We will talk in class about what I want you to focus on in these presentations. The presentation accounts for 10% of the grade.
4. The final exam, which will be held during exam week at the time assigned by the university, will account for 30% of the grade.

Readings

The following material lists the topics that will be covered along with the required readings. I will be discussing many other papers as we go along, some of them in quite some detail. The

supplementary reading lists only cite papers that I expect to mention in class. They are not intended as an extended reading list. For extended readings on many growth-related topics consult Jon Temple's site, [Economic Growth Resources](#)

1. The Macroeconomic Facts

It is, of course, helpful to know what are the main facts to be explained. We begin by briefly surveying some of the main features of the macro-economic data that we would like to explain.

Parente, Stephen, and Ed Prescott (1993): "Changes in the wealth of nations." *Federal Reserve Bank of Minneapolis Quarterly Review*, Spring.

Sala-i-Martin, Xavier (1996): "The Classical Approach to Convergence Analysis." *Economic Journal*, **106**:1019-1036.

Supplementary readings

Acemoglu, Daron, Simon Johnson, and James Robinson (2002): "Reversal of fortune: Geography and institutions in the making of the modern world income distribution." *Quarterly Journal of Economics*, 117(4):1231-1294.

Baumol, William J. (1986): "Productivity growth, convergence, and welfare: what the long-run data show." *American Economic Review*, 76(5):1072-1085.

Baumol, William J., Edward N. Wolff (1988): "Productivity growth, convergence, and welfare: reply." *American Economic Review*, 78:1155-1159.

Ben-David, Dan (1993): "Equalizing exchange: trade liberalization and convergence." *Quarterly Journal of Economics*, 108(3):653-79.

Ben-David, Dan, and David Papell (1995): "The great wars, the great crash, and the unit root hypothesis." *Journal of Monetary Economics*, 435-475.

De Long, Bradford (1988): "Productivity growth, convergence and welfare: comment." *American Economic Review*, 78:1138-1154.

Jones, Charles I. (1995): "Time Series Tests of Endogenous Growth Models." *Quarterly Journal of Economics*, 110:495-525.

Jones, Charles I. (2001): "Was an industrial revolution inevitable?" *Advances in Macroeconomics*, 1(2):Article 1.

Jones, Charles I. (2000): "A note on the closed-form solution of the Solow model." Unpublished, Stanford University.

Kremer, Michael (1993): "Population growth and technological change: One million BC to 1990." *Quarterly Journal of Economics*, 108(3):681-716.

Lucas, Robert E. (1993): "Making a miracle." *Econometrica*, 61(2):251-272.

Maddison, Angus (1994): "Explaining the economic performance of nations 1820-1989." In W.J. Baumol et al. (eds.), *Convergence and Productivity*. Oxford: Oxford University Press, pp. 20-61.

- Pritchett, Lant (1997): "Divergence, big time." *Journal of Economic Perspectives*, 11(3):3-17.
- Quah, Danny (1996): "Empirics for economic growth and convergence." *European Economic Review*, 40:1353-1375.
- Solow, Robert M. (1956): "A Contribution to the Theory of Economic Growth." *Quarterly Journal of Economics*, 70:65-94.

N.B. The data set you need for the first assignment is available from the following sites:

Heston, Alan , Robert Summers and Bettina Aten (2002): Penn World Table Version 6.1, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002. (i) Official Site, (ii) Alternative format with additional options for data extraction.

2. Proximate Sources of Income Differences

A. *Lots of measurement, little theory. There is an enormous empirical literature regressing just about every available data set on growth rates (or income levels).*

Levine, Ross and David Renelt (1992): "A sensitivity analysis of cross-country growth regressions." *American Economic Review*, **82**(4):942-963.

Sala-i-Martin, Xavier (1997): "I just ran two million regressions." *American Economic Review*, **87**(2):178-183.

Durlauf, Steven N. (2001): "Manifesto for a growth econometrics." *Journal of Econometrics*, **100**(1):65-69.

B. *More theory, a little less measurement. A second approach is to reduce the scope of the empirical inquiry, providing more structure with the aid of theoretical models.*

Lucas, Robert E. (1990): "Why doesn't capital flow from rich to poor countries?" *American Economic Review, Papers and Proceedings*, **80**(2): 92-96.

Mankiw, N. Gregory, David Romer and David N. Weil (1992): "A contribution to the empirics of economic growth." *Quarterly Journal of Economics*, **107**(2):407-437.

Supplementary readings

A. *Lots of measurement, little theory.*

Bhargava, Alok (2001): "Modeling the effects of health on economic growth." *Journal of Health Economics*, 20(3):423-440.

Durlauf, Steven N. (2001): "Manifesto for a growth econometrics." *Journal of Econometrics*, 100(1):65-69.

Fernandez, C., Ley, Eduardo and Steel, Mark F. J. (2001): Model uncertainty in cross-country growth regressions. *Journal of Applied Econometrics*, 16(5):563-576.

Hoeting, Jennifer A., et al. (1999): "Bayesian model averaging: a tutorial." *Statistical Science*, 14(4):382-417.

Levine, Ross and David Renelt (1992): "A sensitivity analysis of cross-country growth

regressions." *American Economic Review*, 82(4):942-963.

Sala-i-Martin, Xavier (1997): "I just ran two million regressions." *American Economic Review*, 87(2):178-183.

Sala-i-Martin, Xavier, Doppelhofer, Gernot and Miller, Ronald (2004): "Determinants of long-run growth: a Bayesian averaging of classical estimates (BACE) approach." *American Economic Review*, 94(4):813-835. Link to NBER working paper version.

Tsangarides, Charalambos G. (2004): "A Bayesian approach to model uncertainty." IMF working paper.

B. *More theory, a little less measurement.*

Dinopoulos, Elias, and Peter Thompson (1999): "Reassessing the empirical validity of the human-capital augmented neoclassical growth model." *Journal of Evolutionary Economics*, 9:135-154.

Jones, Charles I., and Robert E. Hall (1999): "Why do some countries produce so much more output per worker than others?", *Quarterly Journal of Economics*, 114:83-116.

Kaldor, Nicholas (1961): "Capital accumulation and economic growth." In F. Lutz and D. Hague, *The Theory of Capital*. New York: St. Martins Press.

Phelps, Edmund (1961): "The Golden Rule of accumulation: A fable for growthmen." *American Economic Review*, 51(4):638-643.

Solow, Robert M. (1956): "A contribution to the theory of economic growth." *Quarterly Journal of Economics*, 70:65-94.

Solow, Robert (1957): "Technical change and the aggregate production function." *Review of Economics and Statistics*, 39:312-320.

Temple, Jonathan (2000): "Growth regressions and what the textbooks don't tell you." *Bulletin of Economic Research*, 52(3):181-205.

3. Optimal Control

We will have a rapid review of optimal control theory.

Thompson, Peter (2005): *Optimal Control*, Chapter 2 in *Lecture Notes on Dynamic Modeling*, FIU manuscript.

4. Differences in Aggregate Capital Levels

Variations on the neoclassical growth model are used to explain why some countries may differ in their levels of physical capital.

Jovanovic, Boyan, and Rafael Rob (1997): "Solow vs. Solow. Machine prices and development." NBER working paper 5871.

Cole, L., G. Mailath, and A. Postlethwaite (1992): "Social norms, saving behavior and

growth." *Journal of Political Economy*, **100**(6):1092-1125.

Supplementary readings

Acemoglu, Daron, and Jaume Ventura (2002): "The world distribution of income." *Quarterly Journal of Economics*, 117(2):659-694.

Chari, V.V., and Hugo Hopenhayn (1991): "Vintage human capital, growth, and the diffusion of new technology." *Journal of Political Economy*, 99(6):1142-1165.

V. V. Chari & Patrick J. Kehoe & Ellen R. McGrattan (1996): "The poverty of nations: a quantitative exploration." Staff Report 204, Federal Reserve Bank of Minneapolis.

Feldstein, Martin, and Charles Horioka (1980): "Domestic saving and international capital flows, *Economic Journal*, 90:314-329.

Jovanovic and Rob (1997): "Solow vs. Solow." NBER working paper no. 5871

Thompson, Peter (2003): "Technological change and the age-earnings profile: Evidence from the international merchant marine, 1861-1912." *Review of Economic Dynamics*, 6:578-601.

Wendell-Holmes, Oliver (1858): "The deacon's masterpiece or the wonderful "one-hoss shay": A logical story."

5. Capital is Allocated to the Wrong Uses

Capital may not be allocated to the most efficient firms, so even if two countries have the same aggregate level of capital they can differ in income.

Acemoglu, Daron, and Fabrizio Zilibotti (1997): "Was Prometheus unbound by chance? Risk, diversification, and growth." *Journal of Political Economy*, **105**:709-751.

Supplementary readings

Jayarathne, Jith and Philip E. Strahan (1990): "The finance-growth nexus: Evidence from Bank Branch Deregulation." *Quarterly Journal of Economics*, 111(3):639-670

Jovanovic, Boyan, and Jeremy Greenwood (1990): "Financial development, growth, and the distribution of income." *Journal of Political Economy*, 98(5):1076-1107

King, Robert G., and Ross Levine (1993): "Finance and growth: Schumpeter might be right." *Quarterly Journal of Economics*, 108(3):717-737.

Rajan, Raghuram G., and Luigi Zingales (1998): "Financial dependence and growth." *American Economic Review*, 88(3):559-586.

Bencivenga, Valerie, and Bruce Smith (1991): "Financial Intermediation and Endogenous Growth." *Review of Economic Studies*, 58:195-209.

6. Human Capital Differences

Differences in the accumulation of human capital may account for large differences in income, but assessing just how important education is turns out to be difficult.

Lucas, Robert E. (1988): "On the mechanics of economic development." *Journal of Monetary Economics*, **22**:3-42.

Bils, Mark and Peter J. Klenow (2000): "Does schooling cause growth?" *American Economic Review*, **90**(5):1160-1183.

Supplementary readings

7. R&D Based Models of Growth

R&D-driven growth models are the most explicit about the introduction of new technologies.

Grossman, Gene, and Elhanan Helpman (1991): *Innovation and Growth in the Global Economy*, Cambridge, MA: MIT Press, chapters 3 and 4.

Jones, Charles I. (1995): "Time Series Tests of Endogenous Growth Models." *Quarterly Journal of Economics*, 110:495-525.

Jones, Charles I. (1999): "Growth: With or Without Scale Effects?" *American Economic Review, Papers and Proceedings*, 89(2):139-144.

Supplementary readings

Aghion, Philippe and Peter Howitt (1992): "A model of growth through creative destruction." *Econometrica*, 60(2):323-351.

Dinopoulos, Elias (1994): "Schumpeterian Growth: An Overview." *Osaka City University Economic Journal*

Dinopoulos, Elias, and Peter Thompson (1998): "Schumpeterian growth without scale effects." *Journal of Economic Growth*, 3(4):313-336.

Dinopoulos, Elias, and Peter Thompson (1999): "Scale effects in Schumpeterian models of economic growth." *Journal of Evolutionary Economics*, 9:157-185.

Dixit, Avinash K., and Joseph E. Stiglitz (1977): Monopolistic competition and optimum product diversity, *American Economic Review*, 67(3):297-308.

Feenstra, Robert C., et al. (1999): "Testing endogenous growth in South Korea and Taiwan." *Journal of Development Economics*, 60(2):317-341.

Funke, Michael, and Ralf Ruhwedel (2001): "Product variety and economic growth: empirical evidence for the OECD countries." *IMF Staff Papers*, 48(2):225-242.

Hausman, Jerry (1994): "Valuation of new goods under perfect and imperfect competition." NBER Working paper no. 4970.

Howitt, Peter (1999): "Steady endogenous growth with population and R&D inputs growing." *Journal of Political Economy*, 107(4):715-730.

Hummels, David and Peter Klenow (2005): "The variety and quality of a nation's exports" *American Economic Review*, 95(3):704-723.

Judd, Kenneth L. (1985): "On the Performance of Patents." *Econometrica*, 53(3):567-586.

Krugman, Paul R. (1979): "Increasing returns, monopolistic competition, and international

trade," *Journal of International Economics* 9(2):469-479.

Laincz, Christopher and Pietro Peretto (2006): "Scale effects in endogenous growth theory: An error of aggregation, not specification." Working paper, Drexel University.

Peretto, Pietro (1998): "Technological Change and Population Growth." *Journal of Economic Growth*, 3(4):283-312.

Romer, Paul M. (1990): "Endogenous Technological Change." *Journal of Political Economy*, 98(5, pt. 2):S71-S102.

Ruffin, Roy (1994): "Endogenous Growth and International Trade." *Review of International Economics*, 2(1):27-39.

Schumpeter, Joseph A. (1942): "Creative Destruction." Chapter 8 of *Capitalism, Socialism and Democracy*. New York: Harper and Brothers.

Segerstrom, Paul S. (1998): "Endogenous Growth Without Scale Effects." *American Economic Review*, 88:1290-1310.

Segerstrom, Paul S., T.C.A. Anant and Elias Dinopoulos (1990): "A Schumpeterian Model of the Product Life Cycle." *American Economic Review*, 80:1077-1091.

Thompson, Peter (2001): "The microeconomics of an R&D-based model of endogenous growth." *Journal of Economic Growth*, 6(4):263-283, December 2001.

Thompson, Peter, and Doug Waldo (1994): "Growth and Trustified Capitalism." *Journal of Monetary Economics*, 34:445-462.

Young, Alwyn (1998): "Growth Without Scale Effects." *Journal of Political Economy*, 106:41-63.

8. Learning By Doing

The third major engine of technical change is learning by doing. There are, unfortunately, serious difficulties in measuring its importance.

Lucas, Robert E. (1993): "Making a miracle." *Econometrica*, 61(2):251-272.

Thompson, Peter (2001): "How much did the Liberty shipbuilders learn?" *Journal of Political Economy*, 109(1):103-137.

9. International Technology Diffusion

Previous models assume that capital or technology do not freely flow from one country to another. What is the evidence for this assumption, and what might be the explanation?

Jaffe, Adam B., Manuel Trajtenberg, Rebecca Henderson (1993): "Geographic localization of knowledge spillovers as evidenced by patent citations." *Quarterly Journal of Economics* 108(3):577-598.

Thompson, Peter, and Melanie Fox Kean (2005): "Patent citations and the geography of knowledge spillovers: A reassessment." *American Economic Review*, 95(1): 450-460,

Supplementary readings

- Parente, Stephen L., and Edward C. Prescott (1994): "Barriers to technology adoption and development." *Journal of Political Economy*, 102(2):298-321.
- Krugman, Paul (1979): "A model of innovation, technology transfer, and the world distribution of income," *Journal of Political Economy*, 87(2):253-266.
- Agrawal, Ajay, Iain M. Cockburn, and John McHale (2003): "Gone but not forgotten: labor flows, knowledge spillovers, and enduring social capital." NBER working paper 9950.
- Agrawal, Ajay., Devesh Kapur, and John McHale (2004): "Defying distance: examining the influence of the diaspora on scientific knowledge flows." University of Toronto: Working paper.
- Almeida, Paul. (1996): "Knowledge sourcing by foreign multinationals: patent citation analysis in the US semiconductor industry." *Strategic Management Journal*, 17(Winter Special Issue):101-23.
- Jaffe, Adam B., Manuel Trajtenberg,, and Michael S. Fogarty (2002): "The meaning of patent citations: report on the NBER/Case Western Reserve survey of patentees." In A.B. Jaffe and M. Trajtenberg, *Patents, Citations, and Innovations: A Window on the Knowledge Economy*. Cambridge: MIT Press, pp. 379-401.
- Kerr, William (2006): "Ethnic Scientific Communities and International Technology Diffusion," Working paper, Harvard.
- Thompson, Peter (2006): Patent Citations and the Geography of Knowledge Spillovers: Evidence from Inventor- and Examiner-Added Citations, *Review of Economics and Statistics*, 88(2):383-389.