TECHNOLOGY, INNOVATION, AND INTERNATIONAL DEVELOPMENT

Calestous Juma

Description

This seminar explores the role of science, technology, and innovation in international development. It is inspired by the seminal work of Joseph Schumpeter, *The Theory of Economic Development*, published in 1912. Drawing from contemporary economic developments, it aims to achieve four main objectives. First, it examines the co-evolutionary dynamics of technological change and economic complexity. Second, it reviews the relevance of complexity analysis in understanding the process of economic catch-up and the geography of innovation with specific emphasis on industrial clusters. Third, it analyzes the political economy of technological change with particular attention to the socio-economic sources of resistance to innovation. Finally, it identifies and analyzes alternative science, technology, and innovation policy approaches that reflect the dynamic and systemic nature of economic transformation in emerging economies. The seminar uses a combination of lectures, student presentations, and guest speakers.

Objectives

The seminar seeks to equip students with analytical skills in science and technology policy analysis. Students are expected to demonstrate mastery of the literature on the role of science, technology, and innovation in development. The sessions will be conducted through guided discussion as well as lectures, guest speakers, and presentations by students. Modest adjustments in the syllabus will be introduced to accommodate specialized interests by students and address important topical issues.

Class Participation

Class participation is an essential part of the course and students will be required to demonstrate knowledge of the readings and be able to offer a critical assessment of the contents. Students will be asked to lead class discussions and others will be expected to contribute to discussion based on the readings and other relevant sources of information.

Grading

Class participation (35%) will be evaluated on the basis of: (a) mastery of the literature and the associated concepts; (b) quality of contributions to class; (c) critical and creative approaches to the issue; and (c) respect for the views of others.
**Concept note** (20%) of no more than 1,500 words based on the literature covered in the first part of the seminar. The concept note should include an indication of the topic of the final paper and should also identify course material and case material that will be covered in the final paper.

**Policy analysis paper** (45%) of no more than 5,000 words covering a conceptual foundation, case material and identification of policy options and their implications.

**Feedback and deadlines**
Feedback will be provided to students at the various milestones in the preparation of the policy analysis paper. This will include feedback in office hours on all drafts and written feedback on the draft policy analysis paper. The aim of the feedback will be to ensure that students get sufficient input before they submit their papers for grading. While offering reasonable flexibility, continuous feedback will depend on adherence to deadlines. No further feedback will be provided on the final paper other than the grade unless agreed upon prior to its submission.

**Projects**

**Concept note and topic identification**
This will be one 1,500-work review of the literature covered in the first part of the seminar. The aim of the concept note is to demonstrate mastery of the core concepts underlying the role of technological innovation in economic development. The note should also include identification of the topic of the final paper. Early identification of the topic significantly improves the learning process and the quality of the final product. Students may later change their areas of focus as they start to work on their extended outlines, case studies, and policy analysis papers. Where possible, students are encouraged to liaise with external professionals as sources of input, networking, and career advice.

**Paper outline**
Each student will be expected to produce an extended outline of their paper (3,000 words). The outline will serve as a conceptual foundation, framework or background that will be used to analyze a specific theme for the final paper. Students will be expected to demonstrate their knowledge of the literature and its relevance to a specific field of interest they intend to examine in the final paper.

**Draft policy analysis papers**
The draft paper (4,000 words) should be divided into the following sections: (a) executive summary; (b) introduction; (c) background to the topic; (e) literature review based on the readings and additional sources; (d) case study serving as an illustration; (e) identification of policy options for action; and (f) references.

**Final policy analysis paper**
The final paper (5,000 words) is expected to demonstrate analytical rigor, mastery of the literature, coherence in presentation, and clarity of the recommendations or policy options as well as their political feasibility.
Variations on the final product
Those taking the seminar to build a knowledge base for doctoral research may seek variations in the structure and format of the final paper.
CONTENTS

PART I: ECONOMIC COMPLEXITY, TECHNOLOGY AND DEVELOPMENT
1. February 4: Introduction
2. February 11: Technology, innovation and development: Schumpeter revisited
3. February 18: Complexity and economic evolution
*Deadline: Concept note due*

PART II: ECONOMIC CATCH-UP AND THE GEOGRAPHY OF INNOVATION
4. February 25: Technological revolutions
5. March 4: Global Industrial dispersal and economic catch-up
6. March 11: Industrial clusters and innovation in low-income countries
7. March 18: Agricultural innovation and catch-up
*Deadline: Paper outline due*

Spring Break: March 22-27, 2015

8. April 1: Public procurement and industrial policy
9. April 8: Public procurement and innovation policy

PART III: POLITICAL ECONOMY OF INNOVATION
10. April 15: The knowledge economy and social forces
11. April 22: Innovation, risk and public controversies
*Deadline: Draft policy analysis papers due*

PART IV: SCIENCE, TECHNOLOGY AND INNOVATION POLICY
12. April 29: Innovation studies and policy research
13. May 6: Planning and building innovation systems
14. May 13: Science and technology advice for development
*Deadline: Final policy analysis papers due: May 20, 2015*
PART I: ECONOMIC COMPLEXITY, TECHNOLOGY AND DEVELOPMENT

February 4, 2015
Unit 1: Introduction
The aim of this unit is to introduce the seminar as well as the participants. The required reading for the seminar will be the syllabus which will be the basis for the day’s discussions.

February 11, 2015
Unit 2: Technology, innovation and development: Schumpeter revisited
In his seminal 1912 book, The Theory of Economic Development, the Austrian economist Joseph Schumpeter articulated an alternative view of economic evolution. The aim of this unit is to trace the origins of Schumpeter’s theory and outline its fundamental features. It explores why Schumpeter’s theory was rejected by the founding fathers of development economics.


February 18, 2015
Unit 3: Complexity and economic evolution
This unit analyzes the critical features of economies as complex evolving systems. This approach is a departure from conventional views that treat economies as rational systems that trend in the direction of equilibrium. The unit places particular emphasis on the role of technological innovation as source of economic vitality and evolution.


*Deadline: Concept note due*

PART II: ECONOMIC CATCH-UP AND THE GEOGRAPHY OF INNOVATION

February 25, 2015
Unit 4: Technological revolutions
Economic growth is associated with long waves of the co-evolution of technological revolutions and social institutions. This unit examines historical evidence of past technological revolutions.
It uses this background to explore the implications of emerging technologies for developing nations.


**March 4, 2015**  
**Unit 5: Global Industrial dispersal and economic catch-up**  
One of the key features of contemporary economic history has been the rise of latecomer economies as important players in international trade and the geographical dispersal of industrial capabilities. This unit examines the dynamics of economic catch-up and the role that existing technologies play in the process.


**March 11, 2015**  
**Unit 6: Industrial clusters and innovation in low-income countries**  
The emergence of industrial clusters and local innovation systems are an important aspect of economic dynamism in low-income countries. This unit analyzes cases of cluster formation in African countries and their place in global value chains.


**March 18, 2015**  
**Unit 7: Agricultural innovation and catch-up**  
Much of the literature on economic catch-up focuses on manufacturing. This unit explores the dynamics of technological catch-up in agriculture, using the case of the wine industry as an example. It underscores the importance of geographical clustering of knowledge and technological capabilities as sources of global competitiveness.


*Deadline: Paper outline due*

**SPRING BREAK: March 22-27, 2015**

**April 1, 2015**  
**Unit 8: Public procurement and industrial policy**
Emerging economies invest in a wide range of advanced industries such as aviation, high-speed rail, power generation systems and other forms of infrastructure projects. These investments are associated with bundles of technological knowledge that are usually not effectively harnessed. This unit analyzes how such investments can serve as centers of industrial learning and diffusion of technological capabilities.


**April 8, 2015**

**Unit 9: Public procurement and innovation policy**

The role of public procurement in stimulating technological innovation varies across countries and technologies. This unit reviews experiences from around the world on public procurement, innovation and public policy. Its focus is to help identify the diversity of policy instruments that can be used in emerging nations.


**PART III: POLITICAL ECONOMY OF INNOVATION**

**April 15, 2015**

**Unit 10: The knowledge economy and social forces**

Technological innovation and social institutions co-evolve to create interdependence systems but self-replicating systems. Efforts to revitalize such systems with new technologies often come in conflict with social opposition. This unit examines the political economy of innovation and identifies the key economic sources of resistance to new technology.


**April 22, 2015**

**Unit 11: Innovation, risk and public controversies**

New technologies are often associated with uncertainties pertaining to the distribution of benefits and risks in society. The uncertainties often lead to protracted public controversies. This unit uses historical case studies to analyze the sources of such technological controversies and outlines strategies for addressing them.


*Deadline: Draft policy analysis papers due*

**PART IV: SCIENCE, TECHNOLOGY AND INNOVATION POLICY**
April 29, 2015

Unit 12: Innovation studies and policy research
Schumpeter’s ideas have in recent decades been gaining prominence among those seeking to analyze economic evolution from complex systems perspectives. This unit review trends in neo-Schumpeterian innovation studies and identifies the implications of the approaches for future research.


May 6, 2015

Unit 13: Planning and building innovation systems
It is widely acknowledged that local, national, regional and global innovation systems often emerge organically, posing major challenges for public policy. This unit explores opportunities to applying public policy and regional planning strategies in shaping the direction and pace of the evolution of innovation system.


May 13, 2015

Unit 14: Science and technology advice for development
A complex systems approach to economic evolution acknowledges the existence of a wide range of uncertainties in the knowledge base needed to guide public policy. The aim of this unit is to undertake a comparative assessment of scientific advice approaches and identify elements of relevance to innovation policy. The focus of the unit is institutional design and quality assurance in science and technology advice.


*Deadline: Final policy analysis papers due May 20, 2015*