About the economist,
Robert Solow

SOLOW GROWTH MODEL 📊

The Solow growth model was first introduced by Robert Solow in 1956 in his paper "A Contribution to the Theory of Economic Growth'. It primarily focuses on the estimation and effects on economic growth given factors including capital, labor, population growth and technological progress and advancement. Robert Solow believed that a nation's economic growth as well as its economy would react accordingly to the changes in these variables.

The model explains during **steady state**, economic growth depends heavily on the rate of technological progress instead of capital and labor. But WHY?

Assumption 1:
A nation's output is being produced using Capital and Labor. Capital and Labor are both fully utilized.

Assumption 2:
It is a closed economy, where there is No Government and No International Trade.

Assumption 3:
As capital increases, depreciation increases as well. In other words, the depreciation rate is positively correlated and proportional to the amount of capital in an economy.
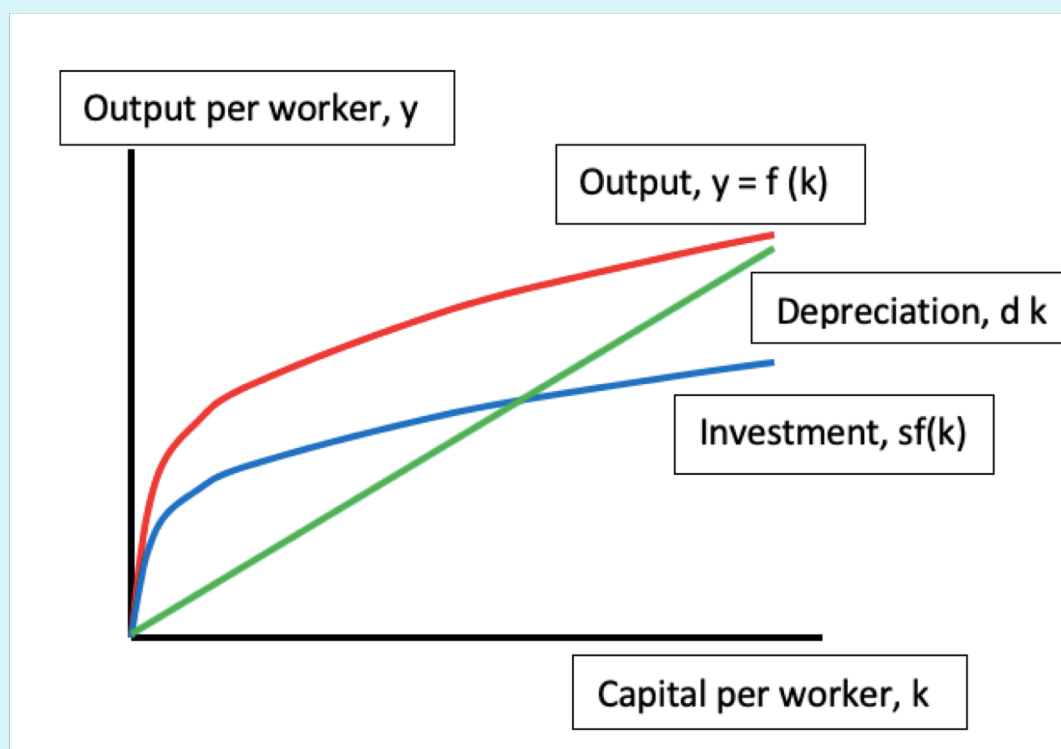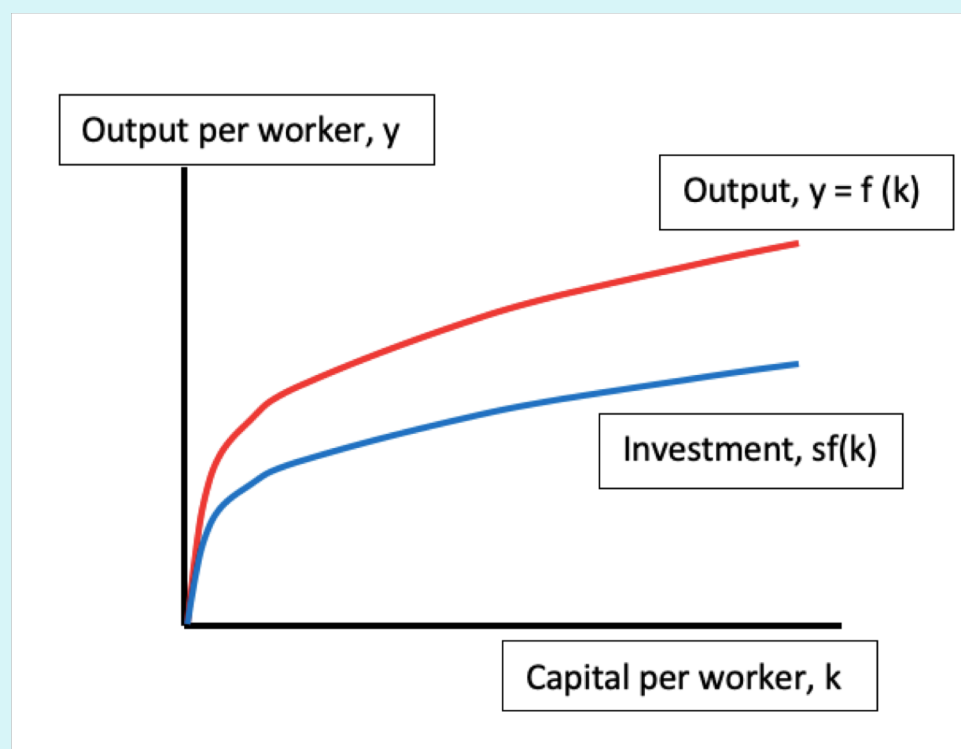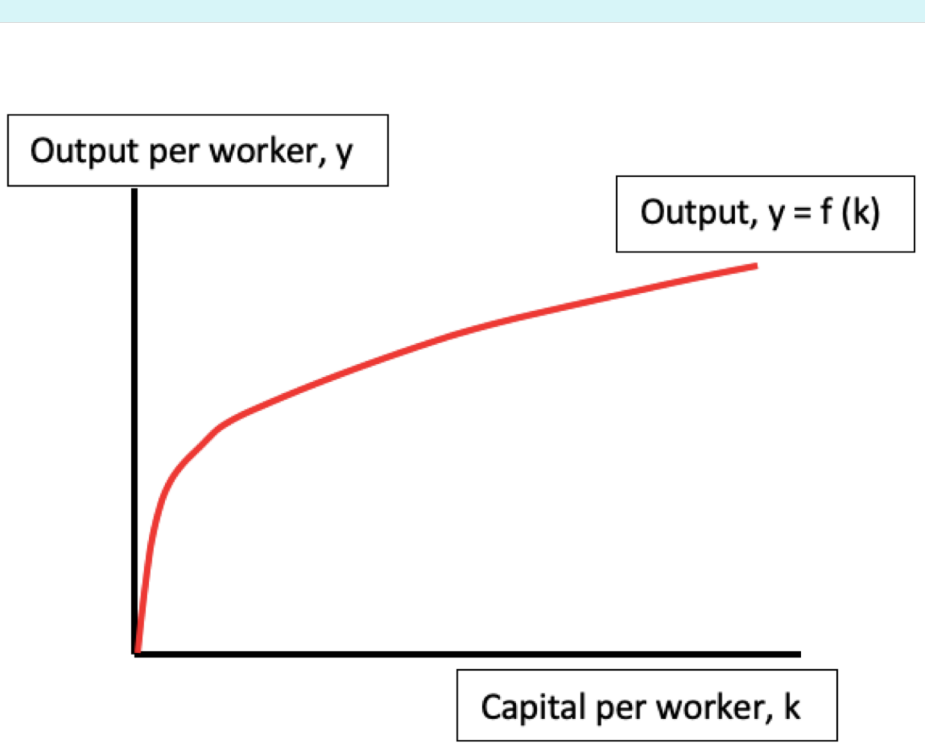
The Steady State:
The Long Run Equilibrium

Does Population Growth contribute to economic growth?

During steady state, with population growth taken into account, all investment has to be spent on replacing depreciated capital stock as well as the increased population. Let **n** be the **Population Growth Rate**

$sf(k^*) = (n+d) k^*$ **during steady state.**
Population increases in an economy also requires extra capital for growth and to support the increased population, and labor is growing at the same rate as population growth.

However, capital per worker (k) and output per worker (y), both remain constant during the steady state.

According to Solow,
the leading cause of economic growth = **Technological Progress** = ideas have been implemented into developing new technologies that improves the production process & standard of living, i.e capital per worker & output per worker.

Let **g** be the growth rate of **Technological Progress**
◆ $sf(k^*) = (g+n+d) k^*$ **during steady state.**
◆ Technological progress is vital for a nation's economic growth and development, new and better technologies may allow higher level of production outputs without increase existing inputs.

To summarize,

Þ both Total Output (Y) and Total Capital (K) grow at the same rate, they grow accordingly to the rate of (g+n).

Þ both output per worker (y) and capital per worker (k) grow according to the growth rate of g.
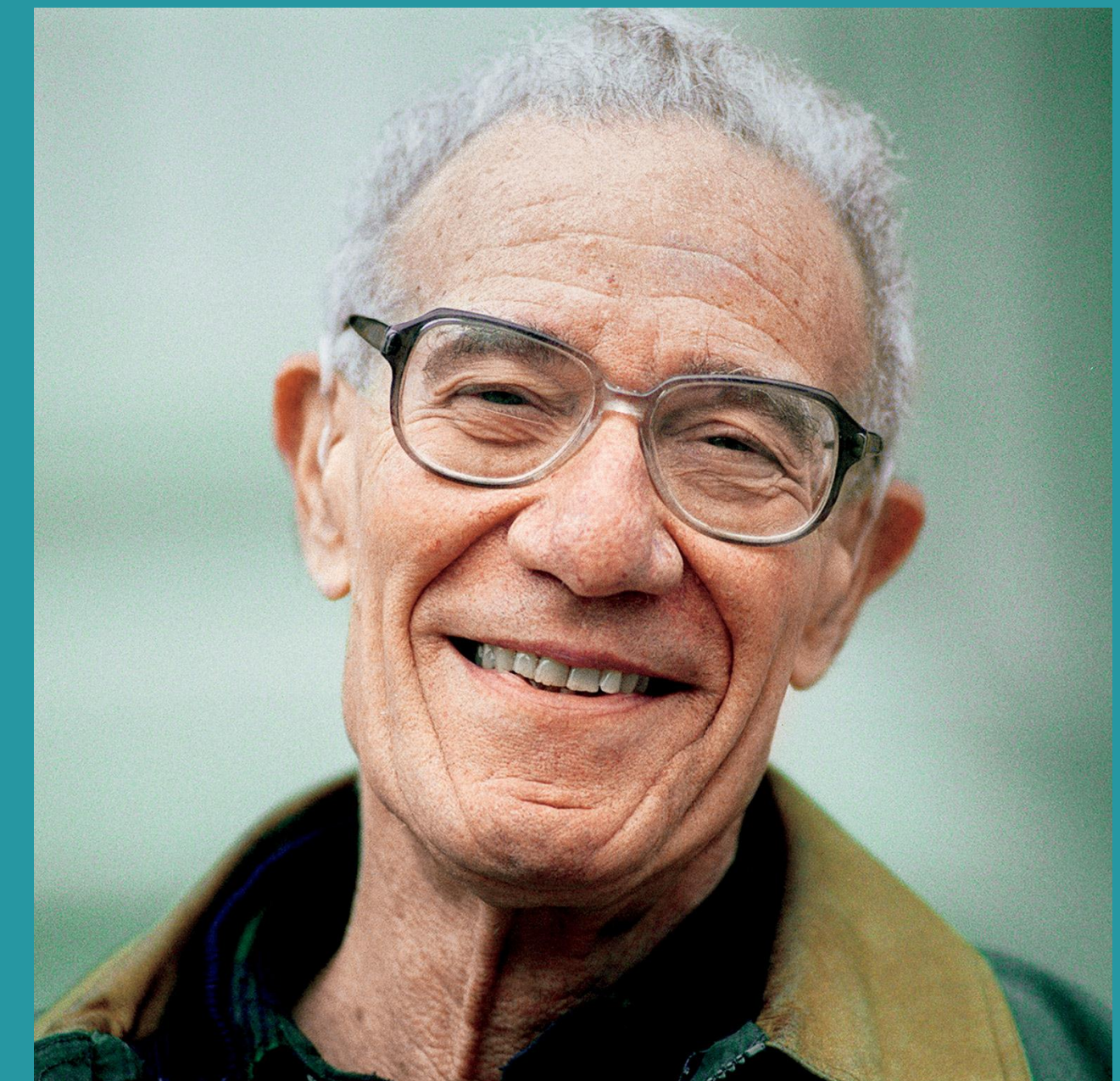
For more detail:
available website   audio narration

Background

◆ Born in New York, on August 23rd, 1924.
◆ Completed his high school early and entered Harvard University with a scholarship at the age of 16.
◆ Studied economics, sociology and anthropology.
◆ Served in the U.S Army in Italy during WWII from 1942 to 1945.

As a Russian-American economist Wassily Leontief 's assistant, he produced the first set of capital coefficient for the input-output analysis. This has motivated Solow to study statistics and to work on his Ph.D thesis about how the model changes according to income differences between the employment-unemployment ratio and wage rates.
1950s: Solow was offered a position as a professor in M.I.T'. For several years, he worked for mathematical models and economic theories such as von Neumann growth theory, theory of Capital, linear programming and the Phillips curve.
1960s: Solow's studies were mostly on employment and growth policies, and the capital theory played a role in the government that devise technological methods for economic growth.
In 1961, he won a prize for the best economist under 40 named 'the American Economic Association's John Bates Clark Award'.
1979: he served as president of the association.
1987: he finally won the NOBEL PRIZE for his analysis of economic growth.
1999: He also received the National Medal of Science
2011: He got honorary degree during the Tufts University's Commencement ceremonies.

How Solow's model apply to today's world.

Technological Progress
Currently in the 21th century, many economists believe that technological progress is vital for a nation's economic growth and development. Specifically, new and better technology used in the agricultural sector will future increased production output and output per worker.

Case Study- China Wheat Production
According to Professor Kadambot Siddique from The UWA Institute of Agriculture, he stated that **'advances in production technology and input optimisation will contribute to Chinese wheat production.'**
Chart 1- China year to year Wheat Production, Source: indexmundi
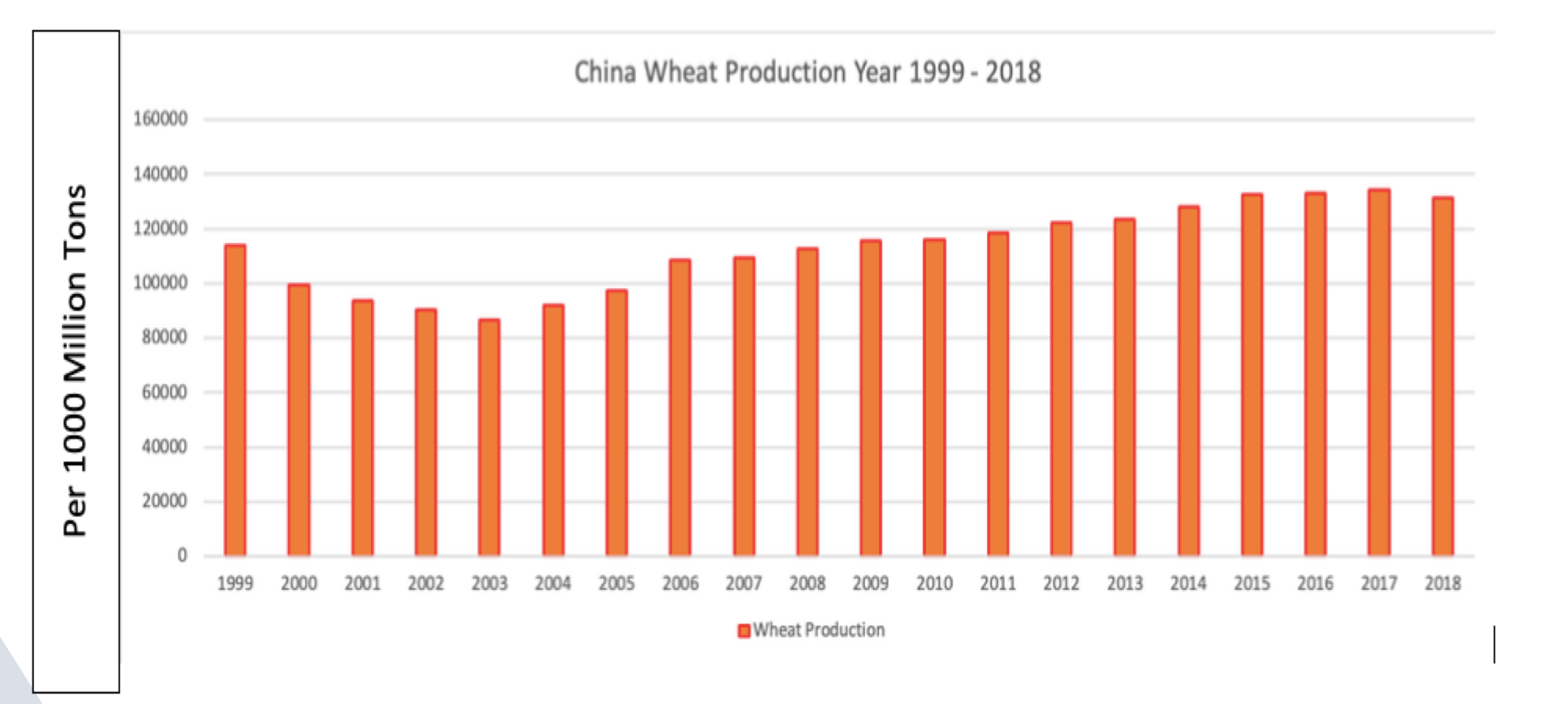
• **Wheat Productivity has gone up gradually over the past years Technologies Developed To Foster Wheat Productivity**
Reduced Tillage- Reduce Soil Disturbance, Improve Soil Fertility
Raised Beds- Improved Drainage System. Removing Excess Surface Water, Prevent Soil Erosion

China Agricultural Labor Force
Chart 2- Distribution of the workforce across economic sectors in China from 2007 to 2017
Source: statista
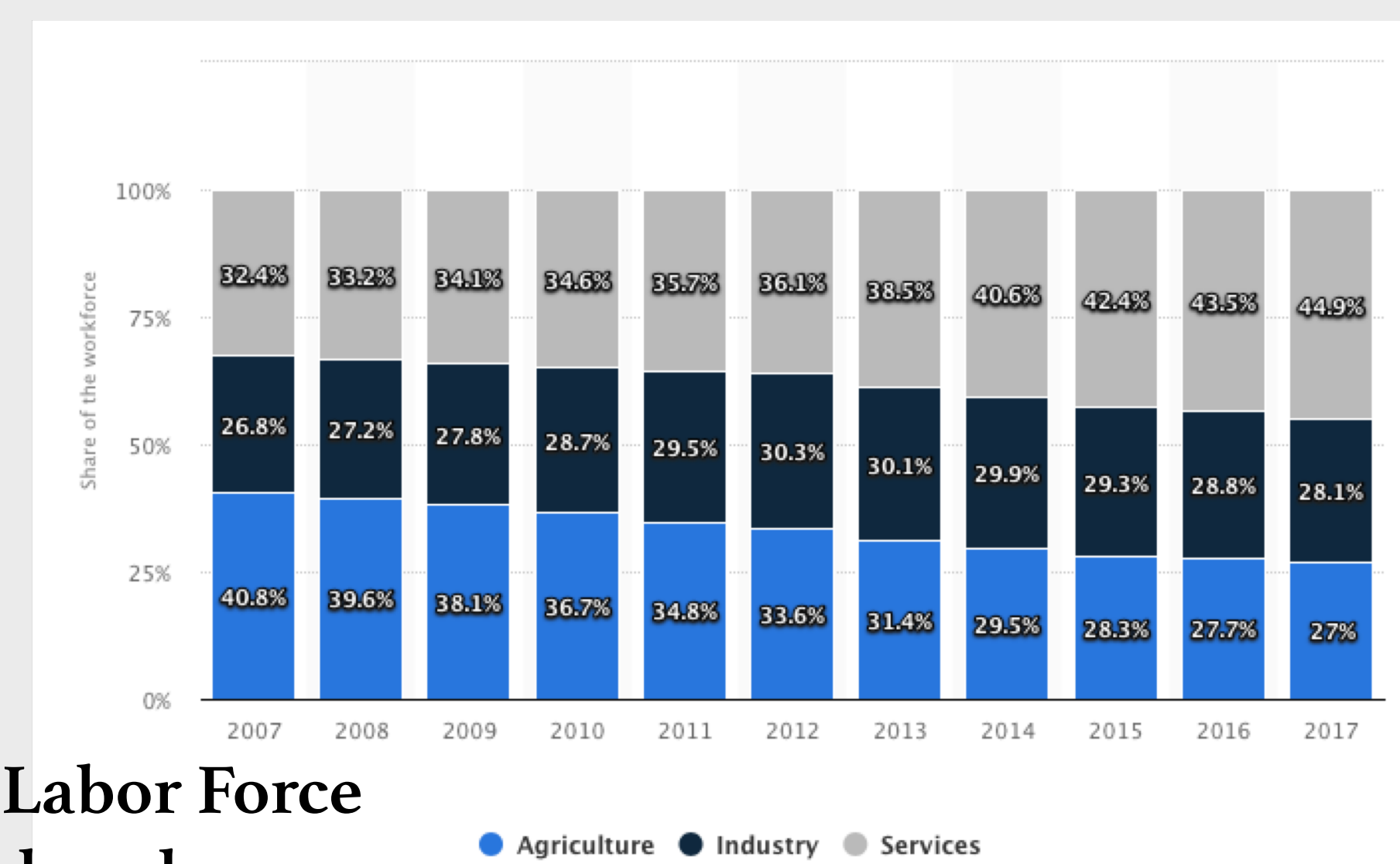
• **Chinese Agricultural Labor Force has gone down over the decade**

Summary
1.Technological Advancement ➡ Wheat Productivity ⬆
2.Lower % of the labor force participating in the Agricultural Sector
3.Increased output per worker (k), capital per worker (y)
The above case study has proven that Technological Advancements do lead to Economic Growth, supporting Solow's Growth Theory