

Duke University
Department of Economics
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Econ 152/252: Economic Growth

The differences in living standards across countries are so large that they are difficult to believe. Ranking countries based on their GDP per capita in 2000, Luxembourg is first with \$47,020, followed by the United States with \$35,587. At number ten is Iceland with \$26,484. Mexico's GDP per capita is \$9,366, close to the world average of \$7,944. Toward the bottom of the list we find Benin with \$1,297, roughly 1/40th of Luxembourg's! Similarly, there are staggering differences for a given country over time. In 1870 the United States had GDP per capita of roughly \$4,000, which is *half* of today's world average! In this course we will study why such differences across countries and time exist. We will see that to explain the differences in the *levels* of income, we need to explain the differences in the *growth rates* of income.

There is a wide variety in growth experiences. Singapore, Taiwan and South Korea, for example, had growth rates in the 6.5-7.5% range over the 1960-2000 period. India grew at 2.5-3%, while Jamaica and Peru grew at about 1%. To appreciate these numbers, note that a growth rate of 7% produces a *doubling* of income per capita roughly every 10 years so that the average citizen of Taiwan experienced a doubling of income *four times* over the sample period. A growth rate of 1%, in contrast, doubles income about every 72 years, meaning that the average citizen of Jamaica did not experience a doubling of income within the sample period. Explaining what causes these differences in growth experiences is the main task of growth economics.

It is impossible to overstate the importance of this task. Following Nobel laureate Robert E. Lucas, we will look at figures like these as representing *possibilities* and ask: Is there some action the government of Jamaica could take that would lead Jamaica to grow like Taiwan? If so, what, exactly? If not, what about the nature of Jamaica that makes it so? As Lucas said, "The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else."

These questions have a long tradition in economics that can be traced back to the classical writers (Smith, Ricardo, Malthus, Marx) and that defines economics as a social science in its broadest sense. Drawing on this heritage, almost a century ago Joseph A. Schumpeter argued that the capitalist system is an engine of growth driven by technological change and that this is the outcome of market rivalry, that is, the continuous striving of firms to improve and defend their market position at the expense of other firms. The development of a unified, consistent framework capable of modeling this process has eluded the best efforts of generations of economists. It is, however, necessary if we are to understand

the broad and sweeping changes that industrial development and growth bring about and the sources from which they spring.

With modern growth theory such a framework has finally emerged. We will study the analytical foundations of this framework and use the most recent advances in modeling to shed light on old and new questions concerning development and growth. A crucial aspect of this exercise is the renewed appreciation of the role of institutions and good government that much of the current research suggests. Because of its emphasis on market imperfections, and the consequent need for institutional corrections, modern growth theory integrates the market and the government in a framework that allows us to think about real-world problems in a novel and more productive way.

A course that covers the topic outlined above faces the challenge of sifting through an enormous literature, most of it recent. Luckily, an undergraduate textbook that does the job very well has just been published:

David Weil, 2005, *Economic Growth*, Pearson Addison Wesley, Boston.

This textbook is the main reference for the course. Another text that is quite useful is:

Hendrik Van den Berg and Joshua J. Lewer, 2007, *International Trade and Economic Growth*, M.E.Sharpe, New York.

I provide below a reading list this is meant to (a) complement the bibliography in Weil with references to branches of the literature that are not emphasized much in the book and (b) to provide you with a list of original works that might help you in your research.

This reading list is divided in two parts. The first one covers older material and gives you an overview of the state of the art from the viewpoint of Barro and Sala-i-Martin (2004), *Economic Growth*, MIT University Press. (This is the leading graduate textbook but it is fairly accessible to strong undergraduate students. It integrates nicely with Weil in that it provides you with the analytical foundations, i.e., the "real thing", behind what Weil discusses mainly in verbal terms.) Their perspective is strongly biased in favor of the neoclassical model of capital accumulation and they represent very well the large group of economists who approach the study of economic growth in terms of conditional convergence regressions. On the other side, we find more theory-oriented people who believe that the neoclassical model fails in countless dimensions and subscribe to a Schumpeterian view of economic growth. A very good graduate textbook that covers a lot of recent results is Aghion and Howitt (1998), *Endogenous Growth Theory*, MIT University Press. These two books are a must have for any serious student of growth. Another excellent book is Grossman and Helpman (1991), *Innovation and Growth in the Global Economy*, MIT University Press – although much older, this book is a must read for those interested in the implica-

tions of modern growth theory for international economics. A more recent, very readable, and absolutely non technical, book that covers Schumpeterian ideas is W. Baumol (2002) *The Free-Market Innovation Machine*, Princeton University Press, Princeton. Finally, Elsevier just published the *Handbook of Economic Growth* (2005). This a fantastic new resource contains a collection of survey chapters that provide a thorough coverage of the current state of the art. This book is rapidly becoming the entry point into the field for all types of students and scholars.

It is worth to emphasize that this is not a “survey” course where we simply read and discuss the literature. This is a research course where we are interested in discussing questions – to which there might not be answers yet – and possible approaches to finding good answers. There is a term paper. This is a research paper – ideally something that is fit to be submitted to the Duke Journal of Economics after a lot of editorial work to polish the presentation. Short of this ideal, the paper should be original and something that displays your own thoughts about a particular problem (e.g., think of it as a mini dissertation). Anything less than this is not good and the grade will reflect it.

Course outline

(a * denotes advanced, optional readings)

1. Introduction to Long-Run Growth

- Weil , Chapter 1-2.
- Barro and Sala-i-Martin, Introduction.
- Baumol, Chapter 1

2. Neoclassical Growth: Factor Accumulation

- Weil, Chapter 3-6.
- Barro and Sala-i-Martin, Chapter 1-5.*
- Solow R. M., 1956, A contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, 70:65-94.
- Romer P., 1986, Increasing Returns and Long-Run Growth, *Journal of Political Economy*, 94:1002-1037.
- Lucas R. E., 1988, On the Mechanics of Economic Development, *Journal of Monetary Economics*, 22:3-42

3. Modern Growth: Technological Progress

- Weil, Chapter 7-11.
- Barro and Sala-i-Martin, Chapter 6-7.*

- Grossman and Helpman, Chapters 3-4.*
- Aghion and Howitt, 1998, Chapter 1-3.*
- Romer P., 1990, Endogenous Technological Change, *Journal of Political Economy*, 98:S71-S102.
- Aghion P. and P. Howitt, 1992, A Model of Growth through Creative Destruction, *Econometrica*, 60:323-351.

4. The Government

- Weil, Chapter 12
- Barro R. J., 1990, Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy*, 98:S103-S125.
- Rebelo S., 1991, Long Run Policy Analysis and Long Run Growth, *Journal of Political Economy*, 99:500-521

5. Conclusions and suggestions for research

- Weil, Chapter 17
- Lucas R. E., 2000, Some Macroeconomics for the 21st Century, *Journal of Economic Perspectives*, 14:159-168.

Additional reading list
Part I: Things seen from the neoclassical perspective

1. Introduction to Long-Run Growth

- Romer P., 1989, Capital Accumulation in the Theory of Long-Run Growth, in *Modern Business Cycle Theory*, edited by R. J. Barro, Harvard University Press, Cambridge.
- Grossman G. M. and Helpman E., 1991, *Innovation and Growth in the Global Economy*, MIT University Press, Cambridge. Chapter 1.
- Barro R. J. and X. Sala-i-Martin, 1995, *Economic Growth*, McGraw Hill, New York. Introduction.

2. Neoclassical Growth: Exogenous Saving

- Barro R. J. and X. Sala-i-Martin, 1995, Chapter 1.
- Phelps E., 1966, *Golden Rules of Economic Growth*, Norton, New York.
- Solow R. M., 1956, A contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, 70:65-94.
- Solow R. M., 1957, Technical Change and the Aggregate Production Function, *Review of Economic and Statistics*, 39:312-320.
- Swan T. W., 1956, Economic Growth and Capital Accumulation, *Economic Record*, 32:334-361.

3. Neoclassical Growth: Endogenous Saving

- Barro R. J. and X. Sala-i-Martin, Chapter 2.
- Cass D., 1965, Optimum Growth in an Aggregative Model of Capital Accumulation, *Review of Economic Studies*, 32:233-240.
- Koopmans T. C., 1965, On The Concept of Optimal Growth, in *The Econometric Approach to Development Planning*, North Holland, Amsterdam.
- Ramsey F. P., 1928, A mathematical Theory of Saving, *Economic Journal*, 38:543-559.
- Gali J., 1994, Monopolistic Competition, Endogenous Markups, and Growth, *European Economic Review*, 38:748-756.

4. Neoclassical Growth: Open Economy Considerations and Empirical Evidence

- Barro R. J. and X. Sala-i-Martin, Chapter 3

- Barro R. J., N. G. Mankiw and X. Sala-i-Martin, 1995, Capital Mobility in Neoclassical Models of Economic Growth, *American Economic Review*, 85: 103-115.
- Barro R. J. and X. Sala-i-Martin, 1991, Convergence Across States and Regions, *Brookings Papers on Economic Activity*, I.
- Barro R. J. and X. Sala-i-Martin, 1992, Convergence, *Journal of Political Economy*, 100:223-251.
- Mankiw N. G., D. Romer and D. N. Weil, 1992, A Contribution to the Empirics of Economic Growth, *Quarterly Journal of Economics*, 107:407-438.
- Benhabib J. and Gali J., 1995, On Growth and Indeterminacy: Some Theory and Evidence, *Carnegie-Rochester Series on Public Policy*.
- Quah D., 1993, Empirical Cross-Section Dynamics in Economic Growth, *European Economic Review*, 37:426-434.
- Durlauf S. and Johnson P., 1994, Multiple Regimes and Cross-Country Growth Behavior, NBER working paper.
- Sala-i-Martin X., Regional Cohesion: Evidence and Theories of Regional Growth and Convergence, *European Economic Review*, 40:1325-1352.
- Quah D., Empirics for Economic Growth and Convergence, *European Economics Review*, 40:1353-1376

5. Endogenous Growth: One-Sector Models

- Backus D., P. Kehoe and T. Kehoe, 1992, In Search of Scale Effects in Trade and Growth, *Journal of Economic Theory*, 57:377-409.
- Barro R. J. and X. Sala-i-Martin, Chapter 4.
- Barro R. J., 1990, Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy*, 98:S103-S125.
- Jones L. and Manuelli R., 1990, A Convex Model of Optimal Equilibrium Growth, *Journal of Political Economy*, 98:1008-1037.
- Rebelo S., 1991, Long Run Policy Analysis and Long Run Growth, *Journal of Political Economy*, 99:500-521.
- Romer P., 1986, Increasing Returns and Long-Run Growth, *Journal of Political Economy*, 94:1002-1037.

6. Endogenous Growth: Two-Sector Models and the Role of Human Capital

- Barro R. J. and X. Sala-i-Martin, Chapter 5.
- Lucas R. E., 1988, On the Mechanics of Economic Development, *Journal of Monetary Economics*, 22:3-42.

- Mulligan C. and X. Sala-i-Martin, 1993, Transitional Dynamics in Two-Sector Models of Endogenous Growth, *Quarterly Journal of Economics*, 108:739-763.
- Romer P., 1989, Human Capital and Growth: Theory and Evidence, NBER Working Paper N. 3137.
- Uzawa I., 1965, Optimum Technical Change in an Aggregative Model of Economic Growth, *International Economic Review*, 6:18-31.
- Goodfriend M. and McDermott J., 1995, Early Development, *American Economic Review*, 85:116-133.

7. Endogenous Growth: Technological Progress

- Aghion P. and P. Howitt, 1992, A Model of Growth through Creative Destruction, *Econometrica*, 60:323-351.
- Aghion P. and Howitt P., 1996, Research and Development in the Growth Process, *Journal of Economic Growth*, 1:49-74.
- Barro R. J. and X. Sala-i-Martin, 1995, *Economic Growth*, McGraw Hill, New York. Chapters 6 and 7.
- Grossman G. M. and Helpman E., Chapters 3 and 4.
- Romer P., 1990, Endogenous Technological Change, *Journal of Political Economy*, 98:S71-S102.
- Jones C., 1995, R&D-Based Models of Endogenous Growth, *Journal of Political Economy*, 103, 759-784.

Part II: Things from the Schumpeterian perspective

1. Some interesting evidence and other issues

- Adams J. and Jaffe A., 1996, Bounding the Effects of R&D: An Investigation Using Matched Establishment-Firm Data, *Rand Journal of Economics*, 27, 700-721.
- Cohen W. and Klepper S., 1996a, A Reprise of Size and R&D, *Economic Journal*, 106, 925-951.
- Cohen W. and Klepper S., 1996b, Firm Size and the Nature of Innovation within Industries: The Case of Process and Product R&D, *Review of Economics and Statistics*, 232-243.
- Malerba F., Orsenigo L. and Peretto P., 1997, Persistence of Innovative Activities, Sectoral Patterns of Innovation, and International Technological Specialization, *International Journal of Industrial Organization*, 15, 801-826.

- Nickell S., 1996, Competition and Corporate Performance, *Journal of Political Economy*, 104, 724-746.
- Jones C., 1999, Growth: With or without Scale Effects? *American Economic Review, AEA Papers and Proceedings*, 89, 139-144.
- Pagano P. and Schivardi F., 2000, Firm Size Distribution and Growth, manuscript Bank of Italy Research Department.
- Wu Y. and Zhang J., 2000, Endogenous Markups and the Effects of Income Taxation: Theory and Evidence from OECD Countries, *Journal of Public Economics*, 77:383-406.

2. Market structure and growth

- Dasgupta P. and J. Stiglitz, 1980, Industrial Structure and the Nature of Innovative Activity, *Economic Journal*, 90:297-293.
- Segerstrom P., 1991, Innovation, Imitation, and Economic Growth, *Journal of Political Economy*, 99:807-827.
- Smulders S. and van de Klundert T., 1995, Imperfect Competition, Concentration and Growth with Firm-Specific R&D, *European Economic Review*, 39:139-160.
- van de Klundert T. and Smulders S., 1997, Growth, Competition and Welfare, *Scandinavian Journal of Economics*, 99, 99-118.
- Peretto P., 1996, Sunk Costs, Market Structure and Growth, *International Economic Review*, 37, 895-923.
- Peretto P., 1998, Technological Change, Market Rivalry, and the Evolution of the Capitalist Engine of Growth, *Journal of Economic Growth*, 3, 53-80.
- Peretto P., 1999, Cost Reduction, Entry, and the Interdependence of Market Structure and Economic Growth, *Journal of Monetary Economics*, 43, 173-196.
- Peretto P. and Smulders S., 2002, Technological Distance, Growth and Scale Effects, *Economic Journal*, forthcoming.
- Thompson P., 2001, The Microeconomics of an R&D-Based Model of Endogenous Growth, *Journal of Economic Growth*, 6, 263-283.

3. Trade and growth

- Baldwin R. and Forslid R., 1998, Trade and Growth: Any Unfinished Business?, *European Economic Review*, 42, 695-703.
- Baldwin R. and Forslid R., 1999, Incremental Trade Policy and Endogenous Growth: A q -theory Approach, *Journal of Economic Dynamics and Control*, 23, 797-822.

- Baldwin R. and Forslid R., 2000, Trade Liberalization and Endogenous Growth: A q -theory Approach, *Journal of International Economics*, 50, 497-517.
- Peretto P., 2003, Endogenous Market Structure and the Growth and Welfare Effects of Integration, *Journal of International Economics*, 60, 177-202.
- Rivera-Batiz L. and Romer P., 1991a, Economic Integration and Endogenous Growth, *Quarterly Journal of Economics*, 106, 531-556.
- Rivera-Batiz L. and Romer P., 1991b, International Trade with Endogenous Technological Change, *European economic Review*, 35, 971-1004.
- Wacziarg R., 1997, Trade, Competition and Market Size, manuscript, Stanford University.

4. Unemployment and growth

- Aghion P. and Howitt P., 1994, Growth and Unemployment, *Review of Economic Studies*, 61, 477-494.
- Daveri F. and Tabellini G., 2000, Unemployment, Growth and Taxation in Industrial Countries, *Economic Policy*, 30, 49-88.
- McKinsey Global Institute, 1995, Employment Performance, Washington.
- McKinsey Global Institute, 1997, Removing Barriers to Growth and Employment in France and Germany, Washington.
- Nickell S., 1997, Unemployment and Labor Market Rigidities: Europe versus North America, *Journal of Economic Perspectives*, 11, 55-74.
- Nickell S. and Layard R., 1997, Labor Market Institutions and Economic Performance, The Labor Market Consequences of Technical and Structural Change Discussion Paper Series, Oxford University.
- OECD, 1994, *The OECD Jobs Study: Evidence and Explanations Part II*, Paris, OECD.
- Peretto P., 2001, Market Power, growth and Unemployment, manuscript, Duke University.

5. Population and growth

- Becker G. and Barro R., 1998, A Reformulation of the Economic Theory of Fertility, *Quarterly Journal of Economics*, 108: 1-25.
- Galor O. and Weil D., 2000, Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond, *American Economic Review*, 90, 806-828.

- Lucas R., 2002, The Industrial Revolution: Past and Future, Ch. 5 in: Lucas R., *Lectures on Economic Growth*, Cambridge, Harvard University Press.
- Peretto P., 1998, Technological Change and Population Growth, *Journal of Economic Growth*, 3: 283-311.
- Connolly M. and Peretto P., 2003, Industry and the Family: Two engines of Growth, *Journal of Economic Growth*, 8, 115-148.

6. Fiscal policy and growth

- Peretto P., 2003, Fiscal Policy and Long-Run Growth in R&D-Based Models with Endogenous Market Structure, *Journal of Economic Growth*, 8, 325-347.
- Turnovsky S., 2000, Fiscal Policy Elastic Labor Supply, and Endogenous Growth, *Journal of Monetary Economics*, 45: 185-210.
- Easterly W. and Rebelo S., 1993, Fiscal Policy and Economic Growth: An Empirical Investigation, *Journal of Monetary Economics*, 32: 417-458.
- Fischer S., 1993, The Role of Macroeconomic Factors in Growth, *Journal of Monetary Economics*, 32: 485-512.
- Barro R., 1990, Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy*, 98:S103-S125.
- Stokey N. and Rebelo S., 1995, Growth effects of Flat-Rate Taxes, *Journal of Political Economy*, 103:519-550
- Mendoza E., Milesi-Ferretti G., Asea P., 1997, On the Ineffectiveness of Tax Policy in Altering Long-Run Growth: Herberger's Superneutrality Conjecture, *Journal of Public Economics*, 66:99-126.