

Nominated Discussion

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Nominated Discussion - Economic Structure in Developing Countries

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Following the report of the World Commission on Environment and Development (The Brundtland Report), the watershed United Nations Conference on Environment and Development (UNCED), and the five years of implementation that followed, it has become widely accepted to see "sustainable development" strategies as a balanced approach to achieving the objectives of economic growth, social development and environmental preservation. Another way to look at this from the perspective of a development economist is how to maintain an appropriate balance through time among the stocks of physical capital, human capital, and environmental capital; and some would also add institutional (or social) capital. These various stocks of capital produce streams of services, most of which enter into the aggregate production function of the economy, and some of which contribute directly to human welfare by enhancing human capabilities and providing humankind with environmental services. One problem, of course, is the different time scales over which bad policies in these areas become evident. Integrated assessment modeling should try to provide a representation of the evolution through time of the socio-economic and environmental systems over time frames of 50, 100, even 200 years.

When a development economist considers the existing socio-economic structure in developing countries in this context, he might wish to take into account the following:

- the projected path of the demographic transition;
- projected changes in economic and social sectors: agriculture, other primary commodity production, light and heavy industry, the modern business service sector, the health and education sectors, as well as the infrastructure for drinking water and sanitation, energy and transport, and telecommunications;
- the relation of the former to the degree of integration of countries and regions in the globalizing world economy;
- the relation of all three of the foregoing to urbanization;

Among other things, changes in the urban and rural distribution of population, and of the proportion of households in different income brackets, will have major implications for consumption and production patterns, as will the extent of forward-looking planning of transportation infrastructure in rapidly growing urban conglomerations. Developing countries differ considerably among themselves with respect to their current socio-economic structures and medium-term prospects for economic growth. These considerations have implications for the optimal level of geographical disaggregation in integrated assessment models as well as for the way that the dynamics of socio-economic systems might usefully be represented. When, moreover, the results of the analyses based on the models are presented to representatives of the international community, such as in United Nations fora, regional disaggregations that reflect relevant political structures are also helpful for facilitating a useful policy dialogue.

It would also seem useful, indeed necessary, to embody certain stylized hypotheses of

economic development such as partial convergence of income levels, economic growth rates, and economic structure, over the very long time horizons used in integrated assessment modeling. Integrated assessment models have often been disaggregated into regions relevant for the analysis of the environmental phenomena and the driving forces required to understand global climate change, but it is necessary to expand the scope of integrated assessment modeling to represent social and economic systems in sufficient complexity to draw conclusions for integrated policy strategies adequate for achieving the multiple objectives of sustainable development, i.e., accelerating economic growth in developing countries, advancing human development and social equity, and achieving a high level of environmental preservation. It is, thus, highly important to be able to model the impact of integrated strategies. First of all, how to design these is the core of the sustainable development debate; secondly, it has a bearing on how sensitivity analysis of climate change scenarios in integrated assessment models is actually done.

Consider, for example, alternative population scenarios. Given what we think we know about economic demography, a low population projection would be associated with changes in developing countries, such as higher rural-urban migration, more rapid economic growth and a more rapid shift toward the production of manufactured goods, especially for export, followed by a more rapid growth of the modern service sector. So it would be a combined effect of trends in population and economic variables that would have implications for CO₂ emissions.

Similarly, increasing expenditures on emission reductions, and the negative feedback on productivity of the climate change not prevented, could be represented in a Harrod-Domar growth model as an increase in the incremental capital-output ratio, which implies slower GDP growth (and employment). This could be offset by increasing the investment share in GDP, but this would be at the expense of consumption. Thus, whatever other aggregate measure of national income is used in sensitivity analysis (GDP or "green GDP"), it would be important also to include growth of consumption of marketed goods and services per capita. This could--at the limit of political acceptability--be kept to a low level (even zero), but GDP as conventionally measured would continue to grow; its composition would change, however, with important effects for CO₂ emissions, probably lowering them. This could be combined with the simulation of the effects of policies for other social objectives, involving increases in the percentage of national expenditures devoted to the economic and health sectors, and this would probably lower CO₂ emissions even further. Thus, careful use of sensitivity analysis can be of considerable use to policymakers.

In order to achieve this, several modeling strategies are available. One is to incorporate a large amount of disaggregation into single models. Another is to use several models to form a cascade, where regional and sectoral disaggregations are accomplished by the use of "satellite models" linked to one or more "core models" and to use highly disaggregated models, for example, macroeconomic models to derive a wider range of policy implications for the first 5 or 10 years of the longer term time horizon of interest to climate change modelers. This is the approach we are trying to take in the UN Global Modeling Forum, which already involves several of the groups represented at this meeting, and which we will be exploring further in the Tokyo Modeling Forum sessions scheduled for Thursday and Friday.