SPECIAL REPORT

The Riemannian Economic Model: Part I

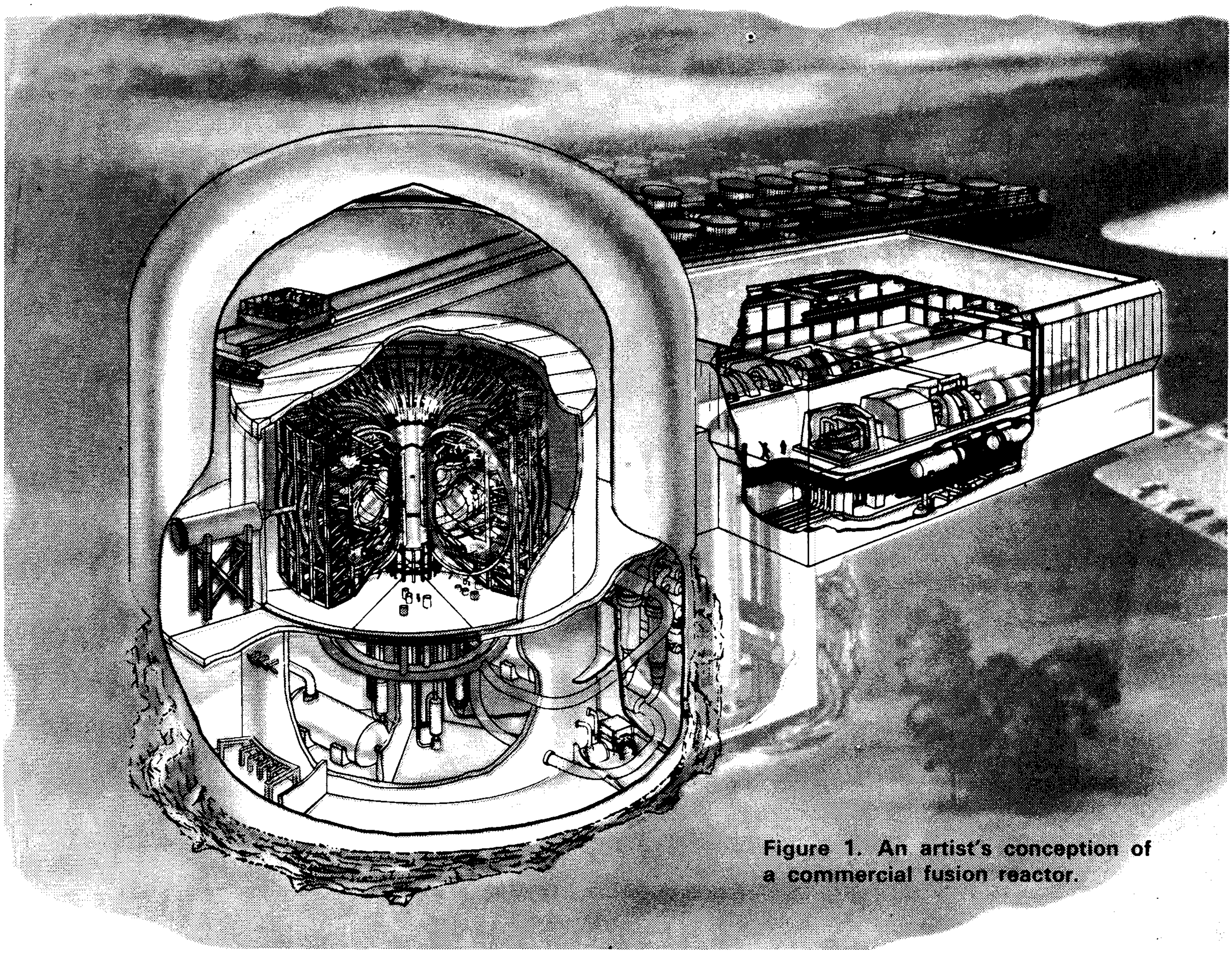


Figure 1. An artist's conception of a commercial fusion reactor.

Introduction

The *Executive Intelligence Review* has developed an econometric model, now in the advanced prototype stage, for computerized simulation of economic activity. In this week's issue, the *EIR* begins the presentation of a revolution in econometrics by printing the address of the Fusion Energy Foundation's Director of Research Dr. Uwe Parpart at the Executive Intelligence Review Seminar in Washington, D.C., last Jan. 31. A full discussion of the mathematics of the new econometric model will appear in Part II of the series.

Employing this model, the *EIR* will publish its own computer-generated indices of economic performance and potential at the beginning of this year's second quarter, as well as occasional computer simulations of regional and sectoral economic activity. Computer simulations of questions of interest to *EIR*'s clients may also be undertaken on a special contract basis. Work to date on historical data, including the effect of the 1973 oil and raw materials price increases on advanced and developing sector economies, indicates a high degree of predictive accuracy absent in existing economic models.

The authors of the model, Drs. Uwe Parpart and Steven Bardwell of the Fusion Energy Foundation, abandoned the now-discredited econometrics practice of attempting to forecast economic performance by applying correlations of historical data to standard definitions of GNP. In the accompanying speech, Dr. Parpart shows why econometrics has sunk to a credibility status not much better than astrology.

Instead, the model's authors, in cooperation with the *EIR*'s economics research staff, adopted the quantitative measures of economic activity proposed by U.S. Labor Party Chairman (and *EIR* Contributing Editor) Lyndon H. LaRouche, Jr., in his report, "The Theory of the New Monetary System," published as a special *EIR* supplement in October 1978. Instead of a *correlative* model, LaRouche proposed a *causal* analysis of the economy, identifying the ratios which define economic "free energy," or negentropy, to use the physics term. LaRouche proposed that negentropy is reflected in the rate at which the economy's tangible surplus product expands in excess of current consumption requirements of population and capital and raw material consumption requirements of industry. The increase in this ratio

successful absorption of new technologies, including the rate of assimilation of scientific concepts among the economically active population.

Parpart and Bardwell have expressed the ratios proposed by LaRouche in a series of partial differential equations susceptible to computer solution by iterative methods, in a procedure identical to those used to simulate thermodynamic and hydrodynamic problems in physics. The economics research staff of the *EIR* has assembled the first-generation data base for this model. What emerges is a causal model of the economy, quantifying the motion of the productive powers of labor through the "medium" of the productive capacities of the economy.

The first data runs through the system will include the American economy, the Japanese economy, the West German economy, and the linked relationships between these economies and developing-sector trading partners. The model is eminently suited — and data are now being gathered to make possible — a similation of the global economy.

The advanced mathematics employed in the model — used hitherto only in simulation of complex physical systems — derive from the work of the nineteenth century German mathematician Bernhard Riemann. The term, "Riemannian," however, has much more than esoteric implications. Riemann's thrust was to build analysis around points of breakdown, or "discontinuity," in continuous functions — the points, in economics, at which the parameters of economic measurement change. New technologies, changing government policies, drastic changes in input prices such as the price of energy, and other features of recent experience are the developments which define economics today. No model based on correlations of historical data — that is, all existing econometrics models — can hope to analyze such developments, by definition. The mathematical analysis of the LaRouche ratios incorporated into the new "Riemannian" model, however, identifies such "singularities," or breakdown points in continuous functions, whenever economic events produce a change in economic parameters. Unlike other models, the *EIR*'s new effort can specify the conditions for either economic upsurge or economic breakdown, and — even more important — quantify the effects of economic choices available to governments and business.

— *David Goldman*
Economics Editor

Figure 2. U.S. Gross National Product

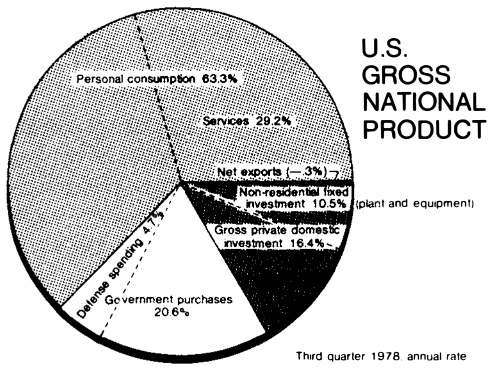
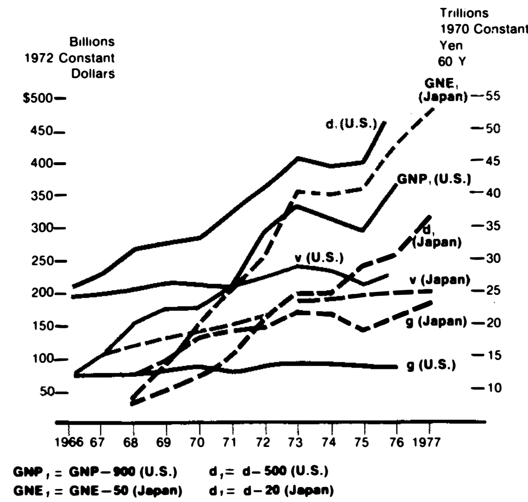


Figure 3. U.S./Japan



Why you can't trust the GNP

Uwe Parpart, the director of research and development for the U.S. Labor Party, introduced the concept of a "Riemannian economic planning model" at a seminar on "Doing Business in 1979 — the European Monetary System and Mexican Oil." The conference, held in Washington, D.C. on Jan. 31, was sponsored by Executive Intelligence Review. *Mr. Parpart's seminar presentation follows.*

The power plant of the future will be based on controlled nuclear fusion (figure 1). This device does not now exist, but it is one which will be providing us the bulk of power in the 21st century — if the scientific results achieved in the United States, Japan and the Soviet Union over the past year and a half are technologically realized.

Why do I begin my presentation with this bit of futurology? To emphasize the point that economic development, the fundamental questions concerning the national economy of any country, are definitively *not* concerned, in principle, with the categories usually presented by Department of Commerce statistics, Department of Treasury statistics, or anything of that sort.

When you look at the $28 billion U.S. trade deficit for 1978, at the figures of unemployed, at the actual conditions of the cities in this country, then the basic problem to be addressed does not concern questions of growth rates in monetary terms, but questions of real economic product.

What I would like to present to you can be termed the Riemannian economic model, a concept relatively unknown to you.

Bernhard Riemann was the most important mathematical physicist of the 19th century, a man not generally known by economists of businessmen in this country or anywhere else. Nevertheless, the contributions that he made to mathematical physics in the 19th century are the bases of the economies that we now have in the advanced sector today. Without the work of Karl Friedrich Gauss, Riemann, Wilhelm Weber, possibly James Clerk Maxwell and others, we would not have the type of economy we now have.

Any attempt to understand how we can today put a man on the moon — that within 20 years we will be technologically capable of bringing the sun down to earth in the form of controlled thermonuclear fusion — any attempt to understand the real economy without the knowledge that it is fundamentally predicated on the rate of scientific progress, on the rate of introduction of

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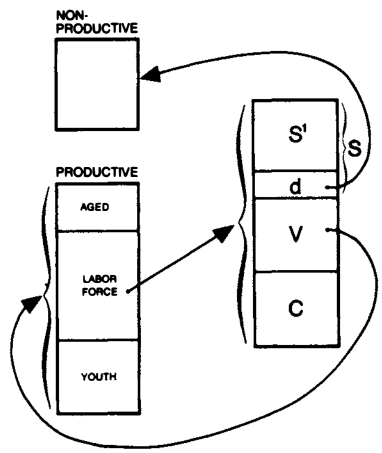


Figure 4. U.S. Capital Spending

	Capital Expenditures	Pollution Abatement Devices	Net Capital Spending	Net Capital Spending (in 1972 dollars)
1976	120.50	6.7	113.8	85.1
75	112.8	4.5	108.3	85.1
74	112.40	4.5	107.9	92.7
73	99.8	3.0	96.8	91.4
72	88.4	1.8	86.6	86.6
71	81.2	1.6	79.6	82.9
1970	79.7	0.8	78.9	86.4
69	75.6	0.8	74.8	86.2
68	67.8	0.7	67.1	81.2
67	65.5	0.7	64.8	82.0
1966	63.5	0.6	62.9	82.0

new technologies and on the rate of progress of the social productivity of the population based upon these scientific and technological advances, will produce an economic theory that is incapable of explaining what the world looks like, how the world works, why the world works in the way it does, or how the world will look in the future.

The GNP fiction

Figure 2 should be more familiar to you. It is a quite ordinary pie, the U.S. Gross National Product for 1978, based on third quarter rates. Here, everything is thrown together into one big pie, which tells nothing about the real economy — or, at best, very, very little about it.

For example, the category termed "government purchases" makes up 20.6 percent of the total GNP. If there is any significant growth, as over the past decade, in that category and it is decided that this growth defines growth in the real economy, then a very fundamental mistake has been made. In fact, these government purchases, rather than contributing to economic growth, tend to do the exact opposite. They tend to function as taxes on the real productive economy.

Defense expenditures, which, for a variety of reasons, may be regarded as necessary, certainly do not contribute anything to the productive throughput of the economy or to social productivity. This expenditure contributes to our defense and the money for defense spending exists by taxing productive economy.

To throw this tax into the GNP and then say, "our economy has grown because defense spending has grown," is total nonsense.

You can see this with regard to other government purchases and categories, for example, the social welfare categories. Again, they may be regarded as necessary and in many cases they are. However, they constitute a tax on the real economy and not a definition of what the real economy is.

How do you get from a Gross National Product way of looking at the economy in monetary terms to at least an approximation of how the real economy works?

One important indicator, though somewhat distorted, is gross investment as a share of GNP. This begins to give a sense of what is actually going on. The 1972-1975 figures are presented in the CIA *Handbook of Economic Statistics*. The figures for 1975-1978 are also available, but have not been printed in this CIA *Handbook*, perhaps because they are so devastating.

In the 1975-1978 figures, the United States percentage goes down to less than 12 percent. The USSR per-

Figure 5. Material content of GNP in kg./cap.

	North America	Western Europe	Japan	USSR	China	Southern Asia
Steel	504	400	912	217	92	9
Aluminum	18	9	9	2	0.5	0.2
Paper	234	98	120	13	19	2
Cement	305	495	587	187	95	41
Chemicals	426	236	365	49	26	7
Grain	915	355	155	525	253	240
"Total mass" (kg/cap. y)	2402	1593	2148	993	485	299
GNP ($/cap. y)	7120	4645	4450	2550	380	210
Energy (kgoe/cap. y)	8144	3211	3035	4024	472	259
Population (10)	236	365	112	254	822	1002

centage goes up to about 30 percent. The West German percentage goes up to 31 percent. The Japanese percentage goes up to 39 percent. From these statistics, one can begin to see what is happening, because this represents the money, the surplus that the real economy produces, which is reinvested in something that produces real wealth.

But even this is problematical regarding the U.S. economy. It turns out that of the 12 percent over the past three years that was reinvested, a very significant percentage was put into such things as pollution control devices and various other kinds of gadgetry which do not make the economy more productive, but, in fact, less productive. If, for whatever reason, scrubbers are installed on a coal-fired plant, the plant is less productive. We could argue the desirability of scrubbers from an environmental standpoint, but the point here is that what is being included as a category for a productive economy is a category which is really a tax on productivity.

Categories of the real economy

Figure 3 introduces certain categories which do not usually occur in economic statistics. There is a category "C", a category "V", a category "d", and then the ordinary GNP.

The critical category for any economy is "C": capital investment in new plant and equipment. From that standpoint, what you can see is that between 1966 and 1977, the U.S. economy has been totally stagnant. On the other hand, when you look at the same category in the Japanese economy, you have a certain disruption, but there is a very significant and steady rise.

Another category, which is negatively significant, is the category "d" which measures all those expenditures within the total GNP laid out for such things as welfare, defense spending, services in the economy — any expenditure which is not directly related to the fundamental questions of productivity based on existing technologies of plant and equipment.

In the period during which the U.S. economy — in real productive terms — is stagnant, you have a dramatic rise in the category of "d." In fact, the entirety of the U.S. GNP rise in this period, in terms of its curve, follows precisely the shape of "d" — which is what you would expect because the category "C" is stagnant. Therefore if the GNP rises, which does in fact occur, it is based on the rise in "d."

What does this mean? It means, in terms of productivity figures, what is already generally known to

Figure 6. Mass per capita

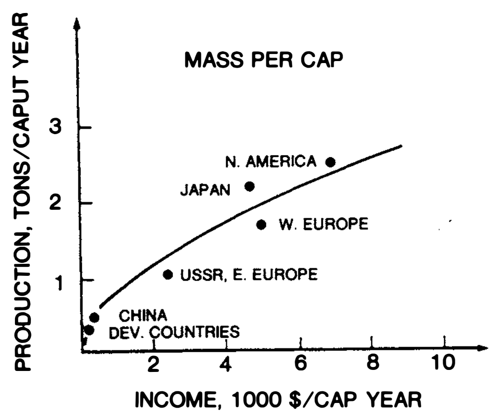
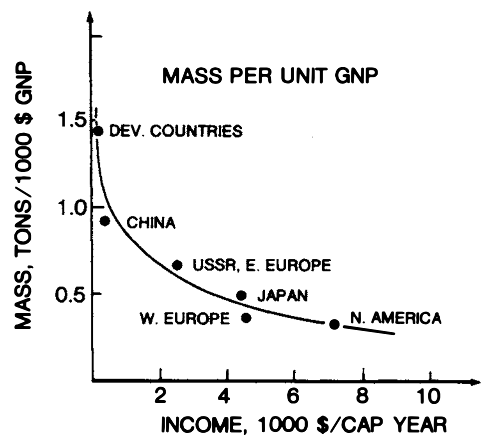


Figure 7. Mass per unit GNP



economists: that the productivity of the U.S. economy has been declining in a very dramatic fashion and that significant investment in new plant and equipment,"C," has not occurred.

In the Japanese economy, there exists a significant rise in "d," representing a similar type of problem: that the Japanese economy is also incurring a significant amount of expenditures in that category. However, since there is a simultaneous rise in the "C" category, one can offset the other. To the extent that that occurs, a healthy economy can be maintained, even though problems come up. And the Japanese economy, of course, has had a significant number of problems in the recent past.

As I mentioned before, the figures on pollution control devices will shock you (figure 4). Capital expenditures in the United States between 1966 and 1976 have gone up from $63.5 billion to $120 billion in 1976. The spending on pollution abatement devices has gone from $.6 to $6.7 billion. In other words, 5 percent of total capital expenditures in the U.S. economy went to this kind of nonsense, a very extraordinary fact. Capital expenditures are being taxed to the tune of 5 percent by such things as bigger and better filters on this, that, and the other thing.

Take an example: if you want to build a new chemical plant today, close to 25 percent of the total capital outlay in the U.S. will be swallowed up simply by fire and pollution control costs, as required by the Environmental Protection Agency.

Figure 5 displays the "material contents" of the Gross National Product in kilograms per capita. For example, in North America, and primarily the United States, each person made a contribution to produce 500 kilograms of steel last year. In Western Europe, 400; in Japan, 900; and so forth. The "total mass" that North Americans were responsible for was 2,400 kilograms of diverse items; in the Western European economy, 1,500; Japan, 2,100, and so forth. There is a significant positive correlation between the GNP per capita, the standard of living in the country under examination, and the actual total mass produced.

The United States has the highest per capita standard of living and the highest total mass. There is also a significant correlation between total mass, GNP, and energy consumption per capita. In all three categories, the United States is the leading world economy. We are now beginning to get a sense of what has to be looked at in the real economy to understand what is going on.

When somebody says, "Let's save energy, let's import less energy to the U.S. That will help our economy" by reducing the negative surplus, he is talking nonsense. In fact, it may be very useful to import very large

Figure 8. Typical composition of GNP

	Country		
	Low-income	Middle-income	High-income
Per caput 1975$/yr.	300	1700	4800
Population 10^6	2371	650	884
Agriculture %	40	12	3
Industry %	30	40	41
Transport %	5	5	6
Service %	25	43	50
Total %	100	100	100

amounts of energy if our social productivity is such that we can actually convert that energy through our productive mechanisms into exportable output valued higher than the energy imports. These things must be considered. We cannot ignore what these real economic categories are.

Some comparisons

Figure 6 presents an interesting curve that again compares income per capita with production in kilograms. The results are what you would expect. The more you spend on your workforce and the higher standard of living, among other things, actually reflect a larger productivity of the workforce, the more output you get. There is a problem in this curve. It would be very nice if this were not a curve that was sloping downward, but a curve that goes up straight. The fact that this is not the case will cause some problems.

The mass per unit GNP is also interesting (figure7). It turns out that in the richer and more developed countries the total mass tonnage per unit GNP is lower, which is expected. For example, in the developing countries, most of what is produced are large amounts of bulk, grain, and not many minicomputers, whereas in North America, Japan, and so on, you have the inverse relationship.

The typical composition of GNP from the standpoint of the real economy (figure 8) shows that as you move from low income to middle income to high income economies, the percentage of agricultural production will decline dramatically, while the component of industry will go up significantly. Also rising significantly is the service category and that category defines a tax on the economy. I want to focus on the very significant decline in the percentage of agricultural production. The U.S. farmer, at this point, is capable of feeding 60 people in the United States. A Chinese farmer is capable of feeding himself and one other person. That gives you some idea of what productivity is really about.

The most revealing and interesting relationships that give us a better grip on how the real economy works are those between energy, population and GNP (figure 9). This is the consumption of energy in so-called hectajoules, or 10^{18} joules. I've simply divided these numbers so you get the energy intensity, the energy per capita, and the actual GNP per capita. Here again, the United States has the highest per capita energy consumption by quite a margin. Next highest is the Soviet Union, with Europe and Japan somewhere in between.

However, an important factor now arises. The rela-

Figure 9. Energy/GNP

	Population (10^6)	Energy (EJ)	Energy/population	$ GNP/cap.
N. America	236	80.5	0.3411	7120
			2.5	1.53
W. Europe	365	50.3	0.138	4645
			1.09	1.05
Japan	112	14.2	0.127	4450
			0.54	1.75
USSR	254	59.6	0.235	2550
			6.35	12.0
China	822	16.3	0.020	380
			x31	33.9
Asia (excl. China)	1002	10.9	0.011	210

tionship between the energy per capita and the actual GNP is distorted. In the United States, as compared to Western Europe, we consume 2.5 times the amount of energy per capita, but our GNP is only 1.53 times as high as in Western Europe. That means that, in one sense, the mode of energy consumption in the United States is less effective than in Western Europe. This is a very real problem. It takes twice as much energy in the United States to produce a ton of steel than it does in Japan. Why? Because the U.S. steel industry is hopelessly outmoded. The U.S. is operating with plant and equipment built in the 1920s. The Japanese steel industry, on the other hand, is based on primarily post-World War II categories of technology. If you compare Western Europe to Japan, you can see that those economies are very, very similar in GNP relationships, as well as in energy intensities. Their efficiencies are considerably higher than those in the United States.

Figure 10 displays something that's not altogether unexpected. On one axis are the number of tractors per thousand hectares and on the other, the cereal yield in tons per hectare. What you expect, in fact occurs. To a certain extent, the more tractors you put in use in the agricultural industry, the higher the per hectare yield. But you cannot turn your land into parking lots for tractors. The ratio cannot continue to rise indefinitely. In fact, Holland and Denmark are probably already overdoing it: twice as many tractors in Holland to produce a cereal yield which is not twice as high as in North America. So there are certain diminishing returns on your investment in this case.

The same problem is encountered in cereal yield versus nitrogen fertilizer per hectare (figure 11). Again, the more fertilizer you put in, the better the cereal yield per hectare. But, again, there is a limit to how much nitrogen fertilizer can be put into the soil before it is ruined. These problems are very significant.

Ideally, if we dump more in, then the productivity of the soil, or generally speaking, the productivity of the industry would appear to rise in a linear fashion. But that does not occur.

The solution to resource depletion

We are never going to be able to run an economy on the basis of the existing technology base. We cannot afford to stagnate with regard to production within the same technology framework. If we do, then we will encounter precisely these kinds of problems. We may be able to increase our productivity, but we will not be able to deal with any long-term problem. In fact, there is a very high sensitivity of the economy to significant price increases

Figure 10. Cereal yield and tractor density

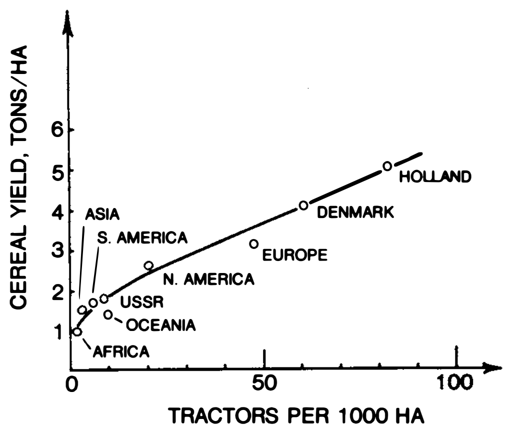
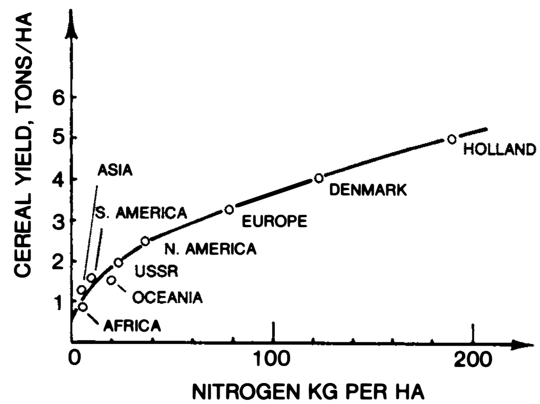


Figure 11. Cereal yield and fertilizer yield



for agricultural production — if you increase your fertilizer input by a given amount.

The general point here is very simple. It is the problem of resource depletion (figure 12). First of all, there is the idea that somehow the earth has limited resources for human existence. Based on that, there are all kinds of strange ideas concerning zero growth and even the necessity of negative growth rates for population, consumption, and so on. That's a lot of bunk.

Contrary to what you may believe, it is not true that we have finite resources. So you say, "Well, isn't it the case that there's only so much iron in the ground? Or, isn't it the case that there's only so much oil in the ground?" There is a certain amount of truth to that but it is not significant.

What primarily concerns us for the economy and the productivity of the economy—not just in the short run. but in the long term — is at what price can we introduce the necessary raw materials into the economy.

Take uranium for example. Some say if we keep operating light water reactors at the present rate, we will run out of uranium before the year 2000. That is not true. What we will run out of is uranium *at the present price* and we will probably run out of that much earlier. There is plenty of uranium but it would cost a lot of money to extract it. Nevertheless, if we are willing to pay the price for it, then we can do it.

For any resource, if that resource is at all significant, it will at first deplete slowly. As time goes on, depletion becomes more rapid. At the same time, the depletion costs go up. Oil in the United States in the 1890s was a very different story than it is today. This is a situation where cost rises very slowly, but as there is more need to drill deeper wells, the depletion costs go up.

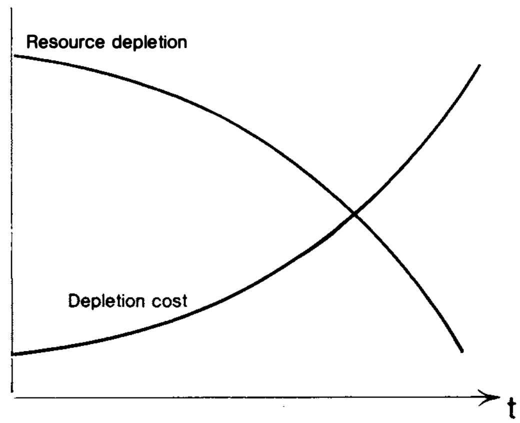
This is the real problem that we face: at what price do we introduce raw materials into the economy? The lower the price, the better, because then productivity will not be hindered. If, per chance, it is necessary to introduce resources at a higher price, then technology has to develop even more rapidly to squeeze as much out of it as we conceivably can.

The basic lesson is this: there is not even a possibility of a resource crisis for mankind. The only possible crisis you can actually encounter in the long term is the crisis of the human mind, a situation in which man is not capable of coming up with the technological solutions in time to deal with relatively limited resources within a given range of social price of production for that resource.

Planning the world economy

This is the fundamental reality of economic planning. If, in the 19th century and well ahead of the depletion of re-

Figure 12. Resource depletion



sources for coal-powered steam engines, the technologies based on the theory of electromagnetism had not been introduced, we would today not be capable of supporting populations at the standard of living that we are now capable of supporting. We would not be in a position to sustain the kind of economic development that we have had.

In terms of social productivity, the basic question is never one of resources, but of combining a skilled population with a technology base to stay ahead of the problem of resource exhaustion. We must introduce new technologies long before the actual scissors problem (as we know exists now) arises for us.

From the standpoint of technology, I think this is clear. What people do not generally consider is the extraordinarily important cultural component involved. If we permit 50 percent of our high school youth to be on drugs, if we permit the educational system to remain in a state of ever-more rapid decay, and if we permit a situation where the cultural level of the population is no longer capable of producing a scientist who is going to produce the results to improve our technology base successively, then we're killing ourselves. We are destroying ourselves.

The lesson of the European Monetary System is that we are now at a point in human history where these problems have to be squarely faced. We have to face up to the fact that the destruction of the creative potential of the population, which has a material base in such things as GNP categories, cannot be permitted any longer. It is necessary to bring up the overall level of productivity of the world population, at least into a general region of significance comparable to the advanced sector.

If that does not occur, then we are not going to exist in the next century. We will have 7 billion people by the year 2000. We will have somewhere around 10 billion people by the year 2050. There is no way we can come up with the resources to support that number on the present technology base, absolutely no way. We have to train a world population, create the technology base, create the scientific breakthroughs that allow us to progress the way we have to. If we permit our children to be brought up by rock music and on drugs instead of with science and the cultured music of Beethoven and Mozart, we are killing ourselves.

That is a very fundamental point. History has taught us this. To the extent that this fundamental principle is the characteristic of the advanced sector, we have no problem with Third World development.

There is the usual answer: "Well, Third World development on that basis has failed. We need appropriate technologies. We need better picks and shovels. We don't need nuclear reactors in the Third World sector."

The actual historical examples that best teach us are the historical example of the United States, of the Soviet Union, of Korea in the postwar period. All were underdeveloped economies at one point and did not base their development on "appropriate technologies." It is not true that somebody told the Koreans, "you cannot build this. You first have to learn to use a better pick and shovel."

What happened was a certain amount of United States input, a certain amount of Japanese input, and a modern economy was built from the ground up. And it is functioning as one of the highest growth economies in the world today.

Why should that not be possible elsewhere? Why should that not be possible in Africa, in South America? Why should that not be possible in Mexico? It is, and it will happen. That is the purpose of the European Monetary System.

The economic planning model, or any way of looking at the world economy that starts with fictitious GNP categories instead of the categories of real economy is going to ignore that basic point.

to be continued