Week 4 SI757 Reading Note
Session of 8 February 2010
Ted Hanss

This week's readings provide a survey of policy levers related to development in both developed and developing countries. The two most interesting papers to me were Freeman and Nelson and thus they make up most of the following discussion.

Freeman offers insights into innovation systems at various geographic scales and the effect on growth rates. Citing Abramovitz's "social capability" (p. 192), Freeman credits the ability to effect systemic, institutional change as having a greater influence on growth than more simplistic, in his view, quantitative measures of financial and human capital. After an overview of British and American growth, he focuses his paper on the "catching up" countries.

Freeman credits British and American growth in large part to the foundations of science and knowledge within their cultures. (Education and "active learning" are significant themes in his paper.) He contrasts the treatment of Newton versus Galileo as an example in contrasts. As a member of the European Union PIIGS, Italy still lags behind its northern neighbors in growth and productivity, perhaps showing that culture can be very slow to change. The U.S. benefited from both an inheriting of British commercial culture (i.e., Schumpeterian entrepreneurial) and scientific culture and from illicit technology transfer from British industry. From that technology transfer U.S. industry began to innovate itself and pulled past Britain in growth and productivity.

In discussing catch-up opportunities, Freeman lays out arguments around the ability for latecomers to leapfrog earlier innovators. While it may be possible to bypass legacy factories and build more efficient infrastructure from day one, Freeman asserts there still must be institutional changes "especially in education, training, and R&D" (p. 201) to truly propel growth (i.e., to leverage innovation rather than merely engage in imitation). Metcalfe and Ramlogan make an analogous point in their paper (though not as well, in my opinion), that "innovation systems formation must be complemented by the wider range of policies that influence the innovation ecology" (p. 444).

In an argument that in abstract echoes Collier's point about the bad neighbor trap in last week's readings, Freeman points out that "geographic and cultural proximity" matter and can explain the regional growth in Asia over the past few decades, which has not been seen in Latin America or Africa. In a nod to development theory implications, Freeman observes that early "'Dependency' theorists were so impressed by the advantages of the United States and Western Europe that they thought it impossible for countries in Asia, Latin America or Africa ever to catch up" (p. 208). But, history shows us that such gaps are not impossible to overcome and the U.S. lead is not insurmountable.

Nelson's paper on "know how" picks up the thread of knowledge, and active learning we saw in Freeman. Nelson explores characteristics of know-how and how it is acquired, using as illustration fields of medicine, and education. Know-how comprises both an understanding of fundamental knowledge and a body of practice. To me this echoes George Miller's pyramid of clinical competence, which progresses from "knows" to "knows how" to "shows" to "does".[1] Further, Nelson notes the dimensions with know-how of articulated versus tacit knowledge. The former can be communicated through books, for example, while the latter is learned through participating in a community of practice. Metcalfe and Ramlogan also note that simple

[1] Miller, G. (1990). The Assessment of Clinical Skills/Competence/Performance. *Academic Medicine,* 65(9), S63-S67.

availability of information does not enable innovation systems----knowledge, derived from information, must be developed and shared within a social system.

Nelson has seen rapid advances in know-how when there is a close connection with a "powerful applied science or engineering discipline" (p. 913). What this provides, according to Nelson, is an environment that facilitates experimenting with and testing of new techniques. Even with high availability of resources (people, funding), if there isn't an environment for controlled, replicable experimentation the field may not advance with any significance. This is where Nelson contrasts R&D in the education field with certain biomedicine domains and ICT development. The effects of R&D in education are much more amorphous as "it is very difficult in education to predict with any precision just how a proposed change in teaching method actually will work out in practice" (p. 916). Education interventions may not have an effect for years and can be confounded with other variables. Nelson is clear that this is not an indictment of education researchers, but a result of "the innate limitations on the ability of research to contribute to the advancement of technologies that are largely tacit and social" (p. 919).

How does this relate to development? Nelson asserts that the field of economics "has much the same weaknesses as the science of education" and that "the prevailing science provides at best only general and hedged guidance to policy" (p. 919). Thus, "the fact that economics as a science provides only broad and uncertain guidance to policy is in good part the result of the fact that objects of interest are impossible to define and measure with precision. The science of economics can be made precise only by shifting the study to an arena far simpler than that in which we really are interested" (p. 919). I take that to imply that theoretical economic models applied to national and regional scale development issues must be acknowledged as imperfect. Our know-how simply doesn't extend to definitive statements about what will or won't work for particular countries at particular stages of growth at particular times.

Nelson notes that for education, a way forward may be to "get rid of these [individual idiosyncratic] constraints, by substituting physical for social technologies" (p. 920). What this calls to mind for me is Atul Gawande's latest book, Checklist Manifesto, which asserts that some tasks (surgery, in Gawande's case) are too complex and thus practice must eliminate the individual and idiosyncratic in order to standardize the technique. The criticism, of course, is that reducing surgery practice to following checklists is based on the assumption that surgery is as systematized and deterministic as engineering. But, that is only true if the checklist is what solely guides the surgeon, who can also draw on his or her fundamental knowledge as well if a non-routine event occurs. Is there a checklist for development? It may be an interesting exercise to take Collier's traps, and Ferguson's observations from Lesotho, and similar writings and see if they lend themselves to a checklist. Rather than simply inserting cash into the development system, a checklist could help turn tacit knowledge around development into articulated and routine best practices.

The Liu and Wang paper is very different from the earlier papers, studying whether foreign direct investment leads to productivity gains by examining data from Chinese industry. Their answer is yes, in combination with R&D and firm size. FDI is also a source of technology transfer (forms of "know how") and not just capital. Katrak looks at whether the liberalization of policies in India affected innovation and growth by incumbent, indigenous firms. The answer was no for the sectors examined. The implication is that protectionist measures may be justified if it does give a leg up to local industries. Finally, Ebner looks at entrepreneurship in east Asia with an interesting analysis of the role of government in playing the role of entrepreneurial spark to industry in early stages of capacity building in physical and knowledge infrastructures. But,

that the trend, as shown with Japan, is to shift industry policy once local firms advance beyond the government's ability to lead. At that point, industry provides the majority of the innovation system.

Week 4: INVESTMENT, TECHNOLOGY TRANSFER, and INNOVATION (Feb 8th)

C. Freeman, "Continental, National and Sub-National Innovation Systems: Complementarity and Economic Growth," *Research Policy* 31:2 (2002), pp 191-211.

R. Nelson, "On the Uneven Evolution of Human Know-How," *Research Policy* 32:6 (2003), 909-922.

S. Metcalfe and R. Ramlogan, "Innovation Systems and the Competitive Process in Developing Economies," *Quarterly Review of Economics and Finance* 48:2 (2008), pp 433-446.

X. Liu and C. Wang, "Does Foreign Direct Investment Facilitate Technological Progress? Evidence from Chinese Industries," *Research Policy* 32:6 (2003), pp 945-953.

H. Katrak, "Does Economic Liberalisation Endanger Indigenous Technological Developments? An Analysis of the Indian Experience," *Research Policy* 31:1 (2002), pp 19-30.

A. Ebner, "Public Policy, Governance and Innovation: Entrepreneurial States in East Asian Economic Development," *International Journal of Technology and Globalization* 3:1 (2007), pp 103-124.