Structural Change and Environmental Impact

Although structural change in many industrialized countries has increased since the early 1970s, the environmental policy aspects of this change have hardly been investigated. Using a set of four indicators, this study examines the correlation between structural changes and environmental pollution in thirty-one Eastern and Western industrialized countries from 1970 to 1985.

It is not so long ago that sheer quantity was considered to be an indicator of a nation’s economic performance. In Eastern Europe the importance attached to this criterion led to “tonnage ideology”. In Western societies similar ideas can be detected. It is no coincidence that a much-read long-term economic forecast from 1965 singled out energy and steel consumption as central indicators of economic success. For a mature economy, however, such indicators have tended to become indicators of economic failure. The following reasons can be given:

- in times of high or increasing costs for raw materials and energy, high consumption of such inputs is relatively uneconomic;
- countries that have reduced their specific energy and raw materials consumption are today at the top of the international list of economic performance;
- resource economy (or “material economy”) has received a major priority in the search for new ways to develop national economies.

In both the East and the West, economists, planners and engineers are seeking a solution to the problem of how to modify the existing patterns of materials consumption. Ideally, such a reorientation is consonant with Robert Reich’s concept of “high value production”, the opposite of “high volume production”, and at the same time addresses new environmental priorities. The hope of a “reconciliation between economy and ecology” relies to a large extent on the premise that a reduction in the resource input of production will lead to a reduction in the amount of emissions and waste and also the costs of production.

In this paper, some of the empirical dimensions of this reorientation will be discussed. The paper is restricted to the quantitative aspect of production. The environmental problem consists, however, not only in the quantity of harmful emissions. The modernized high value economy may well be accompanied by a new quality of environmental risks. This aspect is excluded here.

The concept of “structural change” is used in a broad sense, meaning the technological and the sectoral (branch) structure of the economy. This seems plausible because both are interconnected. If an economy lowers the input level of materials and energy  

— using more intelligent technology — the share of heavy industries tends to decrease, while the service sector tends to increase. Thus we refer to the popular meaning of “structural change” as an increase in knowledge-intensive and service-intensive forms of production at the expense of the traditional chimney industries. “Structural environmental impact” is the environmental stress resulting from a certain production structure, irrespective of pollution control measures in the form of end-of-pipe treatment.

Identifying Indicators

To assess the empirical dimensions of potentially beneficial environmental effects of structural change we need suitable information concerning the material side of production. This by itself is a difficult task, especially so if we are looking for East-West cross-national comparisons. Resource conservation by the national economy and the process of environmentally significant structural change are not appropriately described by the production values used in the national accounts, although the national accounts and input-output tables offer some information.6 An alternative is to select some indicators which act as synonyms for certain characteristics of the production process.

Indicators have played an important part in the environmental debate since it began.7 The international availability of environmental indicators such as emission data relating to certain “representative” pollutants has grown considerably. Our present interest, however, is for environmentally significant input factors.8

Given the present state of research and data availability, only a few such indicators can be tested in a cross-national comparison of Eastern and Western countries. The result of this test thus cannot be a precise picture of the environmental quality in the respective countries. But we can demonstrate at least some patterns of environmentally significant structural change from which hypotheses could be derived for further research. We use four factors whose direct and indirect environmental significance is indisputable:

energy, steel, cement, and the weight of freight transport.

Energy consumption is accompanied by more or less serious environmental impacts. Steel consumption offers a similar general indicator of structural environmental stress. Cement consumption is not only a highly polluting process, it also represents to a large extent the physical reality of the construction industry. (For reasons of data availability we use the production statistics for cement, except in Figure 2). The weight of freight transport is used as a general indicator of the volume aspect of production. Nearly all kinds of transport are accompanied by environmental impacts. For our purpose, we use data for road and rail transport only.

Table 1

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1 The economic performance of the Eastern European countries is expressed in GNP terms as published in the “Comparative International Statistics” of the US Statistical Yearbook. For calculating the GNP in US-Dollars, the constant GNP values were determined and then adjusted according to the existing East-West differences in calculation method. The conversion into US-Dollars is based on the exchange rates published by the World Bank. For the countries of Eastern Europe this method of calculating the GNP results in a somewhat smaller growth-rate than that given in their respective national statistics; nevertheless, the method of calculation employed here seems to be fairly realistic.