

14.452: Introduction to Economic Growth

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This half semester class will present an introduction to macroeconomic modeling, focusing on the theory of economic growth and some of its applications. It will introduce a number of models of nonstochastic and stochastic macroeconomic equilibrium. It will use these models to shed light both on the process of economic growth at the world level and on sources of income and growth differences across countries.

The course has a number of objectives: the first is to familiarize you with a set of issues and questions that are central to macroeconomics, and that are also (hopefully) exciting and important; the second is to develop some of the most important tools of dynamic economics useful in macroeconomics as well as in a number of other subdisciplines of economics including general equilibrium theory, political economy, industrial organization and contract theory; and final objective to provide you with a number of workhorse models useful in multiple areas of macroeconomics.

The main textbook is *Introduction to Modern Economic Growth*, Princeton University Press, 2009.

There will be four problem sets, and only one or two questions within each problem set will be due for grading. The problem sets will have a 30% weight in the final grade, with the remaining 70% coming from the final exam.

Course details:

My e-mail: daron@MIT.edu.

Lectures: TuTh 1-2:30, E51-151 (plus a make up class on Friday, November 7).

Recitation: F 2:30-4pm, E51-151.

Teaching Assistant: Ernest Liu (liuer@mit.edu)

Syllabus

Lecture 1 (first half): Stylized Facts and Proximate and Fundamental Causes of Economic Development

This half lecture will give a brief overview of the stylized facts of economic growth and show the large disparities in income per capita across countries. It will also discuss briefly

how the world distribution of income across countries has come to be so unequal.

1. *Introduction to Modern Economic Growth*, Chapter 1.
2. Helpman, Elhanan (2005) *Mystery of Economic Growth*, Harvard University Press, Cambridge MA
3. Quah, Danny (1997), “Empirics for Growth and Distribution: Stratification, Polarization and Convergence Clubs,” *Journal of Economic Growth* vol. 2, pp. 27-60.
4. Jones, Charles (1997), “On The Evolution of the World Income Distribution,” *Journal of Economic Perspectives* vol. 11, pp. 19-36.
5. 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*, November 2002, volume 117.

Lectures 1 (first half), 2 and 3: Introduction to the Solow Growth Model

The Solow growth model is a workhorse for many macro applications, and it is the starting place for the modern theory of economic growth. Here we begin with the basics of this model, which will already be familiar to many of you.

1. *Introduction to Modern Economic Growth*, Chapter 2.
2. Solow, Robert, (1970), *Growth Theory: An Exposition*, Clarendon Press, Oxford, UK.

Lecture 4: The Solow Model and the Data; Growth Accounting, Levels Accounting and the Facts

This lecture uses the Solow growth model to interpret the stylized facts we encountered in the first lecture. In the process, we will also discuss a number of popular empirical strategies used in cross-country work and also the methodology of growth accounting.

1. *Introduction to Modern Economic Growth*, Chapters 3 and 4.
2. Mankiw, N. Gregory, David Romer, and David N. Weil (1992). “A Contribution to the Empirics of Economic Growth,” *Quarterly Journal of Economics* 107, #2, 407-37.
3. Barro Robert and Xavier Sala-i-Martin (1995) *Economic Growth*, Chapter 10.
4. Alwyn Young (1995). “The Tyranny of Numbers” *Quarterly Journal of Economics*, volume 110, #3, 641-680.

5. Hall, Robert and Charles I. Jones (1999). “Why Do Some Countries Produce So Much More Output per Worker Than Others?,” *Quarterly Journal of Economics*, 114, 1999, 83-116.
6. Klenow, Peter J. and Andres Rodriguez-Clare (1997). “The Neoclassical revival in Growth Economics: Has It Gone Too Far?,” *NBER Macroeconomics Annual*, 73-103.
7. Trefler, Daniel (1993). “International Factor Price Differences: Leontieff Was Right!,” *Journal of Political Economy* 101, #6 961-987.
8. Diamond, Jared M. (1997) *Guns, Germs and Steel: The Fate of Human Societies*, W.W. Norton & Co., New York NY.
9. Acemoglu, Daron, Simon Johnson and James A. Robinson (2001) “The Colonial Origins of Comparative Development: An Empirical Investigation,” *American Economic Review*, 91, pp. 1369-1401.

Lectures 5 and 6: Neoclassical Growth

The neoclassical growth model differs from the Solow growth model in incorporating consumer optimization. These collectors will first introduced the foundations of consumer optimization in dynamic economies and discuss the assumption of representative households. They will then study the equilibria and the Pareto optimal allocations in the workhorse neoclassical growth model. We will characterize both the steady state equilibrium and the dynamic equilibrium path of the economy starting from an arbitrary level of capital stock.

1. *Introduction to Modern Economic Growth*, Chapters 5 and 8.
2. Mas-Colell, Andreu, Michael D. Whinston and Jerry R. Green (1995) *Microeconomic Theory*, Oxford University Press, New York, Oxford, Chapters 4 and 16.

Lecture 7: Overlapping Generations and Dynamic Efficiency

The other workhorse model of dynamic macro is the overlapping generations model developed by Paul Samuelson and Peter Diamond. This lecture focus is on this model. As a preliminary step, called discuss the first than the second welfare theorems in dynamic economies, and then turned to the overlapping generations model. This will enable us to understand sources of and conditions for dynamic inefficiency in overlapping generations model. We will also discuss various applications of overlapping generations models.

1. *Introduction to Modern Economic Growth*, Chapters 5 and 9.
2. Bewley, Truman F. (2007) *General Equilibrium, Overlapping Generations Models, and Optimal Growth Theory*, Harvard University Press, Cambridge, Massachusetts.

3. Shell, Karl (1971) "Notes on the Economics of Infinity" *Journal of Political Economy*, 79, 1002-1011.
4. Diamond, Peter (1965) "National Debt in a Neoclassical Growth Model" *American Economic Review*, 55, 1126-1150.
5. Jones, Larry (1986) "Special Problems Arising in the Study of Economies with Infinitely Many Commodities" in *Models of Economic Dynamics* edited by Hugo Sonnenschein, Berlin, Springer-Verlag, 184-205.

Lecture 8: Neoclassical Endogenous Growth: Capital Accumulation, Externalities and Human Capital

This lecture will first present a model of sustained growth using a variant of the neoclassical growth model, then present the first example of a model with endogenous growth due to the knowledge-base or the technology stock of the society expanding over time, and finally discuss the reasons why modeling sustained economic growth with externalities is unsatisfactory and what special set of issues emerge in modeling technological change. The lecture will also briefly discuss the role of human capital in economic growth and introduce some basic models that are useful for thinking about human capital investments.

1. *Introduction to Modern Economic Growth*, Chapters 10, 11, and 12.
2. Rebelo, Sergio (1991) "Long-Run Policy Analysis and Long-Run Growth" *Journal of Political Economy*, 99, 500-521.
3. Jones, Larry and Rodolfo Manuelli (1990) "A Convex Model of Equilibrium Growth: Theory and Policy Indications" *Journal of Political Economy*, 98, 1008-1038.
4. Romer, Paul (1986) "Increasing Returns and Long-Run Growth" *Journal of Political Economy*, 94, 1002-1037.
5. Ben Porath, Yoram (1967). "The Production of Human Capital Over the Life Cycle," *Journal of Political Economy*, Vol. 75, No. 4-1, pp. 352-365.
6. Nelson, Richard and Edmund Phelps (1966) "Investment in Humans, Technological Diffusion and Economic Growth." *American Economic Association Papers and Proceedings*. 56, pp. 69-75.
7. Acemoglu, Daron (1996) "A Microfoundation For Social Increasing Returns in Human Capital Accumulation." *Quarterly Journal of Economics*, 111 (3), pp 779-804.
8. Lucas, Robert (1988), "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22, 3-42.

9. Acemoglu, Daron and Josh Angrist (2000) “How Large are Human Capital Externalities? Evidence from Compulsory Schooling Laws.” NBER Macroeconomics Annual 2000. MIT Press, Cambridge, pp. 9-59.

Lectures 9 and 10: Endogenous Growth with Expanding Input Varieties

These lectures will introduce the first models of endogenous technological change, where sustained economic growth takes place as a result of purposeful R&D-type activities. We will also briefly discuss some of the evidence on knowledge spillovers and externalities and the innovation process.

1. *Introduction to Modern Economic Growth*, Chapter 13.
2. Romer, Paul M. (1990). “Endogenous Technological Change,” *Journal of Political Economy* 98, S71-S102.
3. Jones, Charles I (1995) “R&D-based Models of Economic Growth” *Journal of Political Economy*, 103, 759-784.
4. Bloom, Nicholas, Mark Schankerman and John Van Reenen, J. (2013) “Identifying Technology Spillovers and Product Market Rivalry” *Econometrica*, 83, pp. 1347-1394.
5. Jaffe, Adam, Manuel Trajtenberg and Rebecca Henderson (1993) “Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations” *Quarterly Journal of Economics* 108, pp. 577-598.
6. Kerr, William (2008) “Ethnic Scientific Communities and International Technology Diffusion ” *The Review of Economics and Statistics* 90, pp. 518-537.
7. Griliches, Zvi (1957) “Hybrid Corn: An Exploration in the Economics of Technological Change” *Econometrica*, 25, pp. 501-522.
8. Griliches, Zvi (1992) “The Search for R&D Spillovers” *Scandinavian Journal of Economics*, 94, pp. 29-47.
9. Irwin, Douglas and Peter Klenow (1994) “Learning by Doing Spillovers in the Semiconductor Industry” *Journal of Political Economy*, 102, pp. 1200-1227.

Lecture 11: Interdependences: Technology Diffusion, Trade and the World Income Distribution in an Open Economy

The models discussed up to this point in the class are closed economy models. These are not good approximations to the world we live in, where international trade and exchange of ideas are important. This lecture will provide an overview of major interdependences

across countries that arise both because of technology diffusion and international trade. The emphasis will be on how these interdependences fundamentally affect the process of economic growth and the world distribution of income.

1. *Introduction to Modern Economic Growth*, Chapters 18 and 19.
2. Krugman, Paul (1979). “A Model of Innovation, Technology Transfer, and the World Distribution of Income,” *Journal of Political Economy* 87, 253-66.
3. Acemoglu, Daron and Jaume Ventura (2002) “The World Income Distribution” *Quarterly Journal of Economics*, 117, 659-694.
4. Ventura, Jaume (1997) “Growth and Interdependence” *Quarterly Journal of Economics*, 112, 57-84.
5. Grossman, Gene and Elhanan Helpman (1991) *Innovation and Growth in the Global Economy*, Cambridge, MA, MIT Press.

Lecture 12: Directed Technical Change: Endogenous Skill-Bias and Endogenous Labor-Augmenting Technological Change

This lecture will introduce models of directed technological change, where not only aggregate technological change, but the direction of technological change is endogenous. These models will enable us to discuss why and when technological change may be skill biased (favoring more educated workers), and why we may expect technological change to be labor augmenting.

1. *Introduction to Modern Economic Growth*, Chapter 15.
2. Acemoglu, Daron (2002) “Directed Technical Change” *Review of Economic Studies*, 69, 781-810.
3. Acemoglu, Daron (2003) “Labor- and Capital-Augmenting Technical Change” *Journal of European Economic Association*, 1, 1-37.
4. Acemoglu, Daron (2007) “Equilibrium Bias of Technology.” *Econometrica*, 75(5), pp. 1371-1410.

Lecture 13: Competition and Technological Change

This lecture will discuss the relationship between competition and technological change, and present some of the evidence related to this question.

1. *Introduction to Modern Economic Growth*, Chapter 14.

2. Aghion, Philippe and Peter Howitt (1992) “A Model of Growth Through Creative Destruction” *Econometrica*, 60, pp. 323-351.
3. Grossman, Gene and Elhanan Helpman (1991) “Quality Ladders in the Theory of Growth” *Review of Economic Studies*, 58, pp. 43-61.
4. Aghion, Philippe, Nick Bloom, Richard Blundell, Rachel Griffith and Peter Howitt (2005) “Competition and Innovation: An Inverted-U Relationship.” *Quarterly Journal of Economics*, 120, pp. 701-728.
5. Acemoglu, Daron and Ufuk Akcigit (2012) “Intellectual Property Rights Policy, Competition and Innovation.” *Journal of the European Economic Association*, 10(1), pp. 1-42.
6. Segal, Ilya, and Michael Whinston (2007) “Antitrust in Innovative Industries.” *American Economic Review* 97, pp. 1703-1730.
7. Aghion, Philippe, Christopher Harris, Peter Howitt and John Vickers (2001) “Competition, Imitation, and Growth with Step-by-Step Innovation.” *Review of Economic Studies*, 68, pp. 467-492.
8. Aghion, Philippe and Rachel Griffith (2007) *Competition and Growth: Reconciling Theory and Evidence*, MIT Press, Cambridge.
9. Boldrin, Michele and David K. Levine (2010) *Against Intellectual Property*, Cambridge University Press, Cambridge.