

Finding the Key

Long-Term Economic Growth and the Role of Ideas

When looking at economic growth in the long term—over thousands of years, rather than annually—what are the major factors that stand out as being most essential? As the following article makes clear, the role of new ideas is key.

Imagine that we lived today the same way people lived 300 or 400 years ago; no electricity, indoor plumbing, comfortable homes, safe foods, pharmaceuticals, or cars, planes or railroads.

That's unimaginable.

Yet for most of human existence life was nasty, brutish and short, with virtually no gains in average living standards. Even in 1790, average per capita consumption in France was no greater than it had been during the days of the Roman empire.

But suddenly, in the latter part of the 19th century, all this changed. And in the 20th century greater gains were made in living standards than during the previous 1 million years human beings had existed on this planet. It's important to understand how and why this happened.

Charles Jones, an economist at Stanford University, has investigated what suddenly changed in the 19th and 20th centuries that led to a spectacular improvement in the human condition. What he found helps explain the importance of high-tech or knowledge-intensive enterprises.

His analysis was recently published by the National Bureau of Economic Research as a working paper entitled: "Was An Industrial Revolution Inevitable? Economic Growth Over the Very Long Run."

There were two reasons for the spectacular progress in living standards over the past 100 years:

- A rapid increase in population growth, which led to many more people producing more ideas or knowledge. Improved nutrition and better education were also important.
- A major improvement in institutions that promote innovation, in particular the

development of property rights, especially rights for inventors.

"The single most important factor in the transition to modern growth has been the increase in the fraction of output paid to compensate inventors for the fruits of their labour," Jones says.

In the world today, the rewards going to inventor/entrepreneurs launching software, Internet, and biotechnology companies illustrate how a powerful incentive system encourages innovation and the financing of uncertainty or risk.

From the invention of the patent system, and the limited liability company, to the development of stock markets and venture capital, from the establishment and expansion of organized research and development in corporations and government to the development of research universities and their linkages to industry, from the use of R&D tax credits to other incentives, we have created a system that encourages investment in new ideas. They, ultimately, are the source of economic growth.

It's well established that we are better off than 100 years ago not because we have the same goods and services as existed then, but because we have new and more valuable goods and services that have generated major gains in productivity and living standards.

Yet this is all so new.

Jones sets the 1 million years of human existence along a time line represented by a 100-yard American football field.

"On this time line, humans were hunters and gatherers until the agricultural revolution, perhaps 10 000 years ago—that is, for the first 99 yards of the field," he says.

"The height of the Roman empire occurs only 7 inches (18 centimetres) from the rightmost goal line, and the Industrial Revolution begins less than 1 inch (2.5 cm) from the field's end." That means "large, sustained increases in standards of living, our working definition of an industrial revolution, have occurred during a relatively short time—equivalent to the width of a golf ball at the end of a football field."

In 2500 BCE, per capita consumption, in today's dollars, was about \$270 (US). By 1500, per capita consumption had risen only slightly, to \$360. That actually fell to \$322 in 1600. But today, 400 years later, per capita consumption is \$3116. That is a dramatic gain.

Likewise, it is only in the 20th century that world population has sharply grown. In 2500 BCE, the entire planet had a population of just 3.34 million, roughly the population today of the Greater Toronto Area. By the year 200 BCE, the world population had grown to 150 million, but 1000 years later it was just 265 million. By 1900 the population had risen to 1.6 billion. But in the 20th century humanity's numbers soared to about 6 billion.

At the same time, education levels have risen. Today we have more people than ever before doing research and development and developing new ideas or knowledge for future economic growth.

In the 20th century, 5 percent of world output went to reward or compensate inventors, and that number may be even higher now. Likewise, 5 percent of the world's labour force is

now engaged in the production of new ideas or knowledge, and in the advanced economies, at least, some 3 percent of output is invested in developing new knowledge through R&D.

As a result, some 110 467 new ideas a year were being developed in the 20th century, compared with 3834 a year in the period from 1500 to 1900; 1027 a year from 1000 to 1500; and 267 a year from 1 to 1000.

Our future well-being depends upon our ability to continue to create the institutions and incentive systems that encourage the development and diffusion of new ideas that are the ultimate source of a better material life.

Source: "Our Good Life Depends on Nurturing New Ideas," by David Crane, January 9, 2000. Reproduced with permission - Torstar Syndication Services.

1. How can Charles Jones' conclusions be applied to the contemporary Canadian economy in finding solutions to increase the rate of growth in per capita incomes?
2.
 - a. It is estimated that for most of human history up until 200 years ago, growth in per capita world output averaged 0.1 percent or less per year. On the basis of the rule of 72, outlined in the chapter, what was the minimum time it would therefore take the world's per capita output to double?
 - b. In the past 200 years, growth in per capita world output has averaged an estimated 1.2 percent per year. How long does it now take for the world's per capita output to double?