Are Humans 21st Century's Coal?

Ariel Karlinsky
April 20, 2024
ariel.karlinsky@mail.huji.ac.il

Will machines, robots and AI render humans obsolete? "Technological Unemployment" had been a central academic and public issue at least since the Industrial Revolution (18th century). Economists and economic historians usually answer, *no*. This answer is firmly grounded in both Economics and in History. But is this time different? The answer might lie underground, in coal.

Economically, the fear of technological unemployment stems from viewing machines as substitutes to humans. In reality, most production requires both machines (capital) and humans (labor). Capital and labor are both complements and substitutes. It's easy to see why they are substitutes: one tractor does as good a job, if not better, than dozens of farmers. This is why there are millions less farmers today than there were in the 18th-19th centuries in the US, with agricultural output increasing. But even this example shows that capital and labor are also complementary: the tractor requires a farmer to operate it. And though many fewer farmers are now needed, the tractor alone "creates" occupations that past humans could not even imagine. It requires engineers to design and improve it, factory workers to create it, mechanics to maintain it, as well as lawyers, salespeople, administrative staff, etc., all involved in the process. This is the mechanism of "Creative Destruction", by which technological advances both destroy and create vast economic activities. Indeed, not only did unemployment not rise in tandem with technological advancement; in many developed countries, such as Israel and the US, it is at historic lows.

So, why might this time be different, even after taking these arguments into account? We turn to another important factor in technological advancement: energy. Energy is another factor of production, in addition to capital and labor. Coal was the primary energy source of the Industrial Revolution: machines had suddenly required previously-unimaginable amounts of energy, which could not be provided by the wood, bio-oil or windmills of the past. Coal was also used to create most electricity well into the 20th century. Based on this history, studious scholars of the time might have brushed off thoughts about "Coal Unemployment": the downfall of coal. Today, we know they would have been wrong. In developed countries, coal has been superseded by other, cleaner and more efficient energy sources: from oil and natural gas to nuclear, solar and wind energy. These have substituted coal almost completely, and the future of coal is precarious at best. The question is thus: is AI to human labor what tractors are to humans (complements); or is it more like natural gas and solar energy to coal (substitutes)?