Appendix 1
Counterproductive Growth

After people have enough to live comfortably, continued economic growth can become counterproductive if increased output provides benefits that are less than its environmental and social costs. Counterproductivity can be explained using two basic economic principles: "the law of diminishing marginal utility" and the idea of "external costs" or "externalities."

Diminishing Marginal Utility

The law of diminishing marginal utility says that, as consumers buy more of any product, they get less satisfaction from each *additional* unit of the product that they buy. Economists use the word "marginal" to refer to those additional units.

Imagine that people have a mental checklist of all their possible uses of a product, arranged in order of importance, and as they get more of that product, they move down the list to less important uses. For example, if you have only a small amount of coffee, you might just drink a cup at breakfast, when you need it most. If you have more coffee, you might drink a cup at lunch as well—not as important but still very satisfying. If you have even more coffee, you can drink it any time, even when you do not want it very much. If you keep getting more coffee, you might finally start using bags of coffee beans as paperweights and doorstops. At this point, the coffee you drink at breakfast is still very satisfying, but you do not want any additional coffee. The marginal utility of coffee is essentially zero.

The law of diminishing marginal utility is central to economic theory,[131] which applies it to individual products.

It obviously also applies to products in general: as people become wealthier, they buy products they need less urgently. The poorest people might have bread or rice to eat and a crude one-room shelter to live in, things that are necessary to survive. When people become a bit more prosperous, they can afford more nourishing food and sturdier homes—still extremely important but not as urgent as survival. When they become even more prosperous, they can afford bicycles, cell phones, and so on—still very useful. Finally, when they become prosperous enough to buy sports-utility vehicles rather than ordinary cars and to fly to Hawaii for their vacations rather than going to the local beaches, the products that they buy with the last addition to their income have relatively little utility compared with the utility of the food and housing that keeps them alive.

Historically, most economists have said that the marginal utility of products in general will never reach zero. They say that consumers have unlimited appetites and will continue to demand more products indefinitely to satisfy their psychological needs, even after all of their physical needs have been satisfied. Nineteenth-century economists emphasized the unlimited psychological need for status. Today's consumers are more likely to have an unlimited appetite for high-tech amusements.

Even if demand is insatiable, though, even if people always want to consume more and more, products in general still have diminishing marginal utility. The psychological need for status or for high-tech amusement is not as urgent as the need for food and shelter. In addition to being less important than necessities and conveniences, products you buy as status symbols or amusements have diminishing marginal utility themselves: the first diamond ring that you buy as a status symbol gives you more satisfaction than one you buy after you already own a hundred diamonds, and the first recreational vehicle you buy gives you more of a thrill than you get from buying jet skis after you already own a powerboat, a snowmobile, an off-road motorcycle, and an off-road SUV.

Counterproductivity can occur even if consumers have insatiable psychological needs. Consumers might want to drive gas-guzzling SUVs as status symbols. If everyone has an SUV, they might want even bigger vehicles as the battle of status

symbols escalates. But the psychological satisfaction they might get from this display of status is outweighed by the droughts, forest fires and other acute effects of global warming that the gas-guzzlers help to cause.

Undiminished Externalities

Economists use the terms "externalized diseconomies" or "externalities" to describe harmful side-effects of economic activity. Externalities are costs borne by third parties, who are not part of the market exchange between the businesses that make products and the consumers who buy them, so the market does not take them into account.

For example, a factory can make products more cheaply if it dumps toxic wastes in the river rather than treating them. Consumers generally will buy these cheap products rather than more expensive ones made by a factory that handles its wastes safely. Dumping wastes in the river may create medical costs for people who live downstream that are much greater than the cost of disposing of the wastes safely, but consumers want to pay less for the products, and they are not likely to think about medical costs paid by people they do not know. These medical costs are external to the market transaction, borne by third parties.

In a pure market economy, manufacturers who pay extra to treat their wastes safely will be driven out of business by competitors who can sell cheaper products because they dump wastes in the river. A totally unregulated market economy will poison everyone's water and air in order to lower the cost of factory products by a few percent. Everyone suffers because a pure market economy does not weigh *all* the costs of a product against its benefits; it ignores the external costs.

Environmental problems, such as water pollution, are the most familiar examples of externalities, but this term lets us think more generally about the costs of growth.

Counterproductivity: Graphic Analysis

Using these two concepts, we can analyze counterproductivity graphically.

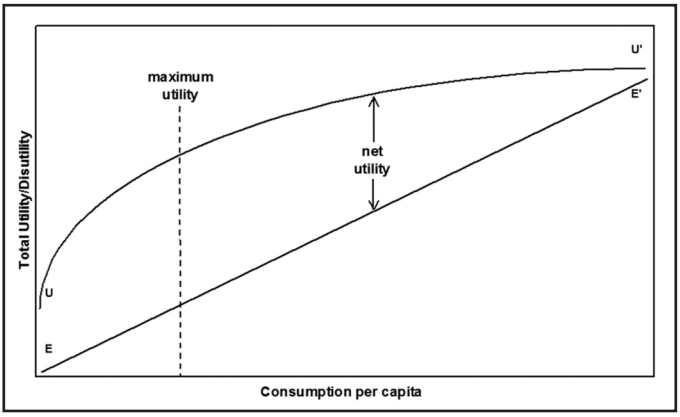

Figure 18: Total Utility and Total Externalities as Output Increases

In Figure 18, the UU′ curve represents the total utility of an economy's output as per capita consumption increases. Because of the law of diminishing marginal utility, consumers get less additional satisfaction from each addition to what they consume, so this curve climbs less steeply as output increases. If we accept the idea that consumers' appetites are insatiable, then marginal utility will never reach zero, but it will become smaller and smaller as consumption increases indefinitely.

The EE′ curve in this figure represents the total external costs of an economy's output as consumption increases. It is a straight line because the graph assumes that each unit of output creates similar external costs, regardless of the level of total output.

This EE′ curve is a simplification. External costs actually vary, depending on what products people consume and what technologies they use. As consumption increases, this curve might jog upward if we needed to use less benign technologies to meet demand—for example, if we used more coal because we did not have enough natural gas to meet demand. It might jog either up or down as people bought different things with their extra income: they might want more personal services, which create relatively low external costs, or they might want to buy more trips on

airplanes, which create high external costs. (We will look at the effect of technological change in a moment.) Despite these jogs along the way, however, externalities keep increasing indefinitely: there is no law of diminishing marginal externalities.

The vertical distance of the UU′ curve above the EE′ curve represents the net utility that the economy provides. Counterproductivity sets in at the Maximum Utility line on the graph. To the left of this line, increasing output widens the distance between the two curves, meaning that net utility increases. To its right, the UU′ curve climbs less quickly than the EE′ curve, so increased output narrows the distance between the two, meaning that net utility decreases. To its left, increasing output increases well-being, but to its right, increasing output decreases well-being because it causes more problems than benefits.

Further to the right, it seems that the EE′ curve will ultimately cross the UU′ curve. This is the point where the total external costs of the economy are greater than the total benefits of the economy, which would happen when there is massive ecological collapse and dieback.

The Effect of Technological Change

The graph makes it seem that counterproductivity *must* occur if economic growth continues: it seems that the distance between the UU′ curve and the EE′ curve must decrease after per capita output reaches a certain point, because marginal utility diminishes, while marginal externalities do not.

But this interpretation of the graph leaves out technological change. It assumes that the consumers always have the same products to choose from: as their incomes increase, they just move down the "checklist" and buy less useful products.

In reality, technological innovation can have two different effects on the products people buy, which could shift the utility curve up or down. Some new technologies cheapen existing products: for example, it is cheaper to download music over the Internet than to buy it on a CD. On the other hand, some new technologies introduce new products that consumers want: when cell phones were invented, everybody wanted one.

Innovations that cheapen existing products would shift the UU′ curve downward, because consumers with any given income could get further down the "checklist" to less useful products. Innovations that introduce desirable new products would shift the UU′ curve upward, because consumers with any income would not get as far down in the "checklist" once these new products were inserted in the list.

Technological changes can also affect the EE′ curve by shifting it upward or downward. For example, changing from coal to natural gas for generating electricity would mean less pollution per unit of output, but changing from petroleum to tar sands would mean more pollution per unit of output.

It is possible to adopt policies that make the economy develop technologies with lower external costs—for example, by using a cap-and-trade system to transition to clean energy—and these policies would shift the EE′ curve downward. This is what we need to prevent growth from making us drastically worse off.

Where We Stand Today

Beginning the 1970s, America seems to have been in the range where net utility stopped growing. Since 2010, we seem to have entered the range where net utility is decreasing enough for the decline to be noticeable.

Americans seem to have sensed the change. In 1910, most Americans realized that we were pressed by economic scarcity and would benefit from economic growth. In 1960, most Americans felt that we had reaped benefits from economic growth and that we were affluent compared with Americans fifty years earlier. But by 2010, Americans generally did not think we were better off than Americans were fifty years earlier. Americans in 1960 felt affluent because they drove around in big cars with tailfins rather than walking as Americans had in 1910, but Americans in 2010 did not feel better off because they drove twice as much as Americans in 1960.

Since 2010, things have become noticeably worse because of the effects of global warming. Consuming more does not make most Americans' lives significantly better. But global warming has

made our lives significantly worse by causing more severe forest fires, storms, floods, and droughts.

Back in 1977, economist Herman Daly already suspected that we had reached the point where growth was diminishing our well-being. He wrote:

> Once we have gone beyond the optimum, and marginal costs exceed marginal benefits, growth will make us worse off. Will we then cease growing? On the contrary, our experience of diminished well-being will be blamed on the traditional heavy hand of product scarcity, and the only way the orthodox paradigm knows to deal with increased scarcity is to advocate increased growth—this will make us even less well off and will lead to the advocacy of still more growth! Sometimes I suspect that we are already on this "other side of the looking glass," where images are inverted and the faster we run, the "behinder" we get.[132]

In the 1970s, Americans were running as fast as they could in order to stay in the same place. Now, we are running as fast as we can and falling behind.

Implications for Policy

This graphic analysis of counterproductivity shows that we need three policies to make our lives better rather than worse in the coming decades.

The first policy we need is to reduce the external costs our economy causes, shifting the EE′ curve downward. Most obviously, we need to control global warming. More generally, we should limit all production and consumption that reduces our overall well-being by causing more costs than benefits, ranging from major blights such as urban sprawl to smaller nuisances such as noise.

Many economists say we should trade off some environmental quality for the sake of faster growth. This idea makes sense in scarcity economies (such as the United States a century ago and the developing nations today), where growth brings significant

benefits. It does not makes sense in the United States today, where diminishing marginal utility has gone so far that growth does not bring significant benefits. Our goal should be a better quality of life rather than the fastest possible economic growth.

The second policy we need is to increase the benefits our economy provides, shifting the UU′ curve upward. The most readily available way to do this is to reduce inequality of income by making our tax system more progressive. When we reduce inequality, we are shifting income from rich people who spend much of their income on products with low utility to low- and middle-income people who spend their income on products with higher utility, so the economy as a whole provides more utility. Our goal should be widely shared prosperity rather than the fastest possible economic growth.

As these two policies shifted the EE′ curve downward and the UU′ curve upward, the Maximum Utility line would shift to the right, allowing more growth before counterproductivity sets in. But it might be hard to move Maximum Utility rightward quickly enough to keep up with the actual rate of economic growth. The faster growth is, the more likely it is that we will fail and growth will become counterproductive—and the more likely it is that we will reach ecological tipping points that reduce our well-being drastically.

Thus, the third policy that we need is to slow growth by giving people the option of working shorter hours plus other options that let them downshift economically. We need to abandon the policy of promoting the fastest possible growth, which America has had since the end of World War II. Instead, we should cut down on producing products that have little or no utility, such as bigger freeways, so we can work shorter hours and have more time for high-utility activities that we now are too busy for, such as spending time with our children.

We could reverse the current decline in well-being and build a better future with these three policies: limiting externalities to a sustainable level, reducing inequality to share prosperity widely, and slowing growth by giving people the choice of downshifting economically and working less.