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EFFECTS OF POPULATION ON FOOD SECURITY, HEALTH CARE AND EDUCATION EXPENDITURE IN CHINA AND INDIA

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This study examines the impact of population on food security, health care and education expenditure between China and India. The increase in population especially in size and growth increases the challenges to countries like China and India in ensuring sufficient food, healthy life and education level. The objective of this study is first to examine the effects of population and food dimension on food security; second to investigate the impact of population on health care expenditure and the third objective is to investigate the impact of young population on education expenditure in China and India. The Autoregressive Distributed Lags (ARDL) developed by Pesaran et al. (2001) was employed for the analysis and data cover period from 1970-2012. The empirical result showed that population has an impact on food security and at the same time, food dimension played an important role to ensure sufficient food. The increase in population has an impact on food security, which means that when food demands increase, food security will decrease. However, with the three food dimension; food availability, food accessibility and food utilization, food are secured and sufficient to support the demand. The impact of population and food dimension on food security is higher in China in the long-run rather than in India but lower in short-run. The impacts on population and population ages structure on health care expenditure have serious issues. Health is important to ensure a healthy life, thus a positive relationship exists between population and health care expenditure. The impact of population size on health care expenditure is higher in China than India, while for population growth, it is vice versa means higher in India than in China. Looking into the population ages structure, the relationship between population ages 0-14 years, 15-64 years and 65 years and above has a positive impact on health care expenditure both in long-run and short-run estimation. Population ages 0-14 years, result estimates that the impact of population on health care expenditure are higher in China, but for population ages 15-64 years and 65

years and above are higher in India than in China both in long-run and short run estimation. The third objective is the relationship between the young populations with the education expenditure. The result confirms that, increase in young population had positive and significant impact on education expenditure. In the long-run, the impact of young population on education expenditure were higher in India rather than China. However, in the short-run China had a higher impact than India.   The findings confirm that population have an impact on food security, health care and education expenditure in China and India. For the recommendation, firstly, ensure the food security with the increase in population. Being aware that food security measures dietary energy supply adequacy where people can easily access to food at all time. Then, food dimension itself, plays a crucial role in ensuring a sufficient and adequate food. Lastly, health care and education both are crucial and much needed in developed and developing countries as healthy and educated community builds great nation. A policy aimed in encouraging health care and education where it requires creating a fitter and more productive society to support China's and India's economic development and growth. The people of today shapes the world of tomorrow.

KESAN PENINGKATAN PENDUDUK KE ATAS KESELAMATAN MAKANAN, PERBELANJAAN PENJAGAAN KESIHATAN DAN PERBELANJAAN PENDIDIKAN DI CHINA DAN INDIA

Oleh

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Tesis ini mengkaji kesan peningkatan penduduk ke atas keselamatan makanan, perbelanjaan penjagaan kesihatan dan perbelanjaan pendidikan bagi kajian kes di China dan India. Kesan peningkatan penduduk khususnya peningkatan dari segi saiz penduduk dan pertumbuhan penduduk memberi cabaran kepada China dan India untuk memastikan keselamatan makanan, kesihatan yang baik dan pendidikan kepada penduduk. Objektif yang pertama adalah untuk mengkaji kesan penduduk dan dimensi makanan ke atas keselamatan makanan; objektif yang kedua ialah untuk mengkaji kesan penduduk ke atas perbelanjaan penjagaan kesihatan dan objektif yang ketiga ialah untuk mengkaji kesan penduduk muda ke atas perbelanjaan pendidikan. Kajian ini menggunakan kaedah "Autoregressive Distributed Lags" (ARDL) untuk mengkaji hubungan jangka panjang dan jangka pendek yang di perkenalkan oleh Pesaran et al. (2001) dan kajian ini menggunakan data dari tahun 1970 sehingga tahun 2012. Hasil kajian menunjukkan peningkatan dalam penduduk akan memberi kesan kepada keselamatan makanan dan pada masa yang sama, dimensi makanan seperti bekalan makanan, kebolehcapaian makanan dan penggunaan makanan memainkan peranan penting dalam memastikan kecukupan makanan. Kesan peningkatan penduduk dan dimensi makanan ke atas keselamatan makanan adalah lebih tinggi di China dalam jangka masa yang panjang berbanding dengan India tetapi kesan yang lebih rendah bagi China bagi jangka masa yang pendek. Kesan penduduk dan struktur umur penduduk ke atas perbelanjaan penjagaan kesihatan juga isu yang penting. Kesihatan adalah penting untuk memastikan hidup sihat dan hubungan antara penduduk dan struktur umur penduduk adalah positif dengan perbelanjaan penjagaan kesihatan. Kesan peningkatan saiz penduduk ke atas perbelanjaan penjagaan kesihatan adalah lebih tinggi di China berbanding dengan India, tetapi kesan pertumbuhan penduduk adalah lebih tinggi di India berbanding dengan China. Bagi struktur

umur penduduk pula, hubungan diantara struktur umur penduduk antara 0-14 tahun, 15-64 tahun dan 65 tahun ke atas adalah positif dalam jangka masa panjang dan pendek. Bagi struktur umur penduduk antara 0-14 tahun, hasil kajian menunjukkan kesan yang lebih tinggi di China, tetapi struktur umur penduduk antara 15-64 tahun dan 65 tahun ke atas adalah lebih tinggi di India dalam jangka masa panjang dan pendek. Objektif ketiga adalah mengkaji hubungan di antara penduduk muda dan penduduk umur pertengahan dengan perbelanjaan pendidikan. Hasil kajian mengesahkan bahawa, hubungan antara peningkatan dalam penduduk muda dan penduduk umur pertengahan dengan perbelanjaan kesihatan adalah positif dan kesan yang ketara. Dalam jangka masa panjang, kesan penduduk muda dan penduduk umur pertengahan ke atas perbelanjaan pendidikan adalah lebih tinggi di India tetapi untuk jangka masa pendek kesan yang lebih tinggi di India. Dapatan kajian mengesahkan penduduk mempunyai kesan ke atas keselamatan makanan, perbelanjaan penjagaan kesihatan dan perbelanjaan pendidikan di China dan India. Sebagai cadangan, terlebih dahulu untuk memastikan keselamatan makanan dengan peningkatan penduduk, dimensi makanan memaikan peranan yang penting untuk memastikan makanan yang secukupnya. Untuk penjagaan kesihatan dan pendidikan, dengan dasar yang bertujuan menggalakkan penjagaan kesihatan dan pendidikan dapat mewujudkan sebuah masyarakat yang lebih produktif dan sesalur untuk menyokong pembangunan dan pertumbuhan ekonomi di China dan India.

iv

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I certify that a Thesis Examination Committee has met on 21 September 2016 to conduct the final examination of Nurhaiza bt Nordin on her thesis entitled "Effects of Population on Food Security, Health Care and Education Expenditure in China and India" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

xvii

LIST OF ABBREVIATIONS

AGE1	Population Age between 0-14 years
AGE2	Population Age between 15-64 years
AGE3	Population Age between 65 years and above
ARDL	Autoregressive Distributed Lag
BEDS	Hospital Beds
CUSUM	Cumulative Sum Control Chart
DES	Dietary Energy Supply
EDU	Education Expenditure
FAC	Food Accessibility
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture and Organization Statistic
FAV	Food Availability
FM	Food Import
FP	Food Production Index
FPI	Food Price Index
FU	Food Utilization
GDP	Gross Domestic Product
GDPC	Gross Domestic Product Per Capita
HCE	Health care Expenditure
IFPRI	International Food Policy Research Institute
INF	Inflation Rate
LE	Life Expectancy
OECD	Organization for Economic Co-Operation and Development
PDS	Public Distribution System
POPG	Population Growth
POPS	Population Size

PRIM	Primary School Enrolment
SAH	Self Assessed Health
SEC	Secondary School Enrolment
UNESCO	United Nations, Educational Scientific & Cultural Organization
UNICEF	United Nations Children's Funds
USAID	United States Agency for International Development
W	Adequate to water resources
WA	Working Age Population
WDI	World Development Indicators
YOUNG	Young Population

CHAPTER 1

INTRODUCTION

1.1 Background of the study

The increasing number of population around the world is an alarming global issue. In year 1970, total world population was 3.61 billion and has increased to 7.043 billion in year 2012. Meanwhile the growth rate in 1970 was 2.07 percent and it decreased to 1.12 percent in 2012. Even though the world population growth rate has decreased since 1970, the total population is still increasing over time. As the population size increases, some countries may be facing problems such as insufficient resources, hunger and poverty, as well as other environmental and social issues. Otherwise, a better health with better medical care should provide a longer life expectancy and a lower mortality rate. However, because of the high increase in population, it will create a problem and thus some countries should manage its population growth to ensure that they have enough resources for future development and to support the well-being of their people.

Based on the United Nation Population Division (UNPD, 2011), half of the populations live in these six countries, which are The United States, Brazil, Pakistan, China, India and Indonesia. The expected total population in year 2050 will achieve almost up to 10 billion people. Most of the future population growth will occur in less developed regions. There is a considerable diversity in the expected future trajectory of population change across various major area and countries, driven primarily by differences in levels and trends of fertility. Besides that, the populations in Africa and Asia will increase greatly for the coming decades. At the beginning of year 2012, the world's population was estimated at 7 billion and between 2010 and 2012; the world's population grew at a rate of 1.2 per cent per annum and approximately 82 million being added every year and roughly a quarter of this growth occurred in the developing countries (Table 1 and Figure 1). On its current trajectory, the world's population is expected to reach 8.1 billion in year 2025 and 9.6 billion in 2050 (World Population Situation Report, 2014).

Table 1.0 represent the total population, average annual increment and growth rate for world population, development groups and major areas. The absolute size of the world's population has grown substantially; the annual increase in population has been declining since the late 1960s. By 2050, it is expected that the world's population will grow by 49 million people per year, more than half of whom will live in the least developed countries. Currently, from the 82 million people added to the world's population every year, 54 per cent are in Asia and 33 per cent in Africa. By 2050, however, more than 80 per cent of the global increase will take place in Africa, with only 12 per cent in Asia.

1

Table 1.0: Population, average annual increment and growth rate, for the world population, development groups and major areas, selected years and periods

World, development group or major area	Population			Average annual increment			Average annual growth rate (percentage)		
	1990	2010	2050	1990-1995	2010-2015	2045-2050	1990-1995	2010-2015	2045-2050
World	5296	6894	9551	84.2	81.7	48.5	1.52	1.15	0.51
Developed Countries	1148	1221	1303	5	3.7	0.1	0.43	0.3	0.01
Developing Countries	4472	5899	8248	79.2	78	48.4	1.81	1.33	0.6
Africa	699	1138	2393	17.3	27	39.9	2.57	2.46	1.74
Asia	3432	4342	5164	53.9	43.9	5.7	1.61	1.03	0.11

Source: World Population Situation Report, 2014
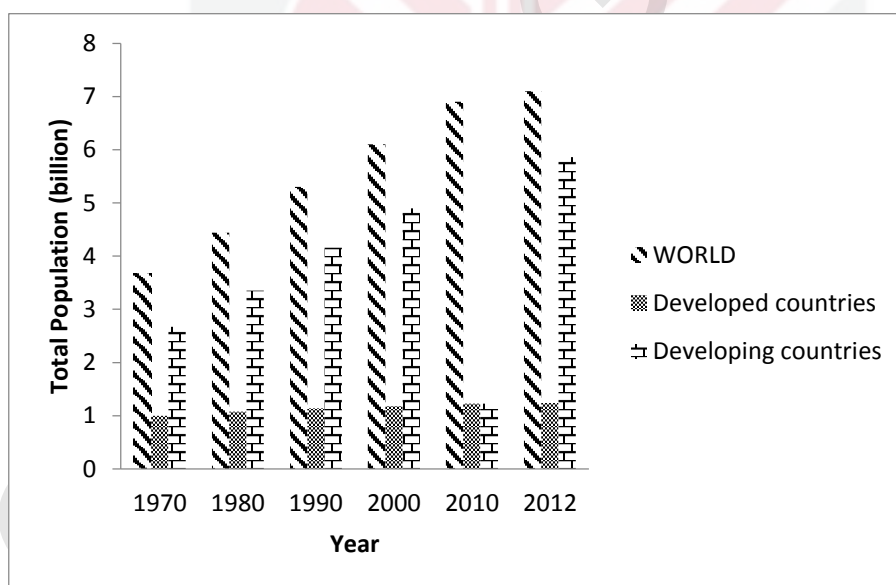
Figure 1.0: Total world population, developed and developing countries (billion)
(Source: United Nation, Population Division, 2015)

Besides that, total population in group countries such as BRIC (Brazil, Russia, India and China) has more than doubled over the past 50 years. Because of

2

their high expected growth rate and large population size, BRIC countries in general and China in particular will have a major impact on global economy. However, population growth is expected to slow down particularly over the next several decades, producing a concurrent fall in their share of the global population. Only India continues to see its population size and global share continue to expand. Total population in BRIC countries since year 1970 is 1.59 billion increased to 2.93 billion in 2012 where the composition of population is higher in China (1.34 billion) and India (1.24 billion) (Figure 1.1) and the total population in BRIC countries is 41% from world population for year 2012. Over the next 50 years, only India's population will continue to expand, reaching nearly 1.7 billion people by the year 2060. As a result, India is projected to overtake China as the most populous nation in the world in 2021, a position China has held since the UN data begins in 1950. India, expected to be the only BRIC to maintain its share of the global population. China will see a significant drop in the share from nearly 20% currently to 13% in year 2050.
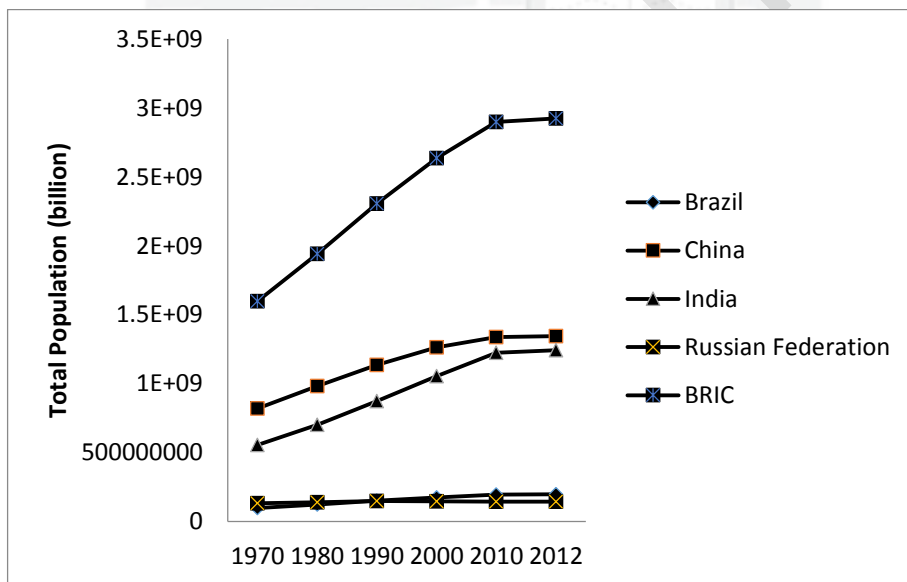
Figure 1.1: Total Population in BRIC countries (Brazil, Russia, India and China).
(Source: World Development Indicator (WDI), 2013)

China was the world's most populous country in 2012, with more than 1.35 billion people. China represents 19.17 per cent of the world's population, implying that one of five people in the world resides in China. In 1979, China implemented the One Child policy to control its population growth. This policy was intended to limit couples to have only one child. By 1987, the One Child policy showed a mixed result, where this policy was deemed successful in the urban areas and less successful in the rural areas. Table 1.1 shows the total

3

population, population growth, population ages structure (ages between 0-14 years, 15-64 years and 65 years and above), total birth rate and total life expectancy for China. From the table, population increased from 818 million to 1350 billion, and the population growth rates decreased from 2.76 percent in 1970 to 0.49 percent in 2012. This was the implication from implementing the population policy in China, in reducing the growth rate of population. Besides that, total number of population age structure indicates that total population ages 0-14 years is decreased and in line with the total birth rate which is reduced from 33.43 per 1000 people on 1970 to 12.1 per 1000 people in 2012. Otherwise total population ages 15-64 years and population ages 65 years and above increased. Population ages 65 years and above have a relation with the life expectancy, in 1970 total years for life expectancy is 64 years and has increased to 75 years in 2012. This indicates that, with the increasing in the total number of population ages 65 years and above gives impact to the total years of life expectancy. The total population whose age was 60 years old in 1987 were 127 million and this figure is expected to increase to 234 million in 2025. In addition, it is estimated that the population ages 65 years and above will increase to 25 per cent in the year 2040 if the One Child policy is to be maintained.

Table 1.1: Total population, population growth, population ages structure, birth rate and life expectancy in China.

Year	Population Total (Million)	Population growth (%)	Population ages 0-14 years	Population ages 15-64 years (% of working age)	Population ages 65 and above	Birth rate, (per 1,000 people)	Life Expectancy at birth, total (years)
1970	818	2.76	40.27	56.4	3.94	33.43	63.61
1990	1,135	1.46	29.29	66.0	5.77	21.06	71.07
2000	1,262	0.78	25.59	67.5	6.86	14.03	72.93
2010	1,337	0.48	18.14	72.3	8.35	11.9	75.03
2012	1,350	0.49	17.98	72.5	8.67	12.1	75.19

Source: World Development Indicator (WDI), 2013.

In year 2012, India was the second largest population after China. India passed the one billion mark in the year 2000. India is expected to surpass China by the year 2030 with approximately 1.53 billion people, compared to 1.46 billion in China. Table 1.2 shows the trend of total population, population growth, population ages structure, birth rate and life expectancy. Every year, the total population in India is increasing and the government is concerned about the expanding population size and total population which increased from 555 million in 1970 to 1236 billion in 2012, while the growth rate are decreases from 2.25 percent in 1970 to 1.26 percent in 2012. If the government does not manage the population growth, it could worsen the situation in the future. In the

4

early 1970s, the Indian government implemented a population control policy called "The Sterilization Program"[1]. This program forced men with two children or more to submit to a compulsory sterilization procedure. This program was not successful because it was much focused on a targeted quota rather than achieving a sustainable birth rate.

Moreover, there was no attention given to the role of women in the society. It was a one-size-fits-all program, which did not correspond well with the cultural and religious practices in India. Due to these factors, the program was ineffective and India did not succeed in reducing the birth rates and total birth rate reduced in a small percentage, which was, reduced from 38.35 in 1970 to 20.72 per 1000 people in 2012. Total life expectancy increases from 49 years in 1970 to 66 years in 2012. This figure indicates that, people have longer life, as there was an increase in the number of population ages 65 years and above. Starting from the year 2000, the Indian government has introduced the National Population Policy to control the population growth. The growth in population was found to be influenced by various factors, including a large percentage of the population in the reproductive age, high fertility rates, low infant mortality rates and early marriage among girls. The policy intended to provide contraception facilities and health care infrastructure, as well as government support in child health care and family planning. Since the policy implementation, the government has successfully reduced the population growth rate. In addition, there are also evidences of lower birth rates and fertility rates.

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[1]Jadvar, R.A., (2012) Population Policy of India, Global Economic Research, Vol 1 Issues II.

5

Table 1.2: Total population, population growth, population ages structure, birth rate and life expectancy in India

Year	Population Total (Million)	Population growth (%)	Population age 0-14 years	Population ages 15-64 years (% of working age)	Population age 65 and above	Birth rate, (per 1,000 people)	Life Expectancy (years)
1970	555	2.25	41.13	74.3	3.30	38.35	48.84
1990	873	2.09	37.50	65.71	3.89	30.69	58.53
2000	1,053	1.68	34.21	57.82	4.36	25.62	62.16
2010	1,205	1.38	30.17	48.45	5.06	21.28	65.69
2012	1,236	1.26	29.43	46.63	5.19	20.72	66.21

Source: World Development Indicator (WDI), 2013.
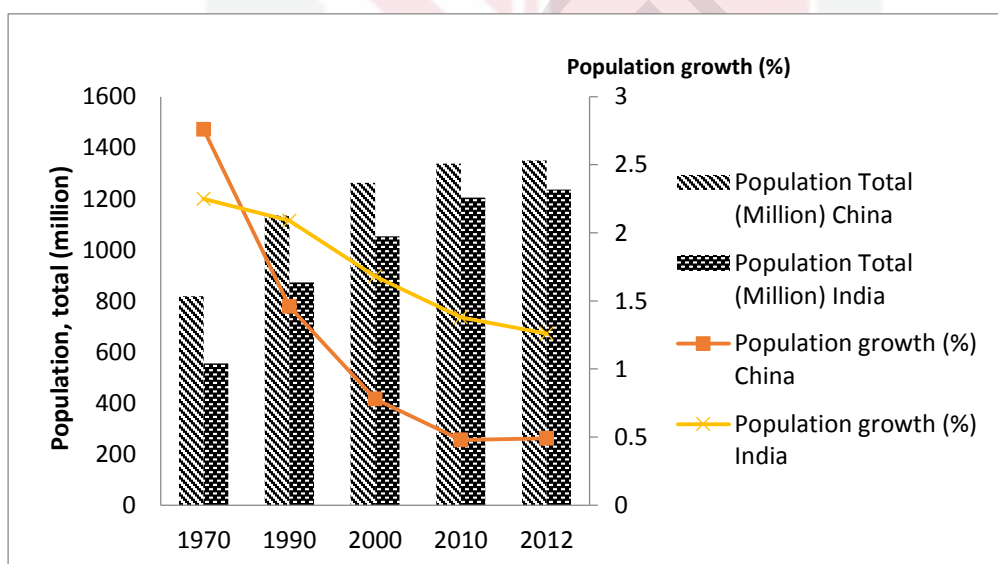
Figure 1.2: Total Population and Population Growth in China and India
(Source: World Development Indicator, 2013)
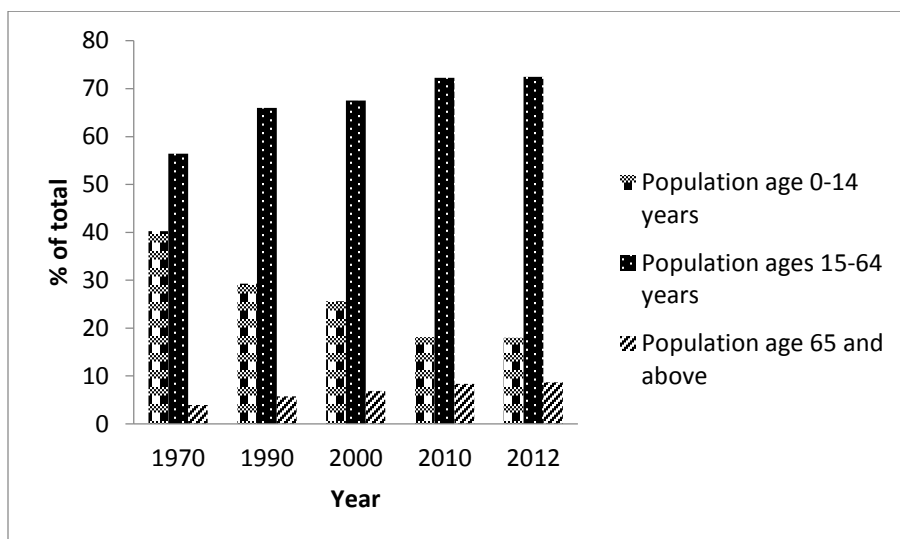
Figure 1.3: Population ages structure (ages between 0-14 years, 15-64 years and 65 years and above) in China from 1970-2012
(Source: World Development Indicator, 2013)
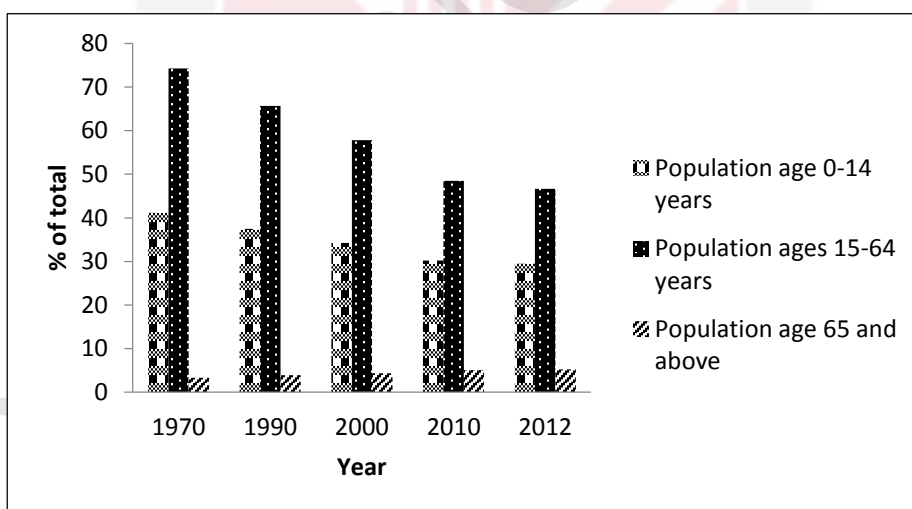
Figure 1.4: Population ages structure (ages between 0-14 years, 15-64 years and 65 years and above) in India from 1970-2012
(Source: World Development Indicator, 2013)

Figure 1.2 shows the total population and population growth in China and India. The trend of total population in both China and India increased from year to year and achieved almost 1.3 billion in 2012, but the percentage of population

growth decreased. An increase in the total population has an impact on the population ages structure as shown in Figure 1.3 for China and Figure 1.4 for India. From the figure, both China and India population ages 0-14 years reduced and population ages 65 years and above increased because of the longer life expectancy and number of population ages 65 years and above increased.

The increased population in China and India and the changing in demographic will influence the food security and expenditure on health care and education. Food security is an important element guaranteeing a sufficient and availability to each population to ensure a better life and at the same time, it supports with the food policy. As the increases in population size, countries may face problems such as increase in population is higher than rate of increase in resources. In addition, China and India are facing problems of insufficient resources to produce food for each population.

Another issue is the government faces heavy burden for health care and education expenditure because of the bigger population and changing in the number of population ages structure. Increases in the number of population and population ages will burden in health care expenditure. Otherwise as a bigger population, they are potential to the country as a human capital. Thus education is important to ensure to produce quality human capital.

1.2   Population, Food Dimension and Food Security

According to the Food and Agriculture Organization (FAO) of the United Nations (UN), a rapid increase in population and high fertility rates has created a food insecurity problem in most of the developing countries (FAO 2010). From the United State Agency for International Development (USAID, 1992), three distinct variables which are central to the attainment of food security are based on three dimension; food availability, food accessibility and food utilization. Food availability means having available and sufficient quantities of food on a consistent basis. Food accessibility proposes having sufficient resources, both economic and physical to obtain appropriate food for a nutritious diet. Food utilization is the appropriate use based on knowledge and basic nutrition care, as well as adequate water and sanitation. Food security is important to ensure that food supply is an adequate and accessible at all times. Food security measures dietary energy supply adequacy which means that food is sufficient at all time, people can easily access the food. The trend adequacy of food is shown in Figure 1.5. Total dietary energy supply of adequacy shows increases but the growth rate of DES dropped sharply from year 1980 to 1990 and after that it increased but in small percentage.

Food security refers to the availability of food and one's access to it. A household considers the food secured when its occupants do not live in hunger or fear of starvation. It is measure of resilience to future disruption or

8

unavailability of critical food supply due to instability, war and other factors. A theory by Thomas Malthus states that an uncontrolled increase in population will create food shortage due to different rates of growth of the population and food production. An increase in population, especially in China and India, will threaten the availability of the resources. There are different effects of a high population and sufficient natural resources that are important for their livelihoods. There will be more pressure on the food production because of the limited land for expansion, inadequate clean water supply and the depleting of other resources. Therefore, to reduce total population policy measures may need to be taken.

There is a significant challenge faced by countries on ensuring food security because of high population, and less availability of quality natural resources to produce food. There is an imbalance between the increases in population with the increase in food production, which is a serious problem of feeding an increase of a million people each day. Thus, it is believed that an increasing number of populations will trigger the food insecurity problem and a higher rate of population growth is the principal factor in stimulating the demand for food. Since it is estimated that the population in China and India will achieve 1.53 billion and 1.46 billion respectively in 2030, this will increase the demand for food and instigate food problems in these region (United Nations Report, 2011). Due to the expectation of population increase in the coming decades, the process of urbanization must be accelerated with an increase in the income level and food production.

In China, the policies on food security, such as reserve policy, increase crop imports, controls over imports of key commodities, growing control over agricultural production and protectionism, export restriction and overseas investment in agriculture (FAO, 2010). To guarantee food security, the Chinese Government has made unremitting efforts to stabilize the basic policy for rural areas by increasing agriculture input, improving food distribution, raising the income level of its citizens and protecting agricultural resources.

By strengthening the development of grain distribution infrastructures, farmers have enjoyed rapid development and they have formed an agricultural products market system combining the markets in producing areas, purchasing areas and distributing areas. In light of the existing problems in facility building for agricultural products circulation, the Chinese Government has made it one of the top priorities in national economic development in the Tenth Five-year Plan Period to speed up the development of related infrastructure so as to further improve the agricultural product circulation system. Besides that, Chinese government also gives allowance to the low-income earners and poverty-stricken population to ensure that they have easy access to food. Thus the government is establishing and improving the minimum subsistence allowance for urban residents and improving the food purchasing power of the low-income earners in cities. Following that, the Chinese Government has arranged special funds for the implementation of the "reemployment project" to provide skill training for the unemployed and help them find new jobs at an early date. And

at the same time, the unemployed can receive a basic subsistence allowance to increase their food purchasing power.

In India, the government ensures that the people will get access to food and nutrition. The social protection programs are needed such as Public Distribution System (PDS) to help poor people to purchase the food they need at the market prices. The government of India is providing two solutions to ensure an adequate purchasing power of the poor to buy food. Firstly, by employment intensive patterns, it can provide remunerative work for the poor and enhance their purchasing power. The second is through social programs like PDS and employment program, which can help increase the income and subsidize food (FAO, 2013). Public Distribution System (PDS) will ensure sufficient food for each household and ensure on availability of commodities such as rice, wheat and others.

To solve the food insecurity in India it includes social protection program such as food aid. To achieve the demand for food, agriculture productivity through the development of drought resistant crops and soils. On the other hand, better infrastructure always plays a role in increasing the food production such as roads, irrigations and storage facilities. With the slower population growth it can help to maintain the food security for the country, because when the population trend is increasing it will affect the demand of food for the decades to come.

Worldwide, around 925 million people are chronically hungry due to extreme poverty, while up to 2 billion people lack food security intermittently due to varying degrees of poverty (FAO, 2010). According to the International Centre for Trade and Sustainable Development, failed agriculture market regulation and lack of anti-dumping mechanisms endangers much of the world scarcity and malnutrition. As late 2007, export restriction and panic buying, US Dollar Depreciation, increase farming for use in biofuels, world oil prices at more than $100 a barrel, global population growth, climate change, loss of agriculture land to residential to industrial and development and growing consumer demand in China and India, claimed to have pushed up the price of grain. On the other hand, total arable land hectares per person decreased for China and India. This is because an increase in population wills detriment the total arable land per person and the food production will be lower for each population. Figure 1.6 shows the total production for China and India. Total production in China is higher than India and both increased. But then again, between year 2010-2012, growth rates of food production are lower in China and negative growth in India. One of the decreasing factors in the total production is the reducing of total arable land. Figure 1.7 shows the total arable land in China and India. The trend of total arable land decreases and this will influence the total food production starting in year 2010 and above.
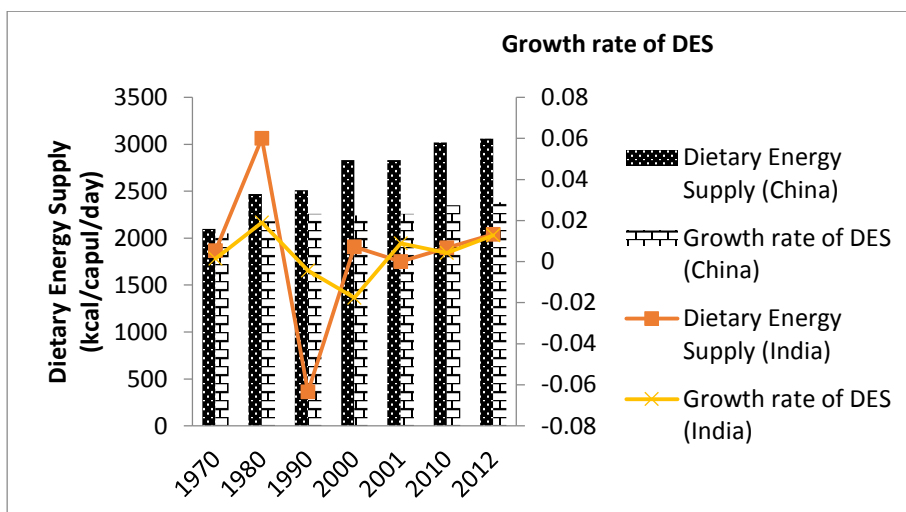
Figure 1.5: Dietary Energy Supply and growth rate of dietary energy supply in China and India from1970-2012
(Source: FAOSTAT, 2013)
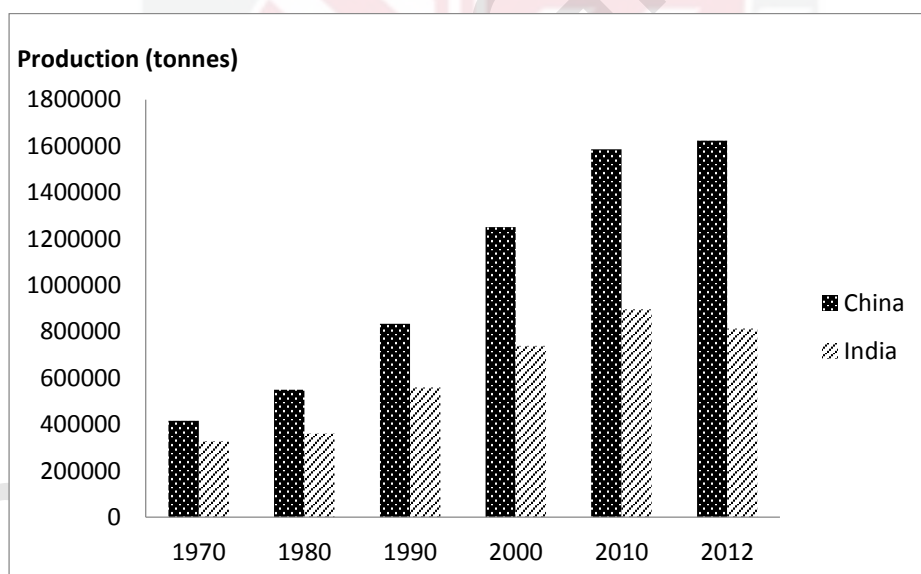
Figure 1.6: Total food production (tonnes) in China and India from 1970-2012
(Source: FAOSTAT, 2013)

11
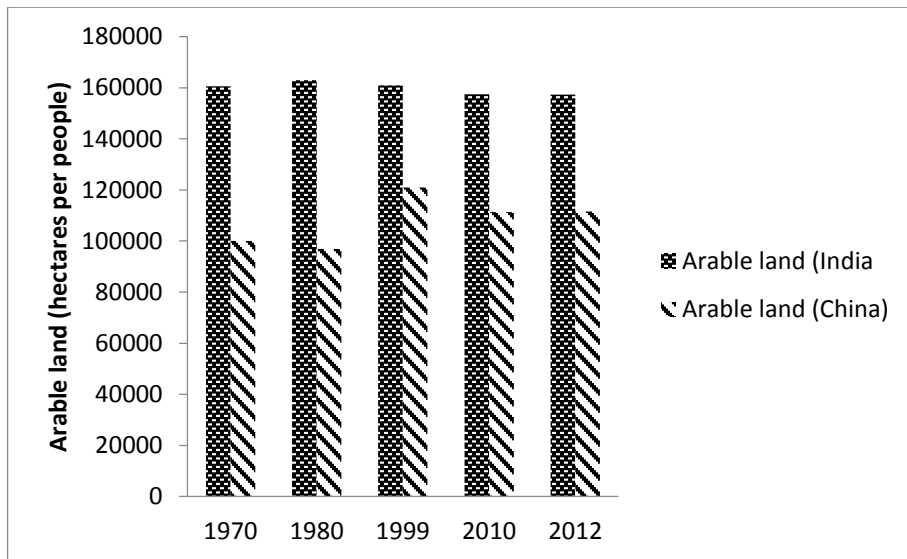
Figure 1.7: Total arable land (hectares per people) in China and India from 1970-2012
(Source: FAOSTAT, 2013)

Another measurement of food security is food availability, which is measured by food import. To solve the food problem, policy makers should control the food import. The trend of food import in China and India decreased from year 1970 - 2012 (Figure 1.8). This trend will impact the adequacy of food. Thus, government should take actions to ensure sufficient food from the food import. Besides that, the food price is also one of the important measurements to the food security and the increases in the food price, will burden people to buy food. Figure 1.8 also shows the trend of domestic food price in China and India. From the figure, the domestic food price always increases.
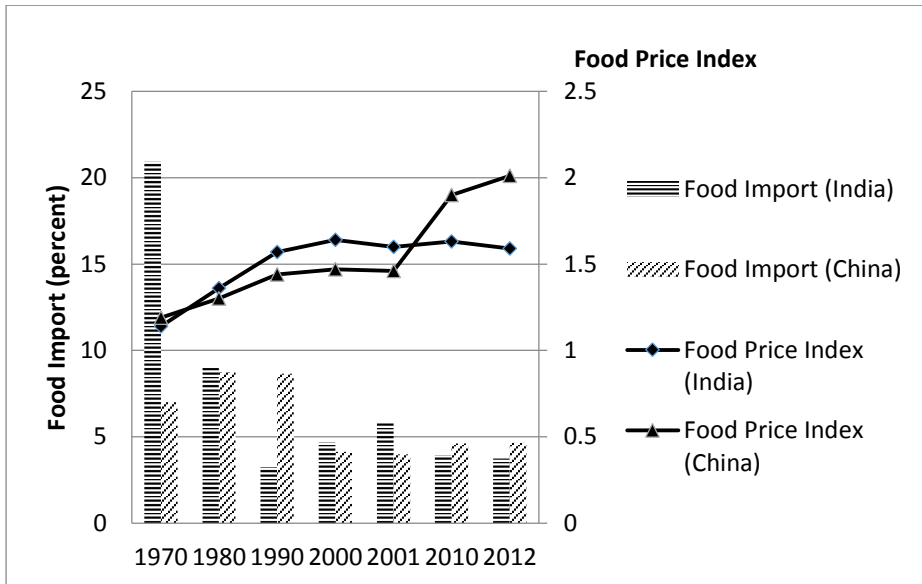
Figure 1.8: Trend of food import and domestic food price for China and India from 1970-2012
(Source: FAOSTAT, 2013)

Other than concern of food production, food import and food price, FAO also highlighted the infrastructures that are important for food security to reach all people at any time. The problem of food accessibility is the low access to food. Infrastructure in terms of adequate energy and water or irrigation supplies, high speed communications, and seamless transportation systems connecting areas of high production with centres of high consumption, all play a crucial role in safe guarding food security. Because of the differing locations of activities along the food supply chain, their economic relationship is based on efficient transportation and long distance communication services. There are essential to ensure sustainable access to basic food product. Moreover, the development of regional infrastructure that can contribute to food supply and price stability will have a decisive impact on the overall level of consumption and on food security. Besides that, food utilization is measured by adequate water supply; this dimension must support the food security.

There is a strong relationship between agricultural productivity, hunger, poverty and sustainability. Almost three-quarters of the world's poor live in rural areas and make their living from agriculture. Hunger and child malnutrition are greater in these areas than in urban areas. Rural proportion obtains the income from the farming but with pro-poor technologies and access to market, it is a problem. Receiving low income and thus will incidence of the malnutrition. Therefore, improvements in agricultural productivity aimed at small scale farmer will benefit rural poor first. Food and feed crop demand is likely to double in the next 50 years, as the global population approaches nine billion.

13

Growing sufficient food will require people to make changes such as increasing productivity in areas dependent on rained agriculture; improving soil fertility management; expanding crop areas; investing in irrigation; conducting agriculture trade between countries; and reducing gross food demand by influencing diets and reducing post-harvest losses. Increased agricultural productivity enables farmers to grow more food, with translates into better diets and under market condition that offer a level playing field, into higher farm income. With more income, farmers can diversify production and grow higher value crops and this will benefit not only themselves but also the economy as a whole.

1.3   Population and Health Care Expenditure

Across the globe, there are variations on the amount different countries spend on health. In high-income countries, the per capita health expenditure is over USD3000 on average, while in resources the poor countries are at USD 30 per capita. In 2008, there were 64 countries per capita health expenditure, which was less than USD100. There is also a wide variation in health expenditure with respect to economic development. Some countries spend more than 12 percent of GDP on health, while others spend less than 3 percent on health (World Health Organization, 2011).

Total healthcare expenditure in China has risen steadily since 1995 from 3.7 percent of GDP to 5.25 in 2012. The increase was mainly due to a sharp increase in private healthcare expenditure from 1.74 percent of GDP in 1995 to 2.38 percent in 2012. Correcting for inflation, however, the average annual real growth in China's total health expenditure was 12 percent at constant price during 1978-2002, compared to 18 percent at current prices (World Health Organization, 2006). For India, the total health spending raised from 4.01 percent of GDP in 1995 to 4.68 percent in 2012. This was mainly due to an increase in private healthcare expenditure.

The health care structure in the country overburdens from their increasing population, thus family planning program is needed to be reactive especially for India. India faces the twin epidemic of continuing emerging infectious diseases as well as chronic degenerative diseases. The former is related to poor implementation of the public health programs, and the latter to demographic transition with increase in life expectancy. Economic deficiency in large segment of population results in poor access to health care. Poor educational status leads to non-utilization of scanty health services and increase in avoidable risk factors and these are related to life expectancy and infant mortality rate. Advances in medicine are responsible for no more than half of the observed improvement in health indices.

The main indicators of the human development are longevity, literacy and GDP per capita. Longevity is measuring of state of health, and links to income and

14

education. Weakness in health sector has an adverse effect on longevity and report by Human Development Index (HDI) in year 2012 India ranked low at the 130th amongst world nations judged and China ranks a very high human development at 12th (United Nation Development Program, 2015). India faces high burden of disease because of lack of environmental sanitation and safe drinking water, under-nutrition, poor living conditions and limited access to preventive and curative health services. Besides that, lack of education, gender inequality and explosive growth of population contributes to increasing burden of disease. And the full impact of HIV epidemic and tobacco related a disease is yet to be felt. Expenditure on health by the government continues to be low start from 1990 (Figure 1.9) both in China and India It is viewed as an investment but rather as a dead loss because of states under financial constrain cut expenditure on health. Growth in national income by itself is not enough, if the benefit do not manifest themselves in the form of more food, better access to health and education (Sen, 1972).
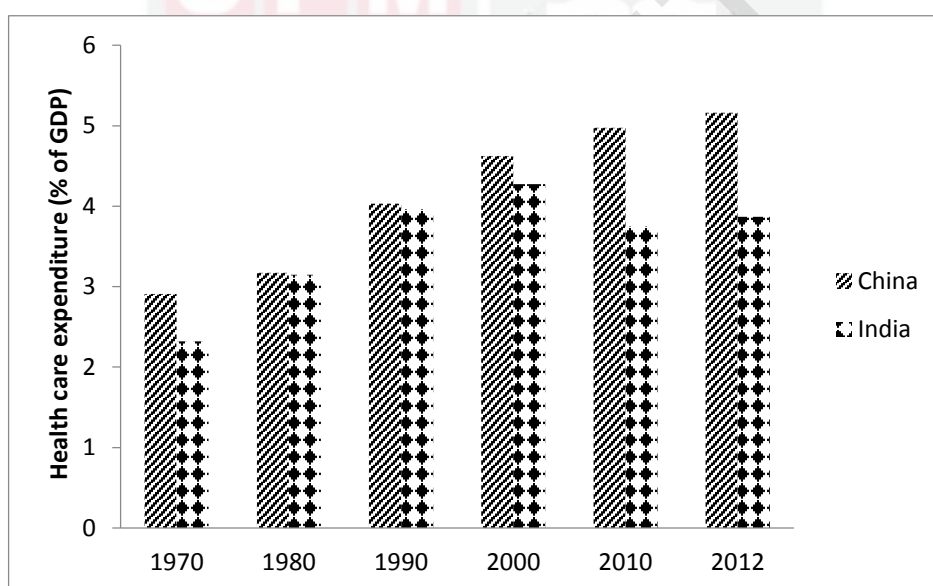
Figure 1.9: Health care expenditure (% of GDP) in China and India from 1970-2012
(Source: World Bank Indicator, 2013)

Health care spending varies by factors such as age and sex. Average health care spending per person increase with age, although spending for children and for young adults is equally the same, but spending on adults, age 65 and older have the highest health care spending and more longer life expectancy increase the cost of medical care (National Institute on Aging, National Institute of Health, 2011). The growing population enlarges the patient pool for healthcare market in China. And China is also facing an aging society, unfortunately, diseases especially chronic diseases affect older adults disproportionately, and as a result of ageing population, China will be

15

increasingly pressured to handle a growing sick population. An ageing society could lead to an increase in needs for medical services which could boost the health care industry. When people get old, they are normally fragile to diseases, and older people consume more drugs than younger people do.

In general, the analysis shows that healthcare costs increases by age with the exception of the very youngest ages. Costs, on average, are very high in the first year and two of birth and drops significantly by the age of five. At this point, cost increases modestly through the teen years. The "cross-over-age" occurs in the early 60s, when the per capita spending for male exceeds than the females. Medicare costs for beneficiaries age 65 and older continue to increase with age (Yamamoto, Health Care Cost Institute's Independent Report Series, 2013).

Population age structure is often included as a covariate in health expenditure regression. Commonly used indicators are the share of young (aged under 15 years) and old people (ages above 65 years) over the active or total population (Xu and Saksena, 2011). The increasing health care suggests an increasing market scale for healthcare. Using data compiled by the World Bank and United Nations, Wang (2012) describes the compression of demographic change into such a short period of time means that China will be the first major economy to grow old before it grows rich. Flaherty et al. (2007) used survey data gathered by the World Health Organization and found that as of 2006, the 60 years and plus population requiring nursing home care in China was 6.5 million. The author then projected this number to rise to 16.8 million in 2030, based on a 5 percent estimate seen in most developing countries (Flaherty et al., 2007).

Besides that, report from United Nations, World Population Prospect (2010) the rising life expectancy within the older population itself is increasing the number and proportion of people at very old ages. The "oldest people" (people aged 85 or older) constitute 8 percent of the world's 65 and over population: 12 percent in more developed countries and 16 percent in less developed countries. In many countries, the oldest old are now the fastest growing part of the total population. On a global level, the 85 and over population is projected to increase 351 percent between 2010 and 2050, compared to a 188 percent increase for the population aged 65 or older and a 22 percent increase for the population under age 65 (Figure 1.10).
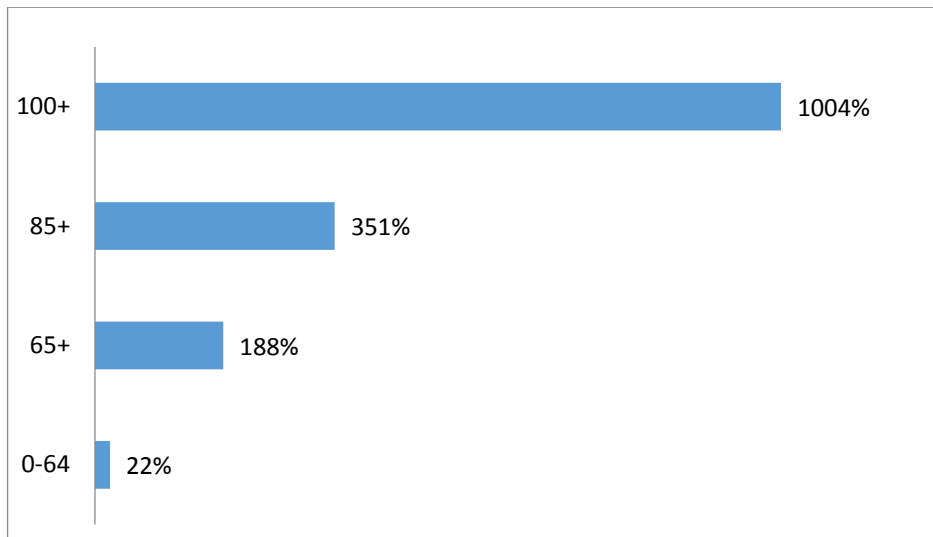
Figure 1.10: Percentage Change in the World's Population by Age, 2010-2050.
(Source: United Nations, World Population Prospect: The 2010 Revision)

In 2010, an estimated 524 million people were aged 65 and above is 8 percent of the world's population. By 2050, this number is expected to nearly triple to about 1.5 billion, representing 16 percent of the world population. Although more developed countries have the oldest population profiles, the vast majority of older people and the oldest population profiles, the vast majority of older people and the most rapidly aging population are in less developed countries. Between year 2010 and 2050, the number of older people in less developed countries is projected to increase more than 250 percent, compared with a 71 percent increase in developed countries.

Besides that, population ages 65 years and above or ageing needs much more on health care, including nursing and other services and expenses are expensive because of high technology and cost of hospitalization. This ages is one of the factors influences the increase in the health care expenditure. The more elderly population will challenge the health system and the projected expenditure for ageing population for both most populous countries is increasing. In fact the total population ages 65 years and above is increasing from 110 million in 2011 to 330 million in 2050 in China, while in India, the health care expenditure increased from 60 million to 227 million in 2050. Over the past century, life expectancy has increased dramatically and the world will soon have ageing people larger than children. Although population ages 65 years and above is occurring in every country, the top 10 countries with the highest share of ageing are the developed countries but the trend will change by year 2050. China and India will be among the countries that cover the developing countries by 2050 in terms of growth of ageing population. A longer life means that people have both, the more productive years and the more

17

years of suffering and ageing, which is associated with the extended period of morbidity (Castro et al., 1998). This age structure will increase pressure on health infrastructure and health spending. The major challenges of population ages 65 years and above include the increase in economic and social demands, rising burden of chronic disease, increase risk of disability, care providing for ageing and the feminization of ageing.

China being a country with population ages 65 years and above lacks the access to health care and identified as major concern by most citizens in China (Gu et al., 2009). On the other hand, India seems to lack in elderly centric policies, the existing policies are for namesake like old age pension scheme for poor elders of the Ministry of Social Welfare and Empowerment, separate queues for older persons in government hospitals, setting up the geriatric department in 25 medical colleges by the Ministry of Health and Family Welfare.

In addition, the rapid economic growth in these countries, accompanied by rapid urbanization, may also include in a non-communicable disease. Urbanization is associated with unhealthy nutrition and physical inactivity, leading to obesity and increase in the prevalence of chronic diseases such as diabetes. The number of people with diabetes in China is projected to increase 103.4 percent from 20.8 million to 42.3 million, between 2000 and 2030. The rate of diabetes in India is expected to increase 150.5 percent from 31.7 million to 79.4 million over the same period. The Global Burden of Disease (GBD) study estimated that in 2001 almost half of the adult disease burdens in low and middle-income countries were attributes to non-communicable diseases. The chronic heart disease and stroke were the two leading causes of mortality and disease burden in people aged sixty and older.

Investment in the social sector is likely to receive increasing attention from policymakers China is currently facing demographic challenges as a result of its population control policies and the nature of its economic development process. While the care of parents and elderly relatives has traditionally fallen to their children, China's one child policy and growing geographic dispersion of families (due to the migration of young people to urban areas) means that the task of ages care is becoming increasingly difficult to manage. To responds to these challenges, Chinese authorities are working to ensure that 98 percent of the urban population has medical insurance and more than 90 percent are covered by the old age pension by 2020, compared with 95 percent and 67 percent currently (State Council 2014a). While, on some metrics, China's and India's medical infrastructure compares favorably to some developed economies, it remains low compared with some developed East Asian and emerging economies (Figure 1.11). Hospital beds density in India has stagnated at 0.9 per 1000 population since 2005 and falls significantly short of WHO laid guidelines of 3.511 per 1000 patients' population.

However, the quality of health care provision obviously depends on several factors besides just infrastructure, and China and India significantly lag most developed countries on these terms, such as number of doctor per person (Figure 1.12) and quality of health services. Ages care homes and medical facilities are likely to require further investment to accommodate urbanization and an ageing population. Currently, India is in year 2012 known to have approximately 600,000 doctors and 1.6 million nurses. This translates into one doctor for every 1,800 people. The recommended WHO guidelines suggested that there should be one doctor for every 600 people. This translates into a resource gap of approximately 1.4 million doctors and 2.8 million nurses.
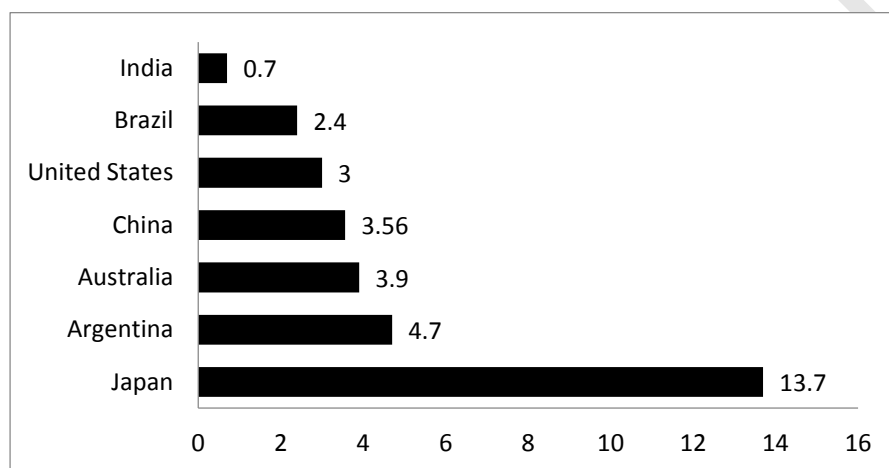
Figure 1.11: Hospital Beds per 1000 people*
 *Hospital beds include inpatient beds available in public, private, general and specialized hospitals and rehabilitation centres
(Sources: World Health Organization, World Bank)
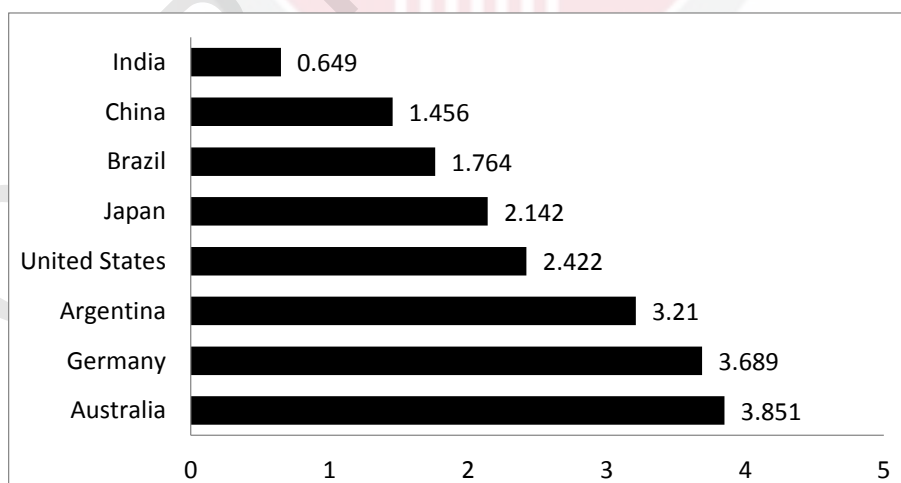
Figure 1.12: Doctors per 1000 people*
(Sources: World Health Organization, World Bank)

19

1.4 Population and Education Expenditure

Recent research by economists Allen Kelly and Robert Schmidt indicated that during the 1980s population growth, on average, acted as a brake on economic growth as measured by the growth rate of per capita gross domestic product, or GDP. The relationship between population growth and depressed economic performance is strongest among the poorest nations of the developing world, and the effect on this group extends back to the 1960s and 1970s. The growth of gross domestic product can be constrained by high dependency ratios, which results when rapid population growth produces larges proportions of children and youth relative to labour force. Since governments and families spend far more on children then these children can quickly repay in economic production. Especially as modern schooling and health care replaces child labour, economists expect consumption related to children to retard household savings, increase government expenditure and ultimately cut into the growth of GDP (Richard, Cincotta and Engelman, 1997).

The rate of population growth and the size of the annual growth increments do matter. Even in the case of countries that can adjust to their present rates of population growth. Economists recognized that it takes time and effort for government and other institutions to expand urban infrastructure, provide new and better health and educational services, successfully integrate technology, enforce environmental regulation and expand trade. Developing countries in which population growth eases through declines in birth rates will be more likely to increase per capita economic growth rates and will have more time to generate needed jobs (National Research Council, 1986).

Education is utmost important to the development of the human capital and the economic development. Large portions of the population will be of working age in year 2020-2025 have already completed their schooling, and those currently in school and recent graduates will be important contributors to this group (National Defence Research Institute, 2011). Thus, the increase in population especially in China and India are the factors of the increase in the education expenditure. The share of GDP devoted to education financing in China and India are 1.9 (% of GDP) and 4.3 (% of GDP) in 1999 and for year 2012, government expenditure on education increased to 3.71 % and 3.8% in China and India respectively. It has been growing significantly over the years, which means that a significant share is being devoted to other competing priorities as opposed to education (UNESCO, 2015). The total investment made by a country on its people in the form of education is a matter of great interest and importance. The Incheon Declaration adopted by the World Education Forum recognises that the proposed Sustainable Development Goal for education cannot be achieved without a significant and well-targeted increase in financing. The declaration has increased the education financing targets for international benchmarking and has set targets to at least 15-20 percent of total public expenditure to education (World Education Forum, 2015).

20

The changing of the demographic transition spreads out in education, because of the increasing in the population ages 0-14 years. Most importantly in education is the contribution to economies, societies and to the economic fortunes of individuals and illiteracy itself is a powerful predictor of poverty. This expenditure on education is important to increase the economic growth and well-being of the society. Figure 1.13 shows the total education expenditure for China and India from year 1970 to 2011. The figure shows the total education expenditure for both countries are increasing and total education expenditure in China is higher than total education expenditure in India.
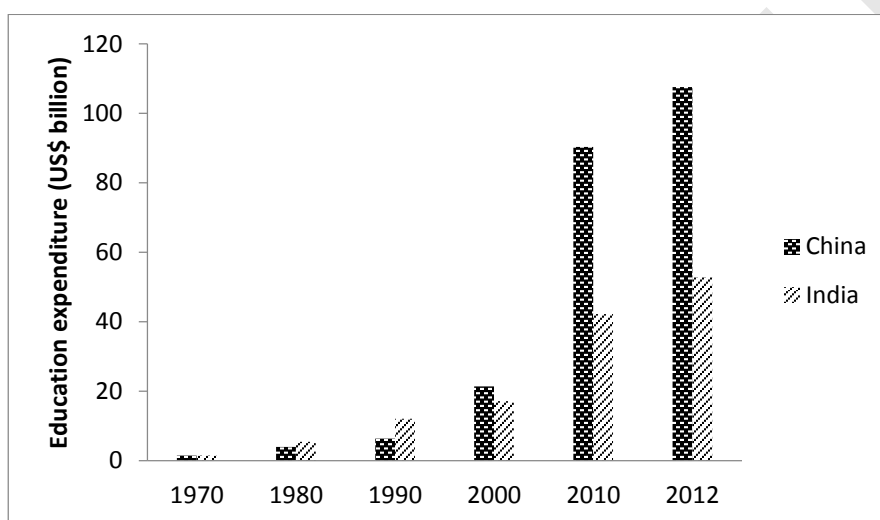
Figure 1.13 Total Education Expenditure in China and India from 1970-2011
(Sources: World Bank Data, 2013)

The relationship between demographic factors on education recognizes academic and policy setting. The increase in the population number will increase the number of school age population. China's rapid population growth is likely to impede educational development either by reducing quality to maintain enrolment or by reducing the quantity to maintain educational quality (Wei, 1988). Nonetheless, China has made significant progress in education. Figure 1.14, Figure 1.15 and Figure 1.16 shows the school enrolment rate for primary, secondary and tertiary for China and India. Gross enrolment includes students of all ages. In other words, it includes students whose age exceeds the official age group from example repeaters. Thus if there are late enrolments, early enrolments or repetitions, the total enrolments can exceed the population of the age group that officially corresponds to the level of education leading to ratios greater than 100 percent (World Bank Data, 2016).

Primary school is higher than the secondary and tertiary among the people of China and India. As the fertility rate decreases from implementing population policy, it will result in a better education because with only a child in the family in China and it will support the family to increase family income and help to improve their child's education. In India, primary school enrolment rate also increased and this means that India has made a progress in increasing their level of child education, especially in the first level and will increase the literacy of the population. Figure 1.15, shows the secondary school enrolment for China and India, this figure shows that both in China and India, total secondary school enrolments increased from year 1970 to 2012 and Figure 1.16 shows that the tertiary school enrolment trend slightly increased from year 2000 both in China and India.
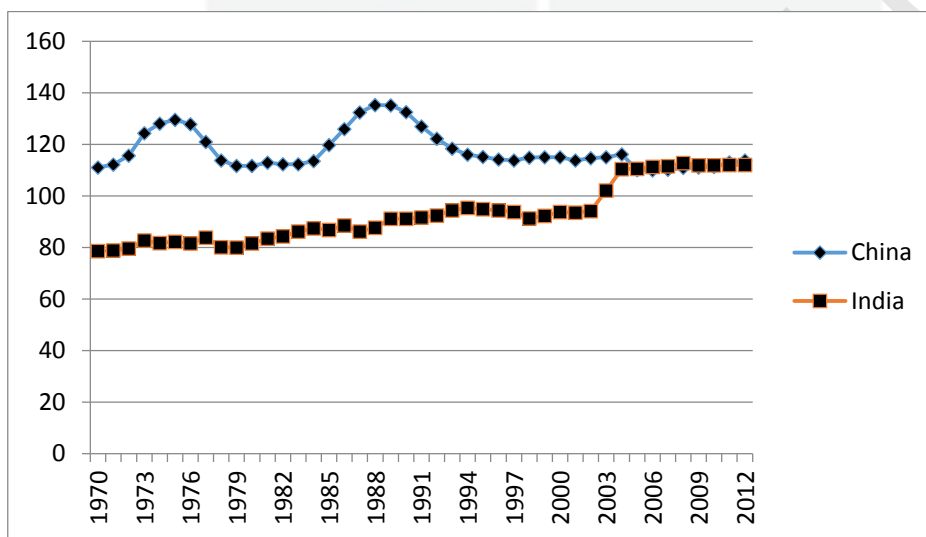
Figure 1.14 School enrolment rate for primary (% gross) in China and India from 1970-2012
(Source: Source: United Nations, Educational, Scientific & Cultural Organization (*UNESCO*), 2013)
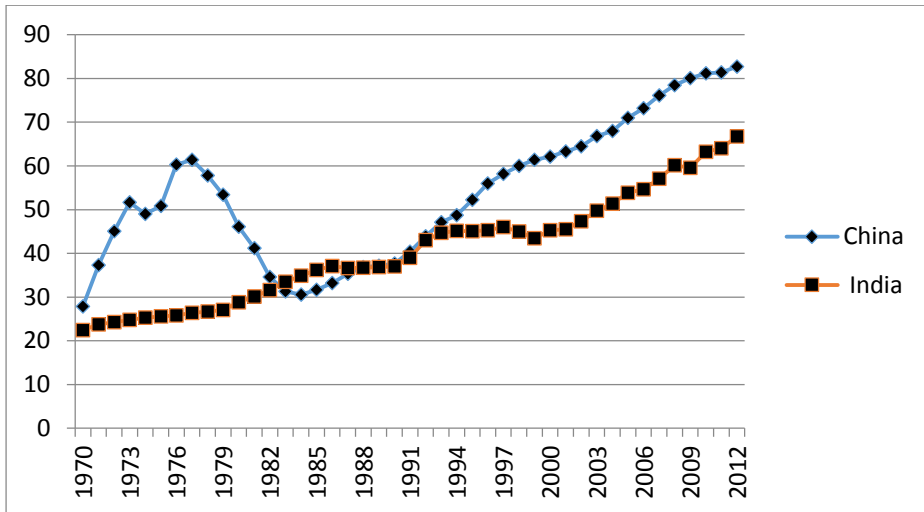
Figure 1.15 School enrolment rate for secondary (% gross) in China and India from 1970-2012
(Source: Source: United Nations, Educational, Scientific & Cultural Organization (*UNESCO*), 2013)
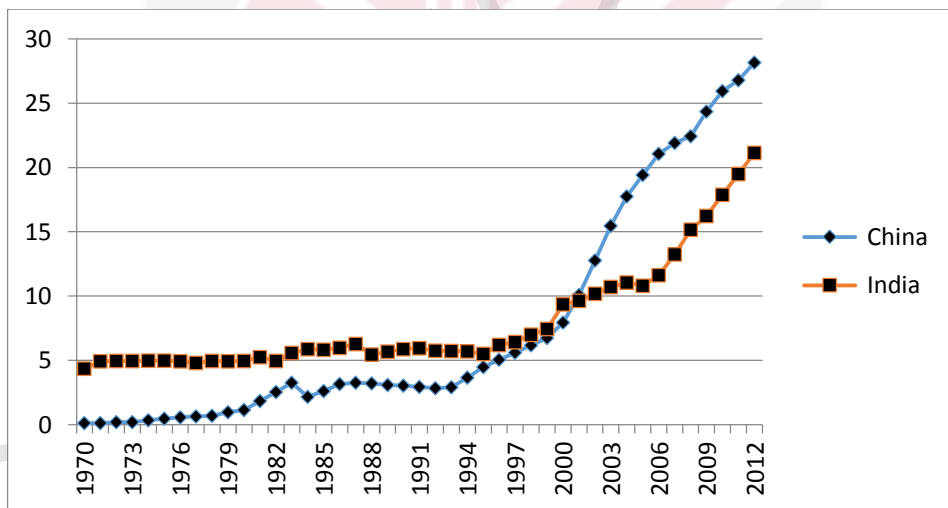
Figure 1.16 School enrolment rate for tertiary (% gross) in China and India from 1970-2012
(Source: Source: United Nations, Educational, Scientific & Cultural Organization (*UNESCO*), 2013)

China and India have the two largest populations in the world; each has over a billion people. The population of China is currently larger than India, but with its higher population growth rate, India's population size projects to surpass China's in year 2030. China's lower fertility rate and longer life expectancy

23

have led to a population that is considerably older than India's. The proportion of the population ages 15-64 years has been higher in China than in India since the mid-1970s and is projected to be so until 2030. Figure 1.3 and Figure 1.4 shows the percentage of the population ages 0-14 years and population ages 15-64 years for China and India for year 2012. An increasing proportion of the population ages 15-64 years provides an opportunity to reap a "demographic dividend"[2] both through both physical force increase in the number of potential workers and an accelerated accumulation of capital due to reduced spending on dependents. The proportion of population in China that is of working age is peak at 2011 and generally decreases thereafter. In India, however, the proportion of the population that is of working age is projected to increase through 2029. China's demographic window of opportunity is rapidly closing, while India's will remain open until at least 2030.

In 1986, China enacted its Compulsory Education Law, which calls for each child to have nine years of formal education, including 5 or 6 years of primary schooling and 3 or 4 years of junior middle schooling. It is worth nothing that since 1978, occupational and polytechnic secondary schools have experienced rapid development. This development has resulted from the huge demand for the medium level technicians, skilled workers and business professionals due to rapid economic growth. During the Cultural Revolution these schools were closed down, so at the start of economic reform there was a shortage of these professionals. In response to the growing demand, the Chinese government began to adjust its policies and promote the development of these occupational schools.

The implication from the reforms of educational policies and implementation in the 1990s and early 2000s are until 2010, the gross entrance rate of senior high school education will rise approximately 40 percent to over 70 percent until 2010 that will be key period for development. From 2010 to 2020, nine-year compulsory education will reach the world's most advanced level, and the gross entrance rate of senior high school education will rise approximately 85 percent. From year 2021 to 2050, China will universalize twelve-year compulsory education with high standards for better quality. The gross entrance rate for higher education will rise 50 percent (Dongpoing, 2005).

Efforts to expand access to education have coincided with an extraordinary growth in population numbers. Following the same trend as the population at large, the school age population has been growing rapidly. Although school systems vary, typically primary schools students are expected to be ages 6-11 years, secondary-school students 12-17 years, and student in tertiary level 18-23 years. The school age population in China and India are projected to

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[2] Based on United Nation Population Fund (UNFPA) defined "demographic dividend" as the economic growth potential that can result from shifts in a population's age structure, mainly when the share of the working-age population (15 to 64) is larger than the non-working-age share of the population (14 and younger, and 65 and older).

increase by 20 percent and 24 percent respectively for 2000 and 2050 (Monthly Labor Review, May 2002) (Table 1.3).

Table 1.3: Projected Change in Size of the School Age Population, 2000 and 2050, for China and India

	School-age population, ages 6-23 (millions)		Percentage of population in school-ages years	
Country	2000	2050	2000	2050
China	378.9	290.4	30	20
India	371.4	374.8	37	24

Source: World Population Prospect: The 2000 Revision, Vol.1

On the other hand, India has the world's largest population in age group between five to 24 years (450 million). It also has around 500 million in the age 25-59 age which constitute the working population and is expected to continuously increase even as the world working population ages diminish. This phenomenon will make India the supplier of workforce to the entire world. In reality, India's education system should be able to produce a workforce, which is globally competitive. Literacy rate in India is one of the key deterrents to socioeconomic progress of the country and India has the largest illiterate population compared to any other nation in the world (India Population Census, 2011).

High proportion of school-age children, characteristic of countries experiencing rapid population growth, absolutely put pressure on existing school and health care facilities. When school enrolments and average educational attainment increase rapidly, government can expect upward pressure on national education budgets. In the absence of even more rapid growth in government revenues or major shift in government spending priorities, this tends to depress public education expenditures per student. Yet most developing countries do shift priorities, continuing to make substantial gains in schooling and health despite the budgetary pressures (Kelley, 1996).

According to the National Policy on Education 1968, the government of India had formulated certain principles to promote the development of education in the country. These principles are free and compulsory education, based on these principles education should be free and compulsory up to the age of 14. Steps should be taken to ensure that child who is enrolled in the school should successfully complete the course. Second, education of teachers; teacher is the most important person to determine the quality of education in the country. He should be honoured in the society. His emoluments and service standard should be increased with due regards to their responsibilities and qualifications. Proper attention must be granted for teacher's education. Third is the education opportunity for all, under the policy every child of the country should get

25

education irrespective of caste, religion, region or whatever the case may be. Special emphasis should be given to backward classes, minority children, girls and physically challenged children to avail education facilities.

National Policy on Education (NPE, 1986) declared last in 1968, has been responsible for considerable expansion of education in the country at all levels. However, due to lack of financial and administrative support, gaps in implementation remained. In 1986 Government published a document on education which formed the base for new NPE with special emphasis on the removal disparities and to equalize education opportunity, especially for India women, Schedule Tribes (ST) and the Scheduled Caste (SC) communities. National Committee's Report on UEE in 1990 stated that school increased 4 times to 930,000. Enrollment at primary level increased 6 times to 110 million. Enrollment increased 13 times at upper primary level. Enrollment of girl increased 32 times. 94% population had access to primary education. But then again 59 million school children were not attending school including 35 million girls. There were high dropout rate. Low level of learning achievement, low coverage disadvantage groups, inadequate school infrastructure, poorly functioning schools, high number of teacher absenteeism, large number of teacher vacancies, poor quality of education and inadequate funds.

1.3 Problem Statement

Having bigger size of population makes China and India faces problems of food security. However guideline from United Nation and FAO a country can secure the food if they focus to improve the food dimension. These countries have a problem in term of food availability, food accessibility and food utilization. In China and India, the huge magnitude of the growth and transformation in food demand poses a serious food security challenge. The main driver relating to food security is the demographic pressure. In order to feed 9 billion people in world by 2050, food production has to increase. Since a higher number of people means consumption of more resources and population growth under current scenarios will lead to reduced food security, increased water use, more pollution of the natural resources and ecosystem degradation.

FAO (2010) indicated that two-thirds of the World's undernourished live in just seven countries and over 40 percent live in China and India. Do China and India have the capacity to meet the food security challenge? Thus to examine the ability to meet the food security challenge, they therefore, need to examine adequacy of total food production, total food import, total income to access the food, price of the food and also food safety issues that are most related to the food dimension. Lam et al. (2013) indicated that China has only 7 to 9 percent of the world arable land, however about 20 percent of the world population but then again the country's arable land per person is well below the global average. Arable land is one of the most important factor that influences the adequacy of food but total arable land are decreased because of factors such as soil erosion and conversion for urbanization and industrialization. Apart from

land, water availability is a major constrain limit for extend of arable land and agricultural production in China. Water scarcity is especially severe in northwest China, which comprises more than 40 percent of China's total land area. Overall, land and water limitations and soil fertility issues would seriously constrain food availability in China. Besides that, low access of food also becomes a problem of the food security. Food price stability and better infrastructure will help to ensure a sufficient food security.

For India, Banerjee (2013) indicated that agriculture in India are facing innumerable problems such as increasing pressure on population on land, decline in soil fertility, migration from the rural areas to urban areas which is reducing the availability of manpower in agriculture, and lack of credit and marketing facilities in the rural areas. As a result, the agriculture sector growth rate during 2007 to 2012 was only 3.6 percent and the food grain production growth was only 1.8 percent indicating the inability of the agriculture production to keep up with the demand. Brahmananda et al. (2013) indicated that because of tightening supply and rapid expansion in demand water is expected to emerge as a key constraint to future agricultural growth and food security. This will make raising food production in India increasingly difficult.

Besides that, in India the per capita caloric availability is much lower than in China. Contributing factors include India's higher population growth, slower income growth and slower agriculture productivity growth. Smallholder agriculture has also created less direct and indirect employment, explaining in part the prevalence of child undernourishment in India. China addressed the challenge of a growing demand by slowing down population growth, its "one-child" population policy. Additionally, increasing the productivity of water, diversifying crop production out of cereals to less water consuming crops, and relying more on food imports as a share of total food availability. Thus, does providing enough food is the biggest issue and what should China and India do, if they have a food constraint? They were able to double their production of rice and wheat without increasing the amount of crop land used by using new technology that produce more, but the amount of crop land per person was drastically dropped and they may not be able to improve productivity. Thus food dimension are important tools to ensure a sufficient food security; food availability, food accessibility and food utilization. Otherwise, with the increase in total undernourished, it also affects disease and mortality, lowers productivity and has severe lifelong effects, particularly for children. From the problem of food accessibility, price spikes can also limit the ability of poor household to meet important food expenses and non-food expenses such as health care and education.

The second issues are the impact of population on health care expenditure. With an increase in population size and change in demographic transition, it has impact on health care. As the increases in number of the population age's group, population ages 0-14, population ages 15-64 and population ages 65 years and above will increase and this age's structure will influence the health care expenditure. Population ages will increase demand for the medical care,

27

health service and other health facilities and the implication such as number of population ages 65 years and above is about placing substantial pressure on government health expenditure.

The population ages 65 years and above in China and India will bring with it an increase in the burden of chronic disease. It has been estimated that population ages 65 years and above will result in a 200 percent increase in death from cardiovascular disease in China during 2000-2040. This group of population ages needs much more on health care, including nursing and other services and expenses are expensive due to high technology, cost of hospitalisation, and also rising burden of chronic disease, increase risk of disability, care providing for population ages 65 years and above and feminization of this ages also will raise the health care expenditure.

However, not only population ages 65 years and above need much more on health care expenditure, the other age structure also need the medical care. Population ages 0-14 years and population ages 15-64 years also need the medical care to their life. Investment on health care expenditure for these ages are important for the country because the population ages 0-14 years and population ages 15-64 years are the assets of the country in the future as healthy human capital. The healthy population ages structure will contribute to economic and increase the labour force especially for group ages 15-64 years and this contribute to the economic growth. Thus these ages population will increase the health care expenditure. Thus a question that arises is does the population size and population growth increases the health care expenditure, and which population ages structure needs more on health care expenditure and does the huge in population size and population growth can induce an increase in health expenditure.

Third issue is with the higher population may also have impact on the education expenditure of the countries. Higher composition of population ages 0-14 years and population ages 15-64 years will increase the school-age population (population age 5-21) and the number of human capital. The increasing in the number of population ages 0-14 years and 15-64 years will put more pressure on educational and training facilities and improvement in the quality of educational. This is likely a big problem for developing countries as 33 per cent of the children of primary school age are not enrolled in school and of those who enter school, 60 per cent will not complete more than three years of primary school[3]. Government plays an important role by providing funds for formal schooling and research. The existence of social benefits of education that are not captured by private agents supports the role of government education policy. The increase in the population number will grow as the number of school age population and the age group between 5 to 24 years are higher in China and India and this age is available as human capital for the

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[3] Gerald M. Meier, Leading Issues in Economic Development, (New York: Oxford University Press, 1995),p.276

future moreover China and India will become a supplier of workforce in the world. The challenge in China and India in producing quality human capital is the illiteracy rate and India has the largest illiteracy rate compared to other nation. Thus, investments in education expenditure are important in China and India.

Based on the three issues discussed above, the main question raise is whether the increase in the population is good or bad for economic development as a whole. This is because higher population will pressure on the resources constrain and livelihood. More people will demand more on food, increase health care expenditure and also need more education expenditure. But with huge population in the countries, they will create constrain of the available resources, demand more on health care and need more education to ensure a good quality of life. Thus, the question is whether China and India can secure their food for their people and does the food dimension plays a role in providing sufficient food to meet the demand of higher population. Thus what are the implication of increase in population on food security and how to solve these issues? Apart from food security, higher population and changing in population ages structure also will increase expenditure especially for health care and education. The question may arise is what implication of increasing population and population ages structures on health care and education expenditure are in China and India.

Thus the research question arise are;
   i.   Does population have an impact towards food security and which food dimensions are more important to secure food in China and India?
   ii.   Do these ages structure have a different impact on health care expenditure in China and India?
   iii.   Which age's structure has an impact on education expenditure in China and India?

The general objective of this study is to examine the effects of population and food dimension on food security, impact of population and population ages structure on health care and education expenditure compared in China and India.

The specific objectives are:
   i)   To examine the role of population and food dimension on food security in China and India.
   ii)   To investigate the impact of population ages structure on health care expenditure in China and India.
   iii)   To investigate the impact of population ages 0-15 years on education expenditure in China and India.

1.6   Significant of Study

This study contributes to the empirical literature by incorporating population indicators measuring such as population size, population growth and also

29

population ages structure from year 0-14 years, 15-64 years and 65 years and above. This age's structure has a different impact on the food security, health care expenditure and education expenditure. Besides that, this study contributes in terms of providing an empirical result on the effect of population to the food security with the food dimension, health care and education expenditure. It also discusses the importance of food dimension on food security and also expenditure on health and education with the prediction that China will face more population ages 65 years and above, meanwhile, India will face population ages 0-14 years in the future that will affect their country's expenditure. Nowadays, the population is important in determining the impact on economic development, especially on food security and expenditure on health care and education. These three issues are important to study and to see the implication from higher population size in China and India.

The relationship between population on food security, health care and education expenditure are important to study. The total population ages 0-14 years and population ages 65 years are also important to discuss because China will face more on population ages 65 years and above, while India will face a problem of more population ages 0-14 years in future. This it is important to examine the impact and relationship of the various types indicator of population on food security, health care and education expenditure.

A study or an analysis of population on food security, health care and education expenditure is important for the future research. From the previous studies focused on micro economic analysis, especially in research on food security. Besides that, most of the previous research focused on the impact of population on economic growth, thus there were a few previous literature on the effect of population on food security, health care and education expenditure. Therefore, there is a need for more macro studies on the underlying implication of population in food security, health care and education expenditure.

In China and India, the crucial issues is the population, because of the higher population, it will stress on the demand of the food and at the same time the government should ensure that the food security is adequate and enough for each. The trend of total population in both countries is increasing, but the trend of the population growth is showing a decreasing percentage. There is a strong need for further knowledge of these particular issues to provide such analysis for policy makers. The result of this study can produce a theoretical and empirical contribution to the economic development. This line of research may also help establish more useful benchmarks in assessing the impact of population and the impact of government effort in making policy.

This study makes a three novel contribution. First, it is the first study that models the food security with food dimension within time series framework using a cointegration and error correction modelling strategy and estimate the role of food dimension on food security in China and India. Besides that, it is

first time in literature, the population and food dimension is used in the study. Existing studies focuses on the conceptual framework to estimate the impact of population and food dimension on food security.

Second, it contributes to the empirical studies on the impact of population and population ages structure on health care expenditure within time series framework using cointegration and error correction strategy. This study is among the first attempts to explore the impact of population ages structure using separate model to estimate the impact on health care expenditure and also with using variable health and economic indicator. Existing studies using time series estimation methodology have concentrated on the cause and dynamic of population ages 65 years and above.

Third, it is the first study that models the education expenditure for China and India within a time series framework using a cointgeration and error correction modelling strategy. It also contributes to the literature, the three education levels are used that is primary, secondary and tertiary. This study also explores the population ages 0-15 years and the relationship of three level of school enrolment feedback on education expenditure. Existing studies using time series estimation methodology have concentrated on the causes and dynamic of fertility decline.

1.7   Scope of Study

This study uses a time series data for China and India, covering the period from 1970 to 2012. The period of study is based on the availability of data for each country. China and India are selected because these two countries are more huge population compared to the other countries, and have showed significant changes in their demographic characteristics, such as high total population, changes in fertility rate and mortality rate, longer life expectancy, and an increase in population ages structure.

China continuously records approximately nine to ten per cent annual GDP growth rates and is the second largest economy in the world today. China's economy is more than twice larger than India's, hence expected to become Asia's powerhouse in the future. China is expecting a rapidly population ages 65 years and above and rising working age population, which may affect future food consumption and production.

Meanwhile, India shows a slowing population growth with an increasing trend of life expectancy, women labor participation and savings rate. By 2025, India is estimated to have over 65 per cent population of working-age group, which offers a unique opportunity for deploying resources. As the population ages, proper deployment of resources and human capital conversion can potentially generate economic growth. India, like other developing countries, is going

31

through a transition phase in which the economy shifts from agrarian production to industrial production, as well as spurring growth in the service sectors. This transition involves a demographic change from a largely rural agrarian society with high fertility and mortality rates to a predominantly urban industrial society with low fertility and mortality rates. The most important issue is not the size of the population, but its age structure. According to the national population policy prediction for India, the size of working-age population will be 63.33 per cent in 2016, whereas population under the age of 15 is estimated at 27.73 per cent. By 2025, the growth rate of working-age population may exceed the overall population growth rate. Throughout this phase, India can benefit by increasing labor productivity and saving potential, as well as improving health, safety, and education standards.

1.8   Organization of Chapters

This thesis is presented in six chapters. Chapter 1 is the introduction that covers the background of the study, the issues and problem statements, the objectives, the significance and the scope of the study and the organization of this thesis. Chapter 2 describes the theoretical and empirical literature. Chapter 3 describes the model specification and data set for each analysis, followed by the details of the Autoregressive Distributed Lag (ARDL) model. Chapter 4 discusses the results and Chapter 5 concludes with policy recommendations.

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156

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162

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