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RESOURCES, TECHNOLOGY, AND DEVELOPMENT:
WILL THE TABLE BE BARE
WHEN POOR COUNTRIES GET THERE?

William D. Nordhaus

May 1986

Resources, Technology, and Development:
Will the Table Be Bare¹
When Poor Countries Get There?

by William D. Nordhaus
Yale University
May 1986

I. Resource Depletion and Economic Development

Who has not had the experience of arriving late at a dinner to find that the meal is largely eaten, the partakers sitting around the table with a glaze of satisfaction on their faces, and but a few crumbs remaining on the plates? Will such a fate befall latecoming nations as well? What awaits today's low-income countries, hoping and planning to serve up to their peoples an ample living standard with its dependence on a resource-intensive, manufacturing economy? Will they find that the materials essential for a modern industrial country have been gobbled up by the advanced industrial countries of North America and Europe? Or, instead, are resources sufficiently ample and advances in technology sufficiently rapid so that countries like India can, if they wish, aspire to western-style standards of living with the necessary attendant resource inputs? In a phrase, will the table be bare when poor countries get there?

In some respects, this question is a modern variant of one of the premier questions of classical economics--the questions raised by Malthus and Ricardo about the adequacy of resources to feed a growing population. recall that gloomy Malthus argued that population growth combined with diminishing returns to fixed land inputs would lead to declining per capita

¹This paper was delivered as the V. K. Ramaswamy lecture in Delhi, India in February 1986.

food production. Malthus' failure to foresee the birth control movement and the demographic transition--factors which began to take hold within three decades of his first edition--produced a historical turn in Europe that belied his prediction and have made his name a symbol of gloomy, but inaccurate forecasters. Outside Europe, however, the prodigious growth of population lends the Malthusian view an air of uncanny accuracy-- particularly on the Indian subcontinent, where population has grown from 130 million in 1800 to 900 million today.

But the facet of resource use I wish to examine is a different one, relating to the impact on the potential economic growth of low-income countries of the pattern of resource use and technological change in advanced countries. More precisely, when examining economic growth in the West, recall that there are numerous linkages between advanced countries' growth and LDC growth. Linkages include the influence of trade; grants of aid; financial linkages of lending, and more recently borrowing, by the West; cultural, education, military and political ties or animosities; and the heritage of imperialism and colonialism.

Of all these linkages, I will consider today the one that comes from drawing on the world's stock of natural resources. In the process of development, the West has relentlessly pursued resources in all corners of the globe. A significant fraction of the low-cost oil, gas, copper, and silver resources--to choose but a handful--have been extracted, used, and dissipated by the tenth of the world's population living in North America and Western Europe. Much of these resources is used to produce what are by Indian standards luxuries, items like second automobiles, vacation air travel, third color television sets, fourth telephones, or gas-heated

swimming pools. But what of the 21st century Indian or Malaysian or Nigerian who wishes his or her first telephone or car or television set? Will there be ample, moderately-priced oil and copper and air space? Or will these and other such resource ingredients for today's high standard of living be out of reach of tomorrow's aspiring consumers?

In one sense, we know the answer to the set of questions just asked. We know that economic activity in the West inevitably depletes the supply of high-grade, low-cost resources. The first oil just bubbled to the surface and needed little more than a pail to collect. But as we have progressively drilled the low-cost oil, it becomes necessary to explore inhospitable climates like the Beaufort or North Seas or eastern Siberia.

But economic progress giveth as it taketh away. The era of rapid economic growth and voracious devouring of resources has been accompanied by--no, has been in large part driven by--enormous technological change. Advanced countries consume large quantities of oil, clean air, and copper because they employ more efficient technologies that require these scarce commodities. Had America remained in the Stone Age of its pre-Columbian inhabitants, our Indians, it would have used no resources. But nor would American science have produced the polio vaccine or the transistor or nylon or communication satellites or fibre optics.

What is the net effect, then, of these two economic forces on developing countries: Is the drag to economic advance from dwindling resources outweighed by the accompanying technological advances? Or will the potential scarcity of resources during the next century on balance weigh down the pace of economic progress?

In discussing their impact on economic growth, it is useful to distinguish three categories of natural resources--renewable, non-renewable, and environmental. First are the renewable resources like land and water that are used in agriculture, forestry, and fisheries. These resources can lead to a drag on economic growth to the extent that higher demands for the outputs of renewable resources drive up the relative costs of goods produced from these resources. Such a drag is properly called "Ricardian" as it was Ricardo who first identified the process by which diminishing returns leads to higher real costs and rents on agricultural lands.

A second class of inputs is non-renewable resources, of which fuels and non-fuel minerals are the most significant. In this category, real costs of production rise and economic growth is reduced by the cumulative demand for non-renewables. As time passes and economies are forced to extract higher and higher cost oil or gas or copper, net output must decline for a given state of technology. This category of resource scarcity is sometimes associated with Harold Hotelling, who was a pioneer in analysis of the economics of exhaustible resources.

The third important category of resource is here called environmental. As environmental resource is a resource because it is limited by some set of physical processes and is environmental because it involves important externalities in its production or use. Recall that an externality occurs when economic agents impose costs on others while those others are not compensated for the damage. Environmental resources include the quality of the air, water, and land--that is, the extent of pollution, radiation, noise, filth, or hazardous wastes. In addition, if production affects the climate or the level of oceans, this would be in the category of an

environmental resource. Such economics can be called Pigovian after the English economist who carefully analyzed their effects.

Lest this set of questions seems to be a mere economic abstraction, a few illustrations will be given. The energy sector provides the most clearly documented example. In its early stages, oil and gas drilling was largely confined to shallow wells, drilled in easily accessible land areas, contiguous to areas of demand. Most drilling before World War II in the U.S. was to depths of less than 250 feet; on-shore footage represented 99 percent of the total. As the easily discovered pools were exhausted, oil and gas exploration moved to higher cost areas. In the last decade, 90 percent of new oil discoveries have been offshore or outside traditional areas of demand.²

The best documented example of depletion is that in oil and gas extraction in the "Lower 48" states of the U.S. In 1947, a new "wildcat" or speculative well would ultimately yield 700,000 barrels of oil equivalent. By 1979, this figure had declined to 100,000 barrels.³ Moreover, this 85 percent decline occurred with an increase in the average footage drilled per well.

You might think that, as a result of such depletion, oil and gas prices would have risen sharply. In fact, even though United States petroleum resources have been substantially exhausted, real oil prices in America in mid-1986 stood at almost exactly the same level as in 1900 (in U.S. dollars divided by the U.S. CPI). The reason, of course, was that depletion was

² See American Petroleum Institute, Basic Petroleum Data Base, vol. II, no. 3, Sept. 1982.

³ Thomas J. Woods, "Resource depletion and lower 48 oil and gas discovery rates," Oil and Gas Journal, October 28, 1985.

more than offset by technological advances in finding and drilling for oil and in transporting it (especially by water). Here in a nutshell is the problem: Will such an outpacing of depletion by technology be the rule of the future? Or will the equation be reversed as depletion outpaces technological advance?

A second example is seen in the impact of industrial activity on the global environment. As a result of economic activity, such as the combustion of fossil fuels, many scientists foresee significant impacts on climate or other natural conditions. Among the important impacts are the climatic and oceanic effects of the greenhouse effect arising from accumulation of CO₂ and other greenhouse gases; depletion of ozone from accumulation of chlorofluorocarbons; and acidification of rain arising from transport of sulfates mainly arising from burning coal. We return to these below.

These two illustrations provide us food for our further analysis. But they are simply casual illustrations. The next section provides an analytical framework for weighing the relative importance of technology and depletion.

II. A Simple Aggregate Model

Before answering the question posed here, it will be useful to develop a simple economic model. In this model, we examine the economic growth of a single country, one which is small enough so that it has a negligible impact on prices and on world trade. Further assume that we can represent our country as producing a single output.

We consider a competitive economy where there are three domestic factors of production--capital (K), labor (L), and one domestic resource (T). For most countries, particularly low-income countries, the key domestic resource is land. This is renewable, appropriable, generally marketed, and not tradeable. Assume for simplicity that capital, population, and employment grow at a given rate n . Land generally grows little (outside of land-fill or soil erosion) and its growth rate is assumed to be zero. In addition, we consider an imported natural resource (R), which might be oil, bought at world prices, but which is becoming more expensive over time as it becomes depleted. (All these assumptions can be relaxed without affecting markedly the conclusions.)

Under these conditions, we can express domestic net income, Y_t , as

$$(1) \quad Y_t = A_t F(K_t, L_t, R_t, T_t) - m_t R_t$$

where $A_t F()$ is gross output, A_t represents total factor productivity, m_t is the price of the imported resource in terms of domestic output, and $F()$ is a constant returns to scale aggregate production function.

In this discussion, the variable A_t might be separated into two parts, one part originating in foreign countries (A_t^f) and a second part (A_t^d) that is indigenous to the country under analysis. By convention we take these to be multiplicative, so $A_t = A_t^f A_t^d$.

Taking the logarithmic derivative of (1), and assuming that resource imports are a small fraction of GNP, or that AF is approximately equal to Y , we obtain the following equation for the growth in per capita income, g ,

omitting time subscripts as inessential:

$$(2) \quad g = a^f + a^d - bn - k\hat{m}$$

In this a^f and a^d are, respectively the rates of foreign and domestic total factor productivity; \hat{m} equals the rate of growth of imported resource prices relative to domestic output; b = elasticity of output with respect to the fixed domestic natural resource; and k = elasticity of output with respect to the imported resource.⁴

Equation (2) presents the key results that we will draw upon here. It shows that, in this world where we focus upon resources, per capita income growth depends upon three ingredients. First, there is the positive boost to growth from technical change, both domestic and foreign. Second, there is a Malthusian drag on growth (equal to bn), representing the loss in per capita income growth from the need to spread fixed land among a growing population and economy. And third there is the imported resource drag ($k\hat{m}$), representing the loss in real income arising from the need to pay higher prices for increasingly scarce imported resources.

How does growth in advanced countries affect that in low-income countries? Through two principal routes. One route is through technology, i. e. through the foreign component of technological change. A more subtle effect comes through resources. To the extent that high-income countries drive up the prices of imported natural resources like oil, this will constitute a drag on low-income countries' growth.

⁴The coefficient on \hat{m} is, strictly speaking, $k/(1-k)$, which is approximately k for small values of k .

What, however, about resources produced and consumed domestically--like Indian oil or coal? In this case, net exports are zero (say $R=0$), and we easily see that, to a first approximation, higher world prices for this resource have no impact on national income. There are second-order effects, but no income or terms-of-trade effects. This is actually sensible economics. Why should a subsistence farmer in Bihar, living in a state of autarky, personally care about world oil prices? To a first approximation, he should not. India as a nation does not suffer from higher world oil prices if its net imports of oil are zero. I should emphasize, however, that underneath these cancelling national income effects there may well be large and divisive internal income transfers between owners and consumers of resources whose prices are changing.

By extension note that if a country is a net exporter of natural resources, then as the price of the resource rises the national income of the country increases. To the extent that economic growth has driven up oil prices, clearly the net incomes of oil exporting countries have taken a turn for the better.

The apparatus outlined here works well for marketed resources but cannot easily be extended to environmental resources. For the latter, we cannot rely on a simple aggregate growth model but must simply analyze the net impacts of such forces as greenhouse effect, acid rain, or ozone depletion.

Using this apparatus, we can make a rough assessment of the relative overall impacts of technological advance and resource depletion. The rate of growth of total factor productivity (TFP) in non-oil developing countries has been in the range of 0 to 4 percent per annum over the last three

decades. At the low end of this range have been many African countries, while at the high end have been the successful middle-income countries of East Asia. A recent study by Bishwanath finds TFP growth in Indian manufacturing at a rate of 1-3/4 percent per annum over the period 1959-78.⁵ For the calculations that follow, I will consider a representative developing country that enjoys total-factor-productivity growth of 2 percent per annum.

The prices of traded non-renewable resources have moved divergently over the last 30 years. For the period from the Korean War until 1962, real commodity prices declined, after which there was little trend up to 1971. The subsequent runup led to a tripling of real commodity prices by 1980, followed by a 20 percent decline by 1984.

Over the entire period, 1955-85, non-food resource prices have risen about 20 percent in dollar terms. To estimate the drag on growth, take a country that has net resource imports of 5 percent of GDP (which would be true of very few low- or middle-income countries.) Applying the formula in (2), then, we calculate the resource drag to be about 1 percent of national income, or .03 percent per annum, over the last 3 decades on average.

Clearly, the negative drag to economic growth from resources is two orders of magnitude smaller than the positive contribution from total factor productivity. It is not possible to estimate the fraction of TFP that is imported into low-income countries. But even if the imported fraction were but one-half, at say 1 percent per annum for a representative developing

⁵Goldar Bishwanath, "Productivity Trends in Indian Manufacturing Industry: 1951-78," Indian Economic Review, Vol. 18, No. 1, 1983, pp. 73-99.

country, the positive contribution of technology would be 30 times larger than the negative drag to growth from resource depletion.

III. Some Key Resource Sectors: Appropriable Resources

The abstract aggregate model outlined in the last section masks many of the concrete interactions between resources and the economy. Therefore, this section considers some specific examples of resource use. Moreover, I here take a forward-looking perspective, bringing to bear studies that examine the possible future economic drag from increasing scarcities of natural resources.

A. Non-renewable resources

Among the appropriable, non-renewable resources, energy and non-fuel minerals appear to be the most significant, so I will report only on these two sectors.

Energy. Energy resources are in value terms by far the most important non-food natural resource. For most countries, energy consumption constitutes 5 to 10 percent of total output. Moreover, international trade in fuels, particularly oil, forms a significant part of the imports of many nations, 25 percent in the case of India of the early 1980s.⁶ If resource depletion is to be a drain on economic growth, we should therefore begin our analysis with energy.

⁶ See World Bank, World Development Report, Oxford University Press, 1982, 1985.

A simplified example will illustrate the potential economic costs of exhaustion of low-cost energy fuels. In this example, assume that all today's energy is replaced by a high-cost "backstop" resource by the year 2100. For illustrative purposes, assume that such a high-cost backstop source would cost approximately as much as today's nuclear power, that is, roughly \$600 per ton coal-equivalent primary energy, as compared to \$170 per ton which was the global-average energy price for 1981. Under these and some other technical assumptions, we estimate that the drag on economic growth amounts to 13 percent of total income by the end of the next century, or about 10 basis points (ten hundredths of a percentage point) per annum over the 120 year period.

A more refined estimate can be made using long-run energy models that incorporate the estimated geological resources of energy fuels. I will discuss only one such estimate made by a model I developed jointly with scientists at the University of Illinois and Argonne National Laboratories.⁷

The basic approach in this model is to use existing geological and engineering information to estimate the impact of depletion of energy resources on the prices of energy fuels. This model relies on econometric techniques to estimate demand relations and on a linear programming algorithm to simulate the behavior of competitive markets. The model divides the world into three regions--the U.S., OPEC, and the Rest of the World--and calculates behavior in each region.

This more complete approach gives similar results to our simple example. In the Nordhaus-Illinois-Argonne model, we estimate that the

⁷ An earlier version of this model was published in my book, The Efficient Use of Energy Resources, Yale University Press, New Haven, 1969.

overall growth drag from energy-resource depletion will be around 0.1 percent per annum (plus or minus a factor of 2) over the coming several decades.

Nonfuel minerals. A second important class of depletable natural resources consists of nonfuel minerals. Of these, one group is superabundant and is unlikely to be affected by depletion. This group includes important minerals as iron, alumina, tungsten, sand and seawater.

A second group of nonfuel minerals is those that are geochemically scarce. Of these the most important today is copper, while others include gold, silver, platinum, silver and zinc. The geochemically scarce materials have become relatively more scarce in recent decades and mining of these minerals has progressed to deeper, leaner, and smaller deposits of lower grade.

How significant a drain on economic growth is likely to arise from the depletion of geochemically scarce nonfuel minerals? Little is known. However, colleagues at Yale and I have attempted to estimate the evolution of resource exhaustion for one important case, that of copper ores for the United States.⁸ This study is based on a methodology very similar to that just described for energy. It goes beyond the energy study discussed above by investigating in detail the substitution properties of twenty-one end uses for copper. In this respect, then, it substitutes an engineering methodology for the econometric methodology of estimating demand.

According to our estimates, given foreseen copper resources, and if there is no differential technological change in copper mining or use,

⁸ See Robert Gordon, Tjalling Koopmans, William Nordhaus, and Brian Skinner, Toward a New Iron Age?, forthcoming, Harvard University Press, 1987.

copper prices are projected to rise markedly in the coming decades. Our results suggests, again in the absence of technological advance, that copper prices will advance between 2 and 4 percent per annum between now⁴ and the middle of the next century (although the price of "copper services," or the services rendered by copper and its substitutes, is likely to rise only one-half as rapidly).

If we extrapolate these results to all the geochemically scarce nonfuel minerals, we can make an order-of-magnitude estimate of their drag on economic growth. The just cited study by Gordon et al. estimates a total drag of 0.01 to .04 percent per annum for the 1980-2050 period for the United States. Assuming that growth patterns in developing countries resemble those in the West, we would expect a similar drag in countries that import most of their nonfuel minerals.

How can we relate these figures to the central question analyzed here, that of the costs imposed on low-income countries by the resource-depleting strategies of high-income countries? From last section's analysis, recall that the depletion rates just estimated would apply to countries that import all the resources considered. To the extent that the resources are domestically produced, the drag imposed is proportionately reduced--while if the country is a resource exporter, the foreseen depletion would drive up world prices and be a boon to resource-rich countries.

B. Renewable Resources

The question of the impact of growth through renewable resources will not be analyzed here for two reasons. First, in surveying the economic

literature, I was unable to find any quantitative studies of this question. Second, an examination of the major renewable resources points mainly to the services of land and water flows. Water is generally not traded so this falls into the category of an autarkic resource. Land obviously is also not a traded good, but its product in the form of food is traded. For the moment, however, I cannot estimate the impact of economic growth on land's contribution to national income, but I suspect that it may prove important.

C. Tentative Conclusion on Appropriable Resources

The examples just provided are but a few that illustrate the international linkage between economic development and the global resource base. A complete survey would include many more, of which our knowledge is incomplete. But these examples lead to two conclusions. First, even if these resources are completely imported, the projected price and consumption paths suggest a very modest drag on economic growth--at most a few hundredths of a percent per annum. Second, if we combine these results with those of the last section, we arrive at a paradoxical conclusion: for appropriable natural resources, economic growth in advanced countries is likely to be growth-enhancing rather than immiserating for low-income countries. This paradox arises because economic advance tends to increase the relative prices of natural resources, and because poor countries tend on balance to export natural resources. This statement is only true on the average, of course, but it does give us some comfort about future impacts of growth on resource-intensive sectors.

IV. International Environmental Problems

Having sounded this optimistic tune, I move on to a less cheerful note --the impact of growth on the international environment. The discussion up to now has focussed on resources for which, to a first approximation, the market prices reflect both economic scarcity in production and economic value in use. This role of market pricing does not function properly for environmental resources. Hence, unless other social control mechanisms (like regulation or custom) fill the void, we may see significant misallocation of environmental natural resource. When the cost of polluting air is set at zero, we see far too much pollution. Conversely, because technical knowledge, particularly basic science and technology, cannot be bottled and sold for its full value, we tend to see private markets produce too little knowledge. How important are these spillover effects likely to be in the case of natural environmental resources?

At this point, the study of international environmental problems is in its infancy.⁹ I will first give a brief catalogue of some of the problems that have been identified and then discuss one of them in detail.

The following are some of the areas in which inappropriability of natural resources has been identified:

Stratospheric Ozone Depletion. The use and release of chlorofluorocarbons (CFCs) are expected to lead to depletion of ozone in the stratosphere. The effect would be to allow a significant increase in solar

⁹ Many of the issues treated below are discussed in a non-technical fashion in Robert Repetto, The Global Possible, Yale University Press, New Haven, 1985.

ultraviolet (UV-B) radiation. This is expected to lead to damage to humans, animals, and plants--especially those at high altitudes and latitudes. The exact timing and extent of ozone depletion--as well as the impacts--are still highly speculative. There is perhaps some ironic justice in the fact that UV-B has a much greater carcinogenic impact on people with light skin colors.

Acid rain. In the last decade, evidence has accumulated that emissions of sulfur and other pollutants have led to long-distance transportation of these chemicals. It is generally believed that this factor is in significant measure responsible for the increased acidity (lower pH) of precipitation. Precipitation in the northeastern U.S. and in Scandinavia--hundreds of miles downwind of sulfur sources--has shown pH values as low as 4.2 (compared to a normal value of 5.6). It is suspected that we have already witnessed effects on aquatic ecosystems and on forests.

In this area, however, the importance of the North-South linkage is probably negligible. Given weather patterns and geography, a small fraction of sulfur deposited on the soil of India, China, or other developing countries arises outside their borders.

Fisheries. Ocean fisheries historically formed, along with the atmosphere, one of the world's great common property resources. The total catch of fish and other water biota was 67 million metric tons in 1981, with a landed value of around \$30 billion (in 1980 prices), or around 0.3 percent of gross world product. Some experts feel that the limits of fishery production have been nearly reached, and as growth continues, the price of fish will inevitably climb.

The major environmental issue in fisheries is whether overfishing will uneconomically reduce future fish production. While this is clearly important for whales, and perhaps for anchovies, the quantitative impact of over-exploitation is today unclear. Given the size of the world's fisheries, however, the aggregate impact of overfishing is sure to be quite small.

There are undoubtedly other issues I have neglected. Some, like radiation from nuclear testing, lie outside economic growth narrowly defined. Others will surely be discovered in the future. I will next discuss in some detail what is probably the major of these issues--the greenhouse effect.

The Greenhouse Effect. The final example discussed here is the greenhouse effect. The origin is well known.¹⁰ Because of the combustion of fossil fuels, CO₂ enters the atmosphere, with a sizable amount remaining airborne for many centuries. The atmospheric CO₂ tends to trap radiation, thereby warming the earth's surface. General circulation models indicate that the average warming that would arise from a doubling of CO₂ is 3° C, with only a small rise at the equator but up to 10° C at polar latitudes. Recent studies suggest that other gases (notably, the CFCs, methane, and ozone) also have such a warming impact, and very crude estimates indicate the non-CO₂ greenhouse gases may have as large an effect as CO₂ by the middle of the next century. Overall, current estimates put the doubling of

¹⁰ The most thorough authoritative report is contained in United States National Academy of Sciences, Changing Climate, National Academy Press, Washington, 1983.

the CO₂ equivalent of all greenhouse gases, if unregulated, at around the middle of the next century.

The impacts of this trend are only dimly seen. However, unlike the appropriable natural resources, environmental impacts will affect nations whether their economies are closed or open. Indeed, poor lands may be most heavily affected as their economies depend most heavily on agriculture, and particularly on rain-fed agriculture, and may have the least ability to make technological and social adaptation to major climatic changes.

Even though the impacts of the greenhouse effect are poorly understood, the best guesses point to some significant potential issues. First, the increase in CO₂ itself is likely to have a major positive impact on agriculture, for CO₂ is a natural fertilizer. Experimental studies indicate that for some crops a doubling of CO₂ may raise yields by as much as 20%; but the effects in non-experimental situations is hard to predict.

A second certain and malignant impact comes from the likely rise in the sea levels as the earth warms. The recent U.S. National Academy of Sciences report, Changing Climate, foresees a potential rise in sea level of up to 1 meter by the second half of the next century. This rise will be most unwelcome to low-lying areas, such as Bangladesh or the Netherlands, and to those areas vulnerable to storm surges.

The most uncertain impact is on climate patterns themselves. Many foresee the melting of the summer Arctic icecap within our lifetimes, with possible significant changes in northern hemisphere climates; some believe that the pattern of monsoons may shift significantly; some studies indicate a migration of desert boundaries by hundreds of kilometers, generally in a poleward direction; further possibilities are dramatic changes in

precipitation patterns, along with higher evaporation, with the consequent effects on river runoffs, all leading to major impacts on rain-fed and irrigated agriculture.

None of these events can be predicted with anything approaching certitude. But the potential impacts of such major shifts--particularly on very poor rural villages with strong attachments to particular traditions and locations--can hardly be exaggerated. And the blame for these damages, if they can be identified, will justifiably be laid at the feet of the god of energy-driven economic growth.

V. Conclusions

What can be conclude from our brief survey of the interaction of natural resources and economic growth? Does the impact of economic growth in advanced countries on resources tend, on balance, to slow or to speed the growth of developing countries?

The first conclusion is that, at present, the impact of natural resources is likely to be relatively small. Natural resources do not appear to have been a major drag on the historical economic growth of most middle- and high-income countries. Nor is absence of resources likely to prove a key ingredient in the future economic fate of today's poor countries. Finding oil did not make Britain the kingpin of Europe or slow its decline; nor are oil-rich countries today the envy of the world community.

My second conclusion is that for marketed or appropriable resources, on the average, the impact of advanced-country growth is likely to increase rather than decrease the real incomes of developing countries. This finding

arises because the latter are by and large exporters of natural resources. Exceptions would tend to be those developing countries that are net importers of resources.

Finally, one provisional negative impact may lie in the area of environmental natural resources. In this area, advanced country growth is almost surely leading to a greenhouse effect and ozone depletion. The latter can have nothing but ill effects, while the former will be the impetus for slow, uncertain, and major changes in the global climate and in agriculture.

Returning to my original question, I can leave you therefore with a cautiously hopeful note. Countries like India will reach the table of prosperity later than many Western countries. Moreover, as we have increasingly learned, the speed with which a country attains a more balanced and ample diet--of food, shelter, clothing, and education--will be largely determined by the wisdom and strenuousness of its people's own efforts. But, except for the stains on the tablecloth from degradation of our common environment, the necessary resource ingredients for a bountiful meal are likely to remain available at reasonable costs for many decades to come.