ON THE MECHANICS OF ECONOMIC DEVELOPMENT*

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This paper considers the prospects for constructing a neoclassical theory of growth and international trade that is consistent with some of the main features of economic development. Three models are considered and compared to evidence: a model emphasizing physical capital accumulation and technological change, a model emphasizing human capital accumulation through schooling, and a model emphasizing specialized human capital accumulation through learning-by-doing.

1. Introduction

By the problem of economic development I mean simply the problem of accounting for the observed pattern, across countries and across time, in levels and rates of growth of per capita income. This may seem too narrow a definition, and perhaps it is, but thinking about income patterns will necessarily involve us in thinking about many other aspects of societies too, so I would suggest that we withhold judgment on the scope of this definition until we have a clearer idea of where it leads us.

The main features of levels and rates of growth of national incomes are well enough known to all of us, but I want to begin with a few numbers, so as to set a quantitative tone and to keep us from getting mired in the wrong kind of details. Unless I say otherwise, all figures are from the World Bank's *World Development Report* of 1983.

The diversity across countries in measured per capita income levels is literally too great to be believed. Compared to the 1980 average for what the World Bank calls the 'industrial market economies' (Ireland up through Switzerland) of U.S. $10,000, India's per capita income is $240, Haiti's is $270, and

*This paper was originally written for the Marshall Lectures, given at Cambridge University in 1985. I am very grateful to the Cambridge faculty for this honor, and also for the invitation's long lead time, which gave me the opportunity to think through a new topic with the stimulus of so distinguished an audience in prospect. Since then, versions of this lecture have been given as the David Horowitz Lectures in Israel, the W.A. Mackintosh Lecture at Queens University, the Carl Snyder Memorial Lecture at the University of California at Santa Barbara, the Chung-Hua Lecture in Taipei, the Nancy Schwartz Lecture at Northwestern University, and the Lionel McKenzie Lecture at the University of Rochester. I have also based several seminars on various parts of this material.

and so on for the rest of the very poorest countries. This is a difference of a factor of 40 in living standards! These latter figures are too low to sustain life in, say, England or the United States, so they cannot be taken at face value and I will avoid hanging too much on their exact magnitudes. But I do not think anyone will argue that there is not enormous diversity in living standards.¹

Rates of growth of real per capita GNP are also diverse, even over sustained periods. For 1960–80 we observe, for example: India, 1.4% per year; Egypt, 3.4%; South Korea, 7.0%; Japan, 7.1%; the United States, 2.3%; the industrial economies averaged 3.6%. To obtain from growth rates the number of years it takes for incomes to double, divide these numbers into 69 (the log of 2 times 100). Then Indian incomes will double every 50 years; Korean every 10. An Indian will, on average, be twice as well off as his grandfather; a Korean 32 times. These differences are at least as striking as differences in income levels, and in some respects more trustworthy, since within-country income comparisons are easier to draw than across-country comparisons.

I have not calculated a correlation across countries between income levels and rates of growth, but it would not be far from zero. (The poorest countries tend to have the lower growth; the wealthiest next; the ‘middle-income’ countries highest.) The generalizations that strike the eye have to do with variability within these broad groups: the rich countries show little diversity (Japan excepted – else it would not have been classed as a rich country in 1980 at all). Within the poor countries (low and middle income) there is enormous variability.²

Within the advanced countries, growth rates tend to be very stable over long periods of time, provided one averages over periods long enough to eliminate business-cycle effects (or corrects for short-term fluctuations in some other way). For poorer countries, however, there are many examples of sudden, large changes in growth rates, both up and down. Some of these changes are no doubt due to political or military disruption: Angola’s total GDP growth fell from 4.8 in the 60s to −9.2 in the 70s; Iran’s fell from 11.3 to 2.5, comparing the same two periods. I do not think we need to look to economic theory for an account of either of these declines. There are also some striking examples

¹The income estimates reported in Summers and Heston (1984) are more satisfactory than those in the World Development Reports. In 1975 U.S. dollars, these authors estimate 1980 U.S. real GDP per capita at $8000, and for the industrialized economies as a group, $5900. The comparable figures for India and Haiti are $460 and $500, respectively. Income differences of a factor of 16 are certainly smaller, and I think more accurate, than a factor of 40, but I think they are still fairly described as exhibiting ‘enormous diversity’.

²Baumol (1986) summarizes evidence, mainly from Maddison (1982) indicating apparent convergence during this century to a common path of the income levels of the wealthiest countries. But De Long (1987) shows that this effect is entirely due to ‘selection bias’: If one examines the countries with the highest income levels at the beginning of the century (as opposed to currently, as in Maddison’s ‘sample’) the data show apparent divergence!
of sharp increases in growth rates. The four East Asian ‘miracles’ of South Korea, Taiwan, Hong Kong and Singapore are the most familiar: for the 1960–80 period, per capita income in these economies grew at rates of 7.0, 6.5, 6.8 and 7.5, respectively, compared to much lower rates in the 1950’s and earlier.\footnote{The World Bank no longer transmits data for Taiwan. The figure 6.5 in the text is from Harberger (1984, table 1, p. 9).} \footnote{According to Heston and Summers (1984), Taiwan’s per-capita GDP growth rate in the 1950s was 3.6. South Korea’s was 1.7 from 1953 to 1960.} Between the 60s and the 70s, Indonesia’s GDP growth increased from 3.9 to 7.5; Syria’s from 4.6 to 10.0.

I do not see how one can look at figures like these without seeing them as representing possibilities. Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia’s or Egypt’s? If so, what, exactly? If not, what is it about the ‘nature of India’ that makes it so? 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.

This is what we need a theory of economic development for: to provide some kind of framework for organizing facts like these, for judging which represent opportunities and which necessities. But the term ‘theory’ is used in so many different ways, even within economics, that if I do not clarify what I mean by it early on, the gap between what I think I am saying and what you think you are hearing will grow too wide for us to have a serious discussion. I prefer to use the term ‘theory’ in a very narrow sense, to refer to an explicit dynamic system, something that can be put on a computer and run. This is what I mean by the ‘mechanics’ of economic development – the construction of a mechanical, artificial world, populated by the interacting robots that economics typically studies, that is capable of exhibiting behavior the gross features of which resemble those of the actual world that I have just described. My lectures will be occupied with one such construction, and it will take some work: It is easy to set out models of economic growth based on reasonable-looking axioms that predict the cessation of growth in a few decades, or that predict the rapid convergence of the living standards of different economies to a common level, or that otherwise produce logically possible outcomes that bear no resemblance to the outcomes produced by actual economic systems. On the other hand, there is no doubt that there must be mechanics other than the ones I will describe that would fit the facts about as well as mine. This is why I have titled the lectures ‘On the Mechanics …’ rather than simply ‘The Mechanics of Economic Development’. At some point, then, the study of development will need to involve working out the implications of competing theories for data other than those they were constructed to fit, and testing these implications against observation. But this is getting far ahead of the