LONG WAVES, INSTITUTIONAL CHANGES, AND HISTORICAL TRENDS: A STUDY OF THE LONG-TERM MOVEMENT OF THE PROFIT RATE IN THE CAPITALIST WORLD-ECONOMY

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ABSTRACT

In this paper we study the long-term movement of the profit rate and related variables in the UK, the US, Japan, and the Euro-zone. Since the mid-19th century there have been four long waves in the movement of the average profit rate and rate of accumulation. The average profit rate tended to fall between the late 19th century and the late 20th / early 21st century. The average profit share fell substantially in the transition from the UK hegemony to the US hegemony. The fall of the profit rate and profit share reflected rising wage and taxation costs. Our findings raise important questions regarding the future development of the capitalist world-economy.

INTRODUCTION

Capitalism as a historical system rests upon the pursuit of profit and accumulation of capital. The profit rate is a central indicator that determines as well as reflects conditions of capitalist accumulation. Through accumulation, it in turn affects the general performance of the capitalist world-economy and contributes to political and social changes.

Since the 1970s, there have been many studies of the profit rate, its determinants, and how the profit rate interacts with accumulation in the context of advanced capitalist countries. Most studies focused on the post-WWII period. There have been relatively few studies of the movement of the profit rate over longer periods and there has been no study that evaluates the long-term movement of the profit rate in the capitalist world-economy as a whole.

Capitalism is by nature a world system. Capitalist accumulation, division of labor, and the production and distribution of value take place within a world-economy that consists of multiple states and national economies. The basic laws of motion of capitalism, including those that regulate the long-term movement of the profit rate, operate not only within national capitalist economies, but also in the capitalist world-economy as a whole.

Based on and inspired by previous studies, in this paper, we take a preliminary step towards the understanding of the long-term movement of the profit rate and its determinants in the capitalist world-economy. Our study focuses on the experience of four leading capitalist economic units – the UK, the US, Japan, and the Euro-zone. The UK presided over the capitalist world-economy in the

19th century. The US has been the hegemonic state since the mid-20th century. In the late 1980s and the early 1990s, some speculated that Japan could replace the US to become the next economic superpower. Japan now remains the world's second largest national economy as well as the largest creditor nation. The Euro-zone is currently the world's second largest economic unit. In this study, we represent the Euro-zone with its three largest national economies: Germany, France, and Italy.

We are able to construct reasonably reliable and consistent data series for the UK and the US back to the mid-19th century. For Japan, our data series start with 1905. For the Euro-zone economies our data series is comparatively short, starting with 1963.

By studying the long-term movement of the profit rate in the leading capitalist economic units, we hope to provide new information that helps to deepen our understanding of the long-term historical dynamics of the capitalist world-economy. The next section reviews alternative theoretical approaches on capitalist long waves, stages of capitalist development, and the long-term historical trends of capitalism as well as previous studies on the long-term movement of the profit rate in advanced capitalist countries.

Section 3 discusses the relative size and significance of the selected leading economic units in the capitalist world-economy and explains the measurement of the profit rate and its determinants. Section 4 presents and discusses the long-term movement of the profit rate and related ratios in the four selected economic units. Section 5 presents and discusses the long-term movement of the average profit rate and related ratios in the capitalist world-economy. Section 6 discusses the relationship between long waves and institutional changes as well as certain long-term historical trends. The last section concludes the paper by discussing possible future developments of the capitalist world-economy.

THEORETICAL ARGUMENTS AND EMPIRICAL EVIDENCE

Long Waves and Stages of Capitalist Development

Many have studied the relationship between long waves of capitalist accumulation and the evolution of capitalist institutions. Long waves usually refer to the 40-50 year long cyclical movements of capitalist economies, with each cycle consisting of an expansionary phase (the phase of more rapid accumulation) and a contraction phase (the phase of sluggish accumulation and major crisis).

The "Social Structures of Accumulation" (SSA) school relates long waves to stages of capitalist development. According to the SSA school, at each stage of capitalist development, there are certain political, economic, and social institutions that form a social structure of accumulation. As long as the existing SSA provides a favorable environment for capital accumulation by ensuring relatively high and predictable profit rates, the capitalist economy tends to expand vigorously. However, over time, due to changing economic and social conditions as well as contradictions within the existing SSA, the profit rate tends to decline, undermining accumulation and eroding the existing SSA, resulting a period of economic crisis and intensified social conflicts. Various classes and social groups would fight for the direction of institutional change until a new SSA emerges (Gordon, Edwards, and Reich 1982; Kotz 1987; Bowles, Gordon, and Weisskopf 1990; Kotz, McDonough, and Reich 1994).

According to the SSA school, between the mid-19th century and the 1980s the US economy had experienced three long waves, each corresponding to a particular social structure of accumulation. The first, competitive capitalist SSA lasted from the 1860s to the 1890s. The second, corporate capitalist SSA lasted from the turn of the century to the 1930s. The third, regulated capitalist SSA lasted from the 1940s to the 1980s (Bowles, Edwards, and Roosevelt 2005: 158-164). There is a general agreement that since the 1980s a new, neoliberal institutional structure has emerged and consolidated. But there has been debate regarding whether neoliberalism constitutes an independent social structure of accumulation (Lippit 1997; Hossein-Zadeh and Gabb 2000; Wolfson 2002; Kotz 2004).

Like the SSA school, the Regulation school relates institutional changes to long waves, but with emphasis on patterns of technical change and the regulation of effective demand. According to the Regulation school, a certain technological style (e.g., Fordism) and a pattern of distribution and

consumption compatible with the underlying production system together form a regime of accumulation. A certain regime of accumulation in turn requires certain institutions constituting a "mode of regulation" regulating the conflict between capital and labor, between industrial capital and financial capital, between capital and state, and between different capitalist states. To the extent that these conflicts are effectively regulated, the prevailing regime of accumulation tends to promote rapid growth and economic stability. However, beyond a certain point, the underlying contradictions of the prevailing regime become increasingly more intensified, undermining profitability, productivity, and economic growth, leading to the disintegration of the existing regime (Lipietz 1987; O'Hara 2003).

Systemic Cycles of Accumulation and Financial Hegemonies

In *The Long Twentieth Century* and *Chaos and Governance in the Modern World System*, Giovanni Arrighi and others argue that the continual reproduction and the expansion of the capitalist world-economy over the past several centuries have been based on the successive recreation of increasingly more powerful leading capitalist organizations. There have been four "systemic cycles of accumulation," each led by a particular governmental-business complex. The Genoese-Iberian cycle stretched from the 15th through the early 17th century; the Dutch cycle stretched from the late 16th through the late 18th century; the British cycle stretched from the mid-18th century through the early 20th century; the US cycle started in the late 19th century and, according to Arrighi, is now approaching its "terminal crisis."

Each systemic cycle consists of a material expansion phase and a financial expansion phase. In material expansions, the emerging hegemonic power of the capitalist world system creates a set of new geopolitical and organizational conditions required for the emergence of wider and deeper divisions of labor, leading to rising profit rates and rapid expansion of material production and trade. However, as material expansion proceeds, eventually capital tends to be over-accumulated and profit rates tend to fall. In response to the crisis of material expansion, the leading capitalist agencies tend to keep a larger proportion of their capital in liquid form instead of re-investing it into material production or trade, thus leading to financial expansions in which financial capital dominates industrial and commercial capital.

Following Fernand Braudel, Arrighi sees the alternation of material expansions and financial expansions as a recurrent pattern of world capitalism. In this pattern, the phase of financial expansion represents the "autumn" of a systemic cycle. It allows the incumbent centers of world capitalism to temporarily re-inflate their power and wealth and enjoy a *belle époque*. However, the dominance of financial capital redistributes income and wealth from labor to capital and from debtors to creditors. Instead of resolving the crisis, financial expansion in fact deepens the over-accumulation crisis and leads to a crisis of legitimacy, intensifying inter-class and inter-state conflicts. The phase of financial expansion, therefore, had in the past preceded the "terminal crisis" of the incumbent hegemonic power (Arrighi 1994; Arrighi and Silver 1999; Arrighi 2005).

Dumenil and Levy (2004) also see important similarities between the current period and the early 20th century capitalism. Inspired by Marx's "law of the tendency for the rate of profit to fall," Dumenil and Levy argue that in certain historical periods, capitalist technological progress tended to be characterized by increased use of fixed capital, leading to falling capital productivity and profit rate, resulting in periods of "structural crisis." In response to the "structural crisis," capitalism underwent major transformations in institutions that tended to favor the interest of "finance" (or the upper echelon of the capitalist class) and restore profitability. According to Dumenil and Levy, the early 20th century was the first period of "financial hegemony" and the current period of neoliberalism is the second period of "financial hegemony."

Historical Trends of Capitalism

Classical Marxism argues that all social systems are historical, and capitalism is a historically specific social system that is appropriate only under certain historical conditions and will have to give way to a new social system as the underlying historical conditions change.

In *Capital*, volume III, Marx advanced the famous hypothesis "the law of the tendency for the rate of profit to fall." Marx argued that the development of productive forces under capitalism tends

to be characterized by rising "organic composition of capital" and leads to a falling rate of profit. In the long run, the tendency for the rate of profit to fall would undermine capital accumulation and deprive capitalism of its historical justification (Marx 1967: 211-266). The theoretical and empirical validity of Marx's hypothesis has been intensely debated.

Like Marx, Immanuel Wallerstein sees capitalism as a historically specific social system that exists and functions under certain historical conditions. According to Wallerstein, the capitalist world-economy rests upon the endless accumulation of capital, which in turn leads to three secular trends: rising wage costs (resulting from the tendency for the bargaining power of the working classes to grow); rising taxation costs (resulting from the tendency for both the capitalists and the workers to demand increasingly more extensive state services); and rising environmental costs. As the three secular tendencies approach their respective asymptotes, capital accumulation is under growing structural pressures and becomes increasingly unfeasible, leading to the structural crisis of the existing world system (Wallerstein 1995; 1998; 2003).

The Long-Term Movement of the Profit Rate: Empirical Evidence

Since the 1970s, many have studied the movement of the profit rate and its determinants in advanced capitalist countries in the post WWII period. There is a general consensus that the profit rate had fallen in the US and other advanced capitalist countries between the mid-1960s and the early 1980s and the fall of the profit rate was a major factor that contributed to the economic stagnation and instabilities in the 1970s and the 1980s (among others, see Gordon, Weisskopf, and Bowles 1987; Armstrong, Glyn, and Harrison 1991; Moseley 1991; Shaikh and Tonak 1994; Moseley 1997; Brenner 1998; Shaikh 1999).

However, there have been relatively few studies of the movement of the profit rate over longer periods. In an earlier study, Poletayev (1992) studied the movement of the profit rate in the UK, the US, Germany, and Japan, for various periods between the 1850s and the 1970s, partly using second hand sources, and concluded that there existed long waves in the movement of the profit rate.

Dumenil and Levy (1993) studied the long-term movement of the rate of profit, the profit share, and capital productivity in the US private economy between 1869 and 1989. They found that during two historical phases, from the Civil War to the beginning of the 20th century, and from the 1940s to the 1970s, technical change had led to a falling capital productivity and a falling rate of profit, resulting in two structural crises. However, in response to the crises, capitalism underwent technological and institutional changes that restored the profit rate more or less to the previous levels. In the long run, both the profit rate and the profit share fluctuated around essentially constant trends.

Dumenil and Levy used a broad measure of the profit that does not take into account the effects of taxation costs. In a recent study, Li and Hanieh (2006) developed a new measurement of the profit rate in the US economy between 1869 and 2000, taking into account the effects of both wage costs and taxation costs, and identified four long waves in the movement of the profit rate. Li and Hanieh found that both the profit rate and the profit share had tended to fall over the long period from the 1870s to the 1980s, followed by some recovery in the neoliberal era.

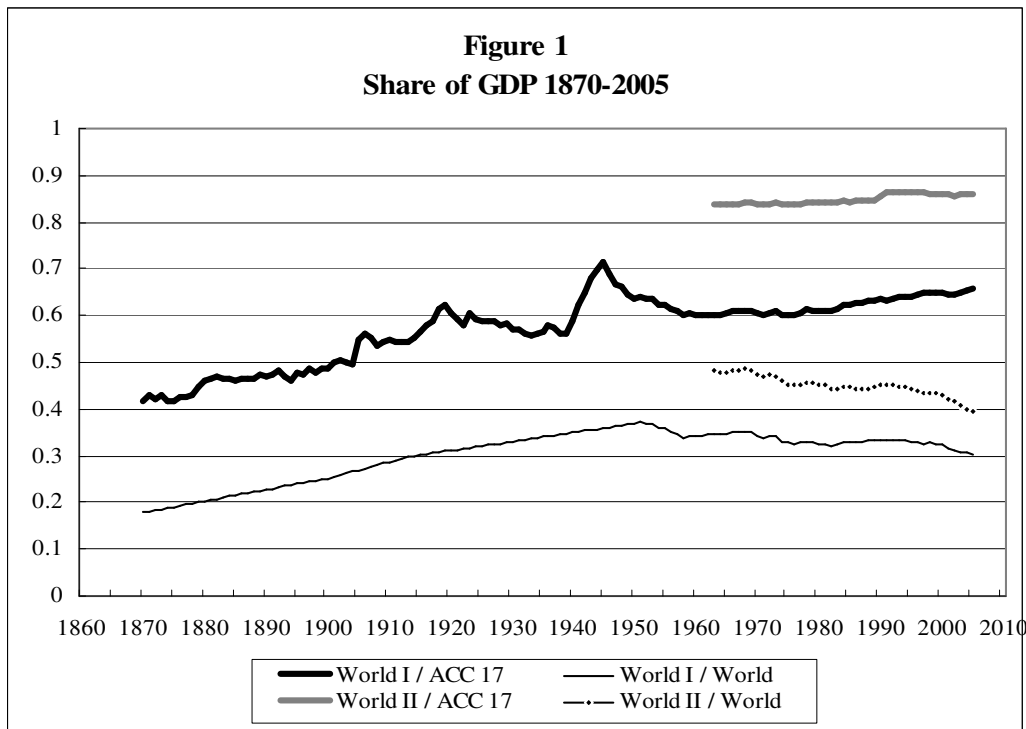**Measuring the Profit Rate in the Capitalist World-Economy**

Capitalism is by nature a world system. The capitalist division of labor, the production and distribution of value, and the accumulation of capital take place in the context of a world-economy. To understand the historical dynamics of capitalism, it is necessary to study not only the movement of the profit rate in national capitalist economies but also that in the capitalist world-economy as a whole.

Ideally, one would like to calculate the average rate of profit for the entire capitalist world-economy. However, given the practical difficulty of constructing long-term profit rate data series that cover the entire world-economy, the second best option is to construct the data series for several leading economic units in the capitalist world-economy, the size and the significance of which are sufficiently large so that they may reasonably represent the overall conditions and trends of the system.

The UK, the US, Japan, and the Euro-zone have acted as the dominant or the leading players in the capitalist world-economy in different periods over the past one and a half century. In this paper, in addition to studying the movement of the profit rate and related ratios for each of these economic

units, we also study the weighted averages of their profit rates and related ratios. We construct average profit rates and other ratios for two different groups: "World I" and "World II." "World I" refers to the UK and the US over the period 1870-1904 and UK, US, and Japan over the period 1905-2005. "World II" refers to the UK, the US, Japan, and the three Euro-zone economies (Germany, France, and Italy) over the period 1963-2005.

      Figure 1 presents the share of "World I" and "World II" in the total GDP of 17 advanced capitalist countries (12 Western European countries, US, Canada, Australia, New Zealand, and Japan, representing the core zone of the world system) and in the total World GDP between 1870 and 2005. The UK and the US together accounted for between 40 and 50 percent of the total core zone GDP in the late 19th century. Throughout the 20th century, the UK, the US, and Japan together accounted for about two-thirds of the total core zone GDP and about one-third of the total world GDP. Since the 1960s, the UK, the US, Japan, Germany, France, and Italy combined have accounted for more than 80 percent of the total core zone GDP. Since the 1970s, the share of the core zone in the total world GDP has been falling and the fall accelerated over the past decade. Despite this relative decline, the six selected advanced capitalist countries now account for about 40 percent of the world GDP.

Figure 1
Share of GDP 1870-2005

The growth performance of the UK, the US, and Japan correlates strongly with that of the entire core zone. The simple correlation coefficient between the three selected countries' average annual growth rates with that of the 17 advanced capitalist countries over 1871-2005 is 0.909. [1]

      The evidence suggests that the selected leading capitalist economic units account for a substantial portion of the world-economy and are of sufficient importance so that they could provide a reasonable representation of the overall performance in profit rate and accumulation for the capitalist world-economy, but especially for the core zone of the world system.

      There are multiple definitions of the profit. Students in the Marxian tradition are traditionally interested in measures of surplus value, which equals the difference between the net value of output

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[1] Long-term GDP data for the world and 17 advanced capitalist countries are from Maddison (2003) and extended to 2005 using growth rates in recent years.

and the total wage bill of production workers. In this paper we are interested in how the movement of the profit rate and its determinants affect the long-term performance of the capitalist system. The survival and the success of the capitalist system depend on the material fortunes and the governing ability of its ruling class – the capitalist class. The ability of the ruling class to rule in turn depends on the material resources at its disposal. The income and wealth of the capitalist class derive from various forms of property incomes: profits, interests, and the rent.

We define the profit as the sum of all property incomes that include corporate profits, non-corporate capitalist profits, net interests, and the rent. The profit equals the value of output less wage costs and taxation costs.

The output is measured by the net domestic product, which roughly corresponds to the Marxian concept of net value of output. The wage costs include the compensation of employees and an estimated labor component of the entrepreneurial income (also know as the proprietors' income).[2] The taxation costs are measured by the taxes on production and imports (indirect taxes) less subsidies.[3]

The profit rate is the ratio of the profit over the capital stock. The capital stock is measured by the net stock of private non-residential fixed capital.[4]

The profit rate is often analyzed as the product of the profit share and the output-capital ratio. The profit share is defined as the share of the profit in the net domestic product. The output-capital ratio (or capital productivity) is the ratio of the net domestic product over the net stock of private non-residential fixed capital.

Our main sources of data are various official and semi-official sources, including *British Historical Statistics*, *The United Kingdom National Accounts*, *Historical Statistics of the United States: Colonial Times to 1970*, *The United States National Income and Product Accounts*, *Estimates of Long-Term Economic Statistics of Japan since 1868*, *Historical Statistics of Japan*, and *OECD Economic Outlook*. In addition, we use some minor sources and our own estimates.

For details of data sources and construction, see the Appendix.

National Profit Rate Long Waves

Figure 2 compares the long-term movement of the profit rate in the UK, the US, Japan, and the Euro-zone, shown in 10 year moving averages to smooth out short-term fluctuations.[5]

The UK was the first industrial capitalist country. For the UK, we are able to construct the most complete data series that cover the 150-year long period between 1855 and 2005. The long-term cyclical movement of the profit rate is quite apparent. Defining a profit rate long wave as the period from one trough point in the ten-year average profit rates to another, then between the mid-19th century and the early 21st century the UK economy has experienced four long waves.[6] The profit rate

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[2] We assume that in the long run non-corporate capitalists earn about the same rate of return on capital as corporate capitalists. Based on our estimates, we assume that in the UK, the US, Japan, and the Euro-zone, respectively, 75, 90, 55, and 75 percent of the entrepreneurial income is labor income. For details of estimations and assumptions, see Appendix.
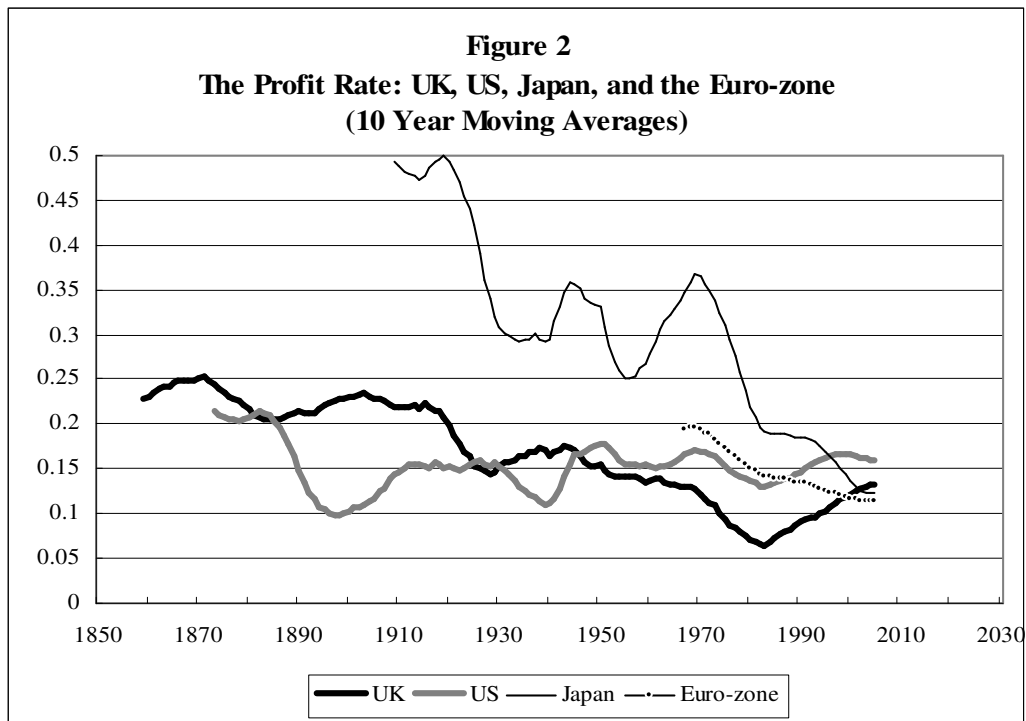
[3] Ideally, the taxation costs should also include income taxes (direct taxes) on the capitalists. However, the income taxes paid by the capitalists cannot be easily separated out from those paid by the workers.

[4] For the three Euro-zone economies, the capital stock is measured by the net stock of business sector non-residential fixed capital. The profit rates of the Euro-zone economies are therefore slightly overstated relative to the profit rates of other selected countries.

[5] The first data point in each ten-year average series is five-year average, and the second, third, fourth, and fifth data points are six-, seven-, eight-, and nine-year averages respectively. The same is for the rest of the ten-year average series used in this paper.

[6] A peak ten-year average profit rate is defined as the highest ten-year average profit rate after an extended period of time over which ten-year average profit rates tend to rise. Similarly, a trough ten-year average profit rate is defined as the lowest ten-year average profit rate after an extended period of time over which ten-year average profit rates tend to fall.

tended to fall through the first three long waves. It did recover strongly during the neoliberal era (from the 1980s to the present) but has yet to regain its peak in the previous long wave.

Figure 2
The Profit Rate: UK, US, Japan, and the Euro-zone
(10 Year Moving Averages)

Between 1869 and 2005 there have been four long waves in the movement of the US profit rate. For the late 19th century long wave, there are data only for the second half (from peak to trough). The profit rate fell substantially between the late 19th century and the early 20th century. However, over the course of the 20th century, the trend of the profit rate had been slightly upward.[7]

The Japanese profit rate data series start with 1905. Between the early 20th century and the 1970s there had been three profit rate long waves. However, during the 1980s the Japanese economy had not seen an upturn in the movement of the profit rate and the fall of the profit rate accelerated during the 1990s.

For the Euro-zone (over the period 1963-2005), all ratios are weighted averages of Germany, France, and Italy. To calculate the average profit rate, countries are weighted by their capital stock in constant 1990 international dollars. The Euro-zone profit rate has tended to fall over the past four decades. The profit rate nearly halved between the early 1960s and the early 2000s. There has been no upturn at all in the neoliberal era.

We do not have data for the Euro-zone economies in earlier periods. However, given what we know of the profit rates that prevailed in the UK and the US in the late 19th century and the early

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[7] The trend of the US profit rate over the 20th century presented in this paper is somewhat different from that in Li and Hanieh (2006) largely because of different treatments of corporate income taxes. Li and Hanieh include corporate income taxes as a part of the taxation costs, while excluding individual income taxes on capitalists due to data limitations. This leads to inconsistent treatment of different property incomes. Their definition of profit includes some property incomes that are after-tax (corporate profits) and some other property incomes that are pre-tax (net interests, rent, non-corporate capitalist profits). To avoid this inconsistency, in this paper we treat the corporate income taxes in the same way as individual income taxes, excluding both categories from taxation costs.

20th century, the current very low profit rates of the Euro-zone economies are likely to be their historical lows.

Table 1 reports the peak and trough ten-year average profit rates for the UK, the US, Japan and the Euro-zone in successive long waves. The peak and trough years indicated refer to the ending years of the peak or trough ten-year periods.

Table 1. The Profit Rate Long Waves: UK, US, Japan, and the Euro-zone

	UK	US	Japan	Euro-zone
Late 19th Century Long Waves	Peak: 25.3% (1871) Trough: 20.5% (1885)	Peak: 21.6% (1873)[a] Trough: 9.9% (1897)		
Early 20th Century Long Waves	Peak: 23.4% (1903) Trough: 14.4% (1928)	Peak: 16.0% (1926) Trough: 11.0% (1939)	Peak: 50.0% (1919) Trough: 29.2% (1934)	
WWII and Postwar Recovery Years	Peak: 17.5% (1943)	Peak: 17.7% (1950)	Peak: 35.7% (1944) Trough: 24.8% (1956)	
Mid-20th Century Long Waves	Trough: 6.5% (1983)	Peak: 17.0% (1969) Trough: 13.1% (1983)	Peak: 36.5% (1969) Trough: 18.9% (1984)	Peak: 19.6% (1968)[b]
Late 20th / Early 21st Century Long Waves	Peak: 13.3% (2005 ?) Trough: ?	Peak: 16.7% (1998 ?) Trough: ?	Trough: 12.3% (2005 ?)	Trough: 11.4% (2005 ?)

[a] Five-year average. [b] Six-year average.

(Peak and trough ten-year average profit rates)

In the late 19th century and the early 20th century, the UK profit rate led the US profit rate by about ten years. Between the 1890s and the 1910s, the UK profit rates were higher than the US profit rates by quite substantial margins. According to Arrighi, this was the *belle époque* of British imperialism.
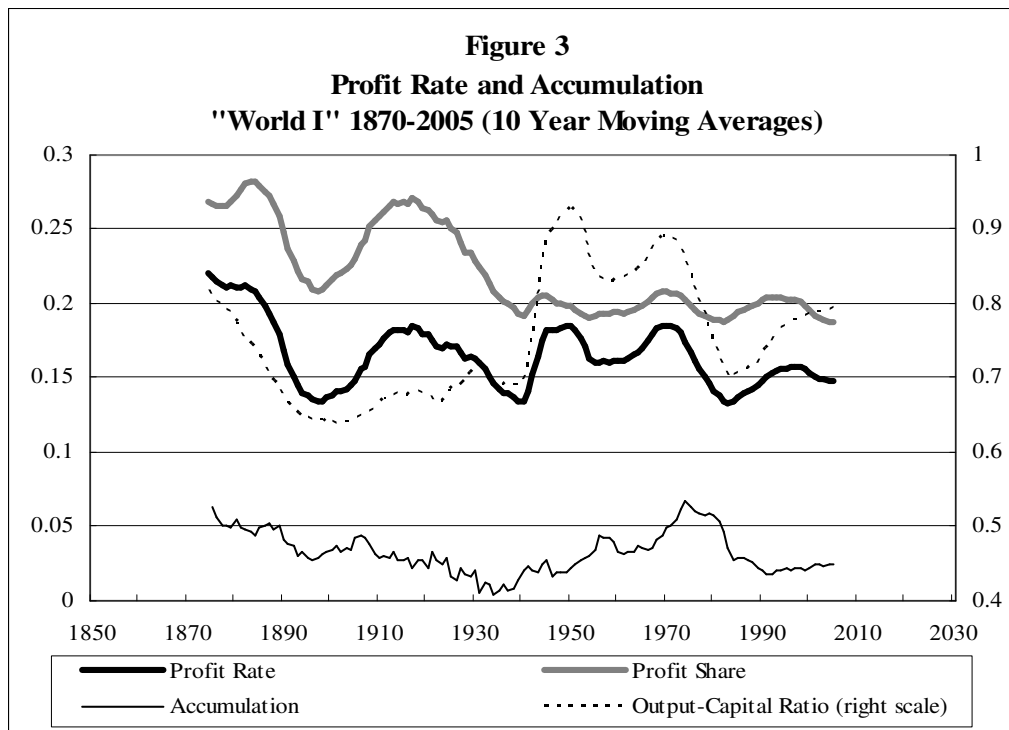
During the 1960s and the 1970s, there was relatively strong cross-country synchronicity in the movement of the profit rate although UK failed to participate in the profit rate boom in the 1960s.

Since the 1980s, the profit rate movements have again diverged across countries. While the US and the UK, the model neoliberal countries, have enjoyed substantial increases in profit rates, the Euro-zone and Japan have suffered sustained falls in profit rates. The US had lower profit rates than the Euro-zone and Japan at the beginning of the neoliberal era, but now has higher profit rates than every other large economic unit in the core zone.

In the long run, there appears to have been a tendency for the profit rates in different parts of the core zone to converge towards similar levels.

World Profit Rate Long Waves

We use the weighted average profit rates of the selected leading capitalist economic units to represent the world average profit rates. Figure 3 presents the average profit rate, profit share, output-capital ratio, and rate of accumulation of country group "World I" (the UK and the US for 1870-1904 and the UK, the US, and Japan for 1905-2005) over the period between 1870 and 2005. The Rate of accumulation is defined as the annual growth rate of real capital stock (measured in constant 1990 international dollars).

Figure 3
Profit Rate and Accumulation
"World I" 1870-2005 (10 Year Moving Averages)

For the calculation of the average profit rate, output-capital ratio, and rate of accumulation, countries are weighted by their capital stock in constant 1990 international dollars and for the calculation of the average profit share, countries are weighted by their net domestic product in constant 1990 international dollars.

Both the profit rate and the rate of accumulation show patterns of long-term cyclical movements. Table 2 presents the peak and trough ten-year average profit rates and rates of accumulation in successive long waves.

Since the mid-19th century there have been four long waves in the movement of the profit rate and rate of accumulation. The second half of the late 19th century profit rate long wave, from peak to trough, lasted for 23 years or longer (1874 is the earliest data point). The early 20th century profit rate long wave lasted for 42 years and the mid-20th century profit rate long wave (including the WWII period) lasted for 44 years. Therefore, each of the previous profit rate long waves lasted for about 40-45 years. The current profit rate long wave started in 1983 and has lasted for 23 years. If the past historical pattern could serve as a guide, then the current long wave could come to an end in the coming 20-25 years.

By comparison, the accumulation long waves have had less regularity. The second half of the late 19th century accumulation long wave, from peak to trough, lasted for 21 years or longer (1875 is the earliest data point). The early 20th century accumulation long wave lasted for 40 years. The mid-20th century accumulation long wave lasted for 57 years. The expansion phase (when rates of

accumulation tended to accelerate) of this long wave was particularly long, lasting for 40 years. The current accumulation long wave did not start until 1991 and has by now lasted for 15 years. If the current accumulation long wave were to end in 20-25 years, it would have lasted for 35-40 years. This would make it roughly comparable to the early 20th century long wave in length.

Table 2. The "World I" Profit Rate and Accumulation Long Waves

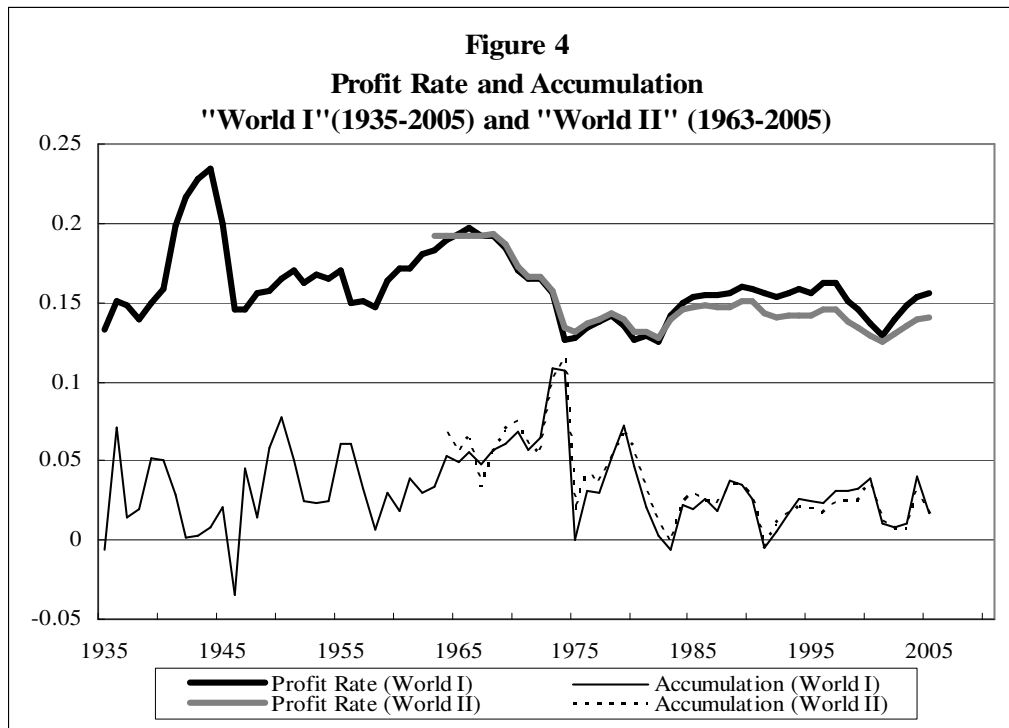|	Profit Rate	Rate of Accumulation
Late 19th Century Long Waves	Peak: 22.0% (1874 ?)[a] Trough: 13.4% (1897)	Peak: 6.3% (1875 ?)[a] Trough: 2.7% (1896)
Early 20th Century Long Waves	Peak: 18.5% (1917) Trough: 13.4% (1939)	Peak: 4.4% (1906) Trough: 0.0% (1934)
Mid-20th Century Long Waves	Peak: 18.5% (1969) Trough: 13.2% (1983)	Peak: 6.7% (1974) Trough: 1.8% (1991)
Late 20th / Early 21st Century Long Waves	Peak: 15.8% (1997 ?) Trough: ?	Peak: 2.5% (2004 ?) Trough: ?

[a] Five-year average.

(Weighted averages of UK, US, and Japan, peak and trough ten-year averages)

The profit rate tended to fall between the late 19th century and the early 20th century and again tended to fall between the mid-20th century and the late 20th century. The current profit rate long wave actually reached a peak in 1997. If this peak were not to be surpassed in the coming years, the current long wave would turn out to have the lowest peak profit rate.

The late 19th century long wave and the mid-20th century long wave were characterized by relatively rapid accumulation. The expansionary phase of the current long wave has so far been characterized by the most sluggish accumulation in all long wave expansions.

Figure 4 presents the average world profit rates and rates of accumulation over the past 70 years, covering the entire mid-20th century long wave and the expansionary phase of the current long wave. The "World I" averages are compared with the "World II" (the country group that includes the UK, the US, Japan, Germany, France, and Italy) averages.

The mid-20th century profit rate long wave included four profit rate short cycles (1938-1947; 1947-1958; 1958-1974; 1974-1982) that corresponded to four accumulation short cycles (1934-1946; 1946-1958; 1958-1975; 1975-1983).

Figure 4
Profit Rate and Accumulation
"World I"(1935-2005) and "World II" (1963-2005)

Between 1982 and 2001 there was a particularly long profit rate "short cycle", lasting for 19 years. This long profit rate "short cycle" in fact encompassed two accumulation short cycles (1983-1991 and 1991-2002). We are now in the expansionary phase of the second short cycle within the current long wave. Towards the end of the current short cycle, the characters of the current long wave would become more apparent and the downturn of the current long wave might have been under way.

The "World II" average profit rates and rates of accumulation have closely correlated with those of "World I" but since the late 1980s the "World II" average profit rates have consistently stayed below the "World I" average profit rates, reflecting the poor performance of the Euro-zone economies.

Long Waves and Stages of Capitalist Development

The profit rate and accumulation long waves presented in this paper correspond to the successive stages of capitalist development or institutional structures that have been discussed in the existing literature. Table 3 illustrates the relationship between the profit rate and accumulation long waves and various schemes of periodization of capitalism.

Each set of longs wave has corresponded to a distinct institutional structure. The 19th century long waves corresponded to competitive capitalism (small businesses, importance of skilled workers, limited government) and the last phase of the material expansion under the British hegemony. The early 20th century long waves corresponded to corporate capitalism (large corporations, growth of non-unionized semi-skilled factory workers, dominance of employers, emerging of central banks) and the financial expansion under the British hegemony. The mid-20th century long waves corresponded to regulated or big government capitalism (Keynesian macroeconomic policies, government regulations of product, labor, and financial markets, expansion of social spending, capital-labor compromises, emerging of transnational corporations) and the material expansion under the American hegemony. Finally, the current long waves correspond to what is commonly known as neoliberal capitalism (transnational corporations, global mobility of capital and outsourcing, decline of organized labor, weakening of government regulations, monetarist macroeconomic policies) and the financial expansion of the American hegemony.

Table 3. Long Waves and Stages of Capitalist Development[a]

		Social Structures of Accumulation	Systemic Cycles of Accumulation (Arrighi)	Dumenil and Levy
Late 19th Century Long Waves	Expansion *Profit Rate* 1850s-1871[b] *Accumulation* 1850s-1874[b]	Competitive Capitalism 1860s-1898	British Hegemony *Material Expansion* 1740-1870	
	Contraction *Profit Rate* 1870s-1897 *Accumulation* 1870s-1896		British Hegemony *Financial Expansion* 1870-1930	First Structural Crisis 1870s-1890s
Early 20th Century Long Waves	Expansion *Profit Rate* 1898-1917 *Accumulation* 1897-1906	Corporate Capitalism 1898-1939		First Financial Hegemony 1900s-1920s
	Contraction *Profit Rate* 1918-1939 *Accumulation* 1907-1934		American Hegemony *Material Expansion* 1870-1970	Great Depression 1930s
Mid-20th Century Long Waves	Expansion *Profit Rate* 1940-1969 *Accumulation* 1935-1974	Regulated Capitalism 1939-1991		Keynesian Compromise 1940s-1960s
	Contraction *Profit Rate* 1970-1983 *Accumulation* 1975-1991		American Hegemony *Financial Expansion* 1970-?	Second Structural Crisis 1970s-1980s
Late 20th / Early 21st Century Long Waves	Expansion *Profit Rate* 1984-1998? *Accumulation* 1992-2004?	Transnational Capitalism 1991-?		Neoliberalism or Second Financial Hegemony 1990s-?
	Contraction -?		American Hegemony *Terminal Crisis*?	

[a] The periodization of successive social structures of accumulation is from Bowles, Edwards, and Roosevelt (2005: 161). The phases of British and American systemic cycles of accumulation are from Arrighi (1994: 364). Dumenil and Levy's periodizaiton of capitalism is from Dumenil and Levy (2004). [b] Peak years of the UK late 19th century long waves.

Further, the contraction phases of successive long waves, such as the 1880s and the 1890s, the 1920s and the 1930s, and the late 1960s and the 1970s, had been periods of major economic crises as well as political and social upheavals. In these periods, social classes and states fought for the future directions of institutional changes. Their struggles led to new social relations of forces that contributed to the demise of the declining institutional structure and paved the way for the rise of a new structure.

In the past, capitalism has succeeded in overcoming major crises through institutional changes within its own framework. The emergence and consolidation of new institutions after major crises contributed to rising profit rates and acceleration of accumulation, which led to new long wave expansions.

However, to the extent capitalism is a historical system that can operate only under certain historical conditions, it does not have indefinite and unlimited abilities of adaptation and self-adjustment. Through institutional changes, important parameters of the system have shifted, generating long-term historical trends. In the long run, these secular trends have led to fundamental changes in the underlying historical conditions and beyond a certain point, the existing world system would no longer be historically viable (Wallerstein 2003:57-64).

Table 4 reports the average profit rate, profit share, wage cost share, taxation cost share, and output-capital ratio for country group "World I" in phases of expansion and contraction of successive long waves (data are only available for UK for the expansionary phase of the late 19th century long wave).

Table 4. The "World I" Profit Rate, Profit Share, and Output-Capital Ratio

	Expansion[a]	Contraction[a]
Late 19th Century Long Wave	R = 24.5%; Π = 26.0% ω = 66.7%; τ = 7.4% Y/K = 94.4% (1855-1871)[b]	R = 17.8%; Π = 24.8% ω = 68.9%; τ = 6.3% Y/K = 71.0% (1870-1897)
Early 20th Century Long Wave	R = 17.2%; Π = 25.7% ω = 68.0%; τ = 6.3% Y/K = 66.6% (1898-1917)	R = 15.2%; Π = 21.8% ω = 69.3%; τ = 8.9% Y/K = 69.7% (1918-1939)
Mid-20th Century Long Wave	R = 17.7%; Π = 20.0% ω = 70.9%; τ = 9.1% Y/K = 88.1% (1940-1969)	R = 14.1%; Π = 19.1% ω = 72.3%; τ = 8.6% Y/K = 73.9% (1970-1983)
Late 20th / Early 21st Century Long Wave	R = 15.2%; Π = 19.6% ω = 71.7%; τ = 8.7% Y/K = 77.8% (1984-2005)	

[a] Phases of expansion and contraction of profit rate long waves.
[b] Ratios are for the expansionary phase of the UK late 19th century long wave.

(Weighted averages of UK, US, and Japan)
R = profit rate; Π = profit share; ω = wage share; τ = tax share;
Y/K = output-capital ratio

The average profit rate fell between the expansionary phase of the late 19th century long wave and that of the early 20th century long wave, and again between the expansionary phase of the mid-20th century long wave and that of the late 20th / early 21st century long wave. It tended to fall through the three phases of contraction. Overall, there has been a tendency for the average profit rate to fall between the late 19th century and the late 20th / early 21st century.

The average profit share tended to fall through the three phases of contraction. There was a substantial fall in the average profit share between the expansionary phase of the early 20th century long wave and that of the mid-20th century long wave and the average profit share in the neoliberal era has been no higher than in the expansionary phase of the mid-20th century long wave.

The average output-capital ratio tended to fall between the late 19th century and the early 20th century and again between the mid-20th century and the late 20th century but rose strongly between the early 20th century and the mid-20th century. There has not been a clear long-term trend in the movement of the average output-capital ratio.

The wage cost has fluctuated around 70 percent of output since 1870 with a slightly upward trend. The wage share tended to rise through the four phases of expansion and three phases of contraction.

The tax share fluctuated just above 6 percent of output in the late 19th century. It increased substantially between the early 20th century and the mid-20th century and fluctuated just above 9 percent of output during the 1950s and the 1960s. The neoliberal era has seen some modest fall in taxation costs. Since the 1990s the tax share has fluctuated just below 9 percent of output.

Wallerstein argues that in the long run capitalist accumulation tends to cause changes in social and political conditions that would in turn lead to long-term tendency for wage and taxation costs to rise. Our findings are largely consistent with Wallerstein's argument.

In *Chaos and Governance in the Modern World System*, Silver and Slater (1999) argue that the system-wide expansions of the capitalist world-economy have been based on successive social compacts between dominant and subordinated groups. The consolidation of each world hegemony presupposed the establishment of new "historical compromises" capable of accommodating rising groups and bringing social conflict under control. Previous hegemonic transitions had been characterized by the progressive widening of the social foundations of the hegemonic bloc.

In this paper we find that in the transition from the British hegemony to the US hegemony (from the early 20th century to the mid-20th century), there was a substantial fall in the average profit share resulting from rising wage and taxation costs. This suggests that periods of hegemonic transition provided opportunities for new social compromises to emerge and tended to bring about major redistribution of income and wealth.

Capitalism as a Historical System

In this study, we find that since the mid-19th century, there have been four long waves in the movement of the average profit rate and rate of accumulation. The average profit rate tended to fall between the late 19th century and the late 20th / early 21st century. The average profit share fell substantially in the transition from the UK hegemony to the US hegemony. The fall of the profit rate and the profit share reflected rising wage and taxation costs. The findings for the average profit rate and the related ratios are largely consistent with what we find for the national profit rates and their related ratios.

For the output-capital ratio, a crucial ratio for Marx's famous hypothesis of rising organic composition of capital and the law of the tendency for the rate of profit to fall, there has not been a uniform long-term trend.

These findings raise important questions regarding the future development of the capitalist world-economy. If the past pattern of profit rate long waves could serve as a guide, will the current long wave enter its declining phase and come to an end in the coming 20-25 years? Will the end of the current long wave bring about the demise of the neoliberal institutional structure? According to Arrighi, the current phase of financial expansion signals the last stage of the US hegemony before its "terminal crisis." If that were the case, would the demise of neoliberalism turn out to coincide with the demise of the US hegemony? Can the capitalist world-economy be successfully restructured in

the post-neoliberal era or is there evidence suggesting that capitalism may be approaching its own historical limit?

It is not the purpose of this paper to address these questions. However, we would like to suggest some tentative thought that might contribute to future studies. Our findings suggest that a profit rate long wave is likely to last for about 40-45 years. According to this pattern, the current, neoliberal long wave has by now probably reached its peak, and will enter its declining phase. Admittedly, there is not a well-developed theoretical framework establishing that a profit rate long wave necessarily lasts for 40-45 years and there is much less regularity in the pattern of accumulation long waves. Nevertheless, there is growing evidence suggesting that the current neoliberal global economy suffers from certain structural contradictions that would lead to major crisis in the coming years.

Many have argued that under neoliberalism, the global economy tends to suffer from insufficient aggregate demand and financial instabilities (Crotty 2000; Eatwell and Taylor 2000; Felix 2001; Greenhill 2003). In this context, the relatively rapid expansion of the US economy has played an indispensable role in stabilizing the neoliberal global economy. However, the growth imbalances between the US and the rest of the world have led to large and rising US current account deficits. At the current trends, the US current account deficit could approach 10 percent of GDP and the US net foreign liabilities could approach 120 percent of GDP by 2015 (Wolf 2005). When the US current account deficits eventually have to be corrected, the global economy could sink either into a prolonged stagnation or depression (Li 2004; Eichengreen 2004; Li and Zhu 2005).

The current capitalist world-economy depends heavily on oil as its major source of energy, which now provides for about 40 percent of the world's energy and 90 percent of the transportation fuels. Many now predict that global oil production is likely to peak and start to fall in the coming decade. All other sources of energy have serious technological and environmental problems and none of them can plausibly in the near future replace oil on a sufficiently large scale at comparable economic costs. If global oil production starts to fall irreversibly, oil price and other energy costs could experience sustained and sharp rises, severely depressing global profit rates and accumulation. Such an outcome alone could be sufficient to send the current long wave into its downturn.[8]

Past historical experience suggests that the declining phase of a profit rate long wave is likely to be accompanied by major political and social turmoil that undermines the existing institutional structure and paves the way for the emergence of new economic, political, and social institutions. If the coming crisis brings the neoliberal institutional structure to an end, can the capitalist world-economy be successfully restructured in the post-neoliberal era?

Our findings suggest that during the transition from the UK hegemony to the US hegemony, there was a substantial fall of the profit share, resulting from rising wage and taxation costs, which in turn reflected the growing bargaining power of the working classes and the growing demand on state services from both capitalists and workers. If the coming crisis, as Arrighi and others have argued, proves to be not only the crisis of neoliberalism but also the "terminal crisis" of the US hegemony, will the demise of the US hegemony pave the way for another wave of rising wage and taxation costs? If yes, will the capitalist world-economy be able to afford another major fall of the profit share and the profit rate?

In the neoliberal era, despite many attacks on the working people's economic and social rights, the capitalist class has accomplished only limited successes in lowering wage costs and taxation costs. If the working classes in the advanced capitalist countries are able to maintain their existing economic and social rights and to some extent expand their rights, given the current demographic trends, the governments of advanced capitalist countries may be forced to dramatically increase spending on health care and pensions in the coming decades, imposing higher taxation costs on capitalists or forcing the government debts to rise to unsustainable levels.[9]

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[8] On the coming peak of global oil production as well as limitations of coal, nuclear energy, and various renewable energies, see Heinberg (2003); Trainer (2003); Kunstler (2005); and Mckillop with Newman (2005).

[9] According to Standard and Poor's simulation, given the demographic trend and the current fiscal stance, government debt as a ratio of GDP is projected to rise 221 percent in Germany, 235 percent in

The re-location of manufacturing and services industries from the core zone to other parts of the capitalist world-economy has contributed to the formation of larger industrial working classes in the periphery and semi-periphery (especially in China and India). In the post-neoliberal era, one may expect that as the working classes in the periphery and semi-periphery become larger and more effectively organized, they would demand a growing range of economic and social rights, pushing up the global wage costs and taxation costs.

In the 20th century, the capitalist world-economy was able to enjoy spectacular growth partly because it enjoyed cheap and abundant oil and could afford ignoring environmental costs. However, the global environmental costs have now risen to the point that the very survival of the humanity is at stake. Global warming is only one among many serious environmental consequences caused by the incessant drive of accumulation under the existing world system. Further, as the global oil supply is going to peak and start to decline, the capitalist world-economy faces the difficult and urgent problem of searching for alternative sources of energy that could support the endless accumulation of capital. There is no guarantee that the alternative sources of energy will turn out to be sufficient to support the current and increasingly higher levels of world energy consumption without undermining environmental sustainability.

The post-neoliberal restructuring could be further complicated by the lack of effective leadership of the capitalist world-economy. Historically, the successful restructuring of the capitalist world-economy had required the emerging of a new, more powerful hegemonic power. However, if the US hegemony proves to be no longer in a position to lead the restructuring, given the current configurations of global geopolitics, it is not obvious at all which of the other major powers or what combinations of major powers would be in a position to do so. Without such leadership, there is a significant possibility that the world may sink into persistent chaos in the post-neoliberal era. On the other hand, to the extent that the capitalist world-economy fails to restructure and reproduce itself, it may provide the opportunity as well as the imperative for a new, fundamentally different social system to emerge.

APPENDIX: DATA SOURCES AND CONSTRUCTION

Definitions

Profit rate = profit / net stock of private non-residential fixed capital

Profit = net domestic product – wage costs – taxation costs

Wage costs = compensation of employees + estimated labor component of the entrepreneurial income

Taxation costs = taxes on production and imports (indirect taxes) less subsidies

Estimating the Labor Component of the Entrepreneurial Income

We assume that in the long run the non-corporate capitalists earn about the same rate of return as the corporate capitalists. Reliable data for the rate of return on corporate sector capital stock are available for the UK over the period 1948-1996, for the US over the period 1929-2003, and for Japan over the period 1969-2002.   Using the corporate sector rates of return, we calculate the imputed profit component of the entrepreneurial income by assuming that the non-corporate capitalists earn the same annual rates of return as the corporate capitalists.   The imputed labor component is simply the difference between the actual entrepreneurial income and its imputed profit component.

We find that between 1948 and 1996, the imputed labor income averaged 69.3 percent of the entrepreneurial income in the UK; between 1929 and 2003, the imputed labor income averaged 89.4

France, 160 percent in UK, 239 percent in US, and more than 700 percent in Japan, by 2050. All of these government bonds would drop to junk bond status (Standard & Poor 2005).

percent of the entrepreneurial income in the US; and between 1969 and 2002, the imputed labor income averaged 53.0 percent of the entrepreneurial income in Japan.

The UK corporate profits include net interests. Therefore for the UK, the imputed labor incomes probably understate the true labor component of the entrepreneurial income. For the UK, we assume that 75 percent of the entrepreneurial income is labor income. For the US, we assume that 90 percent of the entrepreneurial income is labor income and for Japan, we assume that 55 percent of the entrepreneurial income is labor income. For Euro-zone economies, we assume that 75 percent of the entrepreneurial income is labor income, the same as in the UK.

The UK Data

Gross domestic product, net domestic product, compensation of employees, the entrepreneurial income, taxes on production and imports less subsidies, net stock of private non-residential fixed capital for 1948-2003 are from the *United Kingdom National Accounts* (http://www.statistics.gov.uk).

Total net stock of fixed capital for 1855-1980 are from the National Accounts tables in *British Historical Statistics* (Mitchell 1988). The logarithms of the net stock of private non-residential fixed capital (LNPNRFK) from *The National Accounts* are regressed on the logarithms of the total net stock of fixed capital (LNFK) from *British Historical Statistics* for 1948-1980. The results are used to estimate the net stock of private non-residential fixed capital for 1855-1947.[10]

Gross domestic product (at factor cost), income from employment (or compensation of employees), income from self-employment (or the entrepreneurial income), trading profits of companies (or corporate profits), the rent, and capital consumption for 1855-1947 are from the National Accounts tables in *British Historical Statistics*.

For 1855-1888, income from self-employment and trading profits are not separated out. Income from self-employment is assumed to be 70 percent of the sum of self-employment income and trading profits (the average ratio for 1889-1893 was 69 percent).

Indirect taxes for 1855-1947 are estimated to be the sum of customs, excise tax, stamps, and miscellaneous taxes and charges. Data for these taxes are from the Public Finance tables in *British Historical Statistics*.

Gross domestic product at market prices equals the sum of gross domestic product at factor cost and indirect taxes. Net domestic product equals gross domestic product less capital consumption.

The US Data

Gross domestic product, net domestic product, compensation of employees, the proprietors' income, corporate profits, the rental income, net interests, and taxes on production and imports less subsidies for 1929-2003 and the net stock of private non-residential fixed capital for 1925-2003 are from the US Bureau of Economic Analysis (http://www.bea.gov).

The statistical appendix of Dumenil and Levy (1993) provides the net stock of private non-residential fixed capital for 1869-1989. Dumenil and Levy's capital stock series is not directly comparable to the current Bureau of Economic Analysis (BEA) capital stock series. The logarithms of the BEA capital stock for 1925-1989 (LNBEANRFK) are regressed on the logarithms of the Dumenil and Levy's capital stock (LND&LNRFK). The results are used to estimate the net stock of private non-residential fixed capital for 1869-1924.[11]

Net national product for 1897-1928 is from *Historical Statistics of the United States* (Bureau of the Census 1975), Series F 6-9. Gross national product for 1869-1928 is from *Historical Statistics of the United States*, Series F 1-5. The logarithms of net national product (LNNNP) are regressed on

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[10] Regression results: LNPNRFK = -0.5452 + 0.99285LNFK, R-square = 0.99837.

[11] Regression results: LNBEANRFK = 0.43285 + 0.97747LND&LNRFK, R-square = 0.99905.

the logarithms of gross national product for 1897-1928 (LNGNP). The results are used to estimate net national product for 1869-1896.[12]

Net domestic product for 1869-1928 is calculated by subtracting the net income from investments abroad from net national product. Net income from investments abroad is from *Historical Statistics of the United States*, Series U 1-25.

Total employees on non-agricultural payrolls for 1900-1929 are from *Historical Statistics of the United States*, Series D 127-141. Total farming sector labor force for 1900-1929 is from *Historical Statistics of the United States*, D 1-10. Average annual earnings of employees for 1900-1929 are from *Historical Statistics of the United States*, Series D 722-727.

Average annual earnings of non-farm employees and average monthly earnings of farm laborers for 1869-1900 are from *Historical Statistics of the United States*, Series D 735-738 and D 705-714. The average annual earnings of farmer laborers are simply calculated by multiplying the average monthly earnings by 12.

Using the total non-farm sector employees, the average annual earnings of all employees, the average annual earnings of non-farm employees and farm laborers, we calculate the implied farm sector employees in 1900. Assuming the ratio of farm sector employees to the total farm sector labor force for each year between 1900 and 1929 is the same as in 1900, we then estimate the farm sector employees for 1900-1929.

Multiplying the average annual earnings of all employees with the sum of the non-farm sector employees and the farm sector employees results in the total wage bill for 1900-1929. The index of the wage bill is then assumed to be the index of compensation of employees, which is used to calculate the compensation of employees for 1900-1928.

National income for 1919-1928 is from *Historical Statistics of the United States*, Series F 6-9. Total indirect taxes for 1919-1928 equal the difference between net national product and national income. For 1869-1918, total indirect taxes are calculated as the sum of federal government's customs and excise taxes and state and local governments' sales and property taxes, which are from *Historical Statistics of the United States*, Series Y 352-357, Y 358-373, 505-521.

National income for 1900-1918 is calculated by subtracting indirect taxes from net national product. The proprietors' income as percentage of national income for 1900-1928 is from *Historical Statistics of the United States*, Series F 186-191.

Total labor force in the farm and non-farm sector for 1860-1900 are from *Historical Statistics of the United States*, Series D 167-181. Using the non-farm sector labor force and the average annual earnings of non-farm sector employees, the farm sector labor force and the average annual earnings of farm sector laborers, we calculate the total wage bill for 1869-1900. The index of the wage bill is then used to estimate the total wage costs from 1869 to 1899.

The Japanese Data

Gross domestic product, net domestic product, compensation of employees, the entrepreneurial income, corporate profits, rent, net interests, taxes on production and imports less subsidies, and depreciation of fixed capital for 1955-2002 and the net stock of private non-residential fixed capital for 1969-2002 are from *Historical Statistics of Japan* (http://www.stat.go.jp/english/data/chouki).

Gross domestic product, net domestic product, and the agricultural sector gross and net domestic product for 1905-1940 are from *Estimates of Long-Term Economic Statistics of Japan since 1868* (Ohkawa, Shinohara, and Umemura 1974), volume 1.

Labor income share of non-farm sector output for 1905-1940 is provided by Ohkawa and Rosovsky (1973), basic statistical table 17. The non-farm sector labor income is calculated by multiplying the labor income share with the non-farm sector gross domestic product. The farm sector labor income is assumed to be 55 percent of the farm sector net domestic product. The sum of the farm and non-farm sector labor incomes amounts to the wage costs for 1905-1940.

Indirect taxes for 1905-1940 are from *Estimates of Long-Term Economic Statistics*, volume 7.

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[12] Regression results: LNNNP = -0.11487 + 1.00728LNGNP, R-square = 0.99575.

Net stock of private non-residential fixed capital for 1905-1940 is from *Estimates of Long-Term Economic Statistics*, volume 3.

National income at factor cost for 1941-1954 is from Ohkawa and Rosovsky (1973), basic statistical table 18. Indirect taxes for 1941-1954 are estimated by assuming that the ratio of indirect taxes to net domestic product changes by following a "straight line" between 1940 and 1955. Net national product is calculated to be the sum of national income and indirect taxes.

Compensation of employees, income from the unincorporated enterprises (the entrepreneurial income), rent, income from investment (net interests), corporate profits, and net factor income from abroad for 1941-1954 are from Ohkawa and Rosovsky (1973), basic statistical table 18. Net domestic product is calculated by subtracting net factor income from abroad from net national product.

The logarithms of the total net stock of fixed capital for 1969-2002 (LNFK) are regressed on the logarithms of the depreciation of fixed capital (LNDEP). The results are used to estimate the total net stock of fixed capital in 1960.[13]

Total net stock of fixed capital for 1961-1968 is estimated by assuming the depreciation ratio (ratio of depreciation to total net stock of fixed capital) changes between 1960 and 1969 by following a "straight line."

Gross capital stock in constant 1960 prices for 1939-1960 is from *Estimates of Long-Term Economic Statistics*, volume 3, reference table 3. Gross capital stock at current prices for 1939-1960 is calculated by multiplying the gross capital stock in constant prices with the price index of investment goods output. Total net stock of fixed capital for 1940-1959 is then estimated by assuming that the net stock to gross stock ratio changes between 1939 and 1960 by following a "straight line."

The net stock of private non-residential fixed capital for 1941-1968 is estimated by assuming that its share in the total net stock of fixed capital changes by following a "straight line" between 1940 and 1969.

Extending the UK, US, and Japanese Data to 2005

The UK and US data are extended from 2003 to 2005 and the Japanese data from 2002 to 2005 by using the data from *OECD Economic Outlook* (http://lysander.sourceoecd.org/vl=3966077/cl=22/nw=1/rpsv/ij/oecdstats/16081153/v115n1/s1/p1).

For these periods, we assume that net domestic product grew in proportion to gross domestic product, wage costs grow in proportion to compensation of employees, and net stock of private non-residential fixed capital grows in proportion to net stock of business sector non-residential fixed capital (at current prices). Data for indirect taxes less subsidies are directly from *OECD Economic Outlook*.

The Euro-Zone Data

Gross domestic product, compensation of employees, property incomes, indirect taxes less subsidies, business sector non-residential fixed investment, deflator for business sector non-residential fixed investment, government sector consumption of fixed capital, and real net stock of business sector non-residential fixed capital for Italy (1961-2005), France (1963-2005), Germany (1991-2005), and West Germany (1961-1990) are from *OECD Economic Outlook* (http://lysander.sourceoecd.org/vl=3966077/cl=22/nw=1/rpsv/ij/oecdstats/16081153/v115n1/s1/p1).

Net stock of business sector non-residential fixed capital at current prices is derived by multiplying the real net stock of business sector non-residential fixed capital with the investment deflator.

Real business sector consumption of fixed capital is calculated by subtracting real business sector net investment (the annual changes in the business sector capital stock) from the real business sector gross investment (calculated by deflating the business sector fixed investment with the

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[13] Regression results: LNFK = 2.27397 + 1.03446LNDEP, R-square = 0.9585.

investment deflator). Business sector consumption of fixed capital at current prices is then derived by multiplying the real business sector consumption of fixed capital with the investment deflator.

Net domestic product is calculated as gross domestic product less consumption of fixed capital in the business and government sector.

The entrepreneurial income is calculated by subtracting compensation of employees, property incomes (which include business sector consumption of fixed capital), indirect taxes less subsidies, and government sector consumption of fixed capital from gross domestic product.

Conversion of the Values of Capital Stock and Net Domestic Product into Constant 1990 International Dollars

To calculate the weighted averages of the profit rates and profit shares of the selected countries, their values of capital stock and net domestic product need to be converted into the common measure of constant 1990 international dollars.

Real gross domestic product in constant 1990 international dollars of the UK, the US, Japan, Germany, France, and Italy for 1870-2001 are from Maddison (2003) and extended to 2005 by using economic growth rates of these countries in recent years.

To convert the value of capital stock of country i, at time t, into 1990 international dollars, the following formula is used:

$$PNRFK_{it1990} = PNRFK_{it} / GDP_{it} * GDP_{it1990}$$

$PNRFK_{it1990}$ is the net stock of private non-residential fixed capital for country i, at time t in 1990 international dollars. $PNRFK_{it}$ and GDP_{it} are the value of capital stock and gross domestic product at current prices of country i at time t respectively. GDP_{it1990} is the gross domestic product of country i at time t in 1990 international dollars.

A similar procedure is used to convert the net domestic product of the selected countries into 1990 international dollars.

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