20-sector analysis of the U.S. economy

Riemannian model shows sharp decline in capital-intensive sectors

The *Executive Intelligence Review* is pleased to release in this report a groundbreaking set of results produced by the computer-based economic model designed by Drs. Uwe Parpart and Steven Bardwell of The Fusion Energy Foundation. The present report is a 20-sector analysis of the post-1969 behavior of the United States economy according to the parameters of Riemannian economic analysis. Included in this report is a selection from a large group of computer-generated graphs describing the 20 Standard Industrial Categories (SIC's) as assigned by the United States Department of Commerce. The full results and additional applications of the disaggregated economic model are available from *Executive Intelligence Review* on a fee basis.

What the accompanying data establish—contrary to the standard wisdom of computer econometrics—is that the American economy has been in basic decline since 1969, despite the rise in so-called "real Gross National Product." Further, the 20-sector breakdown demonstrates that the decline has been most acute among those SIC's which are capital- and energy-intensive. That is to say, the decline in the economy has been borne disproportionately by those sectors which should otherwise have been the most productive.

As stated in earlier presentations of the aggregate analysis of the American economy, the Riemannian model is unique in the following respects:

1) Rather than take as its basic measure of the economy the Gross National Product, which is the net of all final sales in the economy, the Riemannian model employs measures based on the real output of tangible goods. The new model eliminates considerable "fluff" in the GNP figures by treating so-called service industries as an *overhead cost* charged to the goods-producing sector of the economy.

2) The model examines the way in which the tangible goods production of the economy is employed in economic reproduction, i.e., treats the factors in economic production *causally*. All other computerized models, prominently those of the Wharton School, Chase Econometrics, and Data Resources Inc., rely on correlations between disparate categories of economic activity. Such correlations are notoriously unreliable under conditions of major economic change, e.g. changes in labor productivity, introduction of new technology, changes in energy prices, and so forth.

The Riemannian model divides tangible output for the economy as a whole (or for individual sectors of the economy) into the following segments:

a) V, or "variable capital" in the classical-economic definition, or the portion of total output consumed by the goods-producing workforce ("factor cost");

b) C, or "constant capital" in the classical-economic definition, or the portion of total output consumed as raw materials or maintenance of plant and equipment in all goods-producing activity ("user cost");

c) D, or a designation for the total portion of output not returned into goods-producing activity, including the consumption of all non-goods-producing activity, including the consumption of all non-goods-producing employees, military production, office equipment, and so forth.

The computer program converts this array of data into the following ratios:

a) *Alpha* is the ratio of the change in v to the change in c, or the change in the composition of capital.

b) *Delta* is the ratio of total surplus—the increase in V + C over a given cycle of production—to V, or the incremental amount of V-type goods required to generate an incremental amount of surplus. The delta ratio is also the model's measure of productivity.

c) *Gamma* is the ratio of V to D, or the rate of nonproductive investment in the economy.

The model then generates differential equations for these three ratios and solves them simultaneously for each sector. In the case of the 25-sector breakdown of the economy, the model simultaneously solves 75 differential equations.

This simulation of the economy permits the *causal* effect of changes in factor cost, user cost, productivity, or the balance between goods-producing and non-goods-producing sectors to be projected with great precision. The conventional econometric model merely adds up linear equations for a multitude of factors in order to obtain aggregates. It then abstracts what are generally arbitrary relationships between these factors and attempts to predict future behavior. The aggregate error accumulated through such additions almost always exceeds the range of prediction, making such predictions pure "fudge." By contrast, this method of differential-equation solving demands that the future behavior of each projected causal factor be consistent with the others. Statistical error does not accumulate; on the contrary, the model will fail to solve differential equations for mutually-dependent causal factors if one or more of these factors is wrongly projected.

Present model

The present disaggregate model of the economy is a *partial input-output model.* In brief, the model analyzes the reinvestible surplus of each of 25 sectors (of which 20 are shown below), as a moving average of the increase in total factors of production (v + c) on a year-to-year basis. The total surplus of the 25 sectors is then pooled (as a "Totals" sector). This surplus is then divided into two categories. The first category represents D, or the portion of surplus that is not reinvested into goods-producing activity. As noted, that includes the consumption of non-goods-producing workers, service industries, government, etc. The second part is reinvestible surplus, or S′. The total S′ is then reassigned back to each of the 25 factors according to a function based on the historical rate of growth of each sector.

The data employed are a modification of the Value Added series prepared by the Bureau of the Census, which contain the best-available breakdown of factor and user costs. The data employed in the accompanying examples are the most recent available from the Bureau of the Census, through the year 1976. Modification of the Commerce Department data to conform to the model's requirements, however, permits updating of the data to current months.

The notion of *pooled surplus* is a unique and critical feature of the disaggregate model. The most important factors impinging on investment decisions in individual industrial sectors are not made in those sectors. Global considerations which affect their capacity to reinvest include tax policy; Federal and State regulatory policy; labor relations; credit market conditions; energy and raw materials prices; and foreign economic policy.

For example, the Internal Revenue Service depreciation schedule determines to a certain extent how much of the total product of each industry may be exchanged for new investment goods for expansion. Industries of different energy-intensivity are impacted differently by changes in the energy price. Industries of different capital intensivity are impacted differently by changes in credit market conditions.

The disaggregate model permits the user to analyze the differential impact of such global developments on the surplus-generating capacity of each industry, and on the reinvestment quota available to each industry. Such global developments must be projected in terms of changes in the alpha, delta, and gamma ratios for each of the 25 sectors. In some cases, e.g., energy, such adjustments are not problematic (e.g., a rise in the price of energy constitutes a change in the alpha ratio, or the ratio of incremental factor cost to incremental user cost, of each sector based on its energy consumption). In other cases, e.g., government regulation, the impact of policy changes may be in dispute. However, the model is designed to allow the user the flexibility to explore many alternate hypotheses and arrive at a useable range of projections.

The graphs included in this report display the "free energy ratio" for the 20 SIC's as calculated by the Riemannian model. This ratio is the division of the total reinvestable surplus by the combined costs of production, or S′/(C + V). Essentially, it is a measure of the economy's ability to generate new useable surplus.

Once arrayed in this fashion, the 1969-1979 data for the United States economy are instructive. The graph showing the total activity of the economy stood at a lower point in 1976, after the "recovery," than in 1969. The strong indication is that in terms of its capacity to produce new tangible output, the United States economy has undergone significant deterioration over the previous decade, apart from the disruption of the 1974-75 recession. This casts considerable light on labor productivity and other major economic problems.

Turning to the individual sectors, it is most useful to group them under two headings, industries which have held their own and those which have declined:

Declined	Advanced or Remained Steady
Agriculture	Textiles
Metals	Apparel
Rubber	Tobacco
Oil and Coal	Lumber
Chemicals	Stone
Food	Furniture
Paper	Printing
Transportation Equipment	Leather
Instruments	Metal Products
	Electronic Products
	Machinery

The trend is obvious: in terms of *reproductive potential,* the most capital-intensive sectors of industry have not merely lost competitive position since 1969, but are now in a significantly worse position than a decade ago. The least capital-intensive industries have more or less held their own, although there has been relatively little expansion.

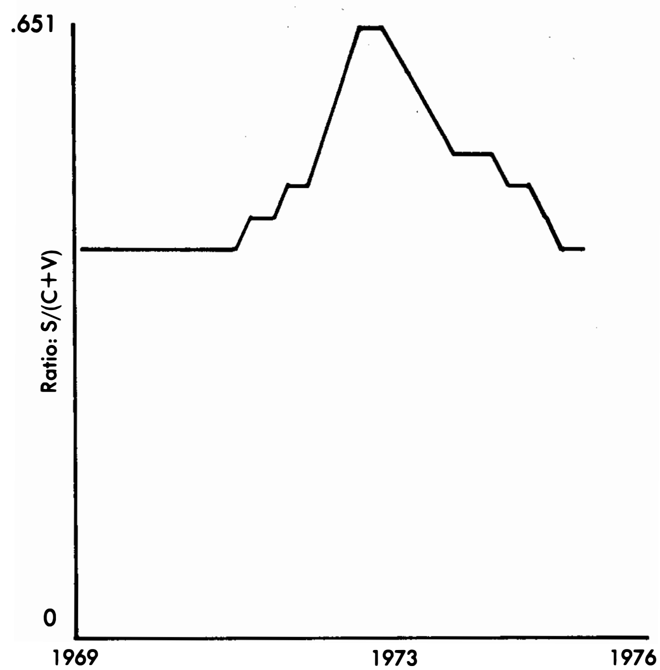
That is, the underlying industrial base of the country has seriously eroded. The economy's underlying capacity to expand—measured by the "free energy ratio"—has been in continuous decline for the past decade. This is not the occasion to examine all the factors responsible for this state of affairs. However, it is worthwhile returning to the computer-generated graph displaying the "free energy ratio" for the total economy. The graph turns *not* at the point of the 1974-75 recession, but in 1973, at the point of the oil price increase. This would tend to suggest that the underlying growth potential of the economy cannot sustain itself under conditions of sharply rising energy prices.

That is the conclusion obtained from previous Riemannian Model studies of the impact of energy prices on the American and various other economies. Conversely, the model showed that a rapid realization of nuclear energy development would reverse the deterioration.

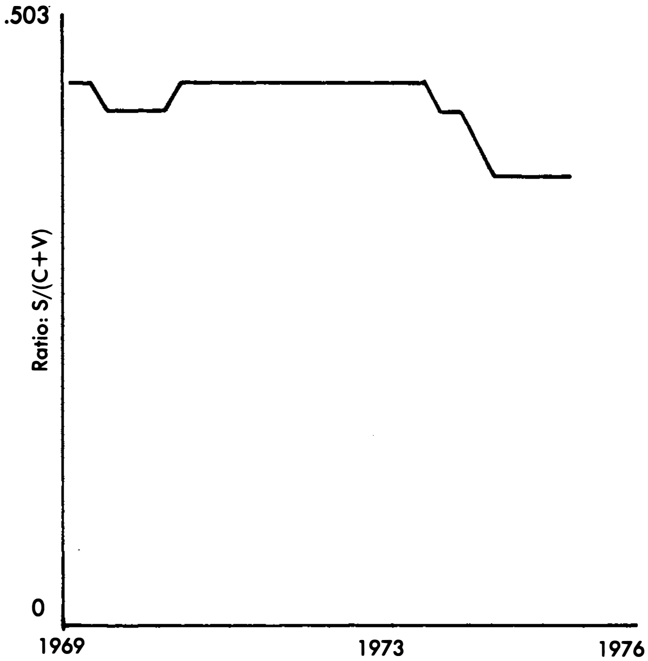
—David Goldman

Industries which have declined

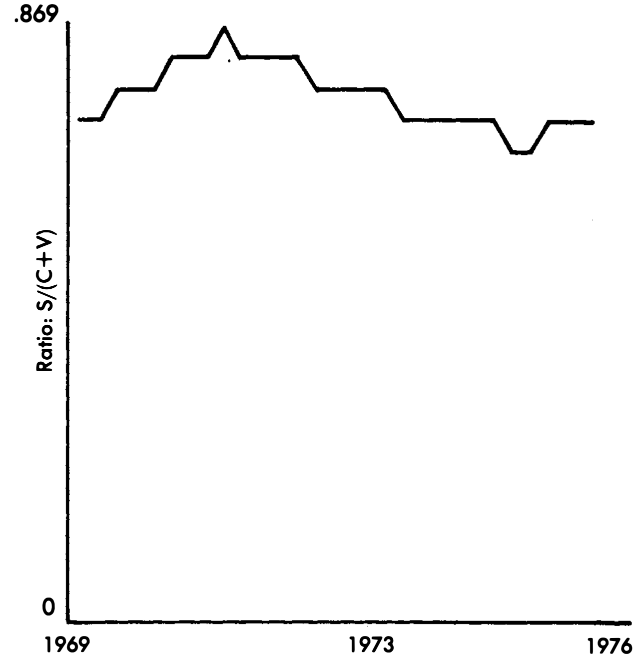
Agriculture



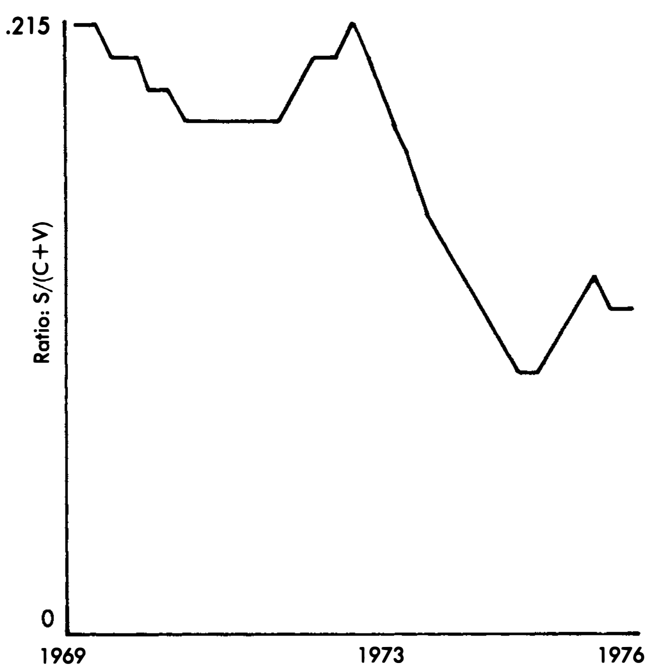
Primary metal industries



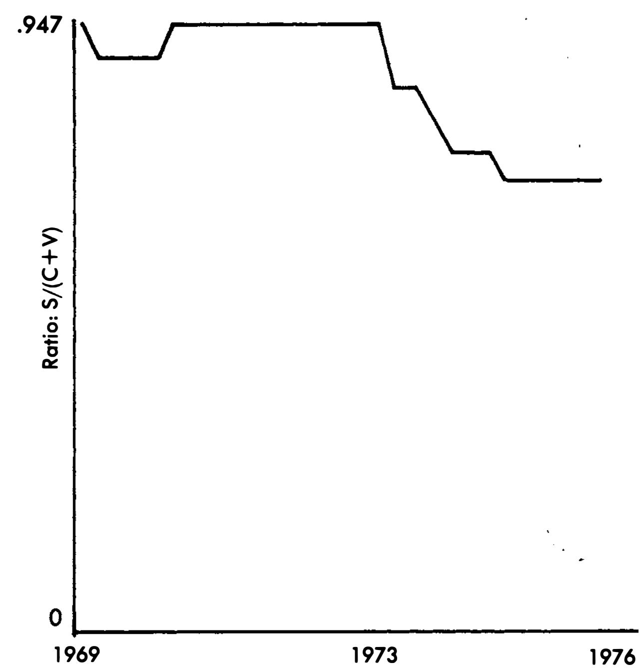
Rubber, misc. plastics products



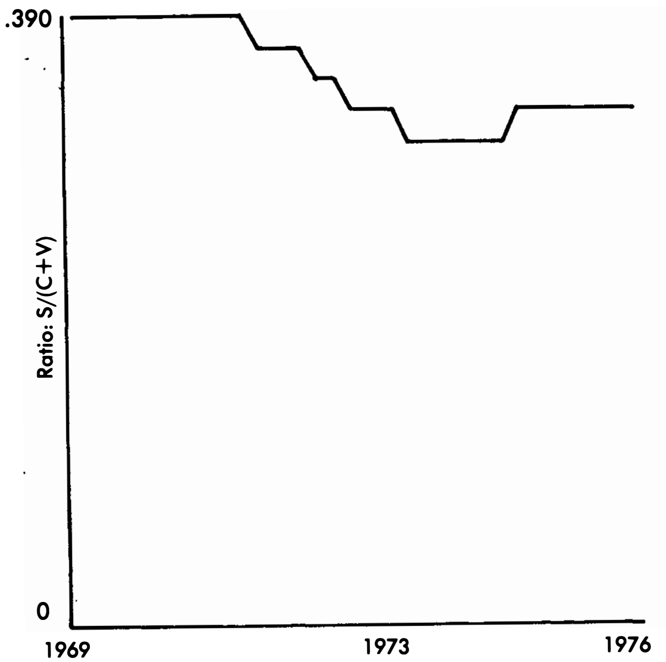
Petroleum and coal products (refining)



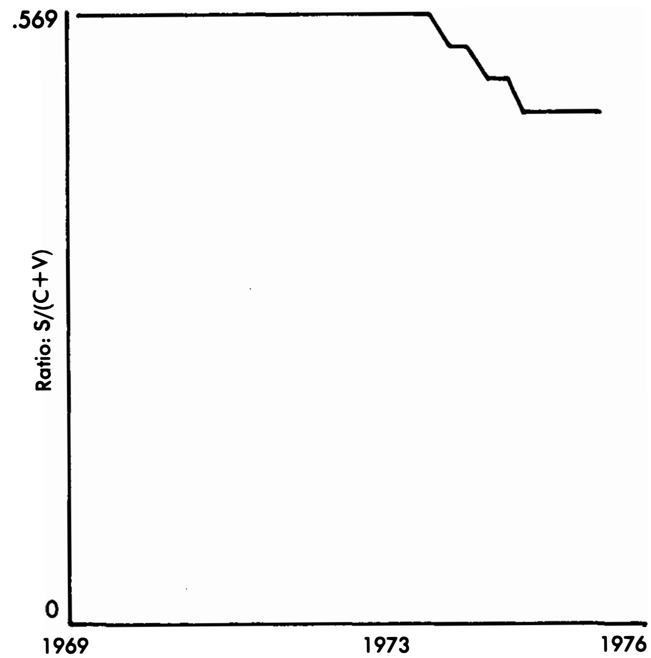
Chemicals, allied products



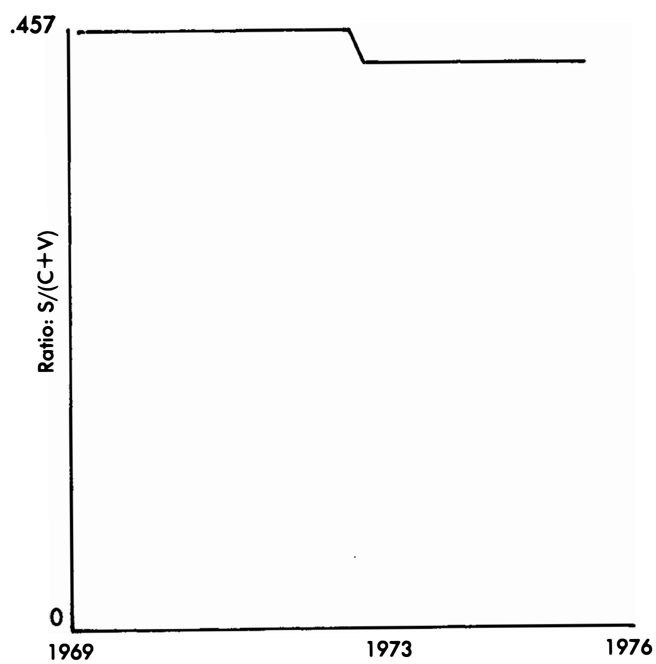
Food and kindred products



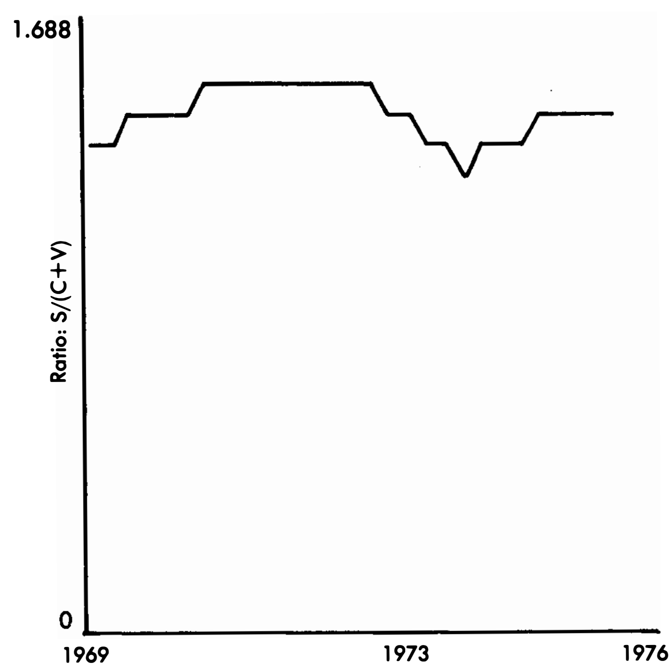
Paper and allied products



Transportation equipment

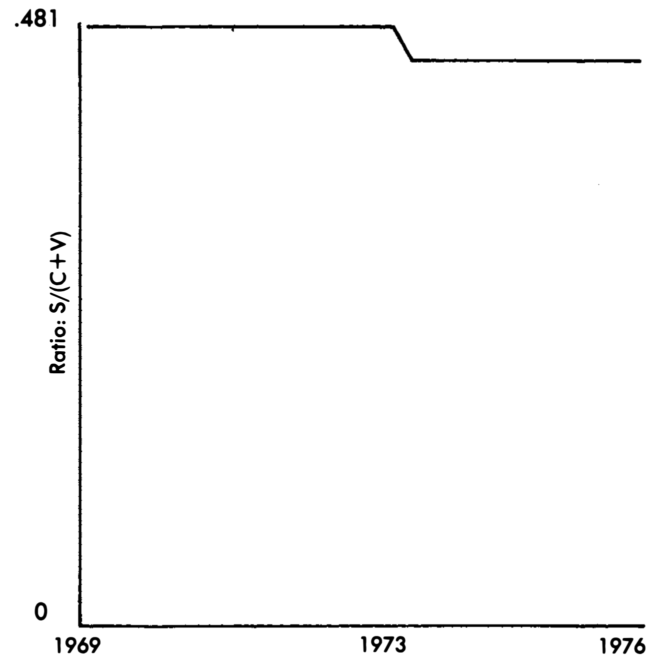


Instruments, related products

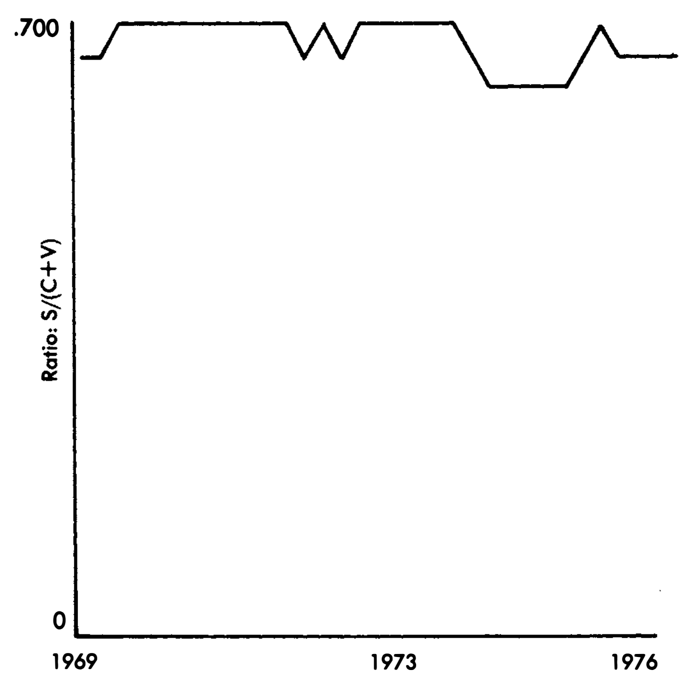


Industries which have remained steady or advanced

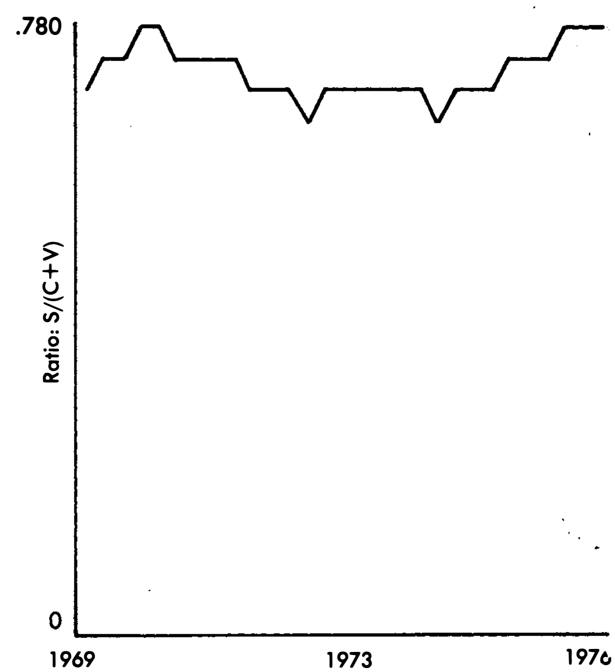
Textile mill products



Apparel, other textile products

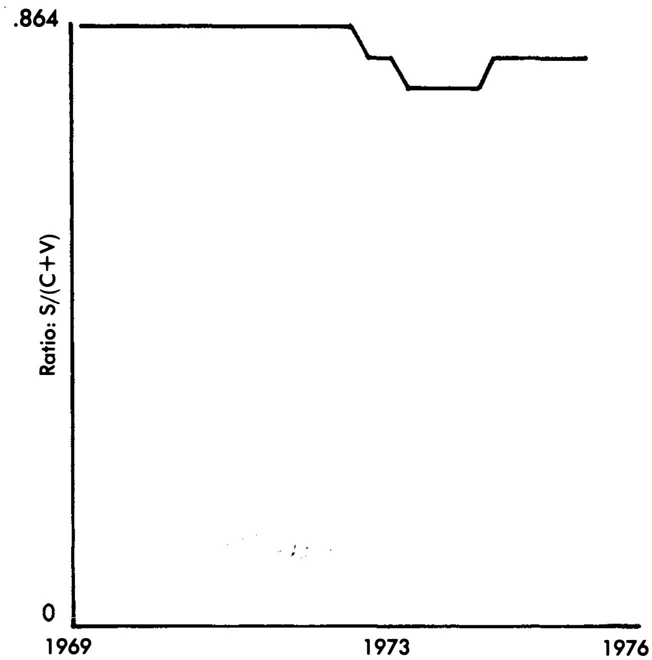


Tobacco products

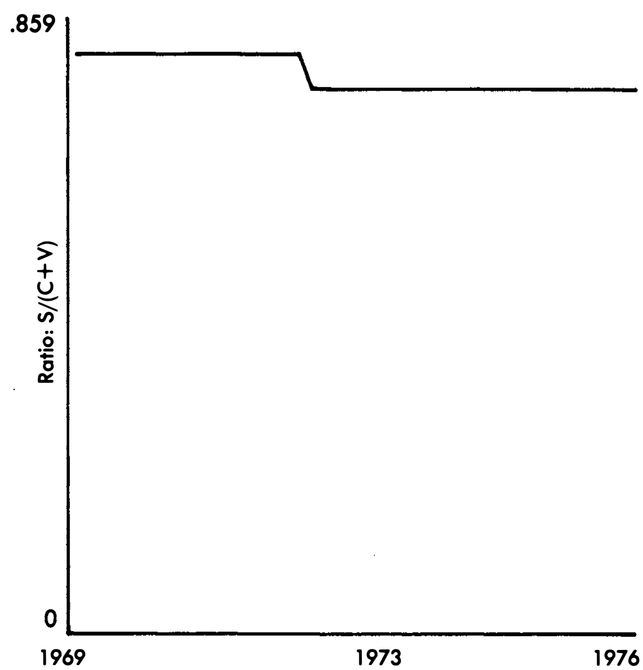


Lumber and wool products

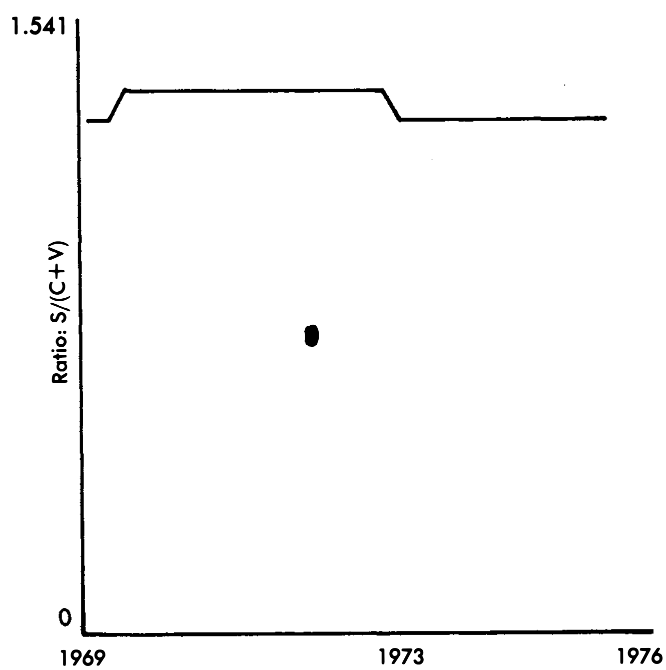
Stone, clay, glass products



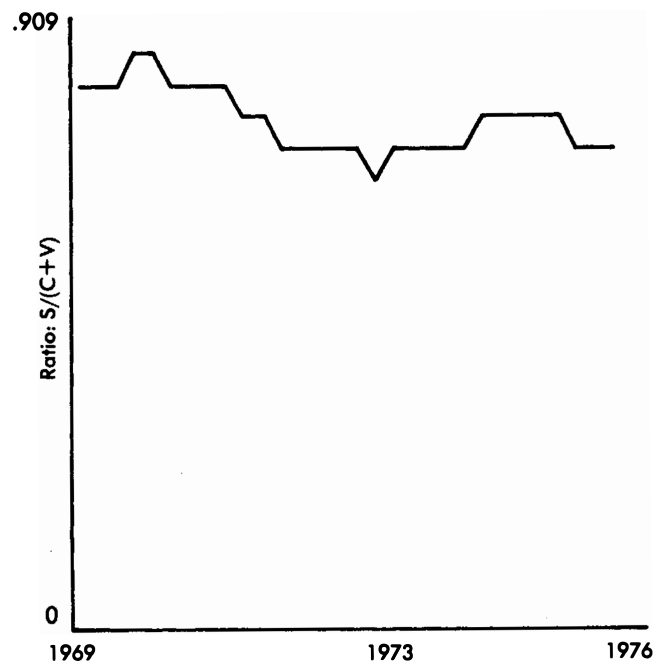
Furniture and fixtures



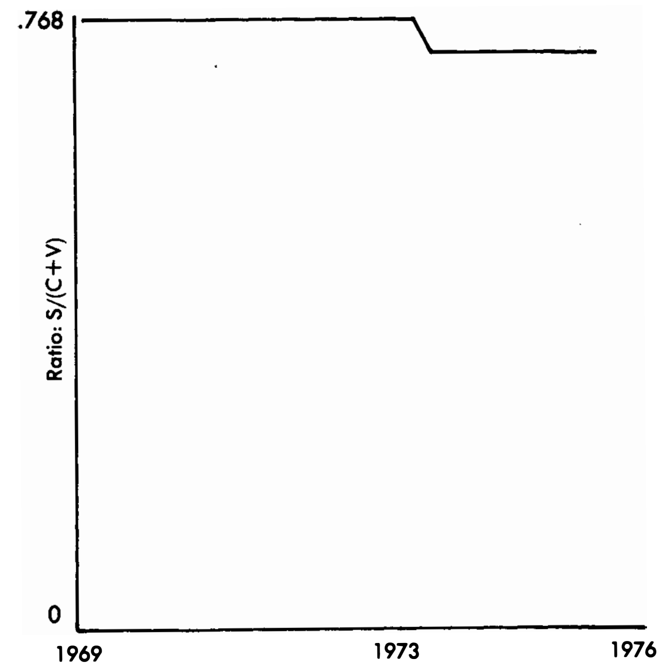
Printing and publishing



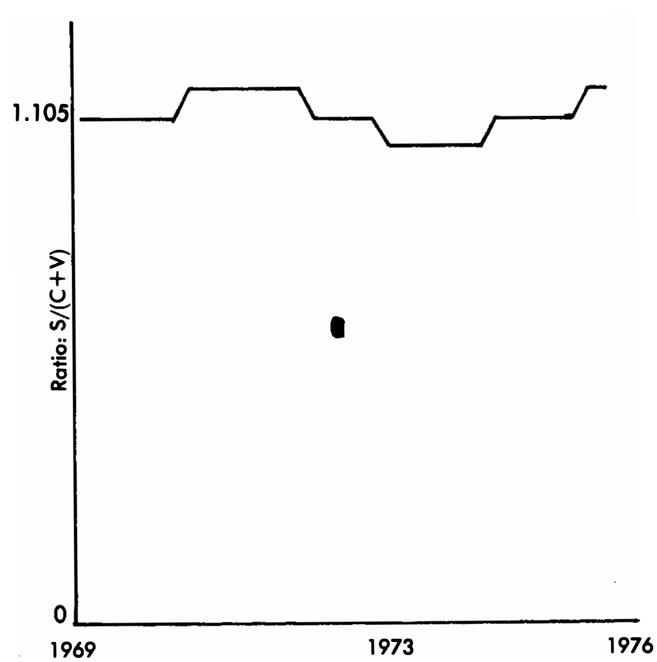
Leather, leather products



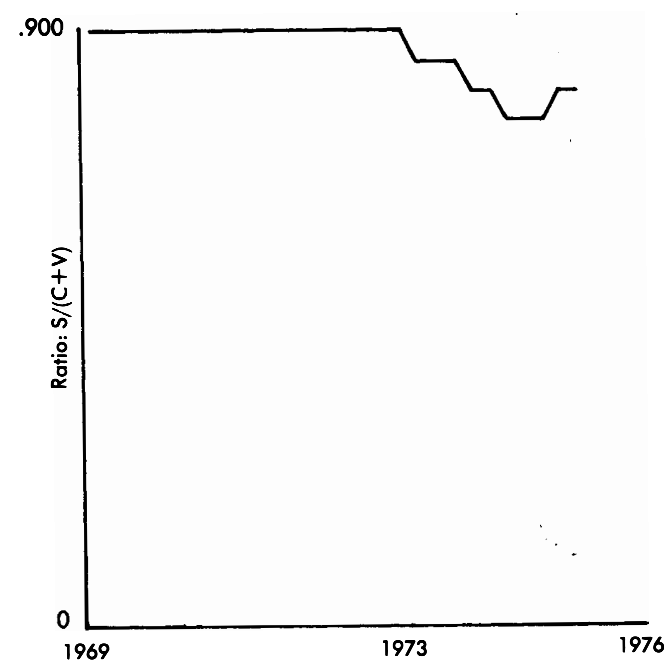
Fabricated metal products



Electric, electronic equipment



Machinery, except electric



Aggregate U.S. Economy

The three graphs reproduced here are computer-generated measures of U.S. economic activity produced by the Riemannian economic model. These measures constitute an alternative to standard Gross National Product measurements.

The first graph shows the 1969-1976 behavior of variable capital (factor cost), or "V," equal to the total consumption of goods-producing workers. The second graph shows "C," constant capital (user cost) or the total consumption by goods-producing industry of raw materials and plant and equipment.

The data employed to arrive at these figures are current-dollar, inventory-adjusted industrial sales figures for the Standard Industrial categories as published by the United States Bureau of the Census, allocated according to the above considerations.

The final graph represents a moving average of the annual increment of C+V, or "S," divided by C+V. It is a measure of the growth potential of the economy in terms of tangible-goods output, and the Riemannian model's basic indicator. Note that although the nominal values of C and V rise in current-dollar terms, the reproductive potential of the American economy has been in regular decline since 1969.