

The Computer-Mediated Economy

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ONE way to forecast 1,000 years ahead is to look back 1,000 years. How is today's economy different from its counterpart 1,000 years ago, and what does that difference suggest about what the economy will be like 1,000 years from now?

Human beings are a product of evolution, suggesting that competition, in various guises, will continue to be part of our nature. Markets and related economic institutions allow for efficient voluntary trade; since they've lasted for at least 10,000 years, I expect they'll still be here 1,000 years from now. However, just as more and more economic activities were delegated to specialists in the last millennium, I expect that most market transactions in the future will also be mediated by specialists, though most likely in the form of computerized agents.

If people still compete, what will they compete for? Economics is driven by scarcity. At one time, land was the scarce factor, then capital, now labor. It is difficult to predict what will be scarce in 1,000 years. In an optimistic scenario, material scarcity should be all but eliminated. Let me forecast that talent—artistic, athletic, intellectual, entrepreneurial, and others—will continue to be scarce. Even today, the value of trade in services exceeds the value of trade in physical goods in developed countries. I expect that trade in services will totally dominate trade in material goods within a century.

The greatest change in the past 1,000 years has certainly been the rate of technological progress, as explored by Robin D. Hanson of George Mason University [2], building on earlier work by J. Bradford DeLong of the University of California, Berkeley, who estimated a long-run model of economic growth going back to two million B.C. DeLong found that GDP growth has been a sequence of three technologies—hunting, farming, and industry—each of which has grown 100 times faster than its predecessor. Hanson suggested the next transformation—possibly involving information technology, nanotechnology,

robotics, and/or artificial intelligence—could move the doubling period of GDP from decades to weeks and is forecast to appear sometime this century.

About 1,000 years ago, each region of the world was relatively isolated. Advances in transportation and communications allowed civilizations to interact, creating tremendous cultural and economic stimulation. If extraterrestrials are out there, especially anywhere nearby, we should discover them in the next 1,000 years, thus opening up the possibility of interstellar trade, probably limited to trade in information.

Another possibility is new intelligent life-forms on Earth based on electronic or biological forms. While life-forms evolving naturally have built-in desires to compete for mates, food, shelter, and resources, new forms may have radically different motivations.

All these projections are predicated on the assumption that human knowledge continues to advance. If we started with a vantage point of the year 1 and looked forward to 1001, we would have seen almost no technological advance, at least in Western Europe. Indeed, by many measures, Western civilization retrogressed in that millennium. Progress is not guaranteed.

Technology has magnified the power of individuals, but this power is a two-edged sword. As Bill Joy, chief scientist of Sun Microsystems, reminds us, a small number of unbalanced individuals can now be immensely powerful, threatening the existence of human life on Earth. Let us hope we find a way to manage technology so it can be used for the benefit of humanity and avoid this apocalyptic scenario. **□**

REFERENCES

1. DeLong, J. *Estimating World GDP, One Million B.C.–Present*. Economics Department, University of California, Berkeley, 1998; see econ161.berkeley.edu/TCEH/.
2. Hanson, R. *Long-Term Growth as a Sequence of Exponential Modes*. George Mason University, 1998; see hanson.gmu.edu/vita.html.

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