# ENDLESS ACCUMULATION, LIMITS TO GROWTH, AND THE TENDENCY FOR THE RATE OF PROFIT TO FALL

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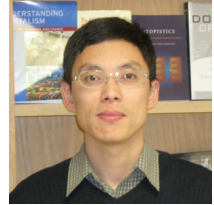
Abstract: This article proposes a simple new model that helps to analyze the long-term movement of the profit rate. The article applies the new model to the United States and China, the world's two largest economies, to illustrate how the new model may help analyze the global capitalist crisis in the 21st century. In the new model, the long-term movement of the profit rate depends on the long-term average economic growth rate and the ratio of accumulation. As the capitalist economy stagnates and ecological sustainability imposes constraints on future economic growth, capitalism may have exhausted its historical capacity to check the tendency for the rate of profit to fall.

Key words: profit rate; accumulation; crisis; the US economy; the Chinese economy

Thomas Piketty's book, *Capital in the Twenty-First Century*, has received widespread attention. Many have commented on Piketty's book and debated the long-term trend of income and wealth inequality in the leading capitalist economies (see Foster and Yates 2014). However, few paid attention to the significant influence that Marx's works had on Piketty, especially the relationship between Piketty's work and Marx's famous hypothesis on the "Law of the Tendency for the Rate of Profit to Fall."

In this article, I propose a simple new model on the interaction between the profit rate and capitalist accumulation (related to what Piketty calls the "Second Fundamental Law of Capitalism"). The article applies the new model to the United States and China, the world's two largest economies, to illustrate how the new model may help analyze the global capitalist crisis in the 21st century.

In the new model, the long-term movement of the profit rate depends on the long-term average economic growth rate and the ratio of accumulation (the share of capitalist net investment in the total profit). As the capitalist economy stagnates and ecological sustainability imposes constraints on future economic growth, capitalism may have exhausted its historical capacity to check the tendency for the rate of profit to fall. The "law of the tendency for the rate of profit to fall" originally proposed by Marx in the 19th century may eventually be validated by the world historical events in the 21st century.

Marx and Piketty

The "Law of the Tendency for the Rate of Profit to Fall" was one of the most important propositions on political economy developed by Karl Marx. Being a system based on the pursuit of profit, capitalism needs a certain level of profit rate to function effectively and stably. According to Marx, the tendency for the rate of profit to fall, if not checked, would impose an insurmountable limit to capitalist accumulation and potentially threaten the survival of capitalism as a viable economic and social system (Marx [1894] 1967, 259).

Marx discussed the "law of the tendency for the rate of profit to fall" in *Capital*, volume 3. According to Marx, capitalist technological progress had a strong tendency toward mechanization (substitution of fixed capital for labor). As capitalist production became progressively more capital intensive, the "organic composition of capital" (the ratio of "constant capital" over "variable capital" or the ratio of the value of the invested means of production relative to the value of labor power) would tend to rise. If the rise of the organic composition of capital was not offset by a larger increase in the rate of surplus value, the profit rate would tend to fall (Marx [1894] 1967, 211–66).

In the modern formulation of Marxist political economy, the profit rate is often disaggregated into the profit share (the share of the capitalist profit in the national economic output) and the output-capital ratio (the ratio of economic output to invested capital stock; see Devine 1987; Dumenil and Levy 1993). The inverse of the output-capital ratio (the capital-output ratio) is closely related to Marx's concept of "organic composition of capital." The capital-output ratio roughly corresponds to the ratio of the value of the invested means of production over the new value created by the current productive labor. If the labor share of economic output (the ratio of the value of labor power over the new value created) changes within a limited range, then the capital-output ratio would in general move in the same direction as the organic composition of capital. Thus, the hypothetical tendency toward rising organic composition of capital may be reformulated as a tendency for the capital-output ratio to rise.

In *Capital in the Twenty-First Century*, Thomas Piketty characterized Marx's conception of capitalism as the "principle of infinite accumulation." While Marx proposed the tendency toward rising organic composition of capital, Piketty argues that when the capitalist rate of return is sufficiently large relative to the economic growth rate, there is a tendency for the "capital-income ratio" to rise (what Piketty calls the "capital-income ratio" is similar to what modern Marxist political economists call the "capital-output ratio" and related to Marx's "organic composition of capital").

Piketty proposes what he calls the first and the second "Fundamental Law of Capitalism." The "First Fundamental Law" is in fact an accounting identity, which simply says that the capital income share (the capital share of national income) equals the rate of return on capital multiplied by the capital-income ratio. The "Second Fundamental Law" says that in the long run, the capital-income ratio is determined by the ratio of the saving rate over the economic growth rate (Piketty 2015, 5–25, 166–70).

If the capital-income ratio rises, this will result in either falling rate of profit (if the capital income share stays constant) or inexorable rise of the capital income share (if the rate of return on capital stays constant). Either way, the stability of capitalism will be undermined. Piketty argues that in the 21st century, as the economic growth slows down but the saving rate stays high, the leading capitalist economies will again face rising capital-income ratios that threaten to destabilize the capitalist system (Piketty 2015, 7–11, 195–96, 227–30).

If we are interested in the profit rate rather than the "capital-income ratio," then it can be shown that in the long run, the profit rate is determined by the profit's growth rate and the "saving rate" of the capitalist class (or the "ratio of accumulation").

Profit Rate and Accumulation: A Simple Model

Profit rate is the ratio of the capitalist profit over the invested capital stock. Mathematically, it is obvious that the movement of the profit rate depends on the relative growth rate of the profit and the capital stock. If the profit grows more rapidly than the capital stock, the profit rate will rise. If the profit declines or grows more slowly than the capital stock, the profit rate will fall. If the profit grows at the same rate as the capital stock, the profit rate will be at "equilibrium," neither rising nor falling.

Consider the capital stock's growth rate:

$$\text{Capital Stock's Growth Rate} = \frac{\text{Net Investment}}{\text{Capital Stock}}.$$

Net investment is the difference between the total new investment in capital stock (gross investment) and the depreciation of the existing capital stock.

In this article, I define the "ratio of accumulation" as the share of net investment in the capitalist profit. It tells what portion of the capitalist profit is used for productive investment rather than for capitalist consumption or financial speculation. It turns out that the capital stock's growth rate depends on the ratio of accumulation and the profit rate:

$$\text{Capital Stock's Growth Rate} = \frac{\text{Net Investment}}{\text{Capital Stock}}$$

$$= \left(\frac{\text{Net Investment}}{\text{Profit}} \right) \times \left(\frac{\text{Profit}}{\text{Capital Stock}} \right)$$

$$= \text{Ratio of Accumulation} \times \text{Profit Rate}.$$

Figure 1 illustrates the interaction between the profit rate and capitalist accumulation using a hypothetical model where the profit's growth rate is assumed to be 5% and the ratio of accumulation is assumed to be 50%.
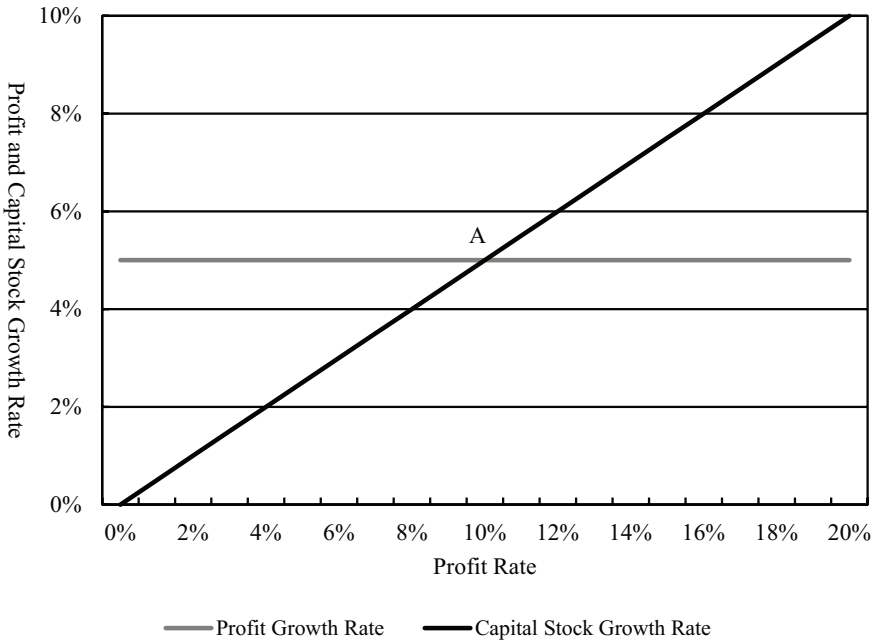

Figure 1   Profit Rate and Accumulation (a Hypothetical Model, Profit Growth Rate = 5%, Ratio of Accumulation = 50%)

Note: A hypothetical model of profit rate and accumulation.

In Figure 1, the profit's growth rate is treated as an exogenous variable and shown as a horizontal line; the capital stock's growth rate is proportional to the profit rate, and the slope of the capital stock growth rate line is the ratio of accumulation. The profit's growth rate and the capital stock's growth rate intersect at point A. To the left of point A, the profit's growth rate is greater than the capital stock's growth rate, thus the profit rate tends to rise. As the profit rate rises, the capital stock's growth rate rises toward point A. To the right of point A, the profit's growth rate is smaller than the capital stock's growth rate, thus the profit rate tends to fall. As the profit rate falls, the capital stock's growth rate falls toward point A. Either way, the capital stock's growth rate converges to equalize with the profit's growth rate. When the capital stock's growth rate equals the profit's growth rate (at point A), the profit rate neither rises nor falls, and "equilibrium" is reached.

At equilibrium (point A):

$$\text{Profit's Growth Rate} = \text{Capital Stock's Growth Rate}$$
$$= \text{Ratio of Accumulation} \times \text{Profit Rate}$$

$$\text{(Equilibrium) Profit Rate} = \frac{\text{Profit's Growth Rate}}{\text{Ratio of Accumulation}}.$$

Thus, the equilibrium profit rate is determined by the profit's growth rate divided by the ratio of accumulation. It tells us where the profit rate will be in the long run if a certain profit's growth rate and a certain ratio of accumulation are held indefinitely. In the hypothetical model, the equilibrium profit rate equals 10% (5% / 50% = 10%).

In the long run, the movement of the profit rate depends on the profit's long-term average growth rate and the long-term average ratio of accumulation. For the profit rate to fall, it requires either a tendency for the ratio of accumulation to rise (which is subject to the theoretical limit of 100%) or a tendency for the profit's growth rate to fall. Conversely, to check the tendency for the rate of profit to fall, it requires either rising profit growth rate or falling ratio of accumulation.

In the following sections, I will use empirical data from the United States and China (the two largest economies in the world) to illustrate how the profit's growth rate and the ratio of accumulation have interacted to determine the profit rate in the actual development of capitalist economies.

Profit Rate: United States and China

The United States is the hegemonic power in the capitalist world system and the world's largest economy measured by market exchange rate. China overtook the United States to become the world's largest economy measured by purchasing

power parity in 2014. Officially, the Chinese leadership claims that China is a "socialist market economy." In reality, the Chinese economy is now dominated by domestic and foreign private enterprises. There has been a growing consensus among the Marxist economists that China now plays a major role in global accumulation (see Hart-Landsberg and Burkett 2005).

In 2013, the United States and China together accounted for 34% of the global economic output by market exchange rate or 32% of the global economic output by purchasing power parity (World Bank 2015). In the near future, the two economies will continue to dominate the global economy. Figure 2 shows the US business sector profit rate from 1929 to 2014 and China's business sector profit rate from 1990 to 2014.

The business sector profit rate is defined as the total profit divided by the business sector capital stock. Total profit is defined as the sum of pre-tax property incomes generated from domestic production (corporate profits, net interest payments, rental income, and the capital component of proprietors' income). The business sector capital stock is measured by the business sector's net stock of fixed assets (measured at replacement cost).
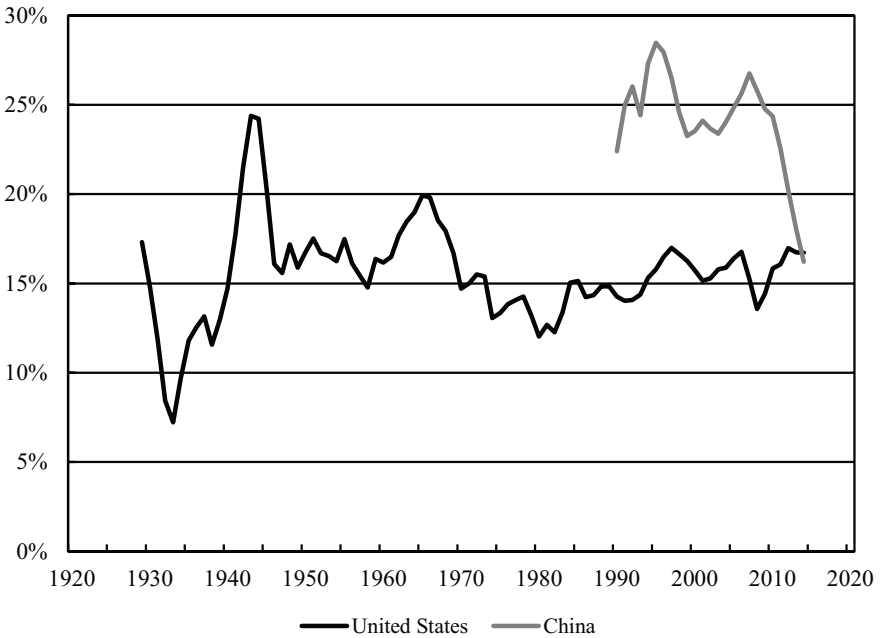

Figure 2   Business Sector Profit Rate (United States and China, 1929–2014)

Sources: The US Bureau of Economic Analysis (BEA 2015a, 2015d) and various issues of *China Statistical Yearbook* (NBS 2015 and earlier years). See also Appendix.

From 1940 to 1970, the US business sector profit rate mostly fluctuated between 15% and 20%. Since the 1980s, the US profit rate has fluctuated around 15%. The profit rate fell below 15% for prolonged periods in the 1930s and in the 1970s and 1980s when the American capitalism struggled with major crisis. The profit rate fell below 15% in 2008 and 2009 during the "Great Recession." Historical experience suggests that the American capitalism probably needs a business sector profit rate above 15% to maintain basic stability.

From 1990 to 2010, China's business sector profit rate was very high, fluctuating around 25, higher than the US profit rate by about 10 percentage points. The very high profit rate underpinned China's rapid accumulation of capital. However, China's profit rate has fallen since 2007 and has declined precipitously since 2010. By 2014, China's profit rate declined to 16.2%, already lower than the US profit rate in the same year (16.7%). Under the current trend, China's profit rate will approach 10% in just a few years, a profit rate level that the American capitalism had seen only during the worst years of the Great Depression.

Table 1 summarizes the historical statistics for the profit's growth rate, the ratio of accumulation, the equilibrium profit rate, and the average profit rate in the United States and China. The first column shows the countries and the historical periods. The second column shows the profit's growth rate, measured by the average annual growth rate of real profit between the beginning year and the ending year of a given period; real profit is measured by the nominal profit deflated by the capital stock price index.[1] The third column shows the ratio of accumulation, measured by the average annual ratio of accumulation during a given period. The fourth column shows the equilibrium profit rate, calculated by dividing the numbers in the second column by the numbers in the third column. The equilibrium profit rate tells that, if the profit's growth rate and the ratio of accumulation in a given period were held indefinitely, where the profit rate eventually would be. The fifth column shows the average profit rate or the average annual profit rate during a given period.

In Figure 1, if the current profit rate is smaller than the equilibrium profit rate, the profit rate will tend to rise and converge toward the equilibrium profit rate; if the current profit rate is greater than the equilibrium profit rate, the profit rate will tend to fall and converge toward the equilibrium profit rate. Thus, in general, when the equilibrium profit rate is higher than the average profit rate, the average profit rate tends to rise; when the equilibrium profit rate is lower than the average profit rate, the average profit rate tends to fall.

In the US economic history, high equilibrium profit rates in the 1940s, 1980s, and 1990s contributed to the rise of the average profit rate in these periods. In the 1950s and 1970s, low equilibrium profit rates contributed to the decline of the

Table 1   Profit Rate and Its Determinants, United States and China (Average Annual Rates of Change or Annual Averages)

	Profit's growth rate (%)	Ratio of accumulation (%)	Equilibrium profit rate (%)	Average profit rate (%)
United States				
1931–40	−0.4	−7.8	na	11.4
1941–50	3.3	11.3	28.8	19.0
1951–60	2.5	18.5	13.3	16.3
1961–70	3.1	24.3	12.6	17.9
1971–80	1.8	27.4	6.5	14.0
1981–90	4.8	22.4	21.3	14.1
1991–2000	3.8	18.5	20.8	15.6
2001–10	1.7	11.6	14.8	15.4
2011–14	4.6	9.3	31.1	16.6
1931–2014	2.6	15.5	16.6	15.5
China				
1991–2000	12.9	41.9	30.8	25.7
2001–10	13.3	45.2	29.4	24.7
2011–14	2.7	63.0	4.2	19.3
1991–2014	11.3	47.5	23.8	24.2

Sources: The US Bureau of Economic Analysis (BEA 2015a, 2015d) and various issues of *China Statistical Yearbook* (NBS 2015 and earlier years). See also Appendix.

average profit rate in these periods. In the 1960s, the equilibrium profit rate was relatively low, and the annual profit rate actually declined from 16.2% in 1960 to 14.7% in 1970. But the high profit rates in the mid-1960s (near 20%) helped to pull up the decadal average.

During 2011–14, the US equilibrium profit rate surged to 31%. The very high equilibrium profit rate contributed to a strong recovery of the US profit rate after the "Great Recession."

On the other hand, China's equilibrium profit rate has collapsed since 2011. During 2011–14, China's equilibrium profit rate fell to only 4.2%. The very low equilibrium profit rate has already led to a precipitous decline of China's average profit rate. If the current trend continues, the Chinese economy is likely to fall into a major crisis in the near future.

In the long run, the long-term average profit rate is similar to the equilibrium profit rate calculated from the long-term average profit growth rate and the ratio of accumulation. From 1931 to 2014, the US profit rate averaged 15.5%, and the equilibrium profit rate was 16.6%. From 1991 to 2014, China's profit rate averaged 24.2%, and the equilibrium profit rate was 23.8%.

Endless Accumulation of Capital?

Capitalism is distinguished from the previous social systems by the dominance of market relations in production and exchange. Under the dominance of market relations, capitalists are compelled to compete against one another for market share and power. Those who fail in competition will become bankrupt and cease to be capitalists. To prevail in market competition, capitalists are both motivated and pressured to use a large portion of their profits to make investment in expanded reproduction and new technology, accumulating capital on increasingly larger scales. It is for this reason that Immanuel Wallerstein considers the "endless accumulation" of capital as the defining feature of capitalism (Wallerstein 1998, 35).

Interestingly, in recent years, the Chinese economy has behaved according to this classical image of capitalism in pursuit of endless accumulation. In the 1990s and the early 2000s, capital accumulation (the business sector net fixed investment) accounted for about 42%–45% of China's total profit. Since 2011, the average ratio of accumulation has surged to more than 60%. The very high accumulation ratios have underpinned China's "economic miracle" and made possible China's rapid industrialization.

However, given a certain level of profit growth rate, higher accumulation ratio results in a lower profit rate. As China's profit growth rate declines, China's high accumulation ratios have contributed to the rapid decline of China's profit rate. This may prove to be the key contradiction that could fatally undermine the Chinese economy in the coming years.

In the 1960s and 1970s, the US accumulation ratio reached 24%–27%. Since then, the US accumulation ratio has steadily declined. During 2011–14, the accumulation ratio averaged about 9%. The very low accumulation ratio, in combination with the rapid growth of real profit, has led to a strong recovery of the profit rate since the "Great Recession."

If the American capitalists have not used their enormous profits for productive investment, what have been the uses of their profits? Without productive investment, how can the American capitalists expand their wealth and maintain their global dominance? Can the low accumulation ratio be sustained indefinitely?

Capitalists may use their profits for productive investment or luxury consumption, or they can lend their profits to the workers, other capitalists, or the government for either consumption or investment. If a capitalist lends money to consumers or the government in exchange for future interest payments, from the capitalist point of view, the money constitutes "assets" that promises future returns. As far as the individual capitalist is concerned, it makes no difference whether the "rate of return" is based on productive investment or investment in financial assets.

Figure 3 shows the average rate of return on total invested assets for the American capitalists. The average rate of return is defined as the ratio of the total

pre-tax property incomes over the total invested assets. The total pre-tax property incomes include domestic and overseas corporate profits, capital component of the proprietors' income, personal rental income, and personal interest income (including interests received from the businesses, the government, and the rest of the world) less interest and dividend payments made to the rest of the world. The total invested assets include the business sector capital stock, household debt, government debt, and the net international investment position (i.e., the US total foreign assets less total foreign liabilities).[2]

In 1929, the US average rate of return was 13%. It fell below 6% in 1932 and 1933. From the 1950s to the 1960s, the average rate of return tended to increase, reaching near 12% by the mid-1960s. However, since the 1960s, it has tended to fall. The average rate of return fell below 8% during 2006–10.

Figure 4 shows the ratios of various productive and financial investments to the total property incomes for the US capitalist economy. From the 1950s to the early 2000s, the total productive and financial "accumulation" (the sum of the net business investment, investment in household debt, and investment in government debt) mostly fluctuated between 40% and 60% of the total property incomes. Subtracting the net capital inflows from abroad (the US net foreign investment has remained
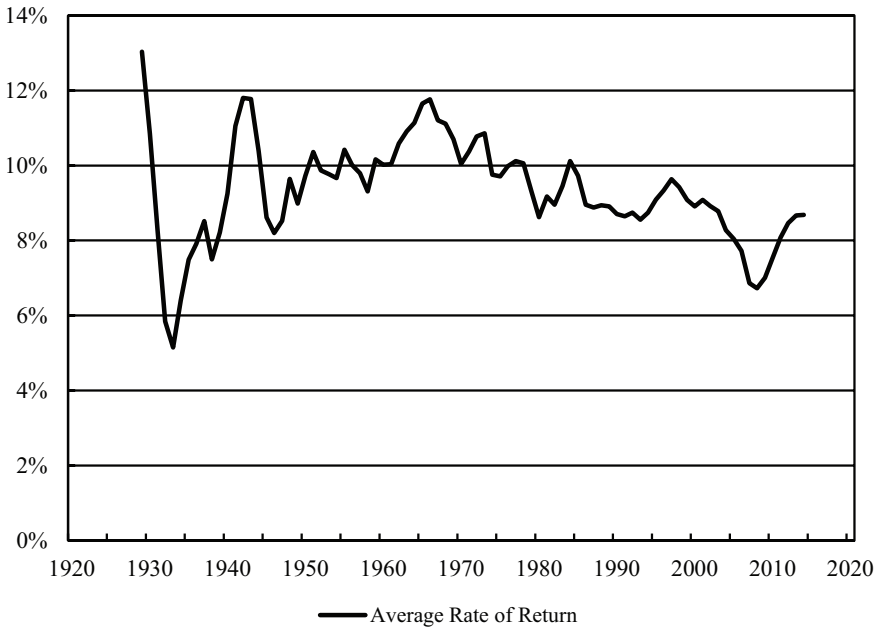

Figure 3   Average Rate of Return on Total Invested Assets (United States, 1929–2014)

Sources: Carter et al. (2006); the US Bureau of Economic Analysis (BEA 2015a, 2015b, 2015c, 2015d) and the US Federal Reserve (Federal Reserve 2015). See Appendix.

negative since the 1980s), the total productive and financial "accumulation" financed by domestic funds (as a ratio of the total pre-tax property incomes) averaged 38% in the 1990s, rose to 46% in the decade 2001–10, and fell to 29% during 2011–14.

In the 1950s and 1960s, net business investment accounted for 20%–25% of the US total property incomes, the investment in household debt was about 15%, and the investment in government debt was about 8%. By the decade 2001–10, the net business investment as a ratio of total property incomes fell to 11%, the investment in household debt averaged 28%, and the investment in government debt was another 28%. During the economic "boom" of 2003–06, household credit market borrowing surged to more than 40% of the total capitalist property incomes. During the "Great Recession," both business investment and household borrowing collapsed, capitalist assets "accumulation" was entirely absorbed by the purchase of government debt (which surged to more than 50% of the total property incomes during 2008–10).

Since the 1980s, the American capitalists have increasingly relied upon financial "accumulation" to substitute for productive investment in the pursuit of wealth expansion. The strategy of financialization has allowed the American capitalists to supplement profits from productive investment with claims on the future income
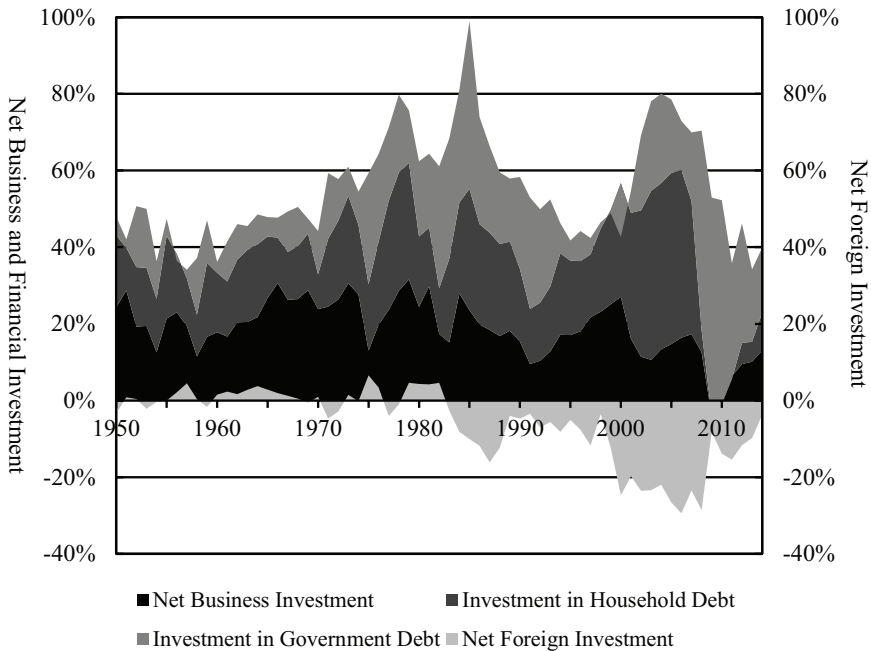

Figure 4   US Business and Financial Investment (as Ratio of Total Property Incomes, 1950–2014)

Sources: The US Bureau of Economic Analysis (BEA 2015b, 2015d) and the US Federal Reserve (Federal Reserve 2015). See Appendix.

flows of the government and the working-class households. This has allowed the American capitalism to increase the total profit despite having low ratios of productive accumulation, thereby raising the business sector profit rate.

The strategy of financialization requires massive increases in household and government debt, which cannot be sustained in the long run. Moreover, the very low ratio of productive accumulation (about 10% of the profit) implies a long-term capital stock growth rate of only 1.5% (given the long-term average business sector profit rate of about 15%). In the long run, persistent stagnation will seriously undermine the relative position of the American capitalism in the capitalist world system.

Limits to Growth?

Equilibrium profit rate is calculated using the profit's growth rate divided by the ratio of accumulation. The profit's growth rate equals the nominal profit growth rate less the inflation rate. In this case, the correct inflation rate is the growth rate of the capital stock price index (see note 1):

$$\text{Profit's Growth Rate} = \text{Nominal Profit Growth Rate} - \text{Capital Stock Price Index Growth Rate}.$$

Nominal profit (the profit measured in current dollars) equals nominal gross domestic product (GDP) multiplied by the profit share of GDP. In the growth rate format, the nominal profit growth rate equals the nominal GDP growth rate plus the profit share's growth rate:

$$
\begin{aligned}
\text{Profit's Growth Rate} &= \text{Nominal Profit Growth Rate} - \\
&\quad \text{Capital Stock Price Index Growth Rate} \\
&= \text{Nominal GDP Growth Rate} + \\
&\quad \text{Profit Share Growth Rate} - \\
&\quad \text{Capital Stock Price Index Growth Rate} \\
&= \left(\begin{array}{l} \text{Nominal GDP Growth Rate} - \text{GDP Price Index} \\ \text{Growth Rate} \end{array} \right) + \\
&\quad \text{Profit Share Growth Rate} + \\
&\quad \left(\begin{array}{l} \text{GDP Price Index Growth Rate} - \text{Capital Stock Price} \\ \text{Index Growth Rate} \end{array} \right) \\
&= \text{Economic Growth Rate} + \text{Profit Share Growth Rate} + \\
&\quad \left(\begin{array}{l} \text{GDP Price Index Growth Rate} - \text{Capital Stock Price} \\ \text{Index Growth Rate.} \end{array} \right)
\end{aligned}
$$

Nominal GDP growth rate less the GDP price index growth rate is the real GDP growth rate, or the conventionally defined economic growth rate. Thus, the profit's growth rate can be disaggregated into the sum of three factors: economic growth rate, profit share growth rate, and the "relative price effect" (differences between the GDP price index growth rate and the capital stock price index growth rate).

Table 2 compares the profit's growth rate in the United States and China and its contributing factors.

In the short term and medium term, the changes in the profit share and relative price often have significant impacts on the profit growth rate. In the long run, the profit share has tended to move within a limited range. From 1931 to 2014, the US profit share rate of change averaged −0.1%. From 1991 to 2014, China's profit share rate of change averaged 0.6%. On the other hand, the relative price effect may have a significant (but not decisive) impact on the profit growth rate even in the long run. From 1931 to 2014, the relative price effect lowered the US profit growth rate by 0.7%. From 1991 to 2014, the relative price effect raised China's profit growth rate by 0.9%.

Despite the more or less significant influences from the profit share and the relative price effect, the long-term average profit growth rate is primarily determined by the economic growth rate. From 1931 to 2014, the long-term average economic growth rate in the United States was 3.4%, and the long-term average profit growth rate was 2.6%. Excluding the volatile 1930s and 1940s, from 1951 to 2014, the long-term average economic growth rate in the United States was 3.2%, and the long-term average profit growth rate was 2.9%. From 1991 to 2014, the long-term average economic growth rate in China was 10.1% and the long-term average profit growth rate was 11.3%.

Capitalism has distinguished itself by its capacity to generate exponential economic growth over the long run. However, since the 1960s, the leading capitalist economies have suffered from progressively lower economic growth rates. Some leading mainstream economists now begin to wonder whether capitalism has entered into a time of long-term stagnation.

Robert Gordon, a leading neoclassical economist specializing in economic growth, makes powerful arguments that the US economy is likely to grow at dramatically reduced pace in the coming decades compared with the growth rates achieved in the 20th century. Gordon argues that the "third industrial revolution," which invented computers, Internet, and mobile phones, has nearly run its course. The overall economic impact of the "third industrial revolution" is far less important than the "second industrial revolution" (which invented electricity and internal combustion engines and had many spin-off inventions).

According to Gordon, in the future, we will have to face a world with fewer and less important innovations. Economic growth will be further hampered by several

Table 2   Profit Growth Rate and Its Contributing Factors, United States and China (Average Annual Rates of Change)

	Profit's growth rate (%)	Profit share growth rate (%)	Relative price effect (%)	Profit's growth rate (%)
United States				
1931–40	2.7	−1.0	−2.1	−0.4
1941–50	5.6	−0.4	−1.8	3.3
1951–60	3.6	−1.1	0.0	2.5
1961–70	4.3	−1.1	−0.0	3.1
1971–80	3.2	0.3	−1.6	1.8
1981–90	3.3	0.5	0.9	4.8
1991–2000	3.4	0.4	−0.0	3.8
2001–10	1.6	0.9	−0.8	1.7
2011–14	1.9	1.2	−0.2	4.6
1931–2014	3.4	−0.1	−0.7	2.6
China				
1991–2000	10.4	2.3	−0.1	12.9
2001–10	10.5	0.9	1.7	13.3
2011–13	8.0	−6.1	1.2	2.7
1991–2014	10.1	0.6	0.9	11.3

Sources: The US Bureau of Economic Analysis (BEA 2015a, 2015d) and various issues of *China Statistical Yearbook* (NBS 2015 and earlier years). See Appendix.

"headwinds": the declining share of labor force in the population, the stagnation of educational attainment, rising inequality, energy and environmental constraints, and heavily indebted households and government. Gordon argues that the US "potential" economic growth rate between 2007 and 2032 will slow down to about 1.6% (Gordon 2012, 2014a, 2014b).

Figure 5 shows the long-term growth of the US per capita real GDP and illustrates Gordon's argument with a hypothetical trajectory based on the historical trend.

According to the United Nations projection, the US population's annual growth rate will slow down to 0.6% between 2010 and 2050, and to 0.3% between 2050 and 2100 (UN 2012). As the US population growth rate slows down to 0.3% and the per capita real GDP growth rate falls below 1%, the long-term economic growth rate will slow down to about 1.3% or lower.

From the Marxist perspective, the stagnation of the capitalist economy results from the basic contradiction of capitalism. Moreover, in the 21st century, capitalist economic growth is subject to the fundamental constraints imposed by the planetary environment (Magdoff and Foster 2010).
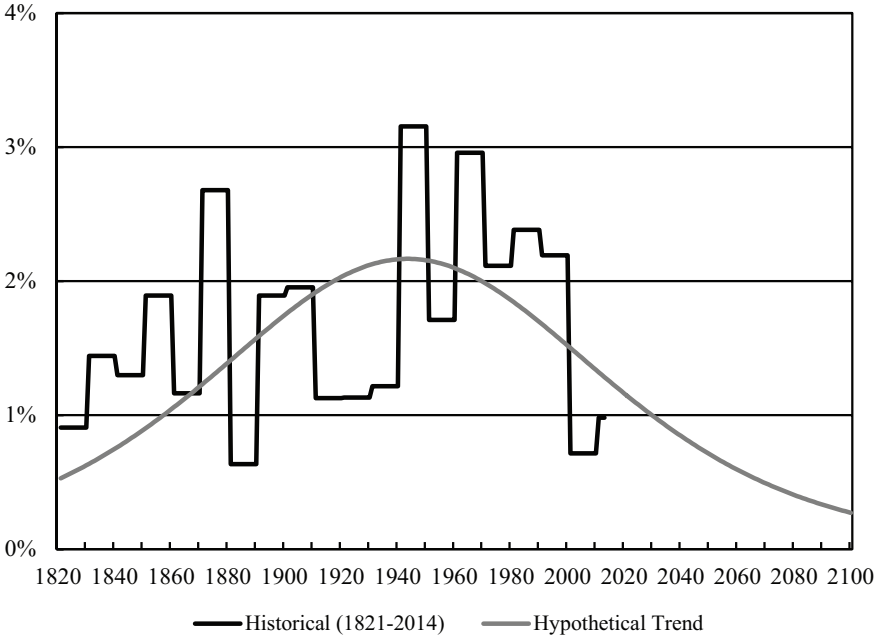
Figure 5   US Long-Term Growth of per Capita GDP (Average Annual Growth Rates, 1821–2100)
Sources: Maddison (2010) and World Bank (2015).

Falling Rate of Profit in the 21st Century

Historical experience suggests that the American capitalism probably needs an average profit rate above 15% to maintain economic and social stability. In the future, if the profit's growth rate slows down to about 1.3%–1.6% (a level consistent with the likely long-term economic growth rate in the coming decades), then the ratio of accumulation must not rise above 8%–10%. Such a low ratio of accumulation could seriously undermine the economic and geopolitical power of the American capitalism.

Even if the American capitalism succeeds in keeping the ratio of productive accumulation low while maintaining a sufficiently high profit rate in the business sector, individual capitalists may be strongly motivated to pursue expansion of wealth through financial accumulation. The unrestrained pursuit of financial accumulation may bring about major financial instabilities. Moreover, the excessive accumulation of financial assets will bring down the long-term rate of return on the total invested assets.

If the profit's growth rate is limited to 1.3%–1.6% and the broadly defined "ratio of accumulation" (net investment in productive and financial assets financed by domestic funds as a ratio of the total pre-tax property incomes) stays around 30%, then the average rate of return on the total invested assets will fall toward 4%–5% (1.3% / 0.3 = 4.3%; 1.6% / 0.3 = 5.3%). This would be even lower than the rate of return at the depth of the Great Depression.

The American capitalism may choose to keep both the productive and the financial accumulation ratios low and spend the bulk of the capitalist profit simply on luxury consumption. However, by its very nature, a capitalist economy cannot plan the socially average ratio of accumulation and consumption. Individual capitalists are both strongly motivated and compelled by the market competition to pursue wealth expansion.

If the capitalist class does manage to keep the accumulation ratio at no more than 10% for a prolonged period of time, it will deprive capitalism of a major ideological justification: the idea that the concentration of wealth in a small group of capitalists is socially necessary because it helps to generate economic growth and technological innovation. To the extent that this is no longer the case, the capitalist class degenerates into a purely parasitic class exploiting the great majority of the society without generating any tangible social benefits. Capitalism will face a major legitimacy crisis that may lead to its political demise.

In the 21st century, global ecological crisis has emerged as the overwhelming crisis confronting the humanity. To achieve global ecological sustainability, it is necessary to reduce the human material consumption and environmental impact to levels consistent with ecological constraints. This is likely to require zero or negative economic growth in the wealthy capitalist economies (Foster 2011).

However, ecologically required "de-growth" is fundamentally incompatible with the basic laws of motion of capitalism. The analysis of this article suggests that the capitalist economy needs a certain level of profit rate to maintain economic and social stability, which in turn requires a certain level of economic growth rate (given the ratio of accumulation). Capitalism cannot possibly operate with zero or negative economic growth rate over prolonged periods, which implies a zero profit rate in the long run.[3]

Humanity is confronted by the following alternative. Either, the capitalist system will continue to exist and operate, leading to global ecological catastrophes. Or, the global working classes and other oppressed people will have to bring about fundamental social changes to achieve ecological and social sustainability.

Either way, the "law of the tendency for the rate of profit to fall" will eventually be validated.

Appendix: Data Sources and Construction

United States

The US labor income, capital income (total profit), indirect taxes (taxes on pro-duction and imports less subsidies), and depreciation (consumption of fixed capi-tal) are from *The National Income and Product Account Historical Tables*, Table 1.10 (BEA 2015d).

The proprietors' income includes both labor income and capital income. There are several commonly used methods to split the proprietors' income between labor and capital income. The first is to assign fixed weights to labor and capital income (with labor often assigned a weight of two-thirds and capital assigned a weight of one-third). The second is to assume that the self-employed workers earn the same wage rate as the employees in the rest of the economy. The third is to assume that the capital stock in the proprietor sector earns the same rate of return as in the corpo-rate sector. The fourth is to assume that the labor and capital income share in the proprietor sector is the same as in the rest of the economy (Giovannoni 2014; Piketty 2015, 203–4). The different methods often yield similar results. In this article, I simply assume that the labor income is 70%, and the capital income is 30% of the US proprietors' income.

The US labor income and capital income are defined as follows:

$$\text{Labor Income} = \text{Compensation of Employees} + 70\% \times \text{Proprietors' Income}$$

$$\text{Capital Income (Total Profit)} = \text{Net Operating Surplus of Private Enterprises} - 70\% \times \text{Proprietors' Income}.$$

The net operating surplus of private enterprises is the sum of corporate profits, proprietors' income, net interest payments, rental income, and net business trans-fer payments.

The business sector net stock of fixed assets is from *Fixed Assets Tables*, Table 6.1 (BEA 2015a).

In Table 1, the "ratio of accumulation" is defined as the ratio of the business sector net fixed investment over the total profit. The business sector net fixed investment is the difference between the business sector net investment (BEA 2015d, Table 5.1) and the change in private inventories (BEA 2015d, Table 1.1.5).

The total pre-tax property incomes are defined as the sum of corporate profits, capital component of the proprietors' income, personal rental income, and personal interest income less interest and dividend payments made to the rest of the world.

Corporate profits (including domestic and overseas profits) are from BEA (2015d, Table 1.12). Proprietors' income, personal rental income, and personal

interest income are from BEA (2015d, Table 2.1). Interest and dividend payments made to the rest of the world are from BEA (2015b, Table 1.1).

The total invested assets are defined as the sum of the business sector capital stock, household debt, federal government debt, municipal securities, and the net international investment position.

The business sector capital stock is from BEA (2015a, Table 6.1). Household debt, federal government debt, and municipal securities from 1929 to 1944 are from Carter et al. (2006, Table Cj870–889). Household debt, federal government debt, and municipal securities from 1945 to 2014 are from *The Financial Accounts of the United States* (Federal Reserve 2015).

The net international investment position from 1929 to 1975 is calculated from Carter et al. (2006, Table Ee23–26). The net international investment position from 1976 to 2014 is from BEA (2015c, Table 1.1).

In Figure 4, the business sector net investment is from BEA (2015d, Table 5.1). Household sector credit market borrowing, federal government credit market borrowing, and borrowing by municipal securities are from Federal Reserve (2015).

The US net foreign investment equals the US net acquisition of foreign financial assets less the US net incurrence of foreign liabilities. The US net acquisition of foreign financial assets and the US net incurrence of foreign liabilities are from BEA (2015b, Table 1.1).

China

All the Chinese economic data used in this article are from *China Statistical Yearbook*, various issues (NBS 2015 and earlier years).

China's total profit (capital income) is defined as GDP less the labor income, indirect taxes, and depreciation of fixed capital:

Labor income is the sum of total wages of urban non-private sector employees, total wages of the urban private sector employees, estimated total wages of the informal sector workers, the rural residents' "entrepreneurial income," and estimated employers' contribution to social security fund and other employee benefits.

Indirect taxes are calculated as the difference between the government sector's total tax revenue, and the business and individual income taxes.

Depreciation of capital is estimated using the data from the tables for "GDP by Income Approach by Province."

The business sector capital stock is estimated using the perpetual inventory method, which defines the capital stock as the cumulative net investment in all previous years:

$$K_T = K_{1990} + \sum\nolimits_{t=1991}^{T} (NI_t).$$

K_T is the real capital stock in year "T." K_{1990} is the initial real capital stock in 1990. NI_t is the real net investment in year "t," and "t" is any year from 1991 to year "T."

The business sector net fixed investment is the difference between the business sector fixed capital formation and the depreciation. The business sector fixed capital formation is estimated using the total economy fixed capital formation and data from China's "flow of funds accounts" tables. The business sector depreciation is estimated using the total economy depreciation and data from China's "input-output tables."

The initial real capital stock in 1990 is estimated using the depreciation in 1990 and assuming a depreciation rate of 7%.

After the real capital stock is estimated, the nominal capital stock (the capital stock in current prices) is estimated by multiplying the real capital stock with the fixed investment price index.

Notes

1. In Figure 1, the equilibrium profit rate is established at the intersection of the profit's growth rate and the capital stock growth rate. The capital stock growth rate equals the nominal capital stock growth rate less the growth rate of the capital stock price index. Thus, the profit's growth rate has to be defined as the nominal profit growth rate less the growth rate of the capital stock price index. If the nominal profit is deflated by some other price index (such as the GDP price index or the consumer price index), the profit's growth rate cannot be directly compared to the capital stock growth rate.
2. As is stated above, while household debt and government debt are financial liabilities for the households and the government sector, they constitute financial assets from the point of view of capitalist financial investors.
3. In the long run, zero or negative economic growth rate implies zero or negative profit growth rate. In Figure 1, this can be represented by a profit growth rate line that either overlaps with or stays below the horizontal axis, implying a zero profit rate.

References

BEA (US Bureau of Economic Analysis). 2015a. "Fixed Assets Tables." Accessed May 31, 2015. http://www.bea.gov/iTable/index_FA.cfm.

BEA (US Bureau of Economic Analysis). 2015b. "International Transactions, International Services, and International Investment Position Tables: International Transactions." Accessed May 31, 2015. http://www.bea.gov/iTable/index_ita.cfm.

BEA (US Bureau of Economic Analysis). 2015c. "International Transactions, International Services, and International Investment Position Tables: Net International Investment Position." Accessed May 31, 2015. http://www.bea.gov/iTable/index_ita.cfm.

BEA (US Bureau of Economic Analysis). 2015d. "The National Income and Product Account Historical Tables." Accessed May 31, 2015. http://www.bea.gov/iTable/index_nipa.cfm.

Carter, B. S., S. S. Gartner, M. R. Haines, A. L. Olmstead, R. Sutch, and G. Wright, eds. 2006. *Historical Statistics of the United States: Earliest Times to the Present*. New York: Cambridge University Press.

Devine, J. N. 1987. "An Introduction to Radical Theories of Economic Crises." In *The Imperiled Economy: Macroeconomics from a Left Perspective,* Book 1, edited by R. Cherry and T. R. Michl, 19–32. New York: Monthly Review Press.

Dumenil, G., and D. Levy. 1993. *The Economics of the Profit Rate: Competition, Crises and Historical Tendencies in Capitalism*. Brookfield, VT: Edward Elgar.

Federal Reserve (The US Federal Reserve Statistical Release). 2015. "Financial Accounts of the United States, Historical Data." Accessed May 31, 2015. http://www.federalreserve.gov/releases/z1/Current/data.htm.

Foster, J. B. 2011. "Capitalism and Degrowth: An Impossibility Theorem." *Monthly Review* 62 (8): 26–33.

Foster, J. B., and M. D. Yates. 2014. "Piketty and the Crisis of Neoclassical Economics." *Monthly Review* 66 (6): 1–24.

Giovannoni, O. 2014. "What Do We Know about the Labor Share and the Profit Share? Part III: Measures and Structural Factors." Levy Economics Institute of Bard College, working paper, no. 805, May. Accessed May 31, 2015. http://www.levyinstitute.org/pubs/wp_803.pdf.

Gordon, R. 2012. "Is U.S. Economic Growth Over? Faltering Innovation Confronts the Six Headwinds." NBER working paper, no. 18315. Accessed May 31, 2015. http://www.nber.org/papers/w18315.

Gordon, R. 2014a. "A New Method of Estimating Potential Real GDP Growth: Implications for the Labor Market and the Debt/GDP Ratio." NBER working paper, no. 20423. Accessed May 31, 2015. http://www.nber.org/papers/w20423.

Gordon, R. 2014b. "US Economic Growth Is Over: The Short Run Meets the Long Run." In *Think Tank 20 Report: Growth, Convergence, and Income Distribution—The Road from the Brisbane G-20 Summit*. Accessed May 31, 2015. http://www.brookings.edu/~/media/Research/Files/Interactives/2014/thinktank20/chapters/tt20-united-states-economic-growth-gordon.pdf?la=en.

Hart-Landsberg, M., and P. Burkett. 2005. *China and Socialism: Market Reforms and Class Struggle*. New York: Monthly Review Press.

Maddison, A. 2010. "Statistics on World Population, GDP, and Per Capita GDP, 1–2008 AD." Accessed May 31, 2015. http://www.ggdc.net/MADDISON/oriindex.htm.

Magdoff, F., and J. B. Foster. 2010. "What Every Environmentalist Needs to Know about Environment." *Monthly Review* 61 (10): 1–30.

Marx, K. (1894) 1967. *Capital: A Critique of Political Economy,* vol. III. *The Process of Capitalist Production as a Whole*. New York: International Publishers.

NBS (National Bureau of Statistics, People's Republic of China). 2015 and earlier years. *China Statistical Yearbook*. Various Issues. Accessed May 31, 2015. http://www.stats.gov.cn/tjsj/ndsj/.

Piketty, T. 2015. *Capital in the Twenty-First Century*. Cambridge, MA: The Belknap Press of Harvard University Press.

UN (United Nations). 2012. *World Population Prospects: The 2012 Revision*. United Nations, Department of Economic and Social Affairs. Accessed May 31, 2015. http://esa.un.org/wpp/.

Wallerstein, I. 1998. *Utopistics, or, Historical Choices of the Twenty-First Century*. New York: The New Press.

World Bank. 2015. *World Development Indicators*. Accessed May 31, 2015. http://data.worldbank.org/data-catalog/world-development-indicators.