



“Summary of article by Herman Daly: Consumption: Value Added, Physical Transformation and Welfare” in Frontier Issues in Economic Thought, Volume 2: The Consumer Society. Island Press: Washington DC, 1997. pp. 284-287

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## **“Summary of article by Herman Daly: Consumption: Value Added, Physical Transformation and Welfare”**

Economic theory typically neglects the importance of natural resources for production and consumption. This paper argues that the economy has exceeded the optimum scale relative to the carrying capacity of natural ecosystems, and that resource constraints on consumption will become increasingly binding.

Resource consumption is inherently limited by the extent of the earth's ecosystem, a limit that we are fast approaching. Total consumption, which is the product of population and per capita consumption, can be limited or reduced by controlling either of these factors. While the South needs to focus more on population, the North should focus on per capita consumption. Toward the latter goal, this article reconsiders the meaning of consumption.

### **CONSUMPTION AND VALUE ADDED**

Alfred Marshall's view that production of goods is a rearrangement of matter that creates utility, and consumption is a rearrangement of matter that destroys utility incorporates the physical laws of matter conservation. Matter and energy cannot be created in production; rather, useful structure is added to matter/energy by the agency of labor and capital. The value of this useful structure is referred to as "value added," and is used up in consumption. Economists have studied the creation and destruction of value added in great detail but have paid little attention to that to which value is added.

Lester Thurow has argued that there is no reason to fear that growing worldwide consumption will cause resource exhaustion, since it is "algebraically impossible" for the rest of the world to reach American consumption standards without also reaching American productivity levels.<sup>1</sup> William Nordhaus believes that global warming would have only a small effect on the U.S. economy because only agriculture, accounting for a mere 3% of GNP, is sensitive to climate. The entire extractive sector of the economy represents only 5% to 6% of GNP, yet it provides the resource base on which the other 95% rests. Even the widely used Cobb-Douglas production function suggests that other inputs (e.g., manmade capital and labor) can be substituted indefinitely for natural resources. Ever-growing output can be achieved with ever-diminishing resource inputs if sufficient quantities of other inputs are available.

### **CONSUMPTION AND THE PHYSICAL TRANSFORMATION**

Although matter/energy cannot be created or destroyed, there are still physical limits to our ability to add and subtract value repeatedly from the same natural resources. The second law of thermodynamics states that entropy (randomness or disorganization) is always increasing, that each rearrangement and recycling of matter leads to both energy and material dissipation beyond recall. To replenish value added that is worn out or consumed, new low-entropy inputs are continually required. Thus we consume not only the value we add to matter but also the value of the preexisting low-entropy arrangement of resources created by nature. The scale of the economy is important: the rate of use of low-entropy resources must be consistent with the workings of the ecosystem that creates them.

Natural value added is just as important as value added by labor or capital. But we tend to treat natural value added as a free gift of nature. The greater the natural value added to a resource, the lower the human effort required to exploit it, and hence the lower the price we put on it.

The basic pattern of scarcity has been changed by economic growth. In the past value added was limited by the supply of labor and capital; now it is also limited by the availability of natural resources. Turning a tree into a table provides net benefits when there are many trees and few tables, but today much of the world has many tables and dwindling numbers of trees. Eventually the economy must reach an optimal scale relative to ecosystem capacity, at which point production should be geared toward maintenance rather than growth. Our goal should be to minimize maintenance costs, i.e., to minimize rather than maximize production. As Kenneth Boulding said long ago, "Any discovery which renders consumption less necessary to the pursuit of living is as much an economic gain as a discovery which improves our skills of production."<sup>2</sup>

## **CONSUMPTION AND WELFARE**

As the economy reaches its optimal scale, the shift from maximizing production efficiency to maximizing maintenance efficiency can be interpreted as a shift from economic growth to sustainable development. Growth can be defined as increasing the provision of economic services by increasing material throughput, holding efficiency constant. Development, in contrast, can be defined as increasing the provision of economic services by increasing efficiency, holding material throughput constant. Sustainable development is simply development without growth, with throughput held at an environmentally sustainable level.

Empirical measures of the value of natural capital services are virtually nonexistent; even measures of the value of services of manmade capital are problematical and incomplete. Thus we cannot provide a firm, empirically based answer to the question of whether the economy is above or below the optimal scale; commonsense judgments must be used instead. What judgments can we make about the marginal benefits of growth in manmade capital versus the marginal costs of consumption of natural capital?

In wealthy countries the marginal benefit of growth is surely low. Expensive advertising is required to cajole people into buying more. Deaths from stress and overconsumption are more common than from starvation. For the poor, for whom higher consumption remains important, gains could be made either through redistribution or through additional consumption of natural

resources; the economic system has a strong bias toward the latter alternative, to the extent that it makes any provision for the poor.

The marginal costs of growth include the familiar litany of environmental problems. A large part of GNP is spent on defensive expenditures to protect ourselves from the side effects of growth, including pollution control, some aspects of health care, commuting time, etc. In addition, capital and labor mobility tears communities apart in the name of growth. It is time to redirect our economy away from growth and toward development.

## **POLICY IMPLICATIONS**

If natural and manmade resources were good substitutes then neither factor could be a limit to growth. If, on the other hand, they are imperfect substitutes, or even complements, either one can be limiting. Today natural capital is the limiting factor: the worldwide fish catch is limited, not by the number of fishing boats, but by the remaining population of fish in the sea. We need to economize on natural capital, which means its relative price should rise. Since much of natural capital is outside the market, public policy changes are needed. Instead of taxing value added (labor and manmade capital), natural resource use and pollutant emissions could be taxed. All taxes are "distortionary" relative to a perfect market; resource taxes would induce desirable distortions.

Different countries will employ different policies to limit total consumption, some emphasizing population and others focusing on per capita consumption. The faddish advocacy of global economic integration will not solve our problems; indeed, national policies cannot be pursued effectively under a regime of completely free trade and capital mobility. This need not imply autarky, but does require some backing away from global integration toward relative self sufficiency.

## **Notes**

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1. Lester Thurow, *The Zero-Sum Society* (New York: Penguin Books, 1980), 118; cited by Daly, 6.
2. Kenneth Boulding, "The Consumption Concept in Economic Theory", *American Economic Review* (May 1945), 2; cited by Daly, 17.