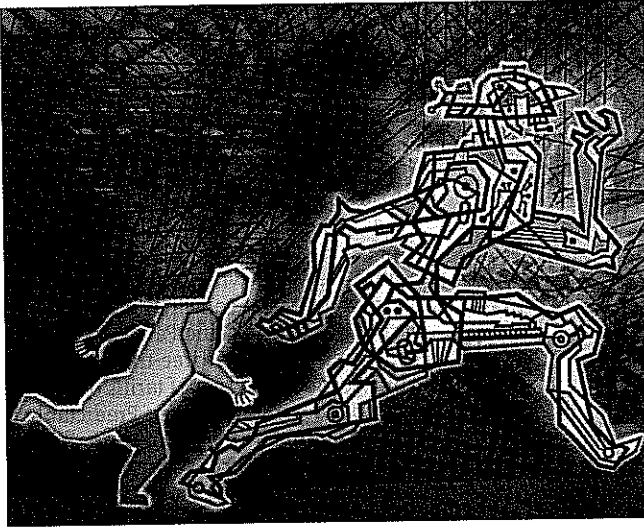


# Economics Focus | Marathon machine

Unskilled workers are struggling to keep up with technological change



THE rich world's crisis of unemployment would be painful enough on its own, but it comes on the heels of a generation of labour-market stagnation. Growth in inflation-adjusted incomes in the rich world slowed sharply as early as the 1970s. In America, median household income has actually fallen since 1999. Economic growth continues, but not all see the rewards. By some estimates, the top 1% of American earners captured 58% of the country's economic growth between 1976 and 2007.

Scapegoats, from crony capitalists to foreign-currency manipulators, are in no short supply, but technology is increasingly fingered as a culprit. Some economists reckon the problem with technology is that there is too little of it. Tyler Cowen, an economist at George Mason University, says in a recent e-book that a "great stagnation" is under way. The gains from the big inventions of previous eras—electricity, jet engines and antibiotics, for example—are now exhausted, and new, comparable innovations are exceedingly rare. Fewer grand inventions mean less productivity growth and a slower improvement in living standards.

It is a troubling diagnosis, but not the only one available. Erik Brynjolfsson, an economist, and Andrew McAfee, a technology expert, argue in their new e-book, "Race Against the Machine", that too much innovation is the bane of struggling workers. Progress in information and communication technology (ICT) may be occurring too fast for labour markets to keep up. Such a revolution ought to be obvious enough to dissuade others from writing about stagnation. But Messrs Brynjolfsson and McAfee argue that because the growth is exponential, it is deceptive in its pace.

Progress in many areas of ICT follows Moore's law, they write, which suggests that circuit performance should double every 1-2 years. In the early years of the ICT revolution, during the flat part of the exponential curve, progress seemed interesting but limited in its applications. As doublings accumulate, however, and technology moves into the steep part of the exponential curve, great leaps become possible. Technological feats such as self-driving cars and voice-recognition and translation programmes, not long ago a distant hope, are now realities. Further progress may generate profound economic change, they say. ICT is a "general purpose technology", like steam-power or electrification, able to affect businesses in all industries.

Watson, the IBM supercomputer which dazzled audiences in throttling human competition on the game show "Jeopardy!", is now being adapted for use in medical diagnoses. Autonomous vehicles, such as the Google creations that have logged some 140,000 miles on American roads, could make transport dramatically cheaper, safer and more efficient. The long-awaited wonders of the space age may finally be at hand.

There will also be growing pains. Technology allows firms to offshore back-office tasks, for instance, or replace cashiers with automated kiosks. Powerful new systems may threaten the jobs of those who felt safe from technology. Pattern-recognition software is used to do work previously accomplished by teams of lawyers. Programmes can do a passable job writing up baseball games, and may soon fill parts of newspaper sections (those not sunk by free online competition). Workers are displaced, but businesses are proving slow to find new uses for the labour made available. Those left unemployed or underemployed are struggling to retrain and catch up with the new economy's needs.

As a result, the labour force is polarising. Many of those once employed as semi-skilled workers are now fighting for low-wage jobs. Change has been good for those at the very top. Whereas real wages have been falling or flat for most workers, they have increased for those who have advanced degrees. Owners of capital have also benefited. They have enjoyed big gains from the increased returns on investments in equipment. Technology is allowing the best performers in many fields, such as superstar entertainers, to dominate global markets, crowding out those even slightly less skilled. And technology has yet to cut costs for health care, or education. Much of the rich world's workforce has been squeezed on two sides, by stagnant wages and rising costs.

## Rage against the machines

A similarly bleak view inspired acolytes of Ned Ludd to smash mechanical looms. Still, the industrial revolution ultimately improved the living standards of workers of all skill levels. It would be surprising if progress in ICT did not do the same. Messrs Brynjolfsson and McAfee emphasise the importance of educational reform and investment in helping workers adapt. Big gains may arrive as firms find better ways to use new technologies. As a new paper by Tim Leunig and Joachim Voth explains, process innovations may be as valuable as inventions themselves.

Henry Ford didn't invent the car, but his moving assembly line led to dramatic declines in car prices and produced a gain to consumers equivalent to about 2% of GDP in 1923. More ICT in sectors such as education and health care could similarly generate significant gains for consumers. As Messrs Leunig and Voth note, falling car prices led to a surge in American car sales, from 64,000 in 1908 to 3.6m in 1923. This leap allowed Ford to employ hundreds of thousands of workers in its factories. A golden age of manufacturing is unlikely to return, but Messrs Brynjolfsson and McAfee reckon that matters aren't hopeless for those without PhDs (a great relief). They describe "freestyle" chess tournaments in which teams of amateur chess players using computers are able to beat both powerful computers and human grandmasters. The human brain is an impressive and dexterous organ. It would be strange indeed if markets, given room to experiment with new technologies, couldn't devise ways to combine man and machine in fruitful—and profitable—new ways. ■

Papers cited in this article can be found at [economist.com/machines](http://economist.com/machines)