

The Information Economy

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One of the most notable economic trends since World War II is the steady, steep decline in the price of computers. This is due mainly to Moore's law: computer processing power doubles about every 18 months. The economist Robert J. Gordon has estimated that the inflation-adjusted price of computing power dropped about 19.8 percent each year between 1951 and 1984 and that it has dropped by about 25 to 30 percent per year since then. This means that today the price of a unit of computing power is about 1/100,000 of its price in 1951.

ALTERED STATE

This 99.999 percent decline in the cost of computing has revolutionized information technology and, along with other technological improvements -- in fiber optics, for example -- has fundamentally altered the world's economies. Further improvements and cost declines in other technologies over the next 20 years will probably continue to cause radical changes in the way we live.

Take telecommunications. In 1956, notes Frances Cairncross in her book *The Death of Distance*, the first transatlantic telephone cable went online. It could carry only 89 simultaneous conversations between all of Europe and all of North America. Not surprisingly, the extreme scarcity of bandwidth led to high prices: in the '50s a three-minute call between New York and London cost about \$60 in 1999 dollars. Then came fiber optics. The first transatlantic fiber-optic cable went online in 1988, with capacity for about 40,000 simultaneous conversations. The cables laid in the next few years will be able to carry more than 3 million simultaneous calls on a few strands of fiber no wider than a human hair. As a result, that same three-minute call between New York and London now costs about 50 cents -- a 99 percent reduction -- and you get a better connection to boot. Not for nothing does Ms. Cairncross call fiber-optic cables the "oil pipelines of the information economy." And now there's the Internet; competition from the Internet telephony service providers is reducing even further the price we pay for long-distance calls.

In his famous Essay on the Principle of Population, the economist Thomas Robert Malthus predicted in 1798 that geometric growth in population would bump up against increases in food production that were only arithmetic, causing mass starvation. Malthus was spectacularly wrong. Between 1800 and today, the world's population has sextupled, rising to just under 6 billion people. Yet during that same time, the price of wheat, adjusted for inflation, has fallen by over two-thirds. Prices of other foods and of minerals have also been on a long-term downward trend.

In the '40s, the famed economic historian Joseph Schumpeter, in his classic History of Economic Thought, wrote of the pessimistic outlook of economists like Malthus: "The most interesting thing to remember is the complete lack of imagination which that vision reveals. Those writers lived at the threshold of the most spectacular developments ever witnessed. Vast possibilities matured into realities under their very eyes. Nevertheless, they saw nothing but cramped economies, struggling with ever-decreasing success for their daily bread. They were convinced that technological improvements and increase in capital would in the end fail to counteract the fateful law of decreasing returns."

In an article in the September 29, 1996, New York Times Magazine, citing the pressure of the growing world economy on scarce resources, Mr. Krugman predicted higher oil prices in the coming century. Granted, we'll have to wait a while to see whether that prediction comes true. So far, though, it's not happening. More than two years ago, I offered to bet Mr. Krugman \$1,000 that the price of oil will have dropped by the year 2000 (see "Is There a New Digital Economy of Ideas?"). He never responded. When I made the offer, West Texas intermediate crude oil was selling for \$25 a barrel; it is now hovering at around \$17. Because of the IT revolution, pessimism makes for bad economics. These days the Internet is doing for competition what trains, radio, and national magazines did earlier in this century. The Internet makes a Web-based retailer in New York compete with one in Dallas, or even in Bangkok. Markets that were previously regional are becoming national, sometimes international, and therefore more competitive.

TRICKLE TREAT

We often hear that the information revolution, with its need for a highly skilled workforce, is making many types of jobs obsolete and leaving low-skilled workers behind. This is true: as the premium paid to people with knowledge skills increases, those without such job skills don't do as well. But many people jump to the false conclusion that the least skilled are worse off today than they once were. Economic well-being, over the centuries and over the last few decades, is actually improving for people in the lowest fifth of the U.S. income distribution, as well as for those in the top fifth.

A good way to measure living standards is to see how people live. Using more than 30 measures, including what people have in their homes, the size of their homes, and what they do with their leisure time, Mr. Cox and Mr. Alm show that the vast majority of Americans are living better than they were 20 to 30 years ago. Moreover, they point out that in 1994 households officially defined as poor had more of the conveniences of modern life than the average household had in 1971. Surprising? The real surprise would be if this weren't true. With all the technological improvements in food production, clothing, transportation, and entertainment production and delivery, to name four major categories, the prices of those things have to fall. So even people who can't contribute to the knowledge economy as high-tech workers are gaining as consumers.

CHINESE LANTERN

Possibly as important as the impact of the IT revolution on our economic well-being is its impact on our freedom. In my October 1997 column ("Trade Will Set You Free"), I wrote that the worldwide growth of the Internet would hamper China's attempts to suppress information and that the increase in available information would help undercut the government's power. Sure enough, the February 7, 1998, issue of the Economist reported that the Chinese government expected the number of Internet users in China to rise from 250,000 in 1998 to 4 million by 2000. Although their leaders attempt to censor the Internet, they cannot censor it completely.

Closer to home, the ease of sending email through the Internet led more than 200,000 people to protest a proposed U.S. government regulation -- the so-called Know Your Customer regulation -- that would have destroyed much of the

remaining financial privacy for Americans. The rule would have required banks to report to the government any unusual financial transactions. Had the outcry been limited to snail-mail or fax delivery rather than through mass emailing, the response from citizens would probably have been much weaker.

The information technology revolution, as well as technology generally, is creating a more prosperous and freer world, and it will continue to do so for at least the next 20 years.