Technology and Economic Growth  
Course No. 90756 Section A / 88391 Section A  
Fall 2014

Class Location and Time:  M, W 1:30 -2:50 PM  SH 222

Professor:  
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Required Materials: Readings will be posted on Blackboard

Course Learning Objectives

The importance of economic growth is difficult to overstate. The more than tenfold increase in income in the United States over the last century is the result of economic growth. So is the fact that incomes in the United States and Western Europe are at least thirty times greater than incomes in much of Sub-Saharan Africa. Economic research has clearly identified technological innovation as the engine of long-run economic growth. This course seeks to provide students with analytical frameworks that will enable them to understand the economic growth process, the role that technological innovation plays in that process, and the way in which technologically dynamic industries have evolved over time.

The basic learning objectives for the students are 1) to acquire theoretical and empirical knowledge about the relationship between technology and economic growth in both modern and historic contexts and 2) to develop analytical skills and ability to conceptualize on their own issues related to the interactions between technology and economic growth in the real world. The progress towards meeting these objectives would be measured by various performance measures, such as the ability to apply the new knowledge and skills in interpreting problems posed in home assignments and exams, ability to do own independent study related to the course material and presenting the results orally in class.
Course Structure

The course will be divided into four parts.

**Part 1 – How do economies grow?**
The first part of the course will present an analytical framework that will prove useful for thinking about the sources of economic growth in the short run and in the long run. The intellectual basis of this framework is the economic model of growth for which MIT economist Robert Solow was awarded the Nobel Prize. Having developed this framework, we will apply it to understand why East Asian countries have grown so rapidly in recent decades. We will also investigate the slowdown of productivity growth in the industrialized world in the late 1970s and its revival in the 1990s.

**Part 2 – Barriers to riches: Why have so many poor countries failed to grow?**
While our basic growth model would suggest that poorer countries should be able to catch-up rapidly with rich ones, the fact is that large numbers of developing countries have grown more slowly than the rich countries, falling further behind the industrialized West over the course of the postwar decades. This section of the course explores some of the factors that have inhibited the growth process in these countries, including their own economic policy errors.

**Part 3 – Historical perspectives on technology and growth**
Sustained economic growth and steadily rising living standards is a relatively recent phenomenon (still limited to a relatively small fraction of the world population as we will have seen in the first two parts). In this section we will put technological progress and growth into a broad historical perspective. We will first inquire into the great divergence of civilizations and entertain some possible explanations, such as geographical and other factors. We will then study historical examples of successful industrializations in Britain, Japan and the United States as well as failures to industrialize in China and Russia.

**Part 4 – The engine of growth – ideas, entrepreneurs, and markets**
This section of the course focuses on the engine of long-run growth, technological innovation and its diffusion with a particular emphasis on the role of entrepreneurial factor and competitive markets. We will introduce some conceptual models of the innovation process but also discuss, at length, the policies and institutions that promote technological innovation and international leadership, especially the debate about the role of intellectual property rights and what determines the success of growth clusters such as Silicon Valley.

**Requirements and Grading:**

**Class participation – 10%:** Class discussions are an integral part of the course, and class participation will account for 10% of the total grade. Unexcused absences or persistent tardiness are grounds for reductions (50% or more) in this component of the grade. To receive full credit for this portion of the grade, students must consistently demonstrate through participation in class discussions that they have completed the required readings and thought through the issues in advance of the class.
Homework assignments – 20%: approximately six homework assignments will be handed out. Late answers will not be accepted for any reason. You are allowed to drop the homework with the lowest grade.

Midterm examination: There will be an in-class exam midway through the semester that will account for 30% of the total grade.

Final examination: There will be a final examination, worth 40% of the total grade, which will be given on the last day of classes.

“In the News” assignment for Master students
Master students will also be required to submit a brief two-page (600 words maximum) essay in which they are to find and discuss an example of an issue we covered in class in a published news article (on-line, newspaper, magazine). The essay will be graded based on the accuracy and thoughtfulness of the argument. More specifically, the essay should contain the following items:

1. Clearly identify the source (author, title, publication, date), including a link if possible.
2. What topic from class is relevant to this article?
3. Discuss, in your own words how the content of the article or news story relates to the topic from class. This will be the portion on which I will primarily base your grade. In this write-up, you should demonstrate that you understand the course topic listed in (2) well enough to find an example of it outside the classroom. You also need to tell me how the concept we discussed in class is relevant and important for the topic of this article.

The essay should be submitted electronically. There are two deadlines in the schedule for this assignment. If the assignment is submitted by the first deadline, you will receive 100% credit on the assignment. The second deadline corresponds to an “extension” with a 10 percent penalty. Since the second deadline already provides you with an extension, if you miss the second deadline, you will receive a grade of zero on this assignment, without exceptions.

The essay will be worth 25% of the total grade. Thus, the maximum total score for master students will add up to 125, and this will be divided by 1.25 to make it comparable with undergraduate students’ total score when determining the letter grade.
## Course Outline:

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<th>Topic</th>
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<td>Aug. 25</td>
<td>Course Overview / The astonishing facts of economic growth</td>
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<tr>
<td><strong>Part 1 – How do economies grow?</strong></td>
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<tr>
<td>Aug. 27</td>
<td>The basic Solow growth model: investment as an engine of growth</td>
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<td>Sept. 3</td>
<td>Putting technology into the growth model</td>
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<td>Sept. 8</td>
<td>Applying the model: can we explain the East Asian miracle?</td>
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<td>Sept. 10</td>
<td>Applying the model: can we explain the East Asian miracle? Part II</td>
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<td>Sept. 15</td>
<td>Convergence, divergence, and the evolution of the world income distribution</td>
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<td>Sept. 17</td>
<td>Putting natural resources into the model: growth, oil shocks and climate change</td>
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<td>Sept. 22</td>
<td>Applying the model: Technology, natural resources and American productivity slowdowns and accelerations</td>
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<td><strong>Part 2 – Why have so many poor countries failed to grow?</strong></td>
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<td>Sept. 24</td>
<td>Argentina: a tale of economic decline</td>
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<td>Sept. 29</td>
<td>The corrosive effects of bad macroeconomics</td>
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<td>Oct. 1</td>
<td>Free trade and protectionism</td>
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<td>Oct. 6</td>
<td>Free trade and protectionism. Part II</td>
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<td>Oct. 8</td>
<td>Financial crashes and currency collapses</td>
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<td>Oct. 13</td>
<td>Midterm examination (in class)</td>
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<td><strong>Part 3 – Historical perspectives on technology and growth</strong></td>
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<td>Oct. 15</td>
<td>Geography and divergent paths of civilizations</td>
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<td>Oct. 20</td>
<td>How the West grew rich: The Industrial Revolution</td>
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<td>Oct. 22</td>
<td>Lessons from early industrialization in Japan</td>
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<td>Oct. 27</td>
<td>What happened to China?</td>
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<td>Oct. 29</td>
<td>Russia: the high cost of totalitarianism</td>
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<td>Nov. 3</td>
<td>Human capital and American leadership</td>
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<td><strong>Part 4 – The engine of growth – ideas, entrepreneurs and markets</strong></td>
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<td>Nov. 5</td>
<td>Science, technology, and modern economic growth</td>
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<td>Nov. 10</td>
<td>How is technology generated? The economics of ideas</td>
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<td>Nov. 12</td>
<td>Entrepreneurship, innovation and productivity growth: Diffusion and adoption of technology</td>
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<td>Nov. 17</td>
<td>Growth and the quality of institutions: Why capitalism thrives in the West and fails everywhere else?</td>
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<td>Nov. 19</td>
<td>Why do we need intellectual property rights (and do we need them)?</td>
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<td>Nov. 24</td>
<td>Invention, innovation and growth: the evolution and impact of semiconductor electronics and the Silicon Valley phenomenon</td>
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<td>Dec. 1</td>
<td>Review and discussion session</td>
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<td>Dec. 3</td>
<td>Final examination (in class)</td>
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Class 1 – Course overview / The astonishing facts about modern economic growth
August 25
Recommended reading
*Introduction to Economic Growth*, C. Jones, Chapter 1. Copy of this reading will be posted on Blackboard.

Class 2 – The basic Solow growth model: investment as an engine of growth
August 27
Required reading
*Introduction to Economic Growth*, C. Jones, Chapter 2, Section 1. Copy of this reading will be posted on Blackboard.

Class 3 – Putting technology into the growth model
September 3
Required reading
Jones, Chapter 2, Section 2. Copy of this reading will be posted on Blackboard.

Classes 4-5 – Applying the model: can we explain the East Asian miracle?
September 8, 10
Required reading

Homework 1 handed out

Class 6 – Convergence, divergence, and the evolution of the world income distribution
September 15
Required reading
Jones, Chapter 3, Sections 2 and 3. Copy of this reading will be posted on Blackboard.

Class 7 – Putting natural resources into the model: growth, oil shocks and climate change
September 17
Required reading
*Introduction to Economic Growth*, C. Jones, Chapter 9. Copy of this reading will be posted on Blackboard.

Homework 1 due.
Homework 2 handed out.

Class 8 – Applying the model: Technology, natural resources and American productivity slowdowns and accelerations
September 22
Required reading
Jones, Chapter 3, Section 1. Copy of this reading will be posted on Blackboard.
Additional reading TBA
Homework 2 due.

Class 9 – Argentina: a tale of economic decline
September 24
Required reading
Gerardo Della Paolera and Alan Taylor, *A New Economic History of Argentina, Cambridge University Press*, Chapter 1, pp. 2-5 “Introduction” Copy of this reading will be posted on Blackboard.

Class 10 – The corrosive effects of bad macroeconomics
September 29
Required reading

Homework 3 handed out.

Classes 11-12 – Free Trade, Protectionism and its Costs
October 1, 6

Class 13 – Financial crashes and currency collapses
October 8
Required reading

Required reading

Homework 3 due.

Class 14 – IN-CLASS MIDTERM EXAMINATION
October 13

Class 15 – Geography and divergent paths of civilizations
October 15
Recommended reading

Class 16 – How the West grew rich: the Industrial Revolution
October 20

Required reading
http://www.minneapolisfed.org/publications_papers/pub_display.cfm?id=3333

Recommended Reading
Nathan Rosenberg and Larry Birdzell, How the West Grew Rich, Basic Books; Reprint edition (May 1987), Ch. 4., pp 113-143.

Class 17 – Lessons from early industrialization in Japan
October 22

Required reading
Handout on the Japanese Cotton Spinning Industry. Copy of this reading will be posted on Blackboard.

Recommended reading

Homework 4 handed out.

Class 18 – What happened to China?
October 27

Required reading
Joel Mokyr, The Lever of Riches: Technological Creativity and Economic Progress, 1990, Oxford University Press, Ch. 9, pp 209-238. Copy of this reading will be posted on Blackboard.

Class 19 – Russia: the high cost of totalitarianism
October 29

Required readings
Serguey Braguinsky and Grigory Yavlinsky. Incentives and Institutions. The Transition to a Market Economy in Russia. Princeton University Press, 2000, Chapter 1, The planned economy revisited. Copy of this reading will be posted on Blackboard.

Recommended reading

Homework 4 due.

Class 20 – Human capital and American leadership
November 3

Required reading
Claudia Goldin, “The Human Capital Century.” Copy of this reading will be posted on Blackboard.
Nathan Rosenberg, Exploring the Black Box, Why in America? 1994, Cambridge University Press, Ch 6, pp 109-120. Copy of this reading will be posted on Blackboard.

Recommended reading

Class 21 – Science, technology and modern growth
November 5

Required readings
Joel Mokyr, The Lever of Riches: Technological Creativity and Economic Progress, 1990, Oxford University Press, Ch. 1, pp 3-16. Copy of this reading will be posted on Blackboard.

Class 22 – How is technology generated? The economics of ideas
November 10

Required Reading
Jones, Chapter 4 Copy of this reading posted on Blackboard.

Homework 5 handed out.

Class 23 – Entrepreneurship, innovation and productivity growth: Diffusion and adoption of technology
November 12

Required reading
Nathan Rosenberg Perspectives in Technology, Ch. 9 “Economic development and the transfer of technology”, pp 151-172; Ch. 11, pp 189-210. “Factors affecting the diffusion of technology.” Copy of this reading will be posted on Blackboard.

Class 24 – Growth and the quality of institutions: Why capitalism thrives in the West and fails everywhere else?
November 17

Required reading

Recommended reading

Class 25 – Why do we need intellectual property rights (and do we need them)?
November 19
*Required reading*
TBA

Homework 5 due.
Homework 6 handed out.

Class 26 – Invention, innovation and growth: the evolution and impact of semiconductor electronics and the Silicon Valley phenomenon
November 24
*Required reading*
TBA
*First deadline for “In the News” assignment for Master students (for full credit)*

Class 27 – Review and discussion session
December 1
*No Required readings*

Homework 6 due.
*Second deadline for “In the News” assignment for Master students (for 10% penalty)*

Class 28 – IN-CLASS FINAL EXAMINATION
December 3