Information Technology and the New Globalization

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Outline

- Introduction
- The Power of Artificial Intelligence
- The Applications of Artificial Intelligence
- The Economic Implications of Artificial Intelligence
- The Future of Economic Globalization
- Enhancing Capital-Labor Substitutability
- The Potential De-Coupling of Consumption from Employment
- Asia's Economies
- Concluding Remarks

Introduction

- Advances in information technology, other things being equal, expand the set of production possibilities of an economy. As a result, the set of consumption possibilities of the economy is also expanded, other things being equal (that is, the economy continues to have the same degree of openness). This should affect all economies. Thus, every economy should be better off in the aggregate with advances in the information technology.
- The problem that arises is one of internal redistribution within each economy, as both winners and losers will be created, just like economic globalization itself. This will be discussed below.

The Power of Artificial Intelligence

- In 2016, Google DeepMind's AlphaGO, an Artificial Intelligence (AI) computer program, beat Mr. LEE Sedol, a Korean national and one of the best go players in the world, winning four out of five matches. This was a feat previously thought impossible even by AI experts. AlphaGO can probably do even better on a re-match as it can begin to individualize its moves against Mr. LEE, based on the analysis of their five matches.
- In 2017, AlphaGO beat Mr. KE Jie, a Chinese national and reputed to be the best GO player in the world, winning 3-0 in the three-game series. Mr. KE referred to AlphaGO as the "God of GO". Moreover, Mr. KE pointed out that AlphaGO had developed new moves since its matches with Mr. LEE. It is capable of "learning".
- This shows what AI has been able to accomplish!
- AlphaGO's victories over the best GO players will have an impact on the entire industry that is based on the GO game. The values of the top purses and the GO game academies and popular interest in the GO game will all undergo changes.

The Power of Artificial Intelligence

- What are the next frontiers for AI to conquer? I believe Blackjack is already a conquered game. Besides, AI's edge, if every Blackjack game is preceded by a reshuffle of the deck, will not amount to much.
- The interesting game for AlphaGO to take on is poker, in its many varied forms. Here AI's fast computation of the probabilities can work to its great advantage. It can also take into account the betting habits of specific opponents and even their body languages. The interesting question is: Will AlphaGO try to bluff too?
- The first sport in which a robot can excel is probably golf, where precision is required and the strategy depends very much on the external conditions—terrain, wind direction and speed, humidity, etc.—and the proper choice of the appropriate type of club to use.

The Applications of Artificial Intelligence

- AI can enable the full automation of routine and repetitive tasks that require little or no discretion. These tasks will be taken over by “robots”.
- Driverless cars are rapidly becoming a reality.
- Medical diagnoses can be done faster and more accurately. Medical treatment can also be individualized to a much greater extent.
- Education can be customized for the individual student, depending on the student’s own abilities, achievements and interests. However, for the training of researchers, perhaps the time-honored “apprenticeship” system is still the best way.

The Applications of Artificial Intelligence

- AI can play an important role in research, for example, in pattern recognition, especially in high dimensions.
- One interesting way to consider these advances in AI is as an increase in capital-labor substitutability—the elasticity of substitution between capital (both tangible and intangible) and labor is increased by AI as more and more tasks hithertofore done by humans can now be done by robots or machines. The elasticity of substitution between capital and labor is increased on new investment embodying the advances in AI. It will be moving away from zero towards unity and perhaps even infinity. (The isoquants in the capital-labor space are becoming flatter.)
- However, there are also vulnerabilities to be addressed: for example, an AI system may be subject to possible hacking, and a totally integrated system may be subject to the risk of total breakdown or failure unless there is some built-in separation and independence within the system.

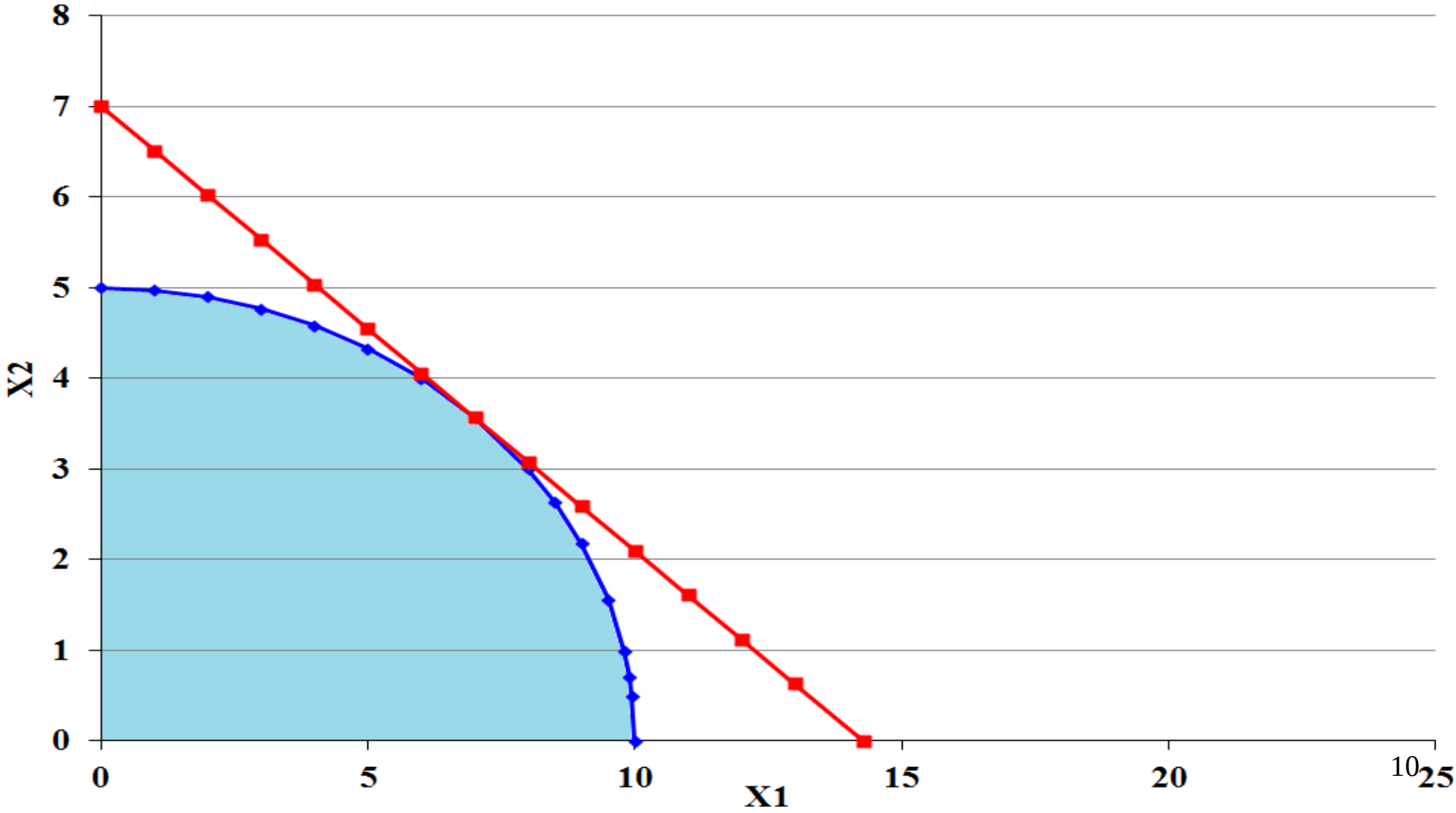
The Economic Implications of Artificial Intelligence

- Does the possibility of customization imply the end of mass manufacturing? Or would artificial intelligence enable an even greater degree of customization on the production line?
- Does the possibility of tele-commuting and the use of remote-control robots imply the end of mass migration or movement of labor?
- Does the possibility of 3-D printing and drone delivery imply the end of mass shipping (e.g., via containers)?

The Future of Economic Globalization

- Economic globalization brings benefits to all countries which participate in the world economy. Consider the following chart. The area shaded in blue is the set of production possibilities of the economy and hence is also the set of consumption possibilities under autarky (that is, there is no trade with the rest of the world). With trade, the set of consumption possibilities becomes the entire triangle bounded by the red line (the international price line) and the two axes.
- Clearly the new set of consumption possibilities properly contains the old set of consumption possibilities. Thus, the economy must be better off because it has not only all the previously available consumption possibilities to choose from but also the additional consumption possibilities not previously available.

The Sets of Consumption Possibilities under Autarky and with International Trade



The Future of Economic Globalization

- This assumes that the economy is small and a price-taker in the world. If the economy is large and can influence the international prices with its exports and imports, the set of consumption possibilities with trade still properly contains the set of consumption possibilities without trade but the international price line will be a curve rather than a straight line.
- It should be noted that the benefits of economic globalization depends on the stability of the newly enlarged set of consumption possibilities, which in turn depends on relatively stable relative real exchange rates. With volatile relative real exchange rates, the international price line (curve) will shift constantly, and any benefits from economic globalization are only transitory and unsustainable.
- Even with advances in information technology, economic globalization will continue to yield benefits because of continuing differences in comparative advantages across economies.

The Future of Economic Globalization: The Creation of Winners and Losers

- However, even though the economy is always better off under economic globalization as a whole, winners and losers will be created in the domestic economy as a result of international trade. The winners are the exporters, the importers and the consumers of imported goods and services. The losers are the domestic industries and workers that are displaced by the imports.
- The losers will not be automatically compensated by the winners through the markets. However, since the economy has a net overall gain from economic globalization, in principle, no one should have to lose. With appropriate government intervention, it is possible to ensure that there are no net losers, for example, by taxing the "winners" to compensate the "losers".
- How can one tax the "winners"? A universal tax of say 0.5% on all exports and imports should generate sufficient revenue to compensate the displaced workers—retraining them if they are young and simply supporting them if they are too old to be re-trained. Such a tax has the additional advantage that it will not distort the international price line.

The Future of Economic Globalization: The Creation of Winners and Losers

- Moreover, the "Factor-Price Equalization Theorem" of the late Prof. Paul A. Samuelson (Nobel Laureate in Economic Sciences) suggests that the wage rate of unskilled labor in the economy will fall to the level of the economy with the lowest wage rate in a globalized world (in the absence of transport costs). This has occurred in many economies, including the U.S. and Hong Kong. These unskilled workers are also "losers" from economic globalization.
- However, economic de-globalization is not the solution because it has the opposite effect of economic globalization. With de-globalization, all countries will be worse off because the set of consumption possibilities of every country will have to shrink. In the process of de-globalization, winners and losers will once again be created. Internal redistribution may once again be necessary. However, it will be redistribution from a smaller, not a bigger, pie. The redistribution, which will necessarily be a negative-sum game, will be much more difficult.
- The appropriate solution is therefore more openness and more trade, not less, coupled with appropriate compensatory measures for the losers financed through taxes on the winners.

Enhancing Capital-Labor Substitutability

- Robotization and other forms of automation can be viewed as the substitution of capital for labor.
- Advances in AI are embodied in capital, both tangible and intangible. They basically increase the elasticity of substitution between capital and labor—moving it further away from zero (no substitutability) and towards unity (the Cobb-Douglas case) and perhaps even infinity (perfect substitutability).
- Such a change will affect the output, employment, investment, relative factor shares and comparative advantages of all economies and will, in particular, affect the global division of labor and the resulting supply chains.
- The decline in the labor share in the U.S. over the past decade may be partially attributed to the increase in the elasticity of substitution between capital and labor (for new vintages of investment).

The Potential De-Coupling of Consumption from Employment

- As the use of robots becomes more and more common, many routine tasks will be taken over by robots, and many routine jobs will become redundant. (For example, automatic teller machines (ATMs) have been replacing live tellers at many commercial banks.)
- A reduction of the standard work week and job sharing are expected to be commonplace in the developed economies.
- A universal basic income for all will be considered seriously and may become a reality in developed economies in say a couple of decades.
- Here I wish to repeat a joke that I heard several months ago. The head of an automobile firm that just completed a fully automated manufacturing plant operated entirely by robots sent a message to the head of its labor union, boasting that "these robots will never join your union!". The head of the labor union replied, "but they will never buy your cars either!" Consumption and employment may begin to be de-coupled in developed economies.

Asia's Economies

- Asian economies, with the exception of Japan, are not quite at the same level of abundance as the developed economies yet.
- Japan may be the first Asian economy to begin robotization in a serious way. Japan is advanced in robotics. It has a declining working-wage population. Its population is aging and requires care. It does not want to have massive immigration. It is wealthy enough to manufacture and to employ robots. Robotization is a natural solution for Japan.
- The other Asian economies are different. But even then, the new Ford Motors automobile manufacturing plant in China employs a large number of robots relative to human workers.
- AI is the focus of R&D investment in both China and India.

Asia's Economies

- However, Chinese GDP per capita is less than US$8,000, not quite 20 percent of the Japanese GDP per capita. Its wealth per capita and capital per capita are similarly low. The average wage rate in China is still but a fraction of those in developed economies. It will be a while, probably way past the middle of this Century, before the Chinese economy reaches the level of abundance as well as scarcity of labor that it will undergo massive automation and robotization.

Concluding Remarks

- In the long run, economic growth is not likely to be constrained by supply but depends on the growth of aggregate demand. Aggregate demand in the world can still grow. There is no sign of satiation in many economies, even in the U.S. The demand for public goods such as basic infrastructure, a clean environment, healthcare and elderly care remains high but is not adequately supplied under the current conditions.
- The enhanced possibility of capital-labor substitution is favorable for the Japanese economy, which increasingly faces a shortage of labor.
- The advances of information technology are so powerful that they will bring us closer to the day when there is so much material abundance that it is possible to have "from each according to his ability and to each according to his need".