China and the West:
The Metabolic Nature of Changing World Order

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I. New Understanding of Smith Theory of "Wealth of Nations"

Current changes in global order deeply rooted in fundamental contradictions in Adam Smith's WEALTH OF NATIONS (1787). The core idea of Adam Smith was the *Smith Theorem* named by George Stigler that *division of labor was limited by market extent* (Smith 1787, Book I. Chapter III, Stigler 1951). It implies that market-share competition, not cost/price competition, is the driving force of increasing division of labor in global markets. It is known that the supply curve could not observe and the long-term equilibrium may not exist under increasing return to scale. Therefore, Smith mechanism of "invincible hand" is not capable of maintaining the trade-balance and achieve a self-stabilizing "efficient market". Therefore, the sustainability of globalization would be in question from a fundamental perspective (Stiglitz 2017).

(1.1) Persistent Trade Imbalance in History

Historian observed that British Empire spent near 170 years to balance the Britain-China trade. British empire used all the government power including launching the Opium War, building India railway (to transport newly planted tea in the North-East India), etc. (Pomeranz and Topik 2006).

U.S. balance of payment position since the WWII made a striking U turn. U.S. had persistent surplus in trade of goods and services, including surplus in both current and financial account from WWII to 1970. However, American trade deficit in goods had started from 1976, current account deficit began after 1982, and financial account deficit persisted since 1983. American dominance in finance sector did not reverse its negative position in international transactions, because the US surplus in service is only about one third of its trade deficit. Similar to the U.K. in 19th century, U.S. trade war with Japan,

Asian tigers, and EU did not solve its chronical problem of trade deficit since 1980s. The recent records of U.S. international transactions are shown in Table 9.1.

Table 9.1 Persistent Deficit of U.S. Current Account and Financial Account (in $ billions)

Year	1980	1990	2000	2010	2018	Sum(2000-2018)
Net of Goods	-26	-111	-447	-649	-891	-13,135
Net of Services	6	30	74	154	269	2,877
Current Acc.	2	-79	-403	-431	-488	-9,576
Financ. Acc.	25	-58	-498	-446	-520	-9,356

Data source: Table 1.1, U.S. International Transactions, BEA (Bureau of Economic Analysis), Department of Commerce, Release date: Mar. 21, 2018.

The non-equilibrium nature of globalization can be seen from persistent imbalance of payments (Table 9.2). Some countries had persistent deficits while others had persistent surplus for more than a decade.

Table 9.2 Balance of Payments by Indicator: Current Account for Major Countries (in $ billions)

Year	2005	2008	2010	2015	2018	Sum (2005-2018)
US	-745	-681	-431	-407	-490	-7,100
UK	-49	-114	-78	-143	-110	-1,407
Brazil	13	-28	-79	-54	-41	- 578
India	-10	-30	-54	-22	-65	-508
France	-143	-28	-22	-9	-19	-261
Russia	84	103	67	67	113	968
Japan	170	142	220	136	174	2,047
China	132	420	237	304	49	3,105
Germany	133	213	196	288	291	3,329

Data source: IMF. Balance of Payments Analytic Presentation by Indicator:

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Current Account Net. IMF Data Warehouse, Feb. 11, 2020.

(1.2) Power and Wealth of Nations

Adam Smith raised the issue of "WEALTH OF NATIONS" but failed to answer WHAT IS WEALTH. This issue is tricky, since bilateral exchange may not create wealth. In reality, technology advances may or may not increase social wealth when scale economy with mass production often drive down average costs, profit margin, and commodity price.

Adam Smith himself quoted Thomas Hobbs with some reservation that "WEALTH IS POWER" (Smith 1776, Book I, Chapter V). A good indicator of power of nations is their military budget (IISS 2020). U.S. military budget in 2020 is $684.6 billions, which is more than the sum of next eleven countries combined, including China, Saudi Arabia, Russia, India, U.K. France, Japan, Germany, South Korea, Brazil and Italy.

There are two types of GDP in international statistics. For study military power, we use GDP ppp (purchasing power parity) for comparison of military spending in Table 9.3. For exchange rate market, we measure financial power by GDP ex in official exchange rate and the ratio of reserve currency given in Table 9.4.

Table 9.3 GDP and Military Spending World Ratio (%)

Country	(Year)	US	China	Japan	Germany	France	UK	Russia	India
GDPppp	(2017)	15.3	19.8	4.3	3.3	2.2	2.3	3.1	7.4
MilitaryBudget	(2018)	35.6	13.7	2.6	2.7	3.5	2.7	3.4	3.7

Data source: GDPppp data (2017) is based on CIA World Factbook. Military spending data (2018) is from SIPRI (Stockholm International Peace Research Institute).

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Table 9.4 GDP, Total Trade, and World Reserve Ratio in 2017 (%)

Area	US	EU	Japan	UK	China	Swiss	Canada	Australia
GDPex	24.3	21.3	6.1	3.2	15.0	0.85	2.1	1.7
Total Trade	12.8	11.4	3.8	2.8	10.6	1.6	2.3	1.2
Currency	dollar	Euro	Yen	Pound	RMB	SwFranc	CanDollar	AusDollar
Reserve	61.7	20.7	5.2	4.5	1.9	0.14	1.8	1.6

Data source: GDPex is GDP in official exchange rate from CIA World Factbook. Total trade is the sum of export and import. Currency names are Pound and Sterling for UK, Swiss currency is Swiss Franc, Canada currency is Canadian dollar, Australian currency is Australian dollar. Reserve currency ratio from IMF:COFER (World Currency Composition of Official Foreign Exchange Reserves).

From Table 9.3 and 9.4, we could see the military and financial power of U.S. is outsized its economic size. However, overexpansion of military and financial power may not sustain its economic power (Kennedy 1989, Arrighi 2010). The rise and fall of great powers in history can be observed from changing GDP ratio in history (Table 9.5). This historical pattern can be better understood by metabolic growth theory (Chen 2014).

Table 9.5. World GDP Ratio by Major Country in History (%)

Date	China	India	Japan	UK	Germany	US	USSR/Russia	
1500	24.9	24.4	3.1	1.1	3.3	0.3	3.1	
1700	22.3	24.5	4.3	10.2	3.7	0.1	4.3	
1820	32.7	16.1	3.0	5.2	3.9	5.4	3.0	
1900	11.1	8.6	2.6	9.4	8.2	15.8	7.8	
1950	4.6	4.0	3.0	6.5	5.0	27.3	3.0	
1978	4.9	3.3	7.6	3.8	5.5	21.6	7.6	
1990	7.8	4.0	8.6	3.5	4.7	21.4	7.3	4.1
2017	18.2	7.4	4.3	2.3	3.3	15.2		3.1

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Data source: 2017 data from CIA World Factbook (2019). Historical data from Maddison (2007).

Seen from Table 9.3, UK reached the peak in 1700, but overtook by U.S. in 1820. U.S. GDP ratio was peak at 27% in 1950, then continued to decline to recent 15% in 2017, while China's GDP ratio from 4.6% in 1950 and steadily increased to 18.2% in 2017. This is a historical trend for near seven decades, not a recent record when China joined WTO in 2001.

Let us exam other factors that associate with trade balance, such as saving, industrial ratio (Table 9.6).

Table 9.6. Macro Factors in Trade for Major Countries (2017)

Item/Country	US	Japan	Germany	France	UK	Russia	China	India
Growth(%)	2.2	1.7	2.5	2.3	1.7	1.5	6.9	6.7
Saving(%)	18.9	28.0	28.0	22.9	13.6	26.5	45.8	28.8
Industry ratio(%)	19.1	30.1	30.7	19.5	20.2	32.4	40.5	23.0
Current Acc.($b)	-449	196	291	-15	-99	35	164	-48

Data source: CIA World Factbook (2019).

If we compare Table 9.2 and 9.4, we can see that developed countries had persistent imbalance in current account. It indicates that trade status has little correlation with their income and technology level. There is little evidence for Trump's argument for trade war,

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since German and Japan had persistent trade surplus but U.S. and U.K. had persistent trade deficit. Their technology and per capita income are in the similar level. India and Brazil have more room to obtain western technology and capital, but their current account balance is negative while China is positive. We have to see other factors to understanding the root of trade imbalance.

The relation between trade balance at micro level and structure at macro and meso level can be studied from the following facts:

First, industry ratio in GDP matters most in trade balance. For example, three countries have large trade deficits: US, UK, France, and India. Their industry ratio in GDP are all below 25%. Among them, US ratio of industry is lowest at 19.1% with largest trade deficit. In comparison, counties with trade surplus like Germany, Japan, and China, their industry ratio are all above 30%. Excessive expansion of finance sector in the States may play a major role of crowding out manufacture in U.S. (Johnson 2009).

Second, saving ratio also matters for trade balance (Feldstein 2008). UK and US had very large trade deficit when their saving ratio as low as only 14% and 19%.

Certainly, high saving rate alone may not lead to high growth rate. Both China and India have high growth while they differ in saving rate and trade status.

Third, there is no evidence that trade balance can be guaranteed by institutional arrangement such as property right system, since US, Japan, and European countries are similar in property right system, but German and Japan had persistent trade surplus while US, UK and France had persistent trade deficit. As large developing countries with high growth, China had large trade surplus while India had large trade deficit. All these countries are members of WTO, there is no evidence that trade patterns are determined by WTO rules.

We should point out that the tremendous costs of the cold war may play a significant role in decline of Soviet Union and U.S.(Stiglitz and Bilmes, 2008). The combined costs of American wars in Korea, Vietnam, Mid-East, and Afghanistan so far is about $8 trillions in 2019 dollars (Harrington & Sunesun, 2019, Macias 2019). In comparison, the United States has built a cumulative trade and service deficit of US $ 11.5 trillion from 1960 to 2018 (Lou, 2020, BEA 2020).

Clearly, excessive military spending and consumer spending were major causes of persistent trade deficit in U.S. in these decades.

(1.3) Three Factors That Limiting Division of Labor with Changing Returns to Scale

The new science of complexity economics introduces a new approach to comprehend seemingly conflicting features in classical and neo-classical economics (Chen 2019). We developed a new perspective of metabolic growth to understand the dynamic mechanism

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behind the rise and fall of great powers. The aggregate economic growth can be de-composited into a series of technology wavelets, as in Figure 9.1.

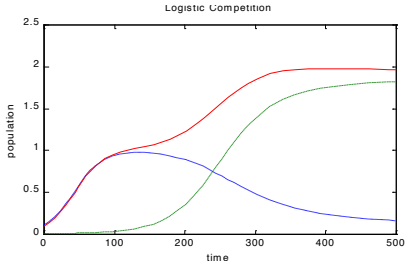

Figure 9.1. Metabolic growth characterized by rise and fall of logistic wavelets.

Note: The old technology (dashed line) declines when new technology (solid line) emerges. The output envelope (dotted line) is the sum of their output of all technologies. Here, the units are arbitrary in computational simulation.

Here, the growth trajectory limited by market extent or resource is described by S-shaped logistic growth. Technology competition leads to rise of new technology and fall of old technology. Their aggregate curve visualizes the macro uneven growth with trend and business cycles.

We extended the Smith Theorem to a GENERAL THEOREM that Division of labor is limited by three factors, i.e. the Market Extent, Natural Resources defined by technology, and Environment Fluctuations (Chen 2010, 2014). We found a trade-off between stability and complexity for complex systems under ecological constraints. The driving force of economic growth is not endogenous growth based on accumulation of existing knowledge (Romer 1986), but metabolic growth with rise of new technologies and fall of obsolete technologies (Chen 2014).

Clearly, the international division of labor is non-equilibrium dynamics with rise and fall of great powers. The source of market power is an integration of market share, technology advantage, resource availability, plus finance and military power. That is why economic crisis is often associated with war and conflicts. The Coase theorem simply ignored the fact that conflicting interests cannot be solved by market mechanism, not because of high transaction costs, but asymmetric status in wealth and power (Coase 1960, Chen 2007).

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II. Paradigm Shift in Modernization and China's New Development Mode

Now, we are facing a paradigm shift in industrialization. The global warming is caused by mass production with increasing energy dissipation at the costs of destroying biodiversity. The ecological crisis is associated with financial crisis when rising medical costs increase fiscal burden of welfare state. The rapid progress of labor-saving and resource-consuming technology is not sustainable for population growth associated with job shrinking. The Anglo-Saxon model of laissez-faire capitalism revealed its severe limit in international order. The new issue is COORDINATION OF NATIONS in technology changes and global warming. A visionary government with long-term agenda is essential for this paradigm shift from "invisible hand" to "coordinating hands".

China model of modernization is characterized by dual track reform with decentralized experiment approach driven by local competition and coordinated by central government. The scale economy in mass production in energy, transportation, grain, and basic material makes China a competitive power in manufacture; the scope economy with many varieties creates huge export market for millions of small business; low-cost welfare based on collectively-own land provide social safety net for famers seeking opportunity in urban industry. The mixed economies consist of SOE, private sector, collective TVE, and multi-national companies. It created rapid growth, technology innovation, management progress, and constructive competition. Governments play an active role in industrial policy and environmental regulation. China conducts reconstruction with long-term plan, so that effective agenda is advanced in infrastructure investment, green economy, and new integration of urban-rural development. Both developing and developed countries could learn from China experiments with many elements learned from other models such as German, Japan, Scandinavian, Singapore, and Israel experiences.

(2.1) Changing World Order and New Economic Thinking

From this perspective of metabolic growth, the current US policy of protectionism could not create enough jobs when new technology destroys more old jobs than created new one. The EU policy of increasing centralization may increase rather than decrease regional disparities. The more dangerous trend is using military alliance to solve regional conflicts caused by increasing unemployment of young generation in Mid-East, South Asia, and Latin America, while rapid aging in developed regions could not maintain their

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competitiveness in labor and technology market. There is a serious threat of the Great Depression created by collapse of the old dominating power in the American age, which is similar to the scenario of the Great Depression when globalization led by British Empire collapsed after the World War I when U.S., Britain, and France failed to coordinated for a new era of globalization (Kindleberger 1986).

(2.2) Life Cycle in Technology and New Perspective on Cooperation and Competition in International Trade

Life cycle of technology can be divided into FOUR STAGES: Infant, growth, mature, and decline stage. See Figure 9.2.

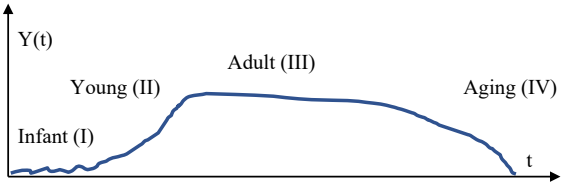

Figure 9.2 Four stages of technology life cycles

From Figure 2, We can understand why governments could play different roles during different stages of technology wavelets (Chen 2014).

In the Infant stage I, cooperation in R&D may be benefit to all countries for reducing uncertainty (Chang 2002).

In the Young stage II, competition does not exclude cooperation at different level of international division of labor. For example, the integration of R&D in US, design in EU, and manufacture in China prove to be a win-win cooperation for many products, because the US takes the lead in R&D, EU is rich in culture diversity, and China has comparative advantage in large market scale, geographic concentration in supply chain, and active support from local governments in China. Notable example is Apple and Volkswagen. Their research & design in US or Europe, parts supplies from countries in East Asia, and production in China.

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In the Adult stage III, large price swing in commodity market is harmful for both producers and consumers. An international anti-trust law is needed for stabilizing international commodity market. Long-term contract for mutual benefits between export and import countries can be achieved by **financial engineering** such as **collar option** between major commodity export and import countries with **profit sharing** and **pricing through a moving time window** may effectively control the magnitude of price fluctuations in commodity market.

In the Aging stage IV, international cooperation among national governments and social organizations is critical for transition of obsolete industry to rising technology. Energy-saving life style is essential for adapting climate change. Reform in rule of game is necessary especially for advertising and legal system based on rule of the winner takes the all to a share economy among innovators, investors, managers, workers, and the society as a whole.

From this picture, we can understand useful lessons from developed countries. China's SOE reform could learn from American's land grant university and endowment fund. I propose to divide China's state-owned assets into three groups: one third used for social welfare, one third for security and infrastructure, and one third for competing university endowment funds, which may integrate research, manufacture, marketing, and local community. Cooperative competition, not exclusive competition is the key to diversify risk and stimulate innovation.

(2.3) Opportunity and Risk for the Digital Economy

Main advantage of digital economy is production based on buyer's order that reduces the risk of over production. Its main danger is the uncertainty created by the virtual economy plus the cyber currency without proper regulation by governments and international organization.

The root cause of the 2008 financial crisis was caused by collapse of derivative market. Our study indicated that the theory of option pricing in the **Black-Scholes model** has fundamental flaw. Its base model is the **Brownian motion,** which is **explosive** in nature. A better alternative for financial market is the birth-death process (Chen 2010,Tang & Chen 2014). This issue is critical to understand the root of 2008 financial crisis. The **scale of derivative market** is about **50 times of the US GDP** and 10 times of the world GDP. It could be a financial weapon of mass destruction in world economy.

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(2.4) Historical Lessons for Changing World Order

In this session, Lawrence Summers made very stimulating observations from historical perspective. He pointed out that there were three challenges to the US leadership after the World War II. The first was the sputnik by Soviet Union in 1957. The second was Japan could say no to US in 1980s. The rise of China could be the third in recent history. U.S. proved to overcome the first two challenges. What is the outcome for the third? I would like to address this issue for further discussion.

The first challenge from the Soviet's sputnik resulted the arm race between U.S. and USSR. Both Soviet Union and U.S. paid heavy price in economic growth. The rise of Germany, Japan, and Asian tigers were the economic winners of the Cold War.

The second challenge from Japan's industrial expansion, which could not last because of Japan's nature of dependent economy. Japan failed to create Asian dollar during the East Asian financial crisis. That is why EU is economically much stronger than Japan. The scale of economy and the independence of finance are essential in the power game of globalization.

Summers had alarmed for "the balance of terror" in financial market when China holds a trillion or more of American debt (Fallows 2008). We had similar doubt to the sustainability of dollar power in global market. China has no incentive to replace U.S. as the leader of the globalization, since its financial burden is much larger than economic gain. This is the critical lesson that we learn from the decline of Soviet Union and U.S. after the Cold War. China did benefit from open trade system. We would like to build a new world of international cooperation, since we live in the same world village.

3. The Future of Changing Globalization: Danger and Opportunity

From global perspective, the population spike in the 20th century is the most significant challenge to the world economy, since aging society in developed world is not capable of leading globalization (Rostow 1998). If advanced countries refuse to transfer technology to developing countries, protectionism cannot resist migration wave from developing countries when they could not create enough jobs for young population. US policy of protectionism would make things worse for U.S. in its economy for the long term, because aging American has increasing demand for human labor in agriculture and service.

The more dangerous trend is using military alliance to solve regional conflicts. These social instabilities were caused by large scale of unemployment of young generation in

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Mid-East, South Asia, and Latin America, while aging developed countries could not maintain their competitiveness in labor and technology market.

From the new perspective of economic complexity, the EU policy of increasing centralization would increase rather than decrease regional disparities. Global issues, such as climate change, ethnic wars and financial crisis need global coordination rather than global confrontation.

There is a historical lesson that the real cause of the Great Depression was lack of emergence of new coordination (Kindleberger 1986). After the collapse of the British-led globalization, the new BIG THREE of U.K., U.S. and France failed to coordinate to avoid a trade war, which was ended by the WWII. Today, if the new BIG THREE (U.S., China, EU) could coordinate in dealing with global issues, we would greatly reduce uncertainty in this complexity world.

Consider the worst scenario, even if current trade war between U.S. and China escalate, China would be more resilient in facing external shocks because of its long history of unifying the country under foreign invasion. From my observation, there was a chance of Divided States of America in trade-war economics. There are regional factors that divide U.S. Texas and the southern states are rich in shell oil and natural gas, their export needs a large and stable market like China when facing strong competition from Russia and OPEC countries. High tech industries in California and west coast also need large and growing market to recover their heavy investment in R&D. If they lost China market, their profit would significantly decline and lost their market share. The agriculture sector in Midwest could not sustain if they lost China's market in agriculture products. The trade war would do more harm to the United States than to China's regional disparity, since decline in China's export sector in coastal regions would stimulate the development of inland area. I do not support the trade war, but I am optimistic about the outcome of Chinese economy under the threat of trade war. In Chinese language, the west term of "crisis" ("wei-ji" in Chinese) implies both danger (wei) and opportunity (ji).

If President Trump could reduce military obligation oversea and save money for domestic construction, he may make "American great again." But Trump could also make American disappointed again if he believed that he could dictate a new world order by his erratic threats and unilateral demand.

This dialogue on "China and the West" is fruitful for understanding the new role of the state in economic growth. A related issue is the coordination of nations for a changing

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world. Current rule-based international order is centered by the western value and interests. A more inclusive world order needs a new thinking in economics and political thoughts.

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