

The Productivity, Economic Structure and Middle-income Trap— Can China Avoid this Trap?

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This paper establishes an economic model to directly study the effects of the labor ratio, economic structure and productivity of a country on its economic growth. The model analysis also indicates the relevancy and importance of the stable exchange and inflation rates to the economic success of a nation. Using data from selected countries over the particular years, this paper explores and explains why some economies have successfully passed through the middle-income trap, while others fell in. The paper then compares China's relevant data with that of others, and discusses challenges and problems China faces and how it can avoid this middle-income trap.

INTRODUCTION

China experienced tremendous and unprecedented economic growth for more than two decades with an annual growth rate above 10% in most years, in the process becoming the number two economy in the world in 2010, just behind the United States. Its Gross National Income (GNI) per capita was above \$4,000 in 2010, which classified China as an upper middle-income country according to the World Bank standard. But in the past several years, China's economy has slowed down significantly and its annual growth rate has been lower than 7%. As a result, there is an increasing concern on whether China will follow the path of many developing countries and fall into the middle-income trap. Even China's top leaders have publicly discussed how to avoid such a trap.

The World Bank (2012) estimated that in 1960, there were 101 middle-income economies and by 2008, only 13 had become high income economies. These countries are: Equatorial Guinea, Greece, Hong Kong, Ireland, Israel, Japan, Mauritius, Portugal, Puerto Rico, the Republic of Korea, Singapore, Spain, and Taiwan. The great majority of the other countries have remained middle-income for decades.

There have been many studies on why these economies successfully passed through the trap while others fell in. Gill and Kharas (2007) emphasized the following six factors --trade and technology, ideas and innovation, finance and risk, cities and livability, cohesion and inequality, and corruption and accountability as the keys for East Asian countries to maintain rapid and stable economic growth. Later, Gill and Kharas (2015) added three more factors-- demography and aging, entrepreneurship and startups, and external commitment and regionalism for countries to overcome the middle-income trap.

There have also been many studies on whether China will fall into the trap and how China can avoid such a trap. The World Bank (2012) urged China to change the role of governments and its developing strategy. Peerenboom (2014) suggested that China need to make fundamental political, legal and social changes to overcome its economic problems. Cai (2012) stated the age factor in China's sustainable growth. Lu (2014) emphasized China's potential risk of falling into the trap because of its erosion of export competitiveness due to real exchange rate appreciation and the slowing of its productivity. A comprehensive case study by CKGBS (2012) compared three types of countries—passed the trap (Japan, Germany, South Korea, Italy, and Spain), falling into the trap (Malaysia, Argentina, Mexico, and Brazil) and just becoming upper middle-income economies (China and Thailand). They identified variant factors in the first five years, ten years, and later ten years to overcome stable economic growth barriers.

This paper develops an economic model to describe how the productivity and economic structure are related with the economic growth. This approach is different from other previous theoretical and empirical studies. The economic model in this paper explicitly establishes the relationship between a country's GDP per capita (gdp) in a given year with its labor ratio, labor distribution in three sectors and labor productivity in these three sectors. Then, based on the model, the paper explores how the changes of labor productivity, labor distribution, and labor ratios will affect a country's gdp growth; and it further analyzes the data from selected countries to explain why some were successful and others failed in overcoming the middle income trap.

Besides two key factors of productivity and economic structure as described above, the model developed in this paper also indicates the importance of the stable exchange and inflation rates to an economy's success toward a high income economy. This is another contribution from this study.

The model developed in this study can also be used to analyze economic problems of any economy. For example, it can be used to explain issues and problems of developed countries like the US. The US has had slow growth for many years and particularly from 2008; its productivities and labor participation rates are main problems. Its economic structure and weakening manufacturing industry is another source. This model can also explain the low-income or poverty trap. Again, economic structure change, particularly labor moving from agriculture to industry and its productivities, is key.

The rest of the paper is organized as follows: Section II reviews the literature; Section III establishes an economic model to relate the economic growth with the productivity and economic structure; then it analyzes how the economic growth rate will be affected by the change of the productivity and economics structure; Section IV analyzes data from the selected countries and explores why some are successful and the others have failed; Section V discusses the paths toward a high income economy. It particularly explores the main problems and challenges China faces and what China should do to avoid the trap. Section VI concludes the paper and discusses applications of this study and future relevant research.

REVIEW OF LITERATURE

Definition of the middle-income trap and measurements of economic development levels

The term of the middle-income trap was first used by Gill and Kharas (2007) on their study of East Asian countries. It is used to describe an economy when it experiences sharp slowdown in its economic

growth and cannot advance to the high-income economy after its initial period of rapid ascent and becoming the upper middle-income economy. The World Bank (2012) identified 101 countries as the upper middle-income economies as in 1960; among them, only 13 advanced to the high income ones and the remaining was still in the trap by 2008. The World Bank uses the GNI per capita to classify an economy as low income (\$1,005 or less), lower-middle income (\$1,006-3,975), upper-middle income (\$3,976-12,275), and high income (\$12,276 and above)¹.

The alternative way to measure an economic development level is to use the GDP per capita. The International Monetary Fund (IMF)(2013) classifies GDP per capita of less \$2,000 (constant dollars) as low-income, \$15,000 or above as the high-income, and between these two as the middle-income. Most literature on empirical economic growth studies uses the GDP per capita, such as Barro and Sala-i-Martin (1991), Mankiw, Romer and Weil (1992), Islam (1995), Caselli et al. (1996), Felipe(2012), Cai (2012), and Im and Rosenblatt (2013).

There is a relationship between the GDP and GNI in a country. Usually the GNI is lower than the GDP in most countries, particularly developing countries. IMF(2013) compared its classifications of economic development levels using the GDP with the ones by the World Bank using the GNI and concluded that 93% of these classifications are consistent.

Some studies also have used a country's relative GDP or GNI to the US to classify the specific country's economic development level. IMF (2013) used the relative GDP of an economy to the US to classify its economic development stage. The World Bank (2012) applied per capita income (GNI) relative to the US. Also, people have used the Purchasing Power Parity (PPP) to adjust GDPs or GNIs to classify economic development levels (WB (2007), Felipe et al. (2012), IMF (2013)).

This study needs to use each industry's productivity in an economy. Data of GDP in agriculture, industrial and service sectors in countries are widely available. So this study uses the absolute GDP per capita, instead of GNI per capita or relative GDP per capita.

Theory of economic growth

The study of the middle-income trap is to find out why an economy slows down dramatically after its initial rapid growth. Theories of economic growth can help explain such phenomena. Ricardo (1817) developed the classical growth theory and focused on the relationship between outputs and inputs of labor and capital, assuming no changes on the other conditions, including technology. Based on this theory, the low economic growth should be caused by inputs of labor and capital. The neoclassical theory (Solow1956, 1957) and Swan (1956)) attributed the technological change to growth and also emphasized the importance of capital accumulations and increases. Their model and theory can also explain how a developing country can catch up and maintain rapid economic growth through exogenous changes. The endogenous growth theory developed by Romer (1990) and Lucas (1990) focused on the increases of human capital (like education) or technological change (like innovation) and its impacts on the economic growth rate. Energy and energy efficiency theories (Blumstein et al. (1980), Howarth (1993), Metcalf (1994)) emphasize the correlation between energy consumption and efficiency and economic growth. Institutional economics (growth theory) (Hamilton (1919), Coase (1937), Williamson (1975)), emphasizes the roles of political, legal and economic systems in a country's economic development.

Recent studies on the economic growth have also focused on conditional convergence of different economies, i. e. whether developing countries can catch up the developed countries and which factors or controls, are the most appropriate for explaining the lack of unconditional convergence. Mankiw et al.(1992) focused on the rate of capital accumulation and population growth/human capital; Calderón and Servén (2004) emphasized the role of public infrastructure; Dollar and Kraay (2003) and Loayza and Servén (2010) stated the importance of policies; and Jones and Romer (2010) focused on the investment

climate and institutions and they developed so-call the “New Kaldor Facts”, based on their empirical study. Ito (2017) concluded that there exist three convergence paths in Asia and economies need to shift from one convergence path to a higher one by implementing economic and political reforms.

Low-income trap

A low-income trap describes the situation when an economy stays at the low-income level for a long period and cannot advance to the lower middle-income. Many poor countries have fell into this trap. The low-income trap is also called as the poverty trap. There have been many studies on low-income trap, such as Azariadis and Drazen (1990), Azariadis and Stachurski (2005), Kraay and Raddatz (2007). Different models have been developed to study the low-income trap, including the one on the aid volatility (Agenor and Aizenman, 2010), natural resource exploitation (Antoci et al, 2011), institutions (Capra et al, 2009, Gradstein 2008) and knowledge externality (Agenor and Canuto 2012).

Middle-income trap

Gill and Kharas (2007) studied East Asian economic developments from 1998 Asian financial crises. They first defined the term of the middle-income trap and suggested to these countries on how to advance its economies. The WB (2012) reported its statistical analyses of 101 countries and concluded that only 13 of them passed the trap from 1960-2008. Gill and Kharas (2015) reexamined the issues of the middle-income trap after ten years’ conceptual inception and stated that nine key factors will help countries pass through the possible trap. The IMF (2013) identifies five variables-Institutions, Demography, Infrastructure, Macroeconomic Environment and Policies, and Economic Structure and conducted cross-countries analyses and comparisons. Im and Rosenblatt (2013) used both absolute and relative (to the US) GDP per capita to study economic growth patterns of the selected countries and they concluded that these countries growth patterns do not conform to one clear pattern that can be easily characterized as a “trap”. Loayza,(2015) focused on how the structural transformation-economic structure change may help avoid the trap.

China’s economic growth and the middle-income trap

Many studies have focused on China’s economy and particularly its past rapid growth. Chow (2002) refers China’s rapid growth to its quality human capital, functioning market institutions and available technology from the world. Chow (2006) explains how globalization has affected China’s economic development and states the flows of goods, capital, technology/ information and people to and from China play the crucial roles. Tyers and Golley (2010) considers the roles of demographic change and suggest that China need to reform its financial system in order to sustain its rapid growth in the future given its labor market changes.

Lin et al. (2003, 2012) have explored the sources for China’s fast economic growth and whether that kind of growth will be sustainable in the coming decades. They emphasize that the government in a developing country like China needs to play an active role, not just through the traditional provision of infrastructure and legal enforcement, but also by identifying and actively supporting industries that contribute to growth. They further state that it is investment, not domestic consumption that has led to China’s rapid economic development and that this will hold true for China’s future success.

There have been strong arguments on whether there are China models and if so what they are. The Beijing Consensus (Ramo 2004) relates China’s economic success to its innovations in the state sector, including state ownership of firms, close financial controls, and political controls in favor of economic growth. These factors could explain China’s early success in the late 1970s and 1980. The Washington

Consensus (Huang 2010)) attributes China's success to private entrepreneurship, its financial liberation, and political opening. This view may better fit China's practices from the late 1990s.

Recent studies on China economy have more focused on whether or not China may fall into the middle-income trap and how to avoid that. The World Bank (2012) suggested that China should change the role of governments and its developing strategy. Peerenboom (2014) stated that China needs to make fundamental political, legal and social changes to overcome its barriers. Cai (2012) attributed the age factor in China's middle income trap. Lu (2014) focused on China's erosion of export competitiveness due to real exchange rate appreciation, and productivity slowing down. CKGBS(2012) conducted a comprehensive case study and compared three types of countries—passed the trap (Japan, Germany, South Korea, Italy, and Spain), falling the trap (Malaysia, Argentina, Mexico, and Brazil) and just becoming the upper middle-income economies (China and Thailand). Its study found that factors affecting countries growths are different in the first five years, ten years, and later ten years after entering into the upper middle-income stages.

THE ECONOMIC MODEL AND DISCUSSIONS

The model and discussions

Let A as the Agriculture Industry, M as the Industrial (Manufacturing) Industry, and S Service Industry; in addition:

GDP= the total gross domestic product;

gdp=GDP per capita=GDP/T;

T—total population;

P_i-Productivity in the relevant industry (i's) or GDP per employee in that industry;

T_E-total number of labors/ employees;

L_T=T_E/T, the labor ratio;

L_i=P_i/T_E, % of employees/labor in that industry;

Then, one has:

$$GDP = GDP_A + GDP_M + GDP_S \quad (1)$$

$$= P_A * T_A + P_M * T_M + P_S * T_S; \quad (2)$$

$$gdp = GDP/T \quad (3)$$

$$= (GDP_A + GDP_M + GDP_S)/T$$

$$= GDP_A / T + GDP_M / T + GDP_S / T$$

$$= (GDP_A / T_A) * (T_A / T_E) * (T_E / T) + (GDP_M / T_M) * (T_M / T_E) * (T_E / T)$$

$$+ (GDP_S / T_S) * (T_S / T_E) * (T_E / T)$$

$$= P_A * L_A * L_T + P_M * L_M * L_T + P_S * L_S * L_T \quad (4)$$

$$= (P_A * L_A + P_M * L_M + P_S * L_S) L_T \quad (5)$$

$$= P_W * L_T \quad (6)$$

Where P_w is the average productivity of labor,

$$P_W = P_A * L_A + P_M * L_M + P_S * L_S \quad (7)$$

Based on Equation (5), a country's gdp in a given year is decided by its labor ratio (L_T), labor distribution in three sectors (L_A, L_M, and L_S) and labor productivity in these three sectors (P_A, P_M, and P_S). From Equation (6), the gdp depends on its overall or average productivity (P_w) and labor ratio.

Assume that gdp¹ is the gdp in year 1 when the economy entered the upper middle-income and gdpⁿ is its gdp in year n when it is advanced to the high-income, then

$$gdp^n / gdp^1 = (P_W^n * L_T^n) / (P_W^1 * L_T^1)$$

$$=(P^n_W / (P^1_W)) * (L^n_T / L^1_T) \quad (8)$$

$$= R_{PW} * R_{LT} \quad (9)$$

Where $R_{PW}=(P^n_W / (P^1_W))$ is the changing of the average labor productivity from year 1 to year n and $R_{LT}=(L^n_T / L^1_T)$, is the changing of labor ratio from year 1 to year n.

In order to pass through the middle-income trap, an economy's gdp needs to increase by about 309% (from \$3,976 GNI to \$12,276 GNI), according to the WB. For simplicity, let's assume 300%. Then, if $gdp(n)/gdp(1) \geq 300\%$, the economy successfully passed the trap in n years; otherwise the economy will stay there. As the data (in next section) indicated, the change of the labor ratio was around 1.03 and 1.15 in the selected developed countries during the specific time period toward the high income economy, R_{PW} or the change of the average productivity must be between 2.61 and 2.91. In other words, the average productivity must increase by from 261% to 291% in these years. Assume that an economy like Japan, Italy or Spain, passed the trap in 12 years or less, then its average productivity increase must be at least from 21.75% to 24.25%. If it takes 15 years, then the average productivity must be increased by 17.40% to 19.40% annually. If it takes 20 years to achieve that, then that will be 13.05% to 14.55%, respectively.

In order to achieve the required overall productivity rise and so toward the high income economy, besides sustainable labor productivity increases in all three sectors, its economic structure must be changed significant during the time period and particularly the labor must be shifted from the agriculture sector towards the industrial and service sectors since the agriculture's labor productivity is the lowest. In addition, the productivity in both industrial and service sectors must be continuously enhanced through modernization, adoptions of new technologies, innovations, and improvements of management. Improvements of educational systems and more better educated and skillful labors are the key to the success. The overall productivity is also related with its institutions, political, legal and social systems and particularly its regulations. When people are given more freedom and with more financial incentives, they will be more innovative and more entrepreneurship. Infrastructure investments and improvements are essential because these are conditions for business and good infrastructure will lead to more efficiency of doing business and lower the operating cost; as a result, these businesses and industries will be more competitive in the world.

From the above models, it is very clear that an economy's labor ratio, labor distribution and productivity in three sectors directly decide its GDP per capita and its growth. In addition, the exchange rate and inflation rate will affect an economy's developments.

Exchange rates and its effects

Since a country's GDP or GNI per capita is calculated in terms of the US dollar, the change of a country's exchange rate over the time period will affect its outcomes. Generally speaking, the increasing export contributes significantly to the economic growth of most developing countries and helps these countries pass through the middle-income trap. That is particularly true to Japan, Singapore, South Korea, Taiwan and Hong Kong. When a developing country has huge trade surpluses, its currency usually will be appreciated. Such an appreciation of the currency will raise this country's GDP or GNI per capita. In other words, a country's advancing to the higher-income economy from the middle-income could be partially from its currency appreciation. For example, China's RMB to US\$ was appreciated more than 20% from 2010 to 2014; then its GDP or GNI per capita was raised by 20%, assuming other factors have no changes. On the other hand, China's RMB to US\$ was depreciated in 2016. As a result, its economic growth rate was 6.7% in terms of its currency but it was only 1.3% in terms of the US dollar.

There are studies on the relationship between a country's currency exchange rate changes and middle-income trap. Li (2016) stated that the currency under-valuation led to some countries' slow growing

toward the high income economies. Ding et al. (2017) concluded that a stable currency valuation is crucial to an economy's passing through the middle-income trap.

Inflation rates and its effects

A country's inflation will also affect its calculation of the GDP or GNI. When a developing country has fast economic growth, its inflation rate usually is high. Suppose that a country's annual inflation rate is 3%, then in 10 years, its average price level will be raised by 34.39%. In other words, even if other factors such as the total outputs and population are not changed, its total GDP will be raised by 34.39% in 10 years.

As discussed in the previous section, its GDP or GNI per capita must be increased by about 300% if a country advances its economy from the middle-income to the high-income. Assume that it will take 10 years to achieve it, then annual improvement will be about 30%, on average. If an economy has 2% exchange appreciation and 3% inflation each year, on average, then it only needs to have about 25% improvement each year in ten years through other factors such as the productivity increases and economic structure changes.

Interest rates and its effects

Although the interest rate does not show up in Section III's models, it is still a crucial factor to an economy. The interest rate is usually associated with the inflation rate. A high inflation will push high interest rate. The interest rate, to some extent, is a good indicator of an economy. During a business cycle, its interest rate will usually be high when an economy experiences fast growth and it will be low during the recession.

There are exceptions in which an economy has a high economic growth but still with very low interest rate. The US did have this kind experience during mid-1990s, co-called a new economy. The main reasons are that ample capitals were available and its productivities were high. Also, there are cases in which an economy has low growth but its interest rate is very high. Brazil has had this kind of experience. The reasons are more related with its over-reliance on natural resources and exports. In other words, its economic structure is the main source.

The real interest rate, the difference between the nominal interest rate and inflation rate, will affect an economy more directly. This real rate will affect savings and that will directly affect consumptions and businesses.

To summarize what discussed above, let's assume that the labor ratio will be increased by 1% annually, exchange rate by 2% and inflation rate by 3%, then in order to pass through the middle-income trap in 10 years, an economy must improve its overall productivity by about 17.5% annually or 9.2% if in 15 years and 5.6% in 20 years.

TABLE 1
SUMMARY OF FACTORS AFFECTING GDP/GNI PER CAPITA

	Labor ratio	Exchange rate appreciation	Inflation rate	Overall/average productivity increase needed		
				10 years	15 year	20 years
During the path to the high-income	1% annually	2% annually	3% annually	17.5% annually	9.2% annually	5.6% annually

Data explanations and analyses

Following the study by CKGBS(2012), this paper selects Japan, Germany, South Korea, Italy, and Spain as representatives of countries successfully passed the middle-income trap; selects Malaysia, Argentina, Mexico, and Brazil as representatives as falling into the trap; and China and Thailand as the ones just entering into the upper middle-income economies. Then, relevant data are collected and analyzed based on the economic model developed in the previous section.

The data from the US are also added. The US is relevant to this study because the US advanced from the upper-middle to the high income economy from 1965-1980, and also because the US dollar has been used to measure the other economy’s GDP and GNI. Besides the data for each country for the relevant years, data in year 2015 are also added in the study to check how each country was doing recently.

Based on the CKGBS (2012), Japan advanced from the upper-middle to the high income economy from 1974-1985, Germany from 1973-1980, Korea from 1988-1995, Italy from 1975-1987, and Spain from 1979-1991. Malaysia entered into the upper-middle income economy in 1995, Argentina in 1991, Mexico in 1993, and Brazil in 1996; but they are still struggling and stay there. Thailand and China became the upper-middle economies both in 2010. Most data are collected from World Bank and United Nations, unless otherwise mentioned. Dollar values are all USD in nominal values. Germany, Italy and Spain have changed to Euro Yuan, so their 2015 exchange rate is not used. Population data are from UN at <https://esa.un.org/unpd/wpp/Download/Standard/Population>; GDP data are from the World Bank at <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>; GNI per capita data are from the World Bank at <http://data.worldbank.org/indicator/NY.GNP.PCAP.CD>; Inflation Rates are from <http://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?end=2015&start=1977&view=chart>; interest rates are from <http://data.worldbank.org/indicator/FR.INR.DPST>; exchange rates are from <http://data.worldbank.org/indicator/PA.NUS.FCRF>. Some latest data of China from the National Bureau of Statistics of China at <http://www.stats.gov.cn/english>.

Population, GDP, GDP and GNI per capita

Table 2 gives Japan, Germany, Italy, South Korea and Spain’s population, GDP, GDP per capita and GNI per capita in the selected years; and Table 3 gives the relevant US data.

TABLE 2
JAPAN, GERMANY, ITALY, SOUTH KOREA AND SPAIN'S POPULATION,
GDP, AND GDP PER CAPITA

	Japan			Germany			Korea			Italy			Spain		
Year	1974	1985	2015	1973	1980	2015	1988	1995	2015	1975	1987	2015	1979	1991	2015
Population (thousand)	109495	119988	126573	78732	78159	80688	42085	44652	50293	55268	56980	59797	37397	39287	46121
GDP (billion)	1,037	1,384	4,383	396	946	3,363	202	559	1,377	227	803	1,821	214	575	1,199
GDP per capita	4281	11466	34524	5,028	12092	41313	4813	12404	27222	4093	14188	29958	5753	14782	25832
GNI per capita	4350	11360	38840	4680	13030	45940	4590	11650	27450	4310	12120	32810	5010	13720	28530

TABLE 3
US POPULATION, GDP AND GNI

Year	1969	1980	2015
Population (thousand)	207,599	229,588	321,773
GDP (billion \$)	1,019	2,862	18,036
GDP per capita	5,032	12,598	56,116
GNI per capita	5,070	13,410	55,980

Table 4 provides the Population, GDP and GNI per capita of Malaysia, Argentina, Mexico, Brazil and Thailand; and Table 5 is China's relevant data.

TABLE 4
POPULATION, GDP AND GNI PER CAPITA OF MALAYSIA,
ARGENTINA, MEXICO, BRAZIL AND THAILAND

	Malaysia			Argentina			Mexico			Brazil			Thailand	
	1995	2005	2015	1991	2001	2015	1993	2003	2015	1996	2006	2015	2010	2015
population (thousand)	20725	25796	30331	33193	37471	43416	90887	106888	127017	165303	190698	207847	66692	67959
GDP (billion)	88705	143534	296283	189720	268696	583168	503962	713284	1143793	850425	1107640	1774724	340923	395168
GDP per capita	4280	5564	9768	5716	7171	13432	5545	6673	9005	5145	5808	8539	5112	5815
GNI per capita	4000	5250	10570	3950	6960	12460	4460	6860	9710	4470	4710	9850	4610	5720

TABLE 5
CHINA'S POPULATION, GDP AND GNI

Year	2000	2010	2015
Population (thousand)	1,265,830	1,340,968	1,376,048
GDP (billion \$)	1,211	6,100	11,007
GDP per capita	959	4,561	8,028
GNI per capita	940	4,340	7,930

It is very interesting to notice that the GDP and GNI per capita in most countries and in most years were quite close to. Mostly and usually the GNI per capita was a little lower than its GDP per capita. But sometimes GNI per capita was higher than the GDP per capita, for example, Japan in 1974 and Germany in 1980.

Labor ratio, and labor and GDP distributions in three industries

Table 6 is the Labor Ratio, and Labor and GDP distributions in three industries in Japan, Germany, Korea, Italy, and Spain; and Table 7 is the relevant US data.

TABLE 6
LABOR RATIO, AND LABOR AND GDP DISTRIBUTIONS IN THREE SECTORS

	Japan			Germany			Korea			Italy			Spain		
	1974	1985	2015	1973	1980	2015	1988	1995	2015	1975	1987	2015	1979	1991	2015
Total Population (Thousand)	109495	119988	126573	78732	78159	80688	42085	44652	50293	55268	56980	59797	37397	39287	46121
Total # of employment (Thousand)	51530	58070	63760	25536	26486	39176	16870	20432	25936	19635	20836	21972	11896	12609	17717
Labor ratio %	47.10	48.40	50.40	32.40	33.90	48.60	40.10	45.80	51.60	35.50	36.60	36.70	31.80	32.10	38.41
Labor in Agriculture (%)	12.6	8.83	3.75	7.2	5.2	1.3	20.7	12.4	6.1	16.7	10.3	3.5	19.32	10.31	4.20
Labor in Industry (%)	36.8	35.01	26.17	46.8	42.9	28.3	34.9	33.3	24.4	38.3	32	27.1	35.94	33.43	19.50
Labor in Services (%)	50.6	56.17	70.08	46	51.9	70.4	44.5	54.3	69.5	45.1	57.7	69.5	44.74	56.26	76.30
GDP in Agriculture (%)	4.65	2.7	0.01	2.51	1.86	0.57	9.85	5.82	2.31	7.07	3.97	2.02	7.09	4.57	2.32
GDP in Industry (%)	41.37	38.23	0.28	33.59	30.82	23.32	38.43	38.38	37.98	27.15	24.17	16.86	27.63	22.16	16.37
GDP in Service (%)	53.98	59.07	71.1%	63.90	67.32	76.1	51.72	55.8	59.71	65.78	71.86	81.12	65.28	73.28	81.30

TABLE 7
US LABOR RATIO, LABOR AND GDP DISTRIBUTIONS

	1969	1980	2015
Total Population	207,599	229,588	321,773
Total # of employment	77,902	99,303	148,833
Labor ratio	37.5%	43.3%	46.3%
Labor in Agriculture (%)	4.40	3.60	1.40
Labor in Industry (%)	33.10	30.80	18.47
Labor in Services (%)	62.50	65.70	80.13
GDP in Agriculture (%)	2.60	2.20	1.00
GDP in Industry (%)	32.30	30.40	15.68
GDP in Service (%)	65.00	67.40	83.32

Table 8 provides the information of the labor ratio, labor and GDP distributions from Malaysia, Argentina, Mexico, Brazil, and Thailand; and Table 8 is the relevant data of China.

TABLE 8
MALAYSIA, ARGENTINA, MEXICO, BRAZIL AND THAILAND'S LABOR RATIO AND
LABOR AND GDP DISTRIBUTIONS

	Malaysia			Argentina			Mexico			Brazil			Thailand	
	1995	2005	2015	1991	2001	2015	1993	2003	2015	1996	2006	2015	2010	2015
Total Population	20725	25796	30331	33193	37471	43416	90887	106888	127017	165303	90698	207847	165303	67959
Total Employment	7645	10064	14143	10380	11401	11340	32832	39472	50611	67920	89318	109842	67920	38016
Labor Ratio	36.9%	39.0%	46.6%	31.3%	30.4%	26.1%	36.1%	36.9%	39.8%	41.1%	46.8%	52.8%	57.0%	55.9%
Labor in Agriculture (%)	20.00	14.61	12.21	0.30	0.80	0.50	27.09	16.80	13.48	24.40	19.34	14.53	38.28	42.03
Labor in Industry (%)	32.30	29.73	27.43	32.96	21.99	24.19	22.16	24.80	23.74	19.90	21.44	22.65	20.64	20.36
Labor in Services (%)	47.70	55.66	60.36	66.73	77.21	75.30	50.76	58.40	62.78	55.70	59.22	63.03	41.08	37.61
GDP in Agriculture (%)	12.95	8.26	8.45	6.72	4.89	6.00	4.48	3.59	3.61	5.45	5.14	5.21	10.53	9.14
GDP in Industry (%)	41.40	45.93	36.43	32.72	27.04	27.77	31.86	33.71	32.78	25.55	27.68	22.74	40.03	35.72
GDP in Service (%)	45.65	45.81	55.12	60.56	68.07	66.23	63.65	62.70	63.62	68.99	67.18	72.05	49.44	55.14

TABLE 9
CHINA'S LABOR RATIO, AND LABOR AND GDP DISTRIBUTIONS

	2000	2010	2015
Total Population (thousand)	1,265,830	1,340,968	1,376,048
Total # of employment	711,500	761,050	774,510
Labor ratio	56.2%	56.8%	56.3%
Labor in Agriculture (%)	50.00	36.70	28.30
Labor in Industry (%)	22.50	28.70	29.30
Labor in Services (%)	27.50	34.60	42.40
GDP in Agriculture(%)	15.06	9.53	8.88
GDP in Industry (%)	45.92	46.40	40.93
GDP in Service (%)	39.02	44.07	50.19

Population and labor growth

Table 10 gives Japan, Germany, Korea, Italy and Spain's Population Growth Rate and Labor Growth Rate during the selected time period; and Table 10 is the relevant US data. From 1974-1985, Japan had 9.6% population growth and 12.7% labor growth; and from 1985-2015, they were 5.5% and 9.8%,

respectively. It shows that the labor growth rate was all higher than the population growth rate in all of these countries

TABLE 10
LABOR RATIO, POPULATION AND LABOR GROWTH OF JAPAN, GERMANY, KOREA, ITALY AND SPAIN

	Japan			Germany			Korea			Italy			Spain		
	1974	1985	2015	1973	1980	2015	1988	1995	2015	1975	1987	2015	1979	1991	2015
Labor ratio	0.471	0.484	0.504	0.324	0.339	0.486	0.401	0.458	0.516	0.355	0.366	0.367	0.318	0.321	0.384
Population growth		0.096	0.055		(0.007)	0.032		0.061	0.126		0.031	0.049		0.051	0.174
Labor growth		0.127	0.098		0.037	0.479		0.211	0.269		0.061	0.055		0.060	0.405

TABLE 11
US LABOR RATIO, POPULATION GROWTH AND LABOR GROWTH

	1969	1980	2015
Labor ratio	0.375	0.433	0.463
Population growth		0.106	0.402
Labor growth		0.275	0.499

Table 12 is the Population Growth Rate and Labor Growth Rate of Malaysia, Argentina, Mexico, Brazil and Thailand and Table 13 is for China.

It shows that Argentina's labor growth rate was lower than its population growth rate from 1991-2001 and its labor growth rate was negative from 2001-2015. Thailand also had negative labor growth rate from 2010-2015. China's labor growth rate was higher than its population rate from 2000-2010 but it was the opposite from 2010-2015.

TABLE 12
LABOR RATIO, POPULATION AND LABOR GROWTH OF MALAYSIA, ARGENTINA, MEXICO, BRAZIL AND THAILAND

	Malaysia			Argentina			Mexico			Brazil			Thailand	
	1995	2005	2015	1991	2001	2015	1993	2003	2015	1996	2006	2015	2010	2015
Labor ratio	0.369	0.390	0.466	0.313	0.304	0.261	0.361	0.369	0.398	0.411	0.106	0.112	0.570	0.559
Population growth		0.245	0.176		0.129	0.159		0.176	0.188		0.154	0.090		0.019
Labor growth		0.317	0.405		0.098	(0.005)		0.202	0.282		0.315	0.230		(0.001)

**TABLE 13
CHINA LABOR RATIO, POPULATION AND LABOR GROWTH**

	2000	2010	2015
Labor ratio	.562	0.568	0.563
Population growth		.059	.026
Labor growth		.070	0.018

Labor productivity

Table 14 is the Labor Productivity and Productivity Changes of Japan, Germany, Korea, Italy and Spain. For example, Japan's labor productivity was increased by 18% from 1974-1985 and 188% from 1985-2015; Germany's productivity was raised by 130% from 1973-1980 and 140% from 1980-2015.

Table 15 is the data for the US. From 1969-1980, its productivity was increased by 120% and it was 320% from 1980-2015.

**TABLE 14
LABOR PRODUCTIVITY AND PRODUCTIVITY CHANGE OF JAPAN,
GERMANY, KOREA, ITALY, AND SPAIN**

	Japan			Germany			Korea			Italy			Spain		
	1974	1985	2015	1973	1980	2015	1988	1995	2015	1975	1987	2015	1979	1991	2015
GDP per Labor	20133	23842	68743	15541	35743	85855	11992	27375	53125	11558	38540	82899	17991	45648	67676
Average labor productivity change		0.18	1.88		1.30	1.40		1.28	0.94		2.33	1.15		1.54	0.48

**TABLE 15
US LABOR PRODUCTIVITY AND CHANGE**

	1969	1980	2015
GDP per Labor	13092	28826	121187
Average labor productivity change		1.20	3.20

Table 16 shows the labor productivity and its changes in Malaysia, Argentina, Mexico, Brazil and Thailand. From 1995-2005, the productivity in Malaysia only was raised by 23% and it was 47% from 2005-2015. In Brazil, its productivity was surged by 336% from 1996-2006 but since then it was slowed down to 40%.

Table 17 is the China's labor productivity. From 2000-2010, its productivity was accelerated by 371% and it was 77% since then.

TABLE 16
LABOR PRODUCTIVITY AND PRODUCTIVITY CHANGE OF MALAYSIA, ARGENTINA,
MEXICO, BRAZIL AND THAILAND

	Malaysia			Argentina			Mexico			Brazil			Thailand	
	1995	2005	2015	1991	2001	2015	1993	2003	2015	1996	2006	2015	2010	2015
GDP per Labor	11603	14261	20949	18277	23568	51426	15349	18070	22600	12521	54615	76544	8963	10395
Average labor productivity change		0.23	0.47		0.29	1.18		0.18	0.25		3.36	0.40		0.16

TABLE 17
CHINA'S LABOR PRODUCTIVITY AND PRODUCTIVITY CHANGE

	2000	2010	2015
GDP per Labor	1702	8016	14212
Average labor productivity change %		3.71	0.77

Relative labor productivities of three industries

The relative productivity of an industry is the ratio of the percentage of an industry's GDP to the percentage of its labor. This relative labor productivity indicates how competitive each industry is. Table 18 is the Relative Productivities in Japan, Germany, Korea, Italy and Spain. Table 18 is from the US.

Each country is different. But in most of these countries, the relative labor productivities in Industrial and Service Sectors are quite close to. In Japan, Korea, and US, its relative labor productivity in industrial sector was higher than the one in service; but in Italy and Spain, that was the opposite.

TABLE 18
RELATIVE LABOR PRODUCTIVITIES IN JAPAN, GERMANY, KOREA, ITALY AND SPAIN

	Japan			Germany			Korea			Italy			Spain		
	1974	1985	2015	1973	1980	2015	1988	1995	2015	1975	1987	2015	1979	1991	2015
Relative productivity in Agri.	0.37	0.31	0.32	0.35	0.36	0.49	0.48	0.47	0.38	0.42	0.39	0.58	0.37	0.44	0.55
Relative productivity in Industrial	1.12	1.10	1.07	0.72	0.96	1.08	1.10	1.15	1.56	0.71	0.76	0.62	0.77	0.66	0.84
Relative productivity in Service	1.07	1.05	1.03	1.39	1.09	0.98	1.16	1.03	0.86	1.46	1.25	1.17	1.46	1.30	1.07

TABLE 19
US RELATIVE LABOR PRODUCTIVITIES

	1969	1980	2015
Relative productivity in Agri.	0.59	0.61	0.71
Relative productivity in Industrial	0.98	0.99	1.06
Relative productivity in Service	1.04	1.03	0.99

Table 20 is the relative labor productivity in Malaysia, Argentina, Mexico, Brazil and Thailand; and Table 21 is the data from China. Except in 1996 in Brazil, in all these years in these countries, the relative labor productivity in industrial sector was higher than its service sector. Compared with developed countries, the service industry in developing countries has a lower share of the total GDP and its productivity is lower than its industrial sector.

Why is the service industry not well developed in developing countries? As Chen (2016) explained, an economy goes through its different levels of development stages, from the agriculture-concentrated to industrialized and then to more-service-concentrated. As a result, the share of the GDP and employment in developing countries are low. Why is the service productivity low in these countries? In developing countries, its distribution of the service sectors is different from the developed ones. Financial service, information and communications service, professional service, and educational service as well as social service are main service sectors in developed countries and these sectors have very high productivities, even higher than most industrial sectors (Chen 2016); but in developing countries, these service sectors are under-developed.

TABLE 20
RELATIVE LABOR PRODUCTIVITIES OF MALAYSIA,
ARGENTINA, MEXICO, BRAZIL AND THAILAND

	Malaysia			Argentina			Mexico			Brazil			Thailand	
	1995	2005	2015	1991	2001	2015	1993	2003	2015	1996	2006	2015	2010	2015
Relative productivity in Agri.	0.65	0.57	0.69	22.39	6.12	12.00	0.17	0.21	0.27	0.22	0.27	0.36	0.28	0.22
Relative productivity in Industrial	1.28	1.55	1.33	1.00	1.23	1.16	1.45	1.36	1.39	1.28	1.29	1.01	1.94	1.76
Relative productivity in Service	0.96	0.82	0.91	0.91	0.89	0.89	1.26	1.07	1.02	1.24	1.14	1.15	1.21	1.47

TABLE 21
CHINA'S RELATIVE LABOR PRODUCTIVITIES

	2000	2010	2015
Relative productivity in Agri.	0.30	0.28	0.31
Relative productivity in Industrial	2.04	1.63	1.40
Relative productivity in Service	1.42	1.25	1.18

Exchange rates

As discussed in the previous section, besides the productivities and economic structure, exchange rates and inflation rates of an economy will directly affect its economic outcomes.

Table 22 is the historical inflation rates of Japan, Germany, Korea, Italy, and Spain in selected years. Since Germany, Italy and Spain have used the European Yuan, its exchange rate is not listed for 2015.

TABLE 22
EXCHANGE RATE CHANGE OF JAPAN, GERMANY, KOREAN AND SPAIN (TO US\$)

Japan			Germany		Korea			Italy		Spain	
1974	1985	2015	1973	1980	1988	1995	2015	1975	1987	1979	1991
292.0825	238.5358	121.0440	2.6726	1.8177	731.4683	771.2733	1131.1575	652.8492	1296.0700	67.1250	103.9116
	22%	97%		47%		-5%	-32%		-50%		-35%

In the above table, each value is the specific country currency value per US\$1; for example, in 1974, \$1=¥292.0825. The above table indicates that Japanese yuan was appreciated by 22% from 1974-1985, and further appreciated by 97% from 1985-2015. Germany currency was appreciated by 47% from 1973-1980; the currency of Korea was depreciated by 5% from 1088-1995, Italy's depreciation was 50% during 1975-1987, and Spain was -35% from 1979-1991.

Although all of these five countries successfully passed over the middle-income trap during the relevant time period, its currency exchange rate changes were quite different. Both Japan and Germany experienced significant appreciations but Korea, Italy and Spain all have depreciations. The reasons for such a difference are complicated. Some possible reasons are its economy size and source to its economic growth. Both Japan and Germany were large economies and their economic growths were led by export increases. When Japan or Germany reached the middle income level, its labor and other costs were low, then it used its low exchange rate to export more products. But late, when its economy advanced, its labor and other costs increased dramatically so its currency was appreciated. Such exchange rate changes could also be led by the other countries' pressures such as the US did in pushing Japanese yuan's appreciations in 1980 and 90s.

TABLE 23
EXCHANGE RATE CHANGE OF MALAYSIA, ARGENTINA, MEXICO, AND BRAZIL
AND THAILAND (TO US\$)

Malaysia			Argentina			Mexico			Brazil			Thailand	
1995	2005	2015	1991	2001	2015	1993	2003	2015	1996	2006	2015	2010	2015
2.504	3.787	3.905	0.953	0.999	9.233	3.115	10.789	15.848	1.005	2.175	3.326	31.685	34.247
4	1	5	6	5	2	6	0	3	1	3	9	7	7
	-34%	-3%		-5%	-89%		-71%	-32%		-54%	-35%		-7%

The above table shows that all these four countries who are facing barriers of the middle-income trap experienced its currency's dramatic depreciation. For example, Malaysia had 34% depreciation from 1995-2005 and 3% further depreciation afterward; Mexico had 71% depreciation from 1993-2003 and then 32% depreciation from 2003-2015. Thailand just entered into the upper-middle income and showed a little bit of its currency depreciation from 2010-2015.

It is very interesting to notice that the currency significant depreciation is a barrier to these countries' economic growth. The tradition international trade theory implies that a country will be more competitive in exports when its currency is depreciated. One possible explanation for this puzzle is the structure of a country's exports or types of products. For labor intensive and low value products, the relevant exchange rate matters but for high value products, that does not matter much. Another more important factor is other emerging and developing countries. Countries like Indonesia, Philippine and India may be more competitive than these countries in terms of labor and other costs and also in terms of the exchange rates.

China's currency value has been an international focus for years. Western countries has pushed China to appreciate its currency to lower China-made products' attractiveness. Table 24 is the exchange rate changes of China from 2010-2015. It was appreciated by 8.7% during this time period.

TABLE 24
CHINA'S RMB EXCHANGE RATE CHANGES (TO US\$)

2000	2010	2015
8.2785	6.7703	6.2275
	22.3%	8.7%

Although the RMB has been depreciated since 2016 and now it is close to \$1=RMB7, one can reasonably expect that China's currency will be appreciated in the coming decade or even decades. China has been resistant to its currency's significant appreciations; but based on Japan and Germany's experiences during 1970 and 80s, the currency appreciation is not necessarily a barrier to advance an economy.

INFLATION RATES

TABLE 25
US, JAPAN, GERMANY, KOREA, ITALY AND SPAIN
INFLATION RATES (AVERAGE ANNUAL %)

US		Japan		Germany		Korea		Italy		Spain	
1969-1980	1981-2015	1974-1985	1986-2015	1973-1980	1981-2015	1988-1995	1996-2015	1975-1987	1988-2015	1979-1991	1992-2015
7.49	3.08	6.84	0.54	4.87	2.10	6.56	3.06	13.71	3.00	10.06	2.81

The above table provides average annual inflation rates of US, Japan, Germany, Korea, Italy and Spain who successfully passed through the middle-income trap during the specific time periods and its inflation rates then after. For example, US advanced to the high income country from 1969 to 1980, average annual inflation rate was 7.49% and was 3.08% since 1981. Each country is different but the common phenomenon is that its inflation rate was much higher during the time period when a country was advanced toward the high income level than the later period. Japan's rate after 1985 was very low mainly due to its extremely low inflation rate from 1995.

TABLE 26
MALAYSIA, ARGENTINA, MEXICO, BRAZIL
AND THAILAND'S INFLATION RATES (AVERAGE ANNUAL %)

Malaysia		Argentina		Mexico		Brazil		Thailand
1995-2005	2006-2015	1991-2001	2002-2015	1993-2003	2004-2015	1996-2006	2007-2015	2010-2015
2.53	2.56	19.38	13.81	34.97	4.08	7.77	5.87	2.21

Table 26 gives the average annual inflation rates of these five developing countries. Argentina had very high inflations; Mexico had extremely high rate of 34.97% during 1993-2003 and was 4.08% from 2004. Malaysia and Thailand had modest rates. Brazil had high inflations but much lower than Argentina.

As discussed before, a modest inflation is good to an economy and that will particularly help the country to improve its nominal GDP per capita. But over-high inflation will hurt its economy and people as economic theories and empirical studies have concluded.

US average annual inflation rate was 7.49% from 1969-1980 and was 3.08% from 1981-2015. China's average annual inflation rate was 2.90% since 2010 and it was 1.85% from 2000-2009. Compared with six developed countries during its fast economic growth, China had quite low inflation rate. China's future challenges will be to control the inflation as happened in Argentina and Mexico, and at the same time to avoid deflation as happened in Japan.

INTEREST RATES

As discussed in the previous section, interest rates and particularly real interest rates matter to economies. Table 26 provides interest rates of six developed countries in selected years.

TABLE 27
US, JAPAN, GERMANY, KOREA, ITALY AND SPAIN
INTEREST RATES (AVERAGE ANNUAL %)

US		Japan		Germany		Korea		Italy		Spain	
1969-1980	1981-2015	1974-1985	1986-2015	1973-1980	1981-2015	1988-1995	1996-2015	1975-1987	1988-2015	1979-1991	1992-2015
7.97	5.49	4.00	1.06	4.89	3.57	9.49	5.40	11.37	3.40	10.71	3.26

Compared with the previous Table 24, the interest rates of countries were consistent its relevant inflation rates, i. e. a country with a high inflation rate had a high interest rate. The following table provides the approximate average annual real interest rate (average annual interest rate –average inflation rate).

TABLE 28
US, JAPAN, GERMANY, KOREA, ITALY AND SPAIN REAL INTEREST RATES (%)

US		Japan		Germany		Korea		Italy		Spain	
1969-1980	1981-2015	1974-1985	1986-2015	1973-1980	1981-2015	1988-1995	1996-2015	1975-1987	1988-2015	1979-1991	1992-2015
.48	2.41	-2.84	0.52	.02	1.47	2.93	2.34	-2.35	0.40	.65	.45

The above table shows that Korea had the highest real interest rates. US real interest rate was 2.41% since 1981 and it was only .48% from 1969-1980.

Table 29 is the interest rates of five developing countries and Table 30 is its real interest rates.

TABLE 29
MALAYSIA, ARGENTINA, MEXICO, BRAZIL
AND THAILAND'S INTEREST RATES

Malaysia		Argentina		Mexico		Brazil		Thailand
1995-2005	2006-2015	1991-2001	2002-2015	1993-2003	2004-2015	1996-2006	2007-2015	2010-2015
4.77	2.91	14.93	12.94	14.79	1.98	20.72	9.97	2.06

TABLE 30
MALAYSIA, ARGENTINA, MEXICO, BRAZIL
AND THAILAND REAL INTEREST RATES

Malaysia		Argentina		Mexico		Brazil		Thailand
1995-2005	2006-2015	1991-2001	2002-2015	1993-2003	2004-2015	1996-2006	2007-2015	2010-2015
2.24	.35	-4.45	-.87	-.08	-2.1	12.96	4.10	-.16

Three countries had negative real interest rates. Malaysia had positive and modest real rates; but Brazil had extremely high real rates from 1996-2006. Neither high real interest rates nor negative real interest rates are good to economies as these five countries have demonstrated.

China's real interest rate was -.15% from 2010-2015, and it was .57% from 2000-2009. Based on other countries' experiences, China needs to pay close attentions to its inflation rates and interest rates and so real interest rates in order to avoid its economic problems.

The Paths toward the high income economy

Each country is different and its path toward the high income economy is distinctive. But there are common factors affecting an economy's stable and sustainable growth. The labor ratio is essential. The percentage of labor forces to its total population decides an economy's labor supply and its total productions. It also directly affects the government and society's needs for the public services. An aging problem will seriously weaken an economy's growth potential. That is one of reasons why many developed economies have had slow economic growth.

The economic structure and particularly its distributions of GDPs and employments in three industries are crucial to an economy. In order to pass through the middle-income trap, an economy needs to gradually and sustainably reallocate labors from the agriculture to industrial and service sectors. To achieve this, industrialization and modernization are the keys. Efficiency and improvements in agriculture are also critical.

The productivity is the most important to an economy's success toward the high income economy. Innovations, new technology developments and adoptions, labor training and education, capital investments, and fitting institutions and regulations are the foundations to enhance the productivity.

An economy's sustainable growth also relies on its suitable and feasible development strategy. Export-oriented strategy led many economies' successes in the past. Although one can reasonably predict further increasing of the international trade and globalization in coming decades, it will be more difficult for many developing countries to overly depend on exports to achieve its fast and sustainable economic growth.

It should be emphasized here that the financial and/or economic crisis of an economy will disturb its path toward the high income status. A serious financial or economic crisis will lead to an economy's significant or even dramatic decrease and such negative growth usually will also last for a long time period before being fully recovered. Many economies such as Malaysia and Argentina which fell into the middle-income trap had such crises. In other words, preventing a serious financial or economic crisis will be the most essential to avoid this middle-income trap.

China is facing many challenges and problems. Its economy has slowed down dramatically in recent years. Decreasing of export is the direct source. But China has had more serious and fundamental problems. First of all, its labor ratio has been decreasing. Its labor ratio was 56.2% in 2000 and 56.8% in 2010 but it reduced to 56.3% in 2015. China's aging population has been growing very fast. In 2014, China had about 200 million seniors at age of 60 or above and that was risen to 220 million in 2015. Given the above, one would reasonably expect that China's labor ratio will be further lower in the coming decade.

As stated before, China's currency RMB was appreciated by 22.3% from 2000-2010 and 8.7% from 2010-2015. But in the past two years, its currency has been depreciated. Given China's economic growth potential and especially its still growing export power, one would expect that its currency will be appreciated in the long run. One would expect to have 15-20% appreciation by 2025, or \$1 to be about RMB 6. As pointed out before, a stable currency exchange rate is essential to an economy's success toward the high income economy.

A proper inflation rate also matters to China's future development. China did not experience much high inflations in the past many decades. Although China still needs to pay close attention to potential high inflation, its more challenging problem will be to avoid deflation or too low inflation and especially avert what has happened in Japan in the past two decades. An annual 3-4% inflation will be helpful to China's sustainable economic growth.

Since 1978, the GDP and employment shares in agriculture industry in China have reduced significantly. Currently China has about 28% working in agriculture and related, 29% in industrial and 43% in service. The GDP in agriculture was 8.6% in 2016, 39.8% in industrial and 51.6% in service. But in the past several years, the industrial sector has shrank more than the agriculture sector.

Table 31 is China's GDP distributions in recent years. From 2014 to 2016, the GDP in agriculture was reduced by .3% each year but the industrial sector was lowered by 1.8% from 2014-2015 and 1.1% from 2015-2016. In many developed countries, like US, Japan and Germany, shares of agriculture in GDPs and employments are only about 1%. Therefore, China still has large potential to reduce its agriculture's shares in its economy.

Given China's population and its development stage, its GDP share in agriculture should be gradually reduced to about 5-6% by 2025; and its employment in this sector should be reduced to about 15-20% by 2025. The correct path for China's economic structure change should be further significantly reducing its agriculture sector and moving more people out from this sector. To achieve this goal, China needs to further develop and strengthen its manufacturing industry; particularly develop and improve more capital-intensive and energy-efficient industries and develop new emerging technologies and industries.

TABLE 31
CHINA'S GDP DISTRIBUTIONS IN THREE INDUSTRIES IN RECENT YEARS

	2016	2015	2014	2013	2012	2011	2010
Agriculture GDP %	8.6	8.9	9.2	10.0	10.1	10.0	10.1
Industrial GDP %	39.8	40.9	42.7	43.9	45.3	46.6	46.7
Service GDP %	51.6	50.2	48.1	46.1	44.6	43.4	43.2

(Data source: China's National Bureau of Statistics)

China needs to improve its agriculture efficiency and especially raise its total factor productivity (TFP). Developed countries rely on its improvements of the TFP to maintain the agriculture's competitiveness and increase its total outputs (Chen, 2016). The economies of scale is important to the agriculture's competitiveness and productivity. Research and development investments are essential to the agriculture's improvements and innovations.

China's service industry has been growing fast. But it has some serious barriers and problems. As Chen (2016) stated, China needs to better develop and strengthen its services in IT and CT, financial, professional, educational and social/public sectors to better meet its relevant growing needs. China also has huge trade deficits in service and its export in service to the total export is very low. Significant developments of the service and improvements of its competitiveness will help China better toward the high income economy.

Given China's huge population and still low urbanization rate (at about 57%), international trade and especially export will still be critical to China's future. Export will generate more jobs and push further developments of manufacturing sectors; and that will help improve its urbanization and economic growth.

To achieve all above, institutional reforms are the keys. China has used the free market system more in its resources allocations and demand/supply equilibriums. Private sectors have been growing fast and its share of the total GDP is now more than 50%. However, there are still many barriers to the free market system and private firms' more active participations in its economy. Speeding up its reforms, protecting private rights of properties, allowing private firms to invest in more sectors and giving them equal access to capitals will be the indicators of China's future reforms—its directions and determinants; and that will further affect whether China can advance to the high income economy.

CONCLUSIONS AND FURTHER DISCUSSIONS

This paper studies factors affecting an economy's growth and particularly whether a country will be able to continuously grow toward a high income economy. It develops an economic model that directly links the labor ratio, economic structure and its productivity with the GDP per capita. The model also indicates the relevance and importance of an economy's proper inflation and exchange rates to its economic success.

Based on the model, the paper compared relevant variables from countries who successfully passed through the middle income trap with the ones who fell into the trap. It also compared Thailand and China, both just moved to the upper-middle income class in 2010. The paper further focused on discussing how China may avoid this trap. In order to successfully pass the middle-income trap, China needs to continuously move labor out from the agriculture industry to industrial and service sectors, enhance its productivities in all of these three sectors, further strengthen its manufacturing industry and improve its service sector, stabilize and advance its exports, and maintain stable and proper inflation and exchange rates. To achieve all of these, China needs to continuously reform its economic system and improve its regulations, and particularly it needs to apply the free market system more and further open its economy. Certainly significant increases of consumption in its total GDP growth is critical. Given its irrelevance to this study and space limit, this important issue is not discussed here.

One possible direction of future research is to establish a complicated econometric model to study how these factors, including the labor ratio, labor distributions in three industries and the productivities in these three sectors affect economies' GDP per capital and its growth. Using panel data of selected countries over years, one will be able to identify significant variables.

The identified variables such as the labor ratio, productivity, economic structure, exchange rate and inflation rate are economic indicators that distinguish different economies and their success. For policy-making purposes, one needs to further study how to improve target variables. For example, if the productivity is a main problem for an economy's sustainable growth, the country needs to focus on enhancing its efficiency of government regulations and business operations, exploiting and adopting new and advanced technologies, better developing and strengthening its educational systems, and fostering more value-added economic sectors.

As discussed in the Introduction, the model derived in this paper can also be used to analyze economic growth problems of all types of economies. For example, one may use this model to study why Japan has had the zero-growth in the past two decades. One can similarly apply this model to explore why there is a poverty or low-income trap.

ENDNOTES

* are the Corresponding Authors; all authors would like to thank their universities for the financial support;

1. In 2015, the World Bank raised the income for the economy's classification--less than \$1,046 as the low income economy, \$1,046 to \$4,125 as the lower mid-income, \$4,126 to \$12,735 as the upper mid-income and \$12,736 and above as the high income.

REFERENCES

- Agénor, P-R. and Aizenman, J. (2010). Aid volatility and poverty traps. *Journal of Development Economics*, 91, 1-7.
- Agénor, P-R. and Canuto, O. (2012). Middle-income growth traps. *World Bank Policy Research Working Paper*, 6210, Washington D.C.: *World Bank*.
- Antoci, A., Galeotti, M. and Russu P. (2011). Poverty trap and global indeterminacy in a growth model with open-access natural resources. *Journal of Economic Theory*, 146, 569-591.
- Azariadis, C. and Drazen, A. (1990). Threshold externalities in economic development. *Quarterly Journal of Economics*, 105, 501-26.
- Azariadis, C. and Stachurski, J. (2005). Poverty traps. Chapter 5 in Aghion P. and Durlauf, S.N. eds., *Handbook of Economic Growth*, Volume 1A, Princeton: Princeton University Press.
- Barro, R.J. and Sala-I-Martin, X. (1991). Convergence across states and regions. *Brookings Papers on Economic Activity*, 22, (1), 107-182.
- Blumstein, C., Krieg, B. Schipper, L. and York. C. (1980). Overcoming social and institutional barriers to energy conservation, *Energy*, 5, (4), 355-371.
- Cai, F. (2012). The Coming demographic impact on china's growth: The age factor in the middle-income trap. *Asian Economic Papers*, 11, (1), 95-111.
- Calderón, C. and Servén, L. (2004). The Effects of infrastructure development on growth and income distribution. *World Bank Policy Research Working Paper*, 3400.35;
- Capra, C. M., Tanaka, T., Camerer, C.F., Feiler, L., Sovero, V. and Noussair, C.N. (2009). The impact of simple institutions in experimental economies with poverty traps. *The Economic Journal*, 119, 977-1009.
- Caselli, F., Esquivel, G. and Lefort, F. (1996). Reopening the convergence debate: a new look at cross-country growth empirics. *Journal of Economic Growth*, 1, (3), 363-389.
- Yueyun (Bill) Chen (2016). International Comparisons of Service Industry-What China Can Learn from Other Countries. *Journal of Advances in Economics and Finance*, 1, (1), 53-71.
- Yueyun(Bill) Chen (2016). Targeted and effective innovations and supply-side reforms: actively supporting and developing import-substitution manufacturing industry. *International Economic Observation*; Beijing Foreign Language University, G20 Research Center, September, 15-18.
- Yueyun(Bill) Chen (2016). International comparisons of agriculture industry-what China can learn from others. *Int'l Journal of Agricultural Economics*, 1, (2), 45-56.
- Yueyun(Bill) Chen (2015). China's Path to the sustainable, stable and rapid economic development: from the largest to the strongest manufacturing country. *Journal of World Economic Research*, 4, (5-1), 8-19.
- Chow, G. C. (2002). *China's Economic Transformation*, Wiley Publishing.
- Chow, G. C. (2006). Globalization and China's economic development. *Pacific Economic Review*, 11, 271-285.
- CKGBD (2012). Middle-income trap's int'l comparisons. Working Paper, *CKGBS*, China
- Coase, R. (1937). The Nature of the firm. *Economics*, 4, (4), 386-405.
- Ding, Z., et al. (2017). Correctly understand and play the role of the exchange rate in China's economic development. *Management World*, Volume 2.

- Dollar, D. and Kraay, A. (2003). Institutions, trade, and growth. *Journal of Monetary Economics*, 50, 133-162.
- Felipe, J., Abdon, A. and Kumar, U. (2012). Tracking the middle-income trap: what is it, who is in it, and why?. *Levy Economics Institute of Bard College*, Working Paper No. 715.
- Gill, I. and Kharas, H. (2007). An East Asian renaissance: ideas for economic growth. Washington D.C.: *World Bank*.
- Gill, I. and Kharas H. (2015), The Middle-income trap turns ten. Washington D.C.: *World Bank*.
- Gradstein, M. (2008). Institutional traps and economic growth. *International Economic Review*, 49, (3), 1043-1066.
- Hamilton, W. H. (1919). The Institutional approach to economic theory. *American Economic Review*, 9, (1), 309-318.
- Hausmann, R., Pritchett L. and Rodrik, D. (2005). Growth accelerations. *Journal of Economic Growth*, 10, (4), 303-29.
- Howarth R., and Andersson B. (1993). Market barriers to energy efficiency. *Energy Economics*, 15, 262–72.
- Huang, Y. (2010). Debating China’s economic growth: the Beijing consensus or the Washington consensus. *Academy of Management Perspective*, 31-48.
- Im, F. G. and Rosenblatt, D. (2013). Middle-income traps: a conceptual and empirical survey. *World Bank Policy Research Working Paper*, No. 6594.
- IMF (2013), Growth slowdowns and the middle-income trap. Working Paper, IMF.
- Islam, N. (1995). Growth empirics: a panel data approach. *The Quarterly Journal of Economics*, 110, 1127-1170.
- Ito, T (2017). Growth convergence and the middle-income trap. *Asian Development Review*, 34, (1), 1-27
- Jones, C. I., and Romer, P.M. (2010) The New Kaldor facts: ideas, institutions, population, and human capital. *American Economic Journal: Macroeconomics*, 2, (1), 224-245.
- Kraay, A. and Raddatz, C. (2007). Poverty traps, aid, and growth. *Journal of Development Economics*, 82, 315-347.
- Lavopa, A. and Szirmai A. (2014). Structural modernization and development traps: an empirical approach. *UNU-Merit Paper*, Series, #2014-076.
- Lavopa, A. M. (2015). *Structural transformation and economic development: Can development traps be avoided?*. Ph. D. Dissertation, Maastricht University.
- Li, Q. (2016). The Effect of middle-income countries’ real exchange rate undervaluation on its economic catch-up. *Asia Pacific Economy*, Volume 4.
- Lin, J. Y., Cai, F. and Li Z. (2003). *The China miracle: development strategy and economic reform*, Hong Kong: Chinese University Press.
- Lin, J. Y. (2012). *The Quest for prosperity: how developing countries can take off*, Princeton: Princeton University Press.
- Lin, J. Y. and Rosenblatt, D. (2012). Shifting patterns of economic growth and rethinking development. *Journal of Economic Policy Reform*, 15, (3), 171-194.
- Loayza, N. and Servén, L. (2010). Business regulation and economic performance. Washington D.C.: *The World Bank*.
- Lu, D. (2014). China’s changing labor force and implications for economic growth. *EAI Background Brief*, No. 895.
- Lucas, R. (1990). Why doesn't capital flow from rich to poor countries?. *American Economic Review*, 80, (2), 92–96.
- Mankiw, N. G., Romer, D. and Weil, D.N. (1992). A Contribution to the empirics of economic growth. *The Quarterly Journal of Economics*, 107, (2), 407-437.
- Metcalf, G.E. (1994). Economics and rational conservation policy. *Energy Policy*, 22, 819–25.
- Peerenboom, R. (2014). China and the middle-income trap: toward a post Washington, post Beijing consensus. *Pacific Review*, 27, (5), 651-673.
- Ramo, J. C. (2004). *Beijing Consensus*, Foreign Policy Centre, London.

- Ricardo, D. (1817). *On the Principles of Political Economy and Taxation (1 ed.)*, London. McKinsey.
- Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*. 98, (5), 71–103.
- Solow, R. M. (1956). A Contribution to the theory of economic growth, *Quarterly Journal of Economics*, 70, 65-94.
- Solow, R. M (1957). Technical change and the aggregate production function, *Review of Economics and Statistics*, 39, 312-320.
- Swan, T. W. (1956). Economic growth and capital accumulation, *Economic Record*, 32, (2), 334–361.
- Tyers, R. and Golley, J. (2010). China’s growth to 2030: the roles of demographic change and financial reform. *Review of Development Economics*, 14, (3), 592-610.
- Wei S., Xie, Z and Zhang, X. (2017). From “Made in China” to “Innovated in China”: Necessity, Prospect, and Challenges, *Journal of Economic Perspectives*, 21, (31), 49-70.
- Williamson, O. (1975). *Markets and Hierarchies: Analysis and Antitrust Implications*. The Free Press, New York.
- World Bank (2011). *The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium*. Washington D.C. *World Bank*.
- World Bank (2012). *China 2030: building a modern, harmonious, and creative high-income society*. Washington D.C. *World Bank*.
- World Bank (2012). *World development indicators*. Washington D.C. *World Bank*.