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Effects of Health Expenditures on Population Age Distribution and Labor Force Participation Rates: Empirical and Comparative Analysis

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EFFECTS OF HEALTH EXPENDITURES ON POPULATION AGE DISTRIBUTION AND LABOR FORCE PARTICIPATION RATES: EMPIRICAL AND COMPARATIVE ANALYSIS

by

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Baby boom and population aging are the main features of the world population that are leading to child and elderly people in the labor force. Categorizing the world into low and high-income countries, the baby boom and child labor can be found in low-income countries, while population aging and elderly people in the labor force can be found in high-income countries. The cause of these features is declining rates of population and labor force ages 15-64, which is the most productive and active proportion. Health expenditures is one of the main factors that is associated with undesired trends of population and labor force through the high correlation with the rates of fertility, birth, death, and mortality. Population and labor force can be controlled by these rates and these rates can be controlled by health expenditures. Therefore, the allocation of health expenditures negatively influences population and labor force participation rates. In my thesis, I am going to investigate the trends of population and labor force participation rates in low-income and high-income countries over the period 1996-2010. The investigation will be done by using the statistics that are related to population and labor force such as the rates of population ages 0-14, ages 15-64, and ages 65+, and the rates of labor force in terms of ages and gender.

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CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 Introduction

For the purpose of this thesis, population can be defined as a group of individuals who are living in the same country or region with a certain standard of living. Population is also shaped in terms of age and gender. In economic and social development, population is the main source of human capital that is required to formulate and implement policies to achieve economic and social prosperity in the world. To achieve sustained and stable development, policymakers must adopt precise and adequate population policies to grow an active and productive population simultaneously with the availability of resources and development needs.

In recent years, especially in the middle of the1990s, many authors and researchers including economists, statisticians, sociologists, and social security scholars have recommended paying attention to the population trends in the world. According to these authors and researchers, population trends are moving toward an older population and decreasing birth and fertility rates, with some differences between countries in general and between low and high-income countries in particular. They found that in low-income countries, high birth and fertility rates lead to an increasing proportion of young population, especially the population under age 15 who are also not productive. They also found that in high-income countries, increasing life expectancy leads to an increasing proportion of older people ages 65 and above, and the decreasing fertility and birth rates lead to a decreasing proportion of young and productive people. Consequently, the population trends in low and high-income countries are moving toward a decreasing proportion of active and productive population between the ages of 15-64.

The labor force participation rate can be defined as the percentage of working-age people (ages 15-64) who are employed or unemployed but looking for a job, excluding students, military, people in prison, and those who are not looking for a job. It also refers to the productivity of the population in a country or region. The trends of labor force participation rates have been steadily declining since 2000. Declining trends are generating many discussions to determine the causes and effects on the labor market in the present and future. Regarding the causes of the declining rates, many studies stated that the majority of changes in the trends of labor force participation rates are the direct result of the changes in the trends of age distribution and growth rates of the population. As I explained before, the decreasing proportion of population ages 15-64 negatively affects the official and prime labor force participation rate, which is the rate of labor force ages 15-64. Regarding the effects of the declining labor force participation rates on the labor market in low and high-income countries, the effects on low-income countries are different from the effects on high-income countries. In low-income countries, the declining labor force participation rates lead to child labor, while in high-income countries they lead to older people continuing to work to compensate for the lack in the standard labor force.

1.2 Background

In this study, I discuss the problem of undesirable population age distribution and labor force participation rates in the world. The importance of this study comes from the many complications and negative economic and social consequences that are generated by the current trends of population age distribution and labor force participation rates such as baby boom, population aging, elderly people in the labor force, and child labor as well. I also discuss and estimate the effects of health expenditures as one of the main factors associated with the undesirable population age distribution and labor force participation rates in low and high-income countries.

As the main controlling or explanatory variable, the total health expenditures will be used in this study. Total health expenditures includes public and private healthcare services that are provided by governments and private providers. It is also computed as a percentage of GDP that is allocated to each individual in a country. Health expenditures per capita is the proper indicator that reflects the amount of health services received by each individual.

The study aims to achieve five main objectives:

1. Define in detail the concepts of population age distribution and labor force participation rates; how these concepts are considered, calculated, analyzed, and forecasted; and what is the optimum of these rates citing the helpful references.
2. Define in detail the trends of population age distribution and labor force participation rates in low and high-income countries together and separately, using the appropriate descriptive statistics and data analysis.
3. Determine the factors that affect population age distribution and labor force participation rates with focus on the effects of total health expenditures and related factors such as the rates of fertility, birth, death, mortality, and survival to age 65.
4. Estimate the effects of health expenditures on population age distribution and labor force participation rates by using econometrics approaches in data analysis such fixed effects regression, t-test, and f-test.
5. Compare the existing population age distribution and labor force participation rates and the estimated effects of health expenditures with the optimum to develop recommendations that help to modify the deviation in the optimum population age distribution and labor force participation rates to avoid negative consequences in the present and future.

Two types of data and variables will be used in this study; the original data and variables that are quoted directly from the World Bank website, and the derived data and variables created by manipulating the original data. The data refer to 32 low-income countries and 50 high-income countries over the period 1996-2010 (annually). These countries were chosen according to the World Bank classification and data availability.

The effects of health expenditures on population age distribution and labor force participation rates will be investigated and estimated through six chapters. In Chapter 2, I explain the reality and optimality of the world population and labor force participation rates and how the optimality can be achieved through two sections of the chapter; one for the population and one for the labor force participation rates. In Chapter 3, I define the data and methodology that will be used to investigate and estimate the effects. In Chapter 4, I investigate the undesired trends of population and labor force participation rates of the world, addressing low and high-income countries separately. Doing separate investigations of population and labor force participation rate trends and the effects of health expenditures on low and high-income countries is more useful and precise. It provides evidence that the aggregate investigation and estimation of the whole world is not a useful reference to diagnose the root causes of the undesirable trends. Also, Chapter 4 includes three sections: one for the whole world, one for low-income countries, and one for high-income countries. In Chapter 5, I estimate the effects of health expenditures on population age distribution and labor force participation rates by using the fixed effects multiple regression to determine these effects numerically. The estimation is done through 3 sections: one for the whole world, one for the low-income countries, and one for the high-income countries. Each section includes two models: one for the effects of health expenditures on the population, and one for effects on the labor force participation rates. I use SAS software, T test, and F test to make and test the estimates. I Chapter 6, I summarize the findings of this study to develop useful and

helpful recommendations that can be applied in low and high-income countries to modify and adjust the current trends of population and labor force participation rates to avoid negative consequences in the present and future.

CHAPTER 2

WORLD POPULATION AND LABOR FORCE PARTICIPATION RATE (PREVIEW)

2.1 Introduction

During the last century, the world population has been increasing rapidly, and has generated many challenges to economic growth and stability for the present and future. The main challenge is the decline of the productive population proportion and standard labor force, which is ages 15-64. The declining rate of ages 15-64 came from rising rates ages 0-14 and 65 and above. As a result, the current trends of population and labor force participation rate should be reconsidered and analyzed to determine what the world needs to do to adjust and modify the trends. Also, it is important to take into account the differences between these trends in low and high-income countries, as I explain in the next chapters. The importance is to formulate and implement population policies that are consistent with the availability of resources and economic development needs to reach the optimum population (in terms of size and ages) and labor force participation rates. In this chapter, I define the determinants of optimum population and labor force participation rate.

2.2 World Population Reality and Optimality

Regarding the optimum population size, many organizations and researchers discussed the concept of optimum population and how it can be determined and reached to avoid the negative consequences of the current undesired trends of population size in the world. Undesirable trends can be seen in low-income countries with oversize populations that are associated with the spreading poverty and low living standards, while high-income countries are associated with a lack of human capital due to the high proportion of older people. The United Nations Environment Programme (UNEP) defined the optimum population in a given area as the number of people who are living in that area in close balance with the resources or in a state of equilibrium. The UNEP definition

of optimum population (United Nations Environment Programme, 1997) stated that if the population is below the optimum, the area is under populated, where the area is over populated when the population is over the optimum.

In the economic terms, the optimum population is the population that produces the greatest gross national income (GNP) given the available resources and skills. Therefore, if the population is below or above, the optimum the living standard will be lowered through the lowered GNP per capita. In addition, the UNEP described that the optimum cannot be achieved by only the number of population, but also by the structures of ages, gender, and education that are the most important features for active and productive population and labor force participation rates. The UNEP recommended that the population should be controlled in terms of age to reach the optimum population, and then the optimum labor force participation rates. Since the 1960s, many countries in the world, especially the countries that have the highest population growth, adopted ambitious policies to control their population. They computed the rates of birth, fertility, and mortality to formulate and implement precise population policies to be consistent with available resources. For example, Japan and Singapore adopted the program of three children per family to reduce the fertility rate to the replacement level. Health, school, and housing services were provided to the first three children. The fertility rate dropped from 4.7 in 1965 to the replacement level in 1975. In 1986, the fertility rate dropped below the replacement and threatened the population growth rate. As a response to that threat, new policies were adopted to raise the fertility rate, such as encouraging marriage and child-bearing under the slogan “Have three or more if you can afford it”. Also, they provided incentives such as lower taxes, rebates, and subsidized child care.

Reproductive behavior is another determinant of optimum population size if the externalities do not exist. Dasgupta (2005) argued that government policies on

schooling, family planning, and old-age pension have impacts to determine the number of children that people can choose to reach the optimum population. This determination needs one condition, which is the absence of the external impacts such as social foundations. The transfer of resources is an example of the impact of social foundations on the size of population. Dasgupta explained that if the transfer of resources is from children to their parents, then the society has high fertility and mortality rates, and can be found among the poor countries. If the transfer of resources is from parents to their children, then the society has low fertility and mortality rates and can be found among the rich countries. Because children may substitute for capital assets, families in poor countries tend to choose a high number of children (child bearing). They need children to work and provide help for their parents such as gathering fire wood, collecting potable water, taking cattle to graze, and cooking. In rich countries, parents provide help to their children, so they tend to choose a low number of children (child rearing). Dasgupta provided a non-market activities paradigm to explain the impacts of externalities on population size determination.

Dasgupta (2005) also argued that utilitarianism is another determinant of optimum population size. There are two modern theories of the population ethic: average and classical utilitarianism, he explained. According to the average utilitarianism, the optimum population size is that size where the average output per person is maximized. In other words, it exists when the average output per person equals the marginal output when adding one more person to the population. For example, if F (N) denotes the output of population size N, then the average output per person is F (N) / N. Also, F (N) / N with additional persons increases by an increasing rate when N is small and by a decreasing rate when N is large; that gives the bell shape to the average output function. The optimum population size can be determined when the average output per person equals the marginal output when adding one more person to the population (F (N) / N =

F` (N). According to classical utilitarianism, Dasgupta mentioned that the optimum population size is that size when the well-being per person is maximized at fixed resources. In other words, it occurs when the marginal well-being of consumption equals the average well-being per unit of consumption. For example, let C denote the consumption per person (the standard of living) at fixed resources K and population N. The well - being is the utility of C (U (C)), and U(C) is an increasing function U`(C) > 0 at a diminishing rate U`` (C) < 0. Also, C = K/N (consumption of goods that each person should receive from the total resources). Solving the equations below will show how the optimum population can be determined;

U` (C) = U (C)/C (1)

C = K / N (2)

From 1 and 2

U` (K/N) = U (K/N) / (K/N) (3)

Multiplying both sides of equation 3 by K/N

(K/N) U` (K/N) = U (K/N) (4)

Therefore, the determinants of the optimum population size have to be applied to modify the current undesired trends of the world population.

Regarding the optimum population in terms of ages, the optimum age distribution of population is the distribution that has more population in the working ages, which are typically ages 15-64. Mizanur et al. (2009) argued that most countries are experiencing a decreasing proportion of population in the working ages due to the declining fertility and mortality rates. The declining mortality rate leads to an increase in the proportion of population ages 65 and above, and the declining fertility rate leads to a decrease in the proportion of youth population. Consequently, there is an increase in the proportions of older and youth populations to the economically active proportion ages 15-64. They also explained that stabilizing population through stabilizing growth, birth, fertility, and

mortality rates could achieve the optimum age distribution. Growth and fertility rates can be used to determine the sufficient number of people that is required to support the labor market in the present and future, they explained. Also, the fertility rate is the determinant of population replacement, and has to be considered together with growth and mortality rates.

In addition, many researchers have noted that population aging in the world has been caused by the reduction of fertility and mortality rates. Lee and Lapkoff (1994), Deaton and Paxon (1997), and Chu (1997) used the comparative statistical analysis of stable population to determine the optimum population age distribution. They found that population aging occurs in the transitional periods between two stable population structures. Also, population structure is affected by the changes in the relationship between fertility and mortality rates which is the stochastic-dominance relationship. The features of population structure depend on which rate is dominant. Therefore, to determine the optimum population age distribution, fertility and mortality rates have to be measured and analyzed to determine which optimum fertility rate is enough for population replacement and rising working ages.

2.3 World Labor Force Participation Rate Reality and Optimality

The trends of the labor force participation rates are reflections of the trends of population, especially in terms of population age distribution. Matheny (2009) pointed out that the growth of the labor force participation rate in the world declined starting in the middle of the 1990s and will turn down after 2010. Also, he argued that the current trends of the labor force participation rates are responses to population aging and the baby boom generation. Population aging and the baby boom lead to a decreasing proportion of population ages 15-64, which is the main source of the standard labor force. The slowing growth or declining labor force participation rates would contribute to a slowing potential GDP, welfare, and development as well. Matheny suggested that

there is a strong correlation between the projections of population, labor force participation rates, and economic growth. Therefore, to determine the optimum labor force participation rates, many essential elements have to be considered, such as population trends, economic growth, and social security needs. If the optimum population exists, then the optimum labor force participation rates have to be between 63 and 66 percent of total population ages 15-64.

Employment and unemployment rates are other determinants of optimum labor force participation rates. Employment and unemployment rates are the result of the trends of the labor force market in a country. Optimum population and labor force that take into account the availability of resources, the needs of economic development, and social security lower unemployment rates. Also, tracking the components of the labor market in terms of ages and gender is a useful reference to adopt a precise labor force policy to achieve the stability of the labor market. DiCecio et al. (2008) provided empirical evidence about labor market tracking in the United States. They used the monthly history of labor force participation rate that is issued by the Bureau of Labor Statistics (BLS) to derive figures about the past and current trends of labor force participation rates in the United States and to consider the future trends. Considering the future labor force participation rates will allow the policy makers to determine what has to be done to keep the rates in the optimum position and direction. They found that the labor force participation rate in the United States for the period 1948 to 2000 was roughly 0.59 and held steady. The rate had risen from 0.59 to 0.763 in 2005, and then fell to 0.658 in 2006. The main reasons for those changes were the recession and structural change in the labor force due to the structural changes in population. As a result of their findings, they suggested that consideration of the expected employment and unemployment rates with economic performance can be used as determinant of the optimum labor force participation rate.

2.4 Conclusion

To conclude this chapter, the current trends of population age distribution and labor force participation rates are undesirable because they are moving toward slowing growth or even decreasing proportion of population ages 15-64. The importance of this proportion is that it represents the economically active and productive proportion and the main resource of the labor force in the world. The same trends of population and labor force participation rates ages 15-64 can be found in both low and high-income countries, but they result from different causes. In low-income countries, the declining rate of ages 15-64 result from a rising rate of ages 0-14 and limited rising rate of ages 65 and above, while in high-income countries, the current trends result from a rising rate of ages 65 and above, and a declining rate of ages 0-14. Also, the factors that related to health expenditures, such as the rates of fertility, birth, death, and mortality, are associated with current undesirable` trends of population and labor force participation rates in both low and high-income countries. In Chapter 4, I use the proper descriptive statistics to show how the current trends of the population and labor force participation rate are undesirable. I also explain how health expenditures and its factors are associated with these trends in low and high-income countries.

CHAPTER 3

DATA, VARIABLES, AND METHODOLOGY

In this chapter, I describe the data sources and define the variables and methodology used to investigate and estimate the trends of population, labor force participation rates, and the effects of health expenditure.

3.1 Data

The data covers 82 countries, including 32 low-income countries and 50 high-income countries. I chose these countries according to two conditions: the World Bank classification in terms of income, and the data availability about these countries. The main source of my data is the World Bank website and other helpful resources such as United Nations, International Monetary Fund, and the World Development Indicators. I collected annual data about these countries over the period 1996-2010. Table 1 shows the low and high-income countries used as the study case.

Table 1

Low and High-Income Countries Used as the Study Case

Low-Income Countries	Low-Income Countries	High-Income Countries	High-Income Countries	High-Income Countries
Afghanistan	Malawi	Australia	Ireland	Slovak Republic
Bangladesh	Mali	Austria	Israel	Slovenia
Benin	Mozambique	Bahamas, The	Italy	Spain
Burkina Faso	Nepal	Bahrain	Japan	Sweden
Burundi	Niger	Barbados	Korea, Rep.	Switzerland
Cambodia	Rwanda	Belgium	Kuwait	Trinidad and Tobago
Central African Republic	Sierra Leone	Brunei Darussalam	Latvia	United Arab Emirates
Chad	Tajikistan	Canada	Lithuania	United Kingdom

Table 1—Continued

Low-Income Countries	Low-Income Countries	High-Income Countries	High-Income Countries	High-Income Countries
Comoros	Tanzania	Chile	Luxembourg	United States
Congo, Dem. Rep.	Togo	Croatia	Malta	Uruguay
Eritrea	Uganda	Cyprus	Netherlands	
Ethiopia	Zimbabwe	Czech Republic	New Zealand	
Gambia, The		Denmark	Norway	
Guinea		Equatorial Guinea	Oman	
Guinea-Bissau		Estonia	Poland	
Haiti		Finland	Portugal	
Kenya		France	Qatar	
Kyrgyz Republic		Germany	Russian Federation	
Liberia		Greece	Saudi Arabia	
Madagascar		Iceland	Singapore	

Source: The World Bank.

3.2 Variables

In order to provide clear explanations about population and labor force participation rates and the effects of health expenditure, all the used variables must be defined. The definition of the variables must include the code that will be used in the equations, the name of the variable, and the definition of the contents and representation of the variables.

There are two types of variables: the original variables that are quoted directly from the World Bank website, and the derived variables that are driven by manipulating the original variables. In this section, I code and define all the variables in Table 2.

Table 2

Original and Derived Variables Used in the Investigation and Estimates

Original Variables			Derived Variables		
Variable Code	Variable Name	Variable Definition	Variable Code	Variable Name	Variable Definition
HX	Health expenditures per capita (per million of GDP)	The share of GDP that countries allocate to health expenditure	ST	Survival to age 65, total (% of total population)	People who are living up to 65 years as a percentage of total population
SM	Survival to age 65, male (% of total male)	Males who are living up to 65 years as a percentage of total males	PF	Female labor force participation rate (% of total females)	Total female labor force as a percentage of total females
FR	Fertility rate, total (births per woman)	Number of births per women	PMT	Male labor force participation rate, total (% of total labor force)	Total male labor force as a percentage of total labor force
FR	Fertility rate, total (births per woman)	Number of births per women	PM	Male labor force participation rate (% of total males)	Total male labor force as a percentage of total males
BR	Birth rate, crude (per 100 people)	Total births as a percentage of total population	PT -14	Labor force participation rate ages 0-14, total (% of total labor force)	Total labor force ages 0-14 as a percentage of total labor force
DR	Death rate, crude (per 100 people)	Total deaths as a percentage of total population	P -14	Labor force participation rate ages 0-14 (% of total ages 0-14	Total labor force ages 0-14 as a percentage of total ages 0-14
MR	Mortality rate, under-5 (per 100 live births)	Total mortality ages under 5 as a percentage of total ages under 5	PT15-64	Labor force participation rate ages 15-64, total (% of total labor force	Total labor force ages 15-64 as a percentage of total labor force

Table 2—Continued

Original Variables			Derived Variables		
Variable Code	Variable Name	Variable Definition	Variable Code	Variable Name	Variable Definition
POP-14	Population ages 0-14 (% of total population)	Population ages 0-14 as a percentage of total population	PT65+	Labor force participation rate ages 65+, total (% of total labor force)	Total labor force ages 65+ as a percentage of total labor force
POP15-64	Population ages 15-64 (% of total population)	Population ages 15-64 as a percentage of total population	P65+	Labor force participation rate ages 65+ (% of total ages 65+)	Total labor force ages 65+ as a percentage of total ages 65+
POP 65+	Population ages 65+ (% of total population)	Population ages 65+ as a percentage of total population			
PFT	Female labor force participation rate, total (% of total labor force)	Total female labor force as a percentage of total labor force			
P15-64	Labor force participation rate ages 15-64 (% of total ages 15-64)	Total labor force ages 15-64 as a percentage of total ages 15-64			

To explain how to compute the derived variables:

ST = (SF total females as a percentage of total population) + (SM total males as a percentage of total population)

P = $\frac{total\ labor\ force}{total\ population}$

PF = $\frac{PFT * total\ labor\ force}{total\ females}$

PMT = 1 – PFT

$$PM = \frac{PMT * total\ labor\ force}{total\ males}$$

$$PT\text{-}14 = \frac{total\ labor\ force - (P15+ * total\ ages\ 15+)}{total\ labor\ force}$$

$$P\text{-}14 = \frac{PT-14 * total\ labor\ force}{total\ ages\ 0-14}$$

$$PT15\text{-}64 = \frac{P15-64 * total\ ages\ 15-64}{total\ labor\ force}$$

$$PT65+ = \frac{(P15+ * total\ ages\ 15+) - (P15-64 * total\ ages\ 15-64)}{total\ labor\ force}$$

$$P65+ = \frac{PT\ 65+ * total\ labor\ force}{total\ ages\ 65+}$$

3.3 Methodology

To investigate and estimate the effects of health expenditures on population age distribution and labor force participation rates, I use two methods; one is described in Chapter 4 and the other in Chapter 5. In Chapter 4, I analyze the trends of population age distribution and labor force participation rates of the world, low-income, and high-income countries. The annual growth of population and labor force in terms of age and gender is used as the main indicator to explain how these trends changed over the period 1996-2010. Computing the growth of population and labor force provides a clear picture about the trends of growth to determine if it was by increasing or decreasing rates. Comparing the changes in population and labor force with the changes in health expenditures and its factors (the rates of fertility, birth, death, and mortality) show the negative influences of health expenditures on population and labor force. In Chapter 5, I estimate the effects of health expenditures on population age distribution and labor force participation rates in terms of age and gender. SAS software is used to do these estimates for the world, low-income, and high-income countries. Also, the estimates are tested by T, F, and adjusted R squared tests.

CHAPTER 4

TRENDS OF POPULATION AND LABOR FORCE PARTICIPTION RATES

4.1 Introduction

To develop a precise picture of the trends of population age distribution and labor force participation rates and the effects of health expenditures on these trends, we have to take into account the determinants below:

1. The declining growth in the rate of population ages 15-64 results from a baby boom in low-income countries and rising rate of population ages 65+ in high-income countries.
2. The declining growth in standard labor force participation rate (ages 15-64) is compensated by child labor in low-income countries, and elderly people in the labor force in high-income countries.
3. Labor force participation rates as a percentage of total labor force (PT) determine the level of child labor and elderly people in the labor force, while the rates as a percentage of total ages (P) determine the rate of people who are out of the labor market.
4. Population age distribution in low and high-income countries is related to the rates of fertility, birth, death, and mortality.
5. The rate female labor force participation in low and high-income countries is related to the rates of child bearing, child rearing, fertility, and birth.
6. The rates of fertility, birth, death, mortality, and survival to age 65 are related to health expenditures in low and high-income countries.

These determinants help to explain the root causes of undesirable trends of population age distribution and labor force participation rates in the world, then in low and high-income countries separately. Also, the effects of health expenditures and the development of recommendations that can be applied depend on the countries'

circumstances and features in terms of population and labor force participation rates. Therefore, to obtain a precise determination about the trends of population and labor force participation rates, the trends must be investigated separately for the world, low and high-income countries. Table 3 shows the average indicators of population age distribution, labor force participation rates, and health expenditures with its factors for the period 1996-2010.

Table 3

Average Indicators of Population Age Distribution, Labor Force Participation Rates, and Health Expenditure

Code	Indicator	World	Low-income	High-Income
HX	Health expenditures, total (%of GDP)	6.6	5.6	7.2
ST	Survival to age 65 (% of total population)	69.4	48.9	77.6
FR	Fertility rate, total (births per woman)	2.595	3.282	1.894
BR	Birth rate, crude (per 100 people)	2.4	4	1.4
DR	Death rate, crude (per 100 people)	1	1.3	0.8
MR	Mortality rate, under-5 (per 100 live births)	0.8	2.2	0.000021
POP-14	Population ages 0-14 (% of total)	29.7	43.8	20.6
POP15-64	Population ages 15-64 (% of total)	61.8	53.1	67.5
POP65+	Population ages 65+ (% of total)	8.5	3.1	11.9
POPF	Female, total (% of total population)	49.9	50.1	49.6
POPM	Male, total (% of total population)	50.1	49.9	50.4
POPG	Population growth rate (% annual)	1.8	2.6	1.2
PT	Labor force participation rate, total (% of total population)	46.1	41.5	49

Table 3—Continued

Code	Indicator	World	Low-income	High-Income
PFT	Female labor force participation rate, total (% of total labor force)	42.3	44.4	40.9
PMT	Male labor force participation rate, total (% of total labor force)	57.7	55.6	59.1
PT-14	Labor force participation rate ages 0-14, total (% of total population)	0.6	1	0.1
PT15-64	Labor force participation rate ages 15-64, total (% of total population)	44.2	39.2	47.8
PT65+	Labor force participation rate ages 65+, total (% of total population)	1.3	1.3	1.1

Source: The World Bank.

From Table 3, we can see that the aggregate indicators are not a useful reference to investigate the trends of population and labor force. They do not reflect the reality of the trends in each country or group of countries with the same economic and demographic features Therefore, it is important to consider these indicators of the world, low, and high-income countries separately, or even country by country to get a more precise investigation. In this chapter, I investigate these trends for the world, low-income, and high-income countries.

4.2 Trends of Population and Labor Force Participation Rates in the World

4.2.1 Trends of Population in the World

To investigate the trends of the world population, I compute the annual percentage changes (growth) of population for each age group. The annual growth shows how the trends changed over the period 1996-2010. Table 4 and Figures 1 and 2 show the annual average proportions of the world population, annual growth, and their trends.

From Table 4, we can see that during the period 1996-2010, the world population was distributed as 28% to 32 % ages 0 -14, 60% to 63% ages15-64, and 7% to 9 %

ages 65 and above. We can also see that the rate of population ages 0 -14 had been declining by increasing rates during the period 1996-2005, then by decreasing rates during the period 2006-2010 and tending to rise. The rate of population ages 15-64 had been rising by increasing rates during the period 1996-2005, then by decreasing rates during the period 2006-2010 and tending to decline. The rate of population ages 65 and above had been rising by increasing rates during the period 1996-2005, then by decreasing rates during the period 2006-2007 and continued rising by increasing rates after 2008. The trends indicate the world population is moving toward a baby boom as indicated by the rising rate of ages 0-14 and population aging by the rising rate of ages 65 and above, while showing the declining rate of the active and productive ages, which are 15-64. To get a better illustration of the changes in the world population, see Figures 1 and 2.

Table 4

Age Distribution and Annual Growth of Population in the World

Year	Ages 0-14 % of Total Population	Ages 15-64 % of Total Population	Ages 65+ % of Total Population	Annual Growth Ages 0-14	Annual Growth Ages 15-64	Annual Growth Ages 65+
1996	31.434	60.631	7.935	-0.00625	0.00187	0.01057
1997	31.228	60.755	8.018	-0.00657	0.00204	0.01041
1998	31.013	60.889	8.098	-0.00689	0.00222	0.01003
1999	30.782	61.041	8.177	-0.00744	0.00249	0.00977
2000	30.533	61.211	8.256	-0.00808	0.00278	0.00965
2001	30.272	61.392	8.336	-0.00856	0.00296	0.00975
2002	30	61.581	8.419	-0.00897	0.00308	0.00985
2003	29.715	61.785	8.5	-0.00951	0.00331	0.00967

Table 4—Continued

Year	Ages 0-14 % of Total Population	Ages 15-64 % of Total Population	Ages 65+ % of Total Population	Annual Growth Ages 0-14	Annual Growth Ages 15-64	Annual Growth Ages 65+
2004	29.414	62.009	8.577	-0.01013	0.00362	0.00909
2005	29.106	62.245	8.649	-0.01047	0.00381	0.00838
2006	28.802	62.483	8.715	-0.01043	0.00380	0.00757
2007	28.517	62.706	8.777	-0.00991	0.00357	0.00717
2008	28.26	62.896	8.844	-0.00900	0.00302	0.00766
2009	28.036	63.038	8.926	-0.00793	0.00226	0.00924
2010	27.843	63.128	9.029	-0.00686	0.001428	0.011539

Source: The World Bank.

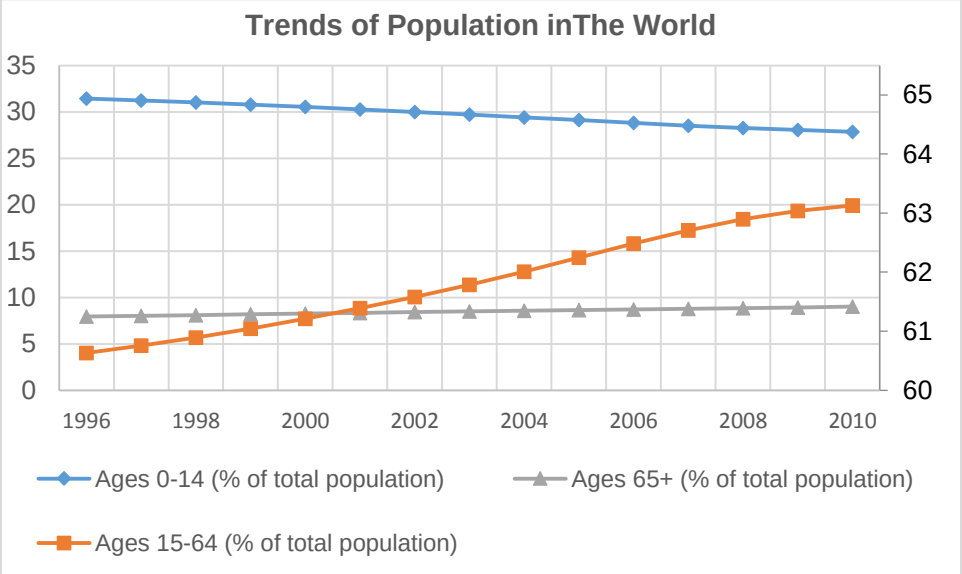

Figure 1. Trends of population in the world. *Source:* The World Bank.

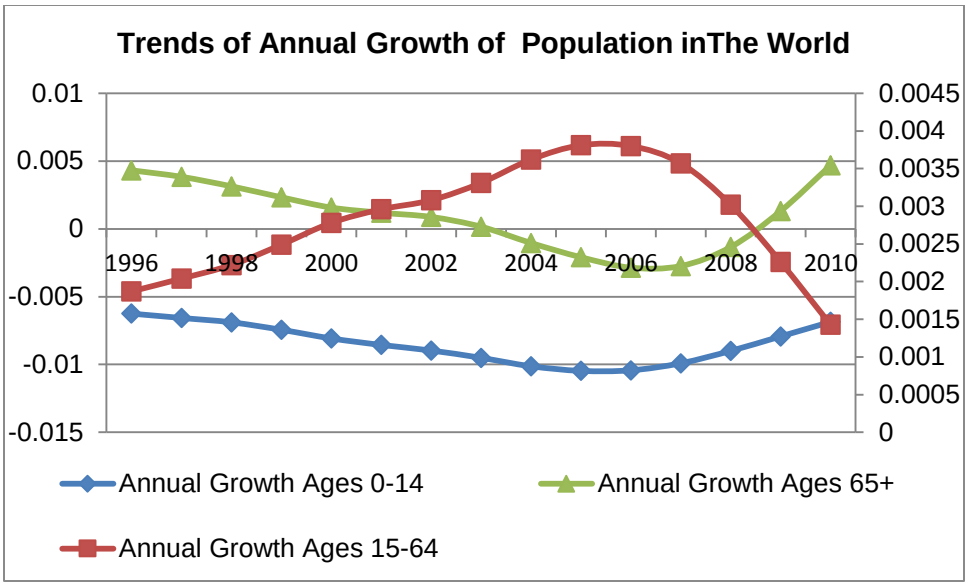

Figure 2. Trends of annual growth of population in the world. *Source:* The World Bank.

4.2.2 Trends of the Labor Force Participation Rates in the World

Regarding the trends of the world labor force participation rates, we have to keep in mind that these trends are reflections of the population trends. We also have to consider that the standard and legal labor force is ages 15-64, and other ages 0-14 and 65 and above represent a kind of violation or exception to the humanitarian aspects and labor productivity criteria. To investigate the trends of the world labor force participation rates, I use the same approach that I have used in population trends in section 4.2.1 by computing the growth in the labor force participation rates in terms of ages and gender.

In terms of ages, I measure the rates of each age group as a percentage of the total labor force (PT 0 -14, PT15-64, and PT 65+), and as a percentage of the total ages of that group (P 0 -14, P 15-64, and P 65+). The main purposes of this measurement are: first, to show how the changes in population age distribution are influencing labor force participation rates in term of ages; second, to show the rates of child labor and elderly people in the labor force; and third, to show the rates of people who are in the labor market for each age group. In terms of gender, I measure the rates as percentages

of the total labor force PFT and PMT, and as percentages of the total gender (total female and male) PF and PM. The main purposes of this measurement are: first, to show how the factors such as child rearing, child bearing, fertility rate, and birth rate that influence population age distribution also influence labor force participation rates; second, to show the rates of female and male labor force; and third, to so show the rates of females and males who are in the labor market.

In terms of ages, and as the first measurement of the labor force participation rates, Table 5 and Figures 3 and 4 show the annual average labor force participation rates as a percentage of the total labor force of each age group (PT), annual growth and their trends.

From the table, we can see that the world PT15-64 constitutes 94% to 95% of the total labor force, while PT 0-14 and PT65+ constitute 1% to 2% and 3% to 4% respectively. Also, PT15-64 had been rising during the period 1996-2006, then declining during the period 2007-2010, while PT 0-14 and PT 65+ had been declining during the first period then rising during the second period. The trends indicate that PTs compensate each other; when PT15-64 rises; PT 0-14 and PT 65+ decline, and vice versa. Also, comparing the world PTs trends with the world population trends in section 4.2.2, we can see that there is a strong and positive relationship between population and labor force; any changes in the population age distribution lead to the same change in PTs in the same direction. In this case, we can say that the world labor force is moving toward child labor and elderly people in the labor force due to the declining rate of PT15-64 and rising rates of PT 0-14 and PT 65+. Figures 3 and 4 show more illustrations about the trends of PTs in the world.

Table 5

Distribution and Annual Growth of PTs in the World

Year	PT 0-14 % of Total Labor Force	PT 15-64 % of Total Labor Force	PT 65+ % of Total Labor Force	Annual Growth PT 0-14	Annual Growth PT 15-64	Annual Growth PT 65+
1996	1.798	94.739	3.495	-0.02243	0.00009	0.00022
1997	1.761	94.751	3.496	-0.02047	0.00013	0.00017
1998	1.736	94.769	3.481	-0.01406	0.00019	-0.00421
1999	1.734	94.864	3.475	-0.00110	0.00101	-0.00195
2000	1.667	94.873	3.46	-0.03885	0.00009	-0.00410
2001	1.661	94.883	3.453	-0.00342	0.00010	-0.00217
2002	1.636	94.922	3.436	-0.01536	0.00041	-0.00487
2003	1.575	94.989	3.432	-0.03733	0.00071	-0.00125
2004	1.528	95.046	3.426	-0.02978	0.00060	-0.00170
2005	1.511	95.099	3.436	-0.01107	0.00056	0.00292
2006	1.395	95.111	3.494	-0.07698	0.00012	0.01701
2007	1.378	95.087	3.535	-0.01186	-0.00025	0.01159
2008	1.39	95.05	3.56	0.00857	-0.00039	0.00714
2009	1.477	94.949	3.573	0.06270	-0.00106	0.00374
2010	1.579	94.814	3.608	0.06874	-0.00143	0.00972

Source: The World Bank.

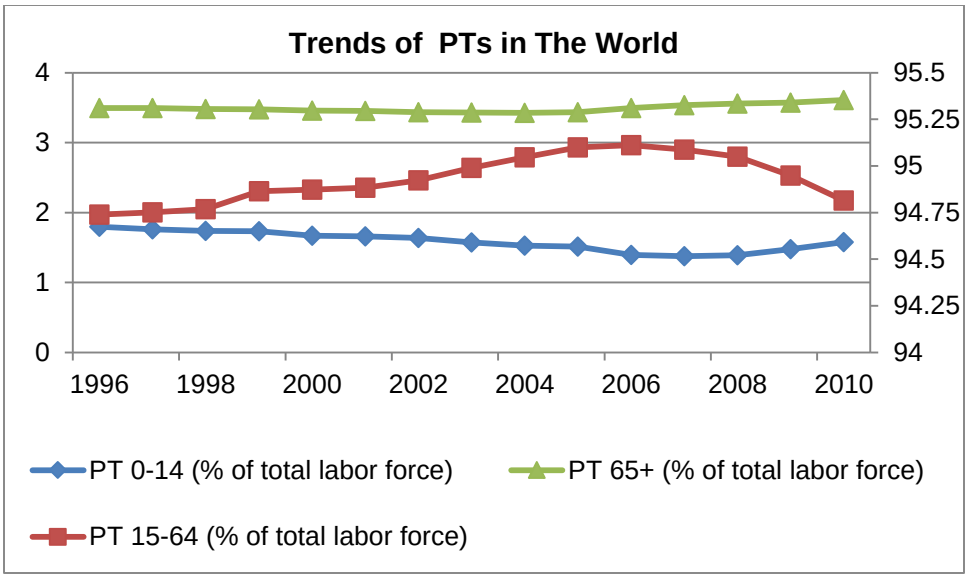

Figure 3. Trends of PTs in the world. *Source:* The World Bank.

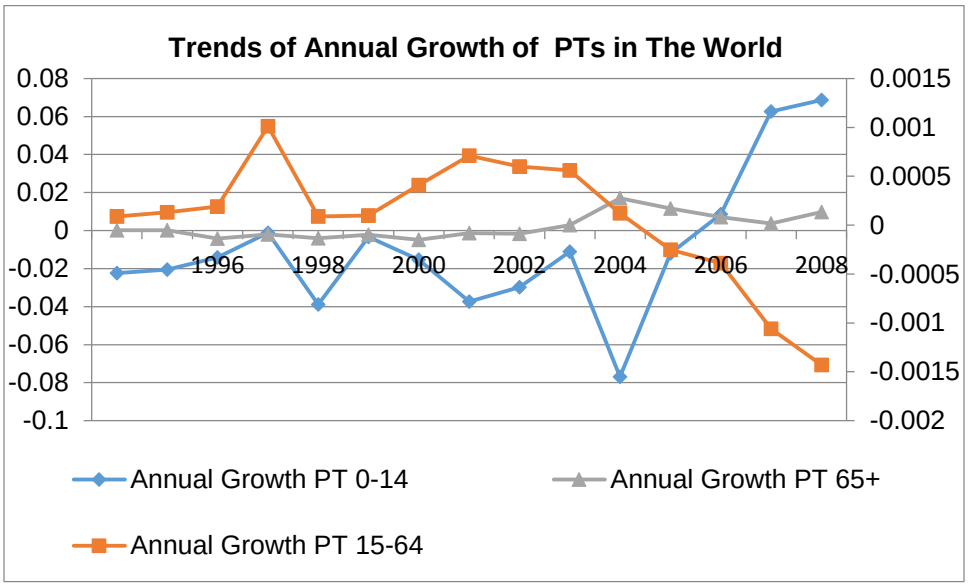

Figure 4. Trends of annual growth of PTs in the world. *Source:* The World Bank.

As the second measurement of the labor force in terms of ages, Table 6 and Figures 5 and 6 show the annual average labor force participation rates as a percentage of total ages of each group (P), annual growth and their trends.

Table 6 and Figures 5 and 6 show that 71%-74% of ages 15-64, 1%-2% of ages 0-14, and 27%-30% of ages 65 and above in the labor market. We can also see that the world P 15-64 had been rising by increasing rates during the period 1996-2006 then rising by decreasing rates and tending to decline during the period 2007-2010, while P-14 and P 65+ had been declining during the first period then rising during the second period. The trends indicate that there is an additional decline in the rate of workers ages 15-64 and an additional rise in the rate of workers ages 0-14 and 65 and above after 2006. The first decline is the result of a declining rate of population ages 15-64 and a rising rate of population ages 0-14 and 65 and above, and the second decline is the result of a declining rate of workers ages 15-64 and rising rates of workers age 0-14 and 65 and above as a percentage of total ages. I develop this finding to investigate the influences of health expenditures on the world labor force participation rates. Figures 5 and 6 provide more illustrations of the trends of the world Ps in terms of ages.

Table 6

Distribution and Annual Growth of Ps in the World

Year	P 0 -14 % of Total Ages 0-14	P 15-64 % of Total Ages 15-64	P 65+ % of Total Ages 65+	Annual Growth P 0-14	Annual Growth P 15-64	Annual Growth P 65+
1996	2.004	71.829	27.768	0.08924	0.00093	0.02137
1997	2.177	71.745	28.469	0.08607	-0.00117	0.02525
1998	2.064	71.791	27.643	-0.05172	0.00065	-0.02902
1999	2.217	71.941	26.741	0.07408	0.00209	-0.03261
2000	1.925	72.101	25.9	-0.13185	0.00222	-0.03148
2001	2.11	72.159	26.813	0.09647	0.00079	0.03526
2002	2.056	72.289	26.952	-0.02583	0.00181	0.00518

Table 6—Continued

Year	P 0 -14 % of Total Ages 0-14	P 15-64 % of Total Ages 15-64	P 65+ % of Total Ages 65+	Annual Growth P 0-14	Annual Growth P 15-64	Annual Growth P 65+
2003	1.997	72.457	26.773	-0.02846	0.00233	-0.00662
2004	1.864	72.679	26.275	-0.06688	0.00306	-0.01862
2005	2	72.952	26.143	0.07281	0.00376	-0.00502
2006	1.933	73.195	28.031	-0.03344	0.00333	0.07222
2007	1.838	73.396	29.343	-0.04888	0.00275	0.04679
2008	1.874	73.634	28.982	0.01921	0.00324	-0.01228
2009	1.977	73.68	29.185	0.05538	0.00063	0.00700
2010	2.097	73.711	29.297	0.06034	0.00041	0.00384

Source: The World Bank.

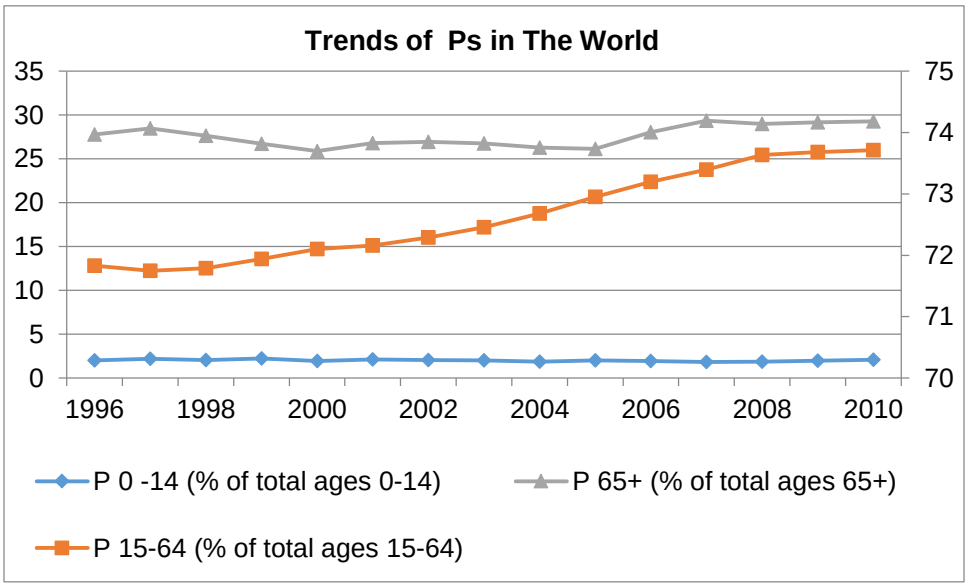

Figure 5. Trends of Ps in the world. Source: The World Bank.

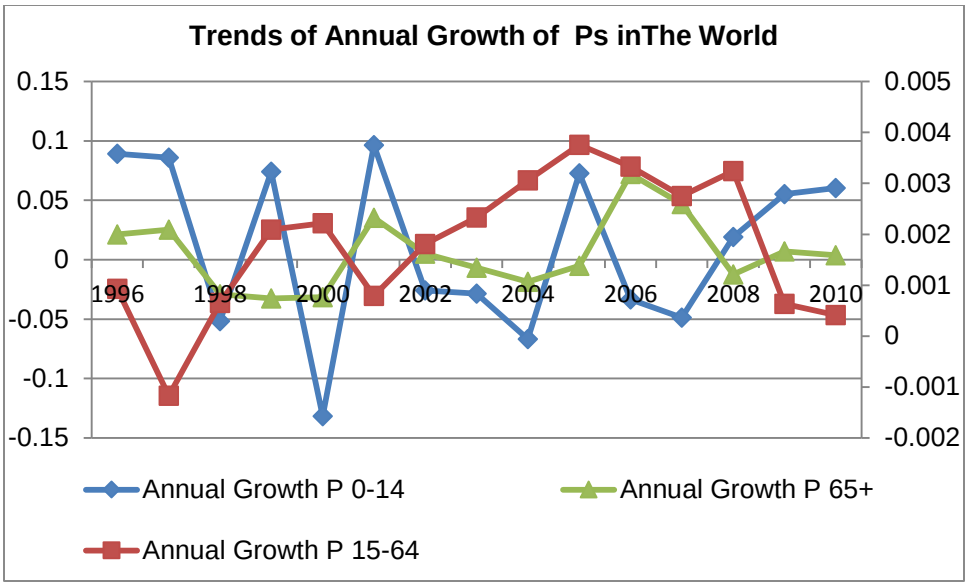

Figure 6. Trends of annual growth of Ps in the world. Source: The World Bank.

In terms of gender and as the first measurement, Table 7 and Figures 7 and 8 show the female and male labor force participation rates as a percentage of the total labor force (PFT & PMT), the annual average growth and their trends. From the table and figures, we can see that the world as a whole has a greater male labor force participation rate (PMT) than female (PFT), and the rates are moving in opposite directions. During the period 1996-2005, PFT had been rising by increasing rates while PMT had been declining by increasing rates; then during the period 2006-2010, PFT had been rising by decreasing rates and tending to decline, while PMT had been declining by decreasing rates and tending to rise. Comparing the trends of PFT and PMT with the trends of population in section 4.2.1, we can see that there is a relationship between these trends. After 2006, the increase in the population ages 0-14 came from the increase in the child rearing and bearing that negatively affected the female labor force participation rate. This finding can be developed to investigate the influences of health expenditures on the population and labor force through its factors such as the rates of fertility, birth, death, and mortality.

Table 7

Distribution and Annual Growth of PFT and PMT in the World

Year	PFT % of Total Labor force	PMT % of Total Labor force	Annual Growth PFT	Annual Growth PMT
1996	41.258	58.742	0.00483	-0.00321
1997	41.453	58.547	0.00473	-0.00332
1998	41.633	58.367	0.00434	-0.00307
1999	41.864	58.136	0.00556	-0.00397
2000	42.065	57.935	0.00479	-0.00345
2001	42.14	57.86	0.00180	-0.00131
2002	42.262	57.738	0.00290	-0.00211
2003	42.416	57.584	0.00363	-0.00265
2004	42.483	57.517	0.00158	-0.00116
2005	42.588	57.412	0.00248	-0.00183
2006	42.685	57.315	0.00228	-0.00169
2007	42.735	57.265	0.00117	-0.00087
2008	42.766	57.234	0.00072	-0.00054
2009	42.786	57.214	0.00047	-0.00035
2010	42.797	57.203	0.00026	-0.00019

Source: The World Bank.

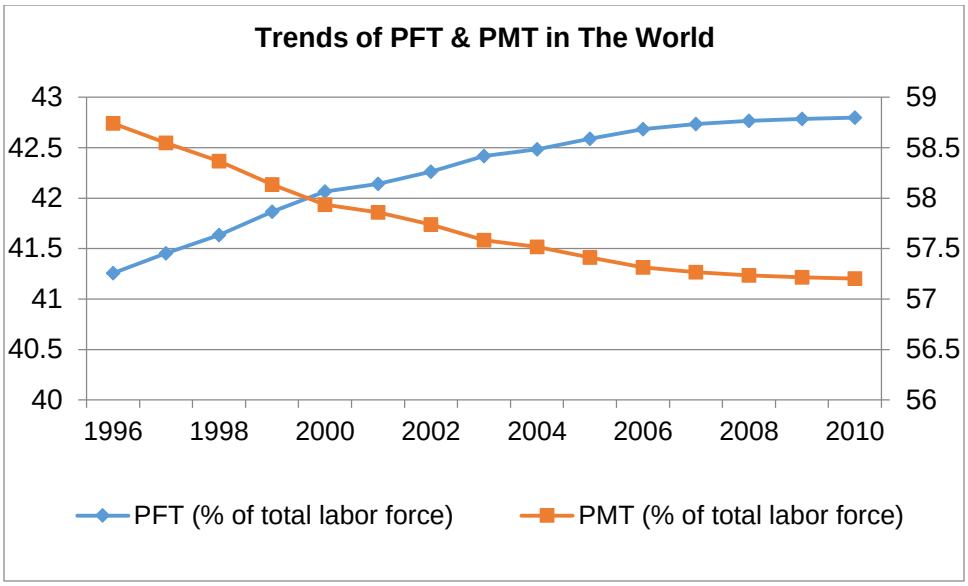

Figure 7. Trends of PFT and PMT in the world. Source: The World Bank.

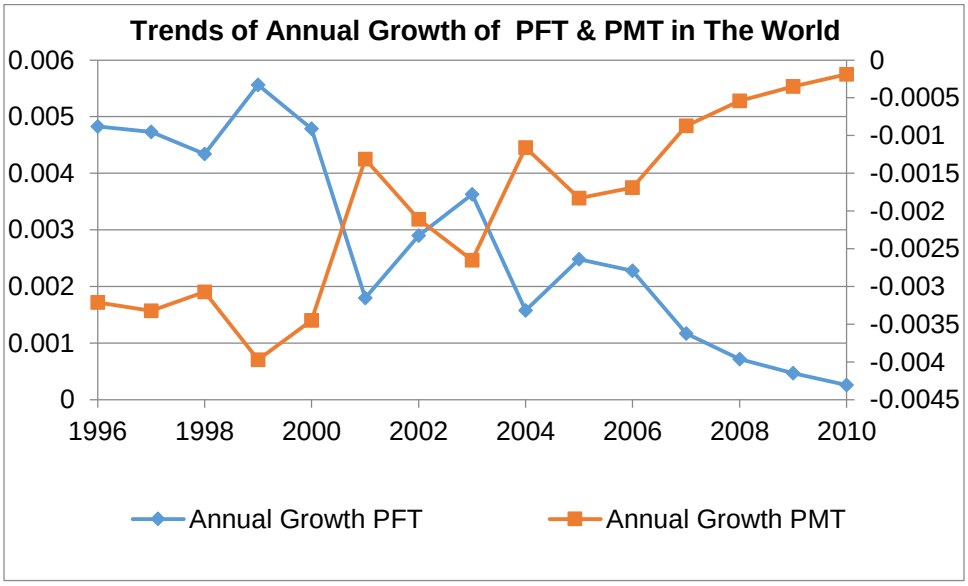

Figure 8. Trends of annual growth of PFT and PMT in the world. *Source:* The World Bank.

As the second measurement of the labor force participation rates in terms of gender (as a percentage of total females and males), Table 8 and Figures 9 and10 show the annual averages and growth of the world PF and PM over the period 1996-2010.

Table 8 and Figures 9 and 10 show that during the period 1996-2005, 35%-37% of the total females, and 51%-54% of the total males were in the labor market. PF had been rising by increasing rates, greater than PM. During the period 2006-2010 PF had decreasing rates and tended to decline, while PM had been rising by increasing rates. The trends of PF can be connected to the trends of PFT and population age distribution. In Section 4.2.1, I found that after 2006 population ages 0-14 declined by decreasing rates and tended to rise due to increasing numbers of births. An Increasing number of births lead to a decreasing female labor force rate and increasing male labor force rate.

Table 8

Distribution and Annual Growth of PF and PM in the World

Year	PF % of Total Females	PM % of Total Males	Annual Growth PF	Annual Growth PM
1996	35.637	51.777	0.00303	-0.00185
1997	35.752	51.686	0.00323	-0.00176
1998	35.934	51.704	0.00507	0.00035
1999	36.07	51.776	0.00381	0.00140
2000	36.338	51.865	0.00742	0.00172
2001	36.543	51.993	0.00565	0.00247
2002	36.836	52.13	0.00800	0.00264
2003	37.138	52.261	0.00822	0.00251
2004	37.418	52.516	0.00752	0.00487
2005	37.634	52.798	0.00579	0.00537
2006	37.914	53.056	0.00742	0.00490
2007	37.911	53.328	-0.00006	0.00512
2008	37.883	53.604	-0.00074	0.00519
2009	37.829	53.885	-0.00143	0.00524
2010	37.727	54.175	-0.00272	0.00538

Source: The World Bank.

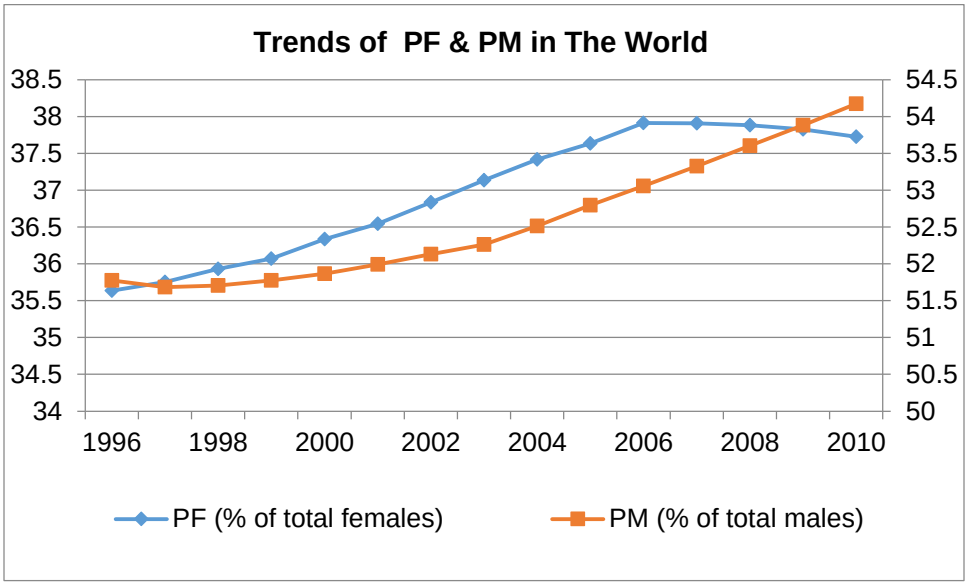

Figure 9. Trends of PF and PM in the world. *Source:* The World Bank.

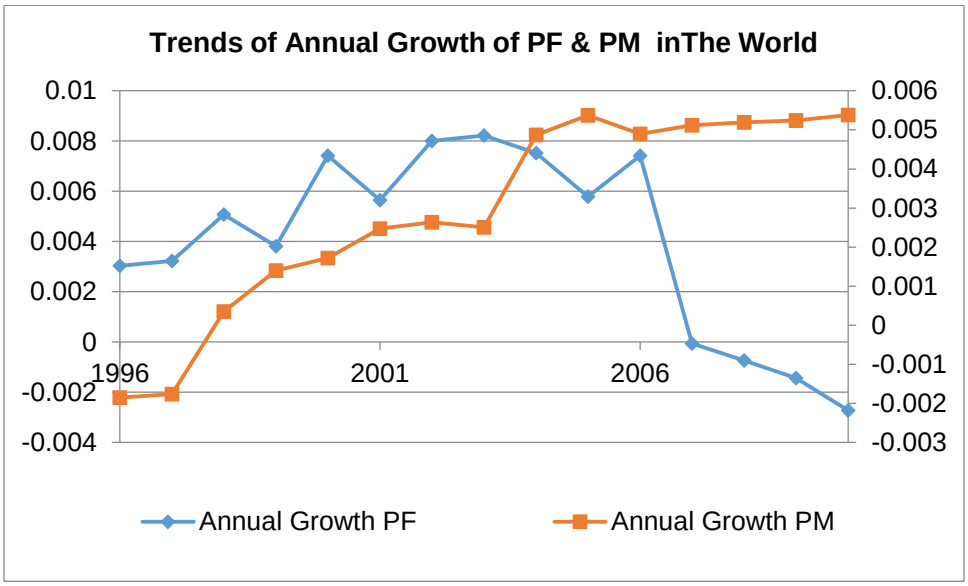

Figure 10. Trends of annual growth of PF and PM in the world. *Source:* The World Bank.

Therefore, trends of the world labor force participation rates indicate that in terms of ages, the rates are moving toward child labor and elderly people in the labor force especially after 2006 due to the declining rate of ages 15-64 and rising rates of ages 0-14 and 65 and above. In terms of gender, the trends indicate that the rates are moving

toward male labor rather than female due to the declining female labor rates and rising male labor rates. These findings can be connected to the influences of health expenditures on the world labor force. In the next section, I investigate the effects of health expenditures on the world population and labor force.

4.2.3 Effects of Health Expenditures on Population and Labor Force in the World

In section 4.2.1 and regarding the world population, I found that the world population is moving toward a baby boom, aging, and a declining rate of productive proportion, which is ages 15-64. In section 4.2.2 and regarding the world labor force, I found that the world labor force is moving toward child labor and elderly people in the labor force, and a declining rate in the standard labor force, which is ages 15-64 as a percentages of the total labor force and total ages. Also, I found that there is a correlation between the trends of population and labor force. An increasing population ages 0-14 negatively influences the female labor force, and the increasing population ages 65 and above positively influences the rate of elderly people in the labor force. According to these findings, it is obvious that health expenditures has observable negative influences on the population and labor force through its factors such as the rates of fertility, birth, death, and mortality. The rates of fertility, birth, and mortality influence the population ages 0-14 and the labor force, especially female labor. The death rate influences the population ages 65 and above and the labor force ages 65 and above. To investigate how health expenditures and its factors negatively influences the world population and labor force, I use the same approach as in the previous sections by computing the annual average growth of health expenditures and the rates of fertility (FR), birth (BR), death (DR), and mortality (MR) over the period 1996-2010.

From Table 9 and Figures 11 and 12, we can see that there was a correlation between health expenditures and the rates of fertility, birth, death, and mortality over the period 1996-2010 in general, and during the period 2006-2010 in particular. As a

stationary year, before 2006 health expenditures had been declining and associated with declining fertility and birth rates, and with steadily declining death and mortality rates. After 2006, health expenditures had been rising and associated with the rising fertility and birth rates, as well as rapidly declining death and mortality rates. Connecting the trends of these rates with the trends of population and labor force in sections 4.2.2 and 4.2.3, we can see that there is an obvious correlation between them. During the same periods, rising fertility and birth rates lead to rising rates of population ages 0-14 and a declining female labor force rate, consequently to a declining rate of labor force ages 15-64 (PT 15-64). Declining death and mortality rates lead to rising rates of population ages 0-14 and ages 65 and above, then to a declining rate of population ages 15-64. Rising rates of population ages 0-14 and 65 and above lead to rising child labor and elderly people in the labor force. Also, health expenditures negatively influences the labor force ages 15-64 as a percentage of total ages (P15-64). Rising health expenditures leads to declining P15-64 and rising P 0-14 and 65 and above. Therefore, the trends of the world rates of fertility, birth, death, and mortality negatively influence the world population and labor force by decreasing the rate of productive proportion of population and labor force, which is ages 15-64. Also, due to the high correlation between health expenditures and the rates of fertility, birth, death, and mortality, health expenditures must be reconsidered in order to adjust and modify the current trends of population and labor force participation rates. In the next chapter, I estimate the effects of health expenditures on population age distribution and labor force participation rates. The estimate is made by using the fixed effects multiple regression. The estimate will determine the signs of health expenditures and the coefficient that represent the amount of negative influence.

Table 9

Rates and Annual Growth of HX, FR, BR, DR, and MR in the World

Year	HX	FR	BR	DR	MR	Annual Growth HX	Annual Growth FR	Annual Growth BR	Annual Growth DR	Annual Growth MR
1996	5.05	2.79	2.52	1.11	1.05	-0.042	-0.014	-0.015	-0.017	-0.018
1997	4.85	2.75	2.52	1.09	1.03	-0.039	-0.016	-0.014	-0.017	-0.015
1998	4.75	2.71	2.49	1.08	1.02	-0.021	-0.016	-0.012	-0.011	-0.015
1999	4.57	2.67	2.46	1.06	0.99	-0.038	-0.013	-0.012	-0.011	-0.027
2000	4.33	2.67	2.44	1.05	0.96	-0.054	-0.001	-0.008	-0.015	-0.030
2001	4.08	2.60	2.40	1.03	0.92	-0.057	-0.026	-0.015	-0.014	-0.041
2002	4.20	2.57	2.38	1.03	0.88	0.029	-0.012	-0.010	-0.007	-0.040
2003	3.94	2.54	2.36	1.02	0.84	-0.062	-0.008	-0.006	-0.009	-0.044
2004	3.92	2.53	2.35	0.99	0.81	-0.005	-0.006	-0.007	-0.028	-0.045
2005	3.90	2.51	2.33	0.98	0.77	-0.005	-0.009	-0.009	-0.009	-0.044
2006	4.15	2.51	2.32	0.96	0.74	0.064	0.001	-0.001	-0.019	-0.040
2007	4.28	2.52	2.34	0.94	0.71	0.032	0.003	0.007	-0.022	-0.043
2008	4.40	2.52	2.36	0.92	0.68	0.027	0.002	0.008	-0.023	-0.046
2009	4.48	2.52	2.38	0.90	0.64	0.018	0.002	0.008	-0.023	-0.046
2010	4.56	2.53	2.40	0.87	0.61	0.017	0.002	0.008	-0.025	-0.048

Source: The World Bank.

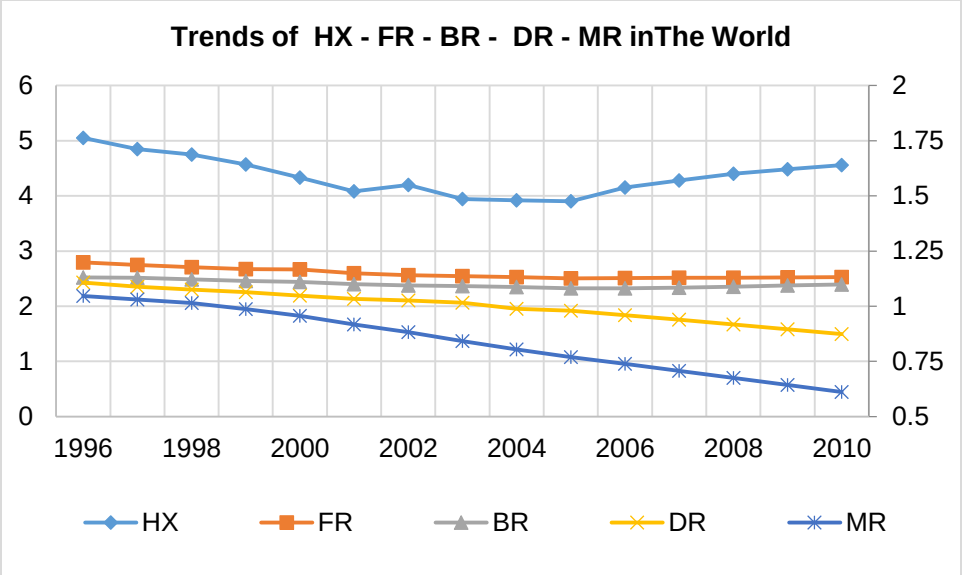

Figure 11. Trends of HX, FR, BR, DR, and MR rates in the world. *Source:* The World Bank.

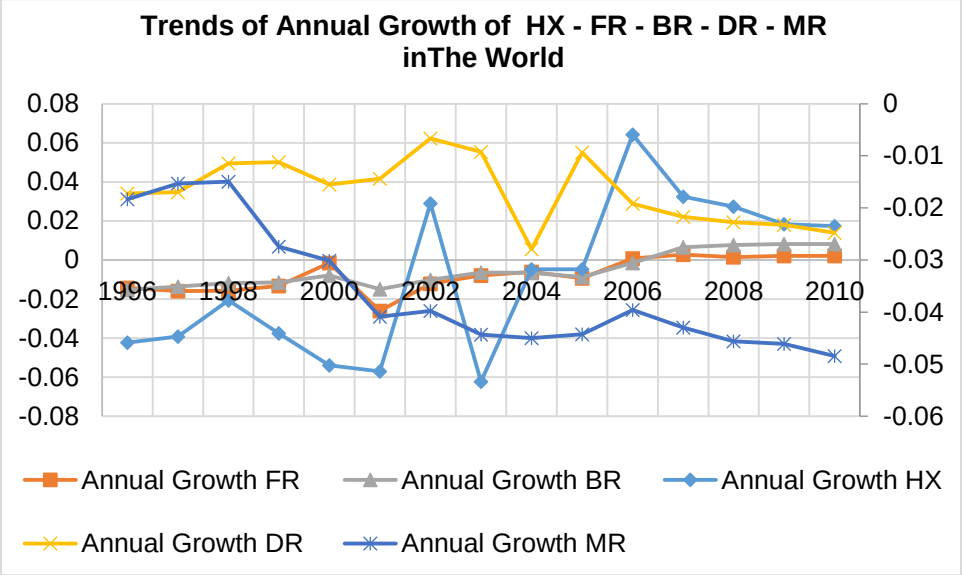

Figure 12. Trends of annual growth of HX, FR, BR, DR, and MR rates in the world. *Source:* The World Bank.

The aggregate trends of population and labor force participation rates in the world cannot be used as useful references to adopt specific plans and policies that can be applied in all countries. Each country has its own population and labor force structure.

Also, each country has its own economic features that depend on its resources and development needs. Therefore, the trends of population and labor force participation rates have to be analyzed and estimated for each country or each group of countries that have similar economic and demographic features. In the next two sections (4.3 and 4.4), I investigate the trends of population and labor force participation rates in low and high-income countries.

4.3 Trends of Population and Labor Force Participation in Low-Income Countries

4.3.1 Trends of Population in Low-Income Countries

To investigate the trends of population in low-income countries, I am going to use the same approach as in section 4.2.1 by computing the annual growth of population proportions. Also, I use the year 2006 as a stationary year to compare the population trends before and after this year to determine their directions in low-income countries. Table 10 and Figures 13 and14 show the annual average growth of population in low-income countries over the period 1996-2010.

Table 10 and Figures 13 and 14 show that the population in low-income countries over the period 1996-2010 was distributed as 42%-45% ages 0-14, 51%-54 % ages 15-64, and 3.13%-3.14% ages 65 and above. They also show that low-income countries have a higher rate of ages 0-14 than the world average and lower rates of ages 15-64 and 65 and above. Regarding the population trends, we can see that before the stationary year 2006, the rate of population ages 0-14 had been declining by increasing rates, then by decreasing rates and back to declining by increasing rates after 2006. The rate of population ages 15-64 had been rising by increasing rates then by decreasing rates before 2006 and back to rising by increasing rates after 2006 but less than before 2006, and can be considered as a declining trend. The rate of population ages 65 and above had been steadily rising over the period 1996-2010. Comparing these trends with the world population trends in section 4.2.1 indicates three main

findings: first, the world baby boom can be found in low-income countries due to the fact that despite the declining rate of population ages 0-14 they still have a high proportion of children; second, the declining rate of population ages 15-64 can be found in low-income countries too, due to the fact that despite the rising rate of population ages 15-64, they still comprise a relatively low proportion of the population; and third, population aging is rare in low-income countries due to the fact that they have a small rate of the population ages 65+, but this rate had been steadily rising over the period 1996-2010. Therefore, the findings show that a large rate of the population in low-income countries is youth but not productive, and they still have a baby boom.

Table 10

Age Distribution and Annual Growth of Population in Low-Income Countries

Year	Ages 0-14 % of Total Population	Ages 15-64 % of Total Population	Ages 65+ % of Total Population	Annual Growth Ages 0-14	Annual Growth Ages 15-64	Annual Growth Ages 65+
1996	44.962	51.893	3.145	-0.00246	0.00041	0.00011
1997	44.839	52.016	3.146	-0.00274	0.00237	0.00022
1998	44.703	52.153	3.144	-0.00303	0.00263	-0.00048
1999	44.546	52.313	3.141	-0.00351	0.00307	-0.00089
2000	44.367	52.494	3.139	-0.00402	0.00346	-0.00083
2001	44.168	52.696	3.137	-0.00449	0.00385	-0.00057
2002	43.952	52.911	3.136	-0.00489	0.00408	-0.00026
2003	43.733	53.131	3.136	-0.00498	0.00416	0.00000
2004	43.524	53.34	3.136	-0.00478	0.00393	0.00000
2005	43.333	53.531	3.136	-0.00439	0.00358	0.00000
2006	43.164	53.7	3.136	-0.00390	0.00316	0.00003
2007	43.01	53.853	3.137	-0.00357	0.00285	0.00019
2008	42.862	54.001	3.138	-0.00344	0.00275	0.00032
2009	42.704	54.157	3.139	-0.00369	0.00289	0.00035
2010	42.53	54.33	3.14	-0.00407	0.00319	0.00038

Source: The World Bank.

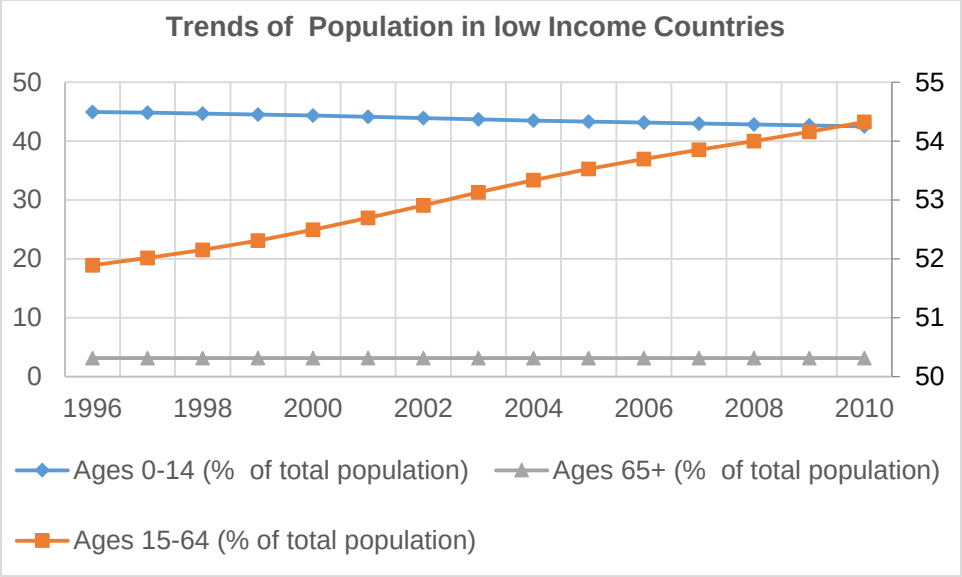

Figure 13. Trends of population in low-income countries. *Source:* The World Bank.

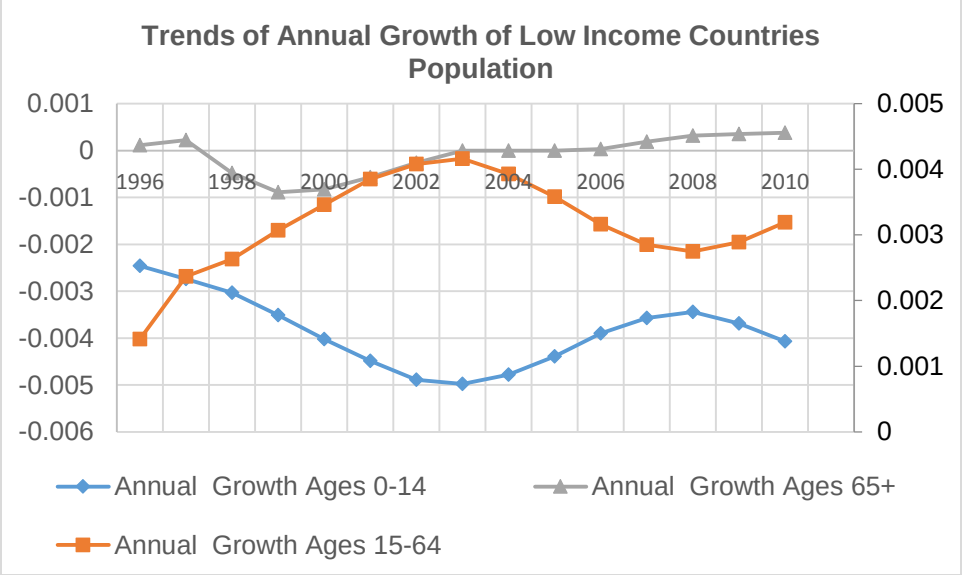

Figure 14. Trends of annual growth of population in low-income countries. *Source:* The World Bank.

4.3.2 Trends of the Labor Force Participation Rates in Low-Income Countries

To investigate the trends of labor force participation rates in low-income countries, I use the same approach that I have used in section 4.2.2 by measuring the rates in terms of age and gender. In terms of ages and as the first measurement, Table

11 and Figures15 and 16 show the annual averages and growth of PTs in low-income countries over the period 1996-2010.

Table11 and Figures 15 and 16 show that in low-income countries, PT15-64 constitutes 93%-94% of the total labor force, while PT 0-14 and PT 65+ constitute 2%-3% and 3.8%-3.9% of the total labor force respectively. The rate of PT 0-14 in low-income countries is higher than the world average rate, while the rates of PT15-64 and PT 65+ are lower. Also, we can see that before the stationary year 2006, PT15-64 had been rising by increasing rates, while PT 0-14 and PT65+ were declining. After 2006, PT 15-64 had been rising by decreasing rates and tending to decline, while PT 0-14 had been rising rapidly and PT 65+ had been steadily rising. Comparing the trends of PTs with the population trends, we can see that there is a positive relationship between them. The declining rate of population ages 15-64 leads to a declining PT15-64, and rising PT 0-14 and PT65+ to compensate for the decline in PT15-64. Also, PT 0-14 had been rising more than PT 65+, which proves that child labor can be found in low-income countries, but elderly people in the labor force is rare due to the fact that low-income countries have a small proportion of ages 65 and above and it is always steadily rising.

Table 11

Distribution and Annual Growth of PTs in Low-Income Countries

Year	PT 0-14 % of Total Labor Force	PT 15-64 % of Total Labor Force	PT 65+ % of Total Labor Force	Annual Growth PT 0-14	Annual Growth PT 15-64	Annual Growth 65+
1996	2.904	93.29	3.868	0.00011	-0.00012	0.00132
1997	2.905	93.205	3.872	0.00013	-0.00015	0.00114
1998	2.889	93.222	3.835	-0.00544	0.00017	-0.00973
1999	2.868	93.287	3.831	-0.00739	0.00070	-0.00094
2000	2.875	93.305	3.809	0.00273	0.00019	-0.00571

Table 11—Continued

Year	PT 0-14 % of Total Labor Force	PT 15-64 % of Total Labor Force	PT 65+ % of Total Labor Force	Annual Growth PT 0-14	Annual Growth PT 15-64	Annual Growth 65+
2001	2.888	93.323	3.786	0.00452	0.00019	-0.00603
2002	2.843	93.385	3.742	-0.01573	0.00067	-0.01162
2003	2.721	93.535	3.718	-0.04299	0.00160	-0.00641
2004	2.624	93.659	3.71	-0.03569	0.00132	-0.00219
2005	2.571	93.71	3.734	-0.01992	0.00055	0.00642
2006	2.532	93.721	3.848	-0.01536	0.00012	0.03054
2007	2.366	93.757	3.874	-0.06536	0.00039	0.00685
2008	2.47	93.752	3.878	0.04363	-0.00006	0.00105
2009	2.516	93.682	3.895	0.01893	-0.00075	0.00428
2010	2.587	93.529	3.938	0.02802	-0.00163	0.01111

Source: The World Bank.

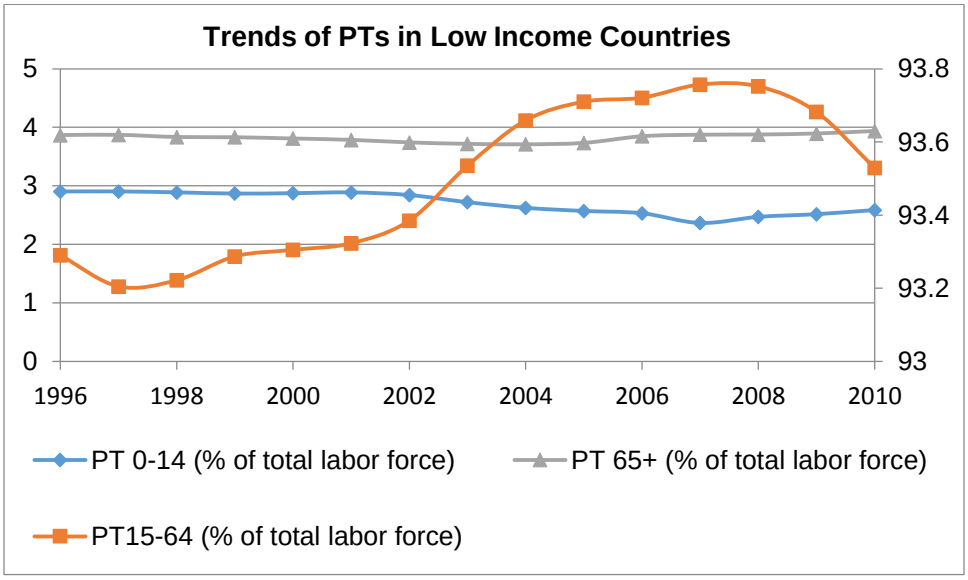

Figure 15. Trends of PTs in low-income countries. *Source:* The World Bank.

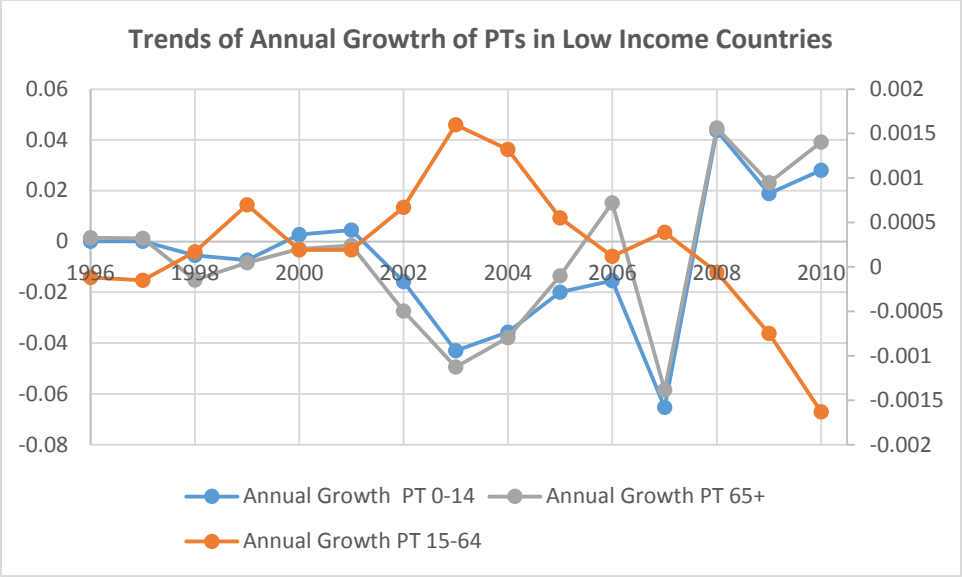

Figure 16. Trends of annual growth of PTs in low-income countries. *Source:* The World Bank.

As the second measurement of the labor force participation rates in terms of ages, Table 12 and Figures 17 and 18 show the annual averages and growth of P in low-income countries.

From the table and figures, we can see that in low-income countries 74%-75% of ages 15-64, 2%-3% of ages 0-14, and 50%-52% of ages 65 and above are in the labor market. The rates of Ps in low-income countries are higher than the world average rates. Also, we can see that before the stationary year 2006, P15-64 had been rising, while P 0-14 had been declining with limited changes in P65+. After 2006, P15-64 had been declining, while P 0-14 had been rising also with limited changes in P 65+. The trends indicate that there is additional decline among the rate of workers ages 15-64 and an additional rise in the rate of workers ages 0-14 and 65 after 2006. The first decline is the result of a declining rate of the population ages 15-64 and rising rates of the ages 0-14 and 65+. The second decline is the result of the declining rate of workers ages 15-64 and rising rates of workers age 0-14 and 65 and above as a percentages of total ages. Also, these findings are additional evidence of child labor in low-income countries due to

the fact that any deterioration in the standard labor force is compensated by workers ages 0-14.

Table 12

Distribution and Annual Growth of Ps in Low-Income Countries

Year	P 0-14 % of Total Ages 0-14	P 15-64 % of Total Ages 15-64	P 65+ %of Total Ages 65+	Annual Growth P 0-14	Annual Growth P15-64	Annual Growth P 65+
1996	2.801	74.662	51.221	0.01171	-0.00141	0.09978
1997	2.834	74.569	51.371	0.01178	-0.00125	0.00293
1998	2.836	74.531	50.748	0.00071	-0.00051	-0.01213
1999	2.846	74.469	50.786	0.00353	-0.00083	0.00075
2000	2.863	74.584	50.727	0.00597	0.00154	-0.00116
2001	2.875	74.712	50.77	0.00419	0.00172	0.00085
2002	2.83	74.881	50.884	-0.01565	0.00226	0.00225
2003	2.706	75.003	50.971	-0.04382	0.00163	0.00171
2005	2.562	75.225	51.629	-0.01613	0.00078	0.00738
2006	2.54	75.316	51.811	-0.00859	0.00121	0.00353
2007	2.552	75.344	52.183	0.00472	0.00037	0.00718
2008	2.559	75.425	52.199	0.00274	0.00108	0.00031
2009	2.565	75.484	52.189	0.00234	0.00078	-0.00019
2010	2.66	75.563	52.112	0.03704	0.00105	-0.00148

Source: The World Bank.

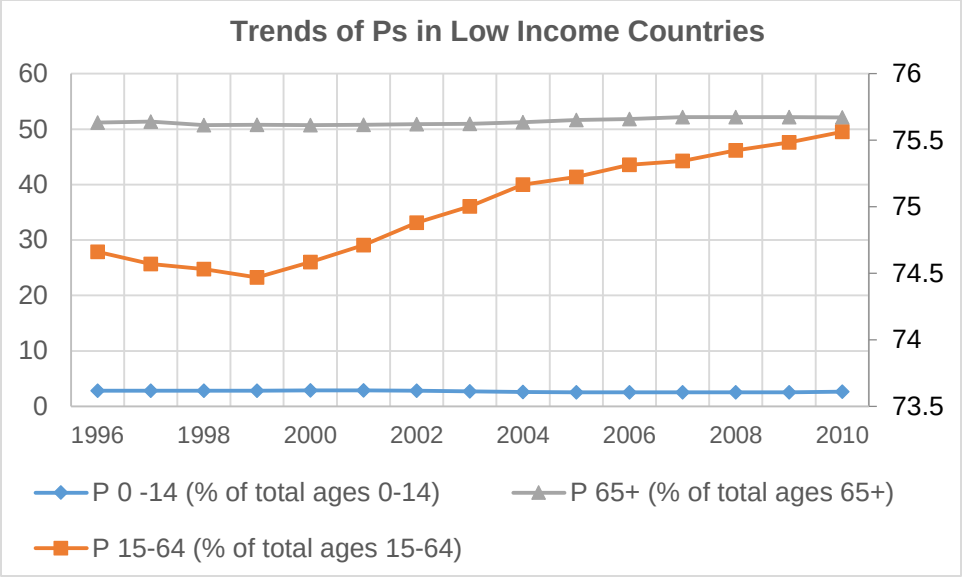

Figure 17. Trends of Ps in low-income countries. *Source:* The World Bank.

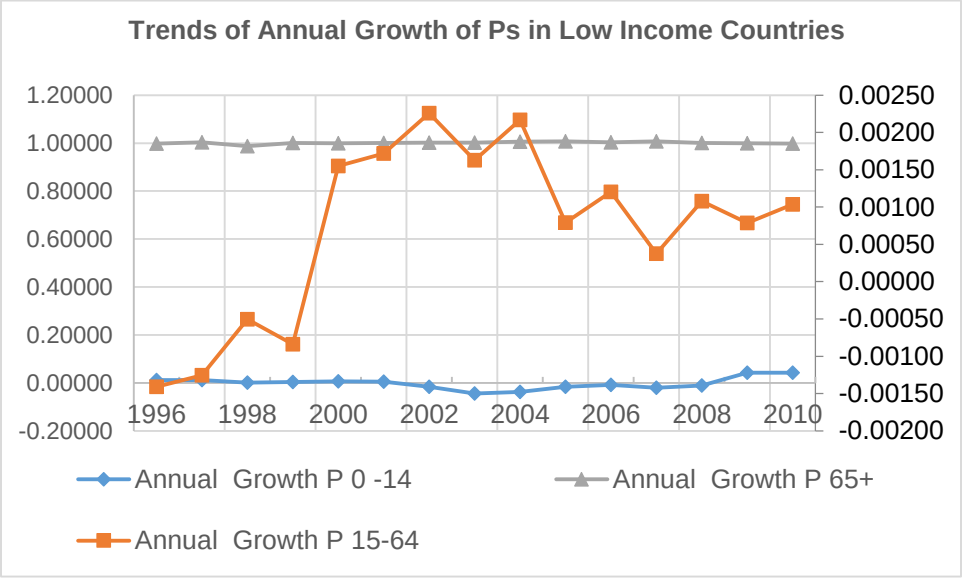

Figure 18. Trends of annual growth of Ps in low-income countries. *Source:* The World Bank.

In terms of gender, the first measurement of the labor force participation rates is as a percentage of the total labor force, PFT represents the female rate and PMT represents the male rate. To investigate the trends of labor force participation rates of

low-income countries in terms of gender, I compute the annual averages and growth of PFT and PMT over the period 1996-2010.

Table 13 and Figures 19 and 20 show that low-income countries have a higher rate of male labor (PMT) than female (PFT). Also, the rates are moving in opposite directions and compensating for each other. Also, low-income countries have a greater PFT than the world rate but smaller MT. Before the stationary year 2006, the PFT had been declining and the PMT rising, while after 2006 the PFT had been rising and the PMT declining. Comparing the trends of PFT and PMT with the trends of population in section 4.3.1 we can see that the trend of ages 0-14 influences the trends of PFT and PMT. The declining rate of the population ages 0-14 that results from a declining birth rate leads to a rising PFT and a declining PMT and vice versa. This finding, as I explained in section 4.2.2, can be developed to investigate the influences of health expenditures on labor force participation rates through the rates of fertility, birth, death, and mortality.

Table 13

Distribution and Annual Growth of PFT and PMT in Low-Income Countries

Year	PFT % of Total Labor Force	PMT % of Total Labor Force	Annual Growth PFT	Annual Growth PMT
1996	0.43862	0.56138	0.00225	-0.00122
1997	0.43964	0.56036	0.00232	-0.00181
1998	0.44103	0.55897	0.00317	-0.00249
1999	0.44193	0.55807	0.00205	-0.00161
2000	0.44307	0.55693	0.00257	-0.00204
2001	0.44299	0.55701	-0.00017	0.00013
2002	0.44343	0.55657	0.00098	-0.00078

Table 13—Continued

Year	PFT % of Total Labor Force	PMT % of Total Labor Force	Annual Growth PFT	Annual Growth PMT
2003	0.44406	0.55594	0.00141	-0.00112
2004	0.44448	0.55552	0.00096	-0.00076
2005	0.44478	0.55522	0.00068	-0.00054
2006	0.44589	0.55411	0.00250	-0.00200
2007	0.44664	0.55336	0.00167	-0.00135
2008	0.44763	0.55237	0.00221	-0.00178
2009	0.44791	0.55209	0.00064	-0.00052
2010	0.44850	0.55150	0.00130	-0.00106

Source: The World Bank.

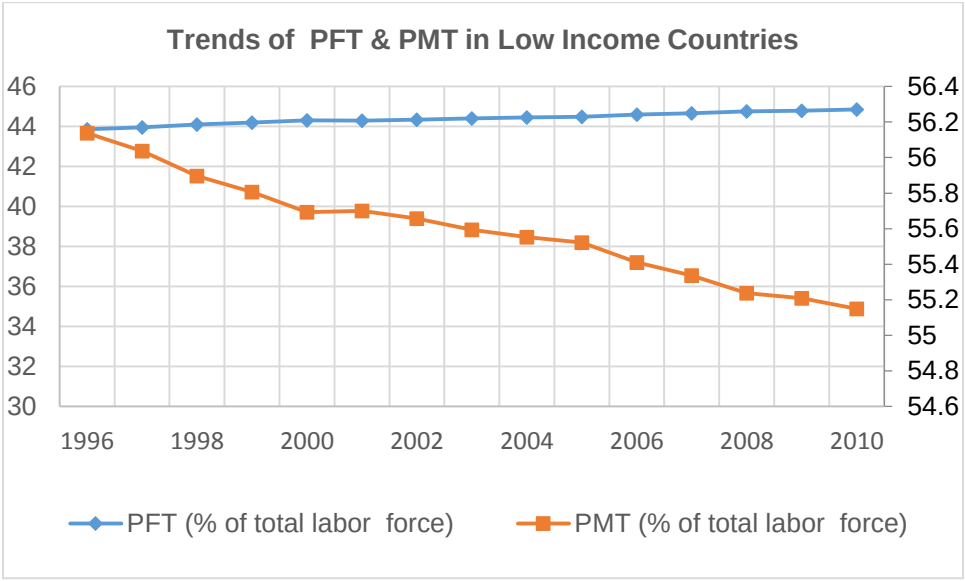

Figure 19. Trends of PFT and PMT in low-income countries. Source: The World Bank.

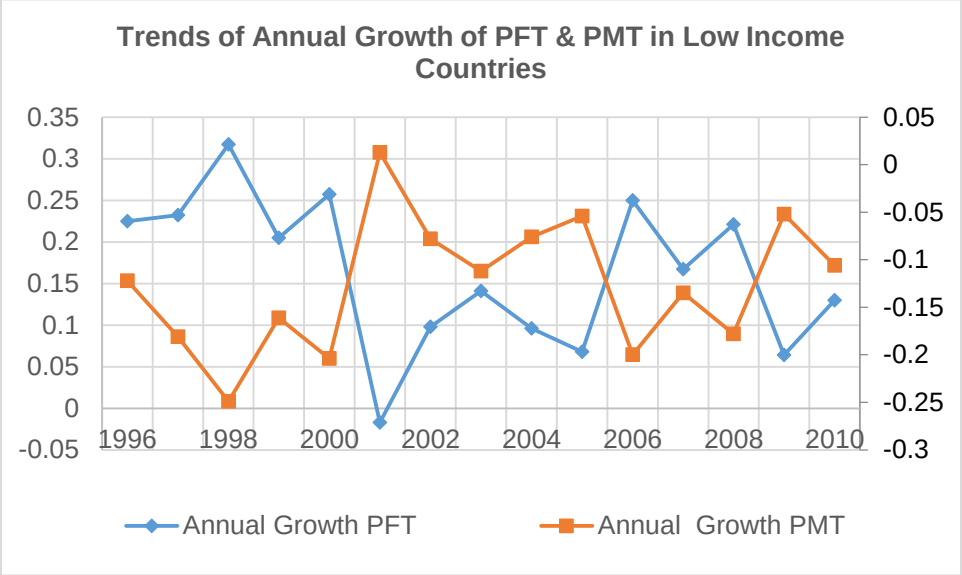

Figure 20. Trends of annual growth of PFT and PMT in low-income countries. *Source:* The World Bank.

The second measurement of labor force in terms of gender is as a percentage of total gender (total females and males). I compute the annual averages and growth of F and M in low-income countries over the period 1996-2010.

Table 14 and Figures 21 and 22 show that 35%-39% of females and 45%-47% of males are participating in the labor market of low-income countries. Low-income countries have a higher PF than the world rate but a lower PM. Also, the rates had been changing over the period 1996-2010. Before the stationary year 2006, PF had been declining and PM rising, while after 2006 PF had been rising and PM declining. Connecting the trends of PM and PF with the trends of PFT and PMT, and the trends of population in section 4.3.1, we can see that there is a relationship between these trends. Before 2006 and as a result of rising rates of birth and ages 0-14, PFT and PF had been declining and PMT and PM rising, while after 2006 and as a result of declining rates of birth and ages 0-14, PFT and PF had been rising, and PMT and PM declining.

Table 14

Distribution and Annual Growth of PF and PM in Low-Income Countries

Year	PF % of Total Females	PM % of Total Males	Annual Growth PF	Annual Growth PM
1996	35.637	45.155	0.00211	-0.00072
1997	35.752	45.128	0.00323	-0.00060
1998	35.934	45.121	0.00507	-0.00016
1999	36.07	45.133	0.00381	0.00026
2000	36.338	45.23	0.00742	0.00215
2001	36.543	45.471	0.00565	0.00533
2002	36.836	45.679	0.00800	0.00458
2003	37.138	45.844	0.00822	0.00362
2004	37.418	46.031	0.00752	0.00408
2005	37.634	46.204	0.00579	0.00376
2006	37.814	46.3	0.00477	0.00208
2007	38.014	46.385	0.00530	0.00182
2008	38.232	46.489	0.00572	0.00224
2009	38.469	46.645	0.00621	0.00337
2010	38.727	46.784	0.00669	0.00297

Source: The World Bank.

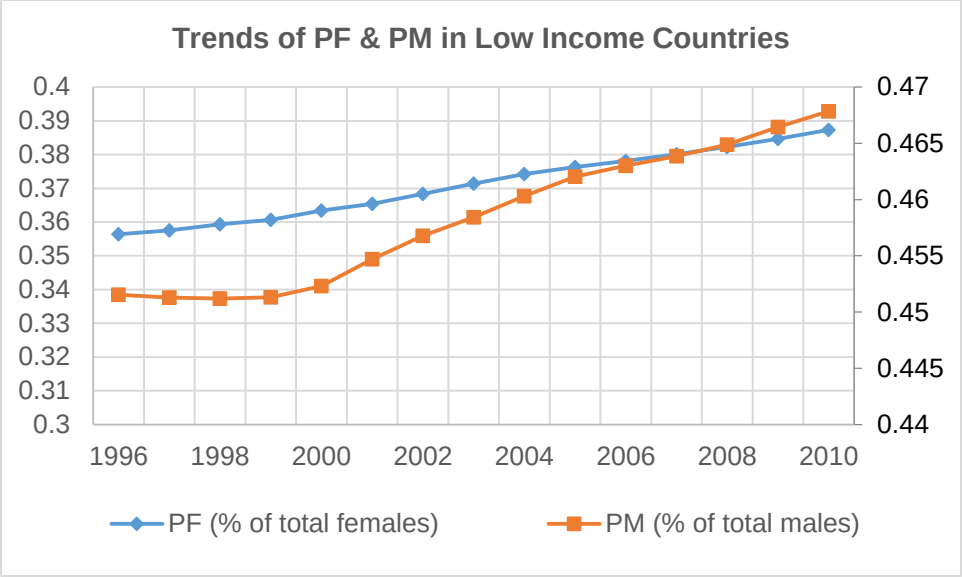

Figure 21. Trends of PFT and PMT in low-income countries. *Source:* The World Bank.

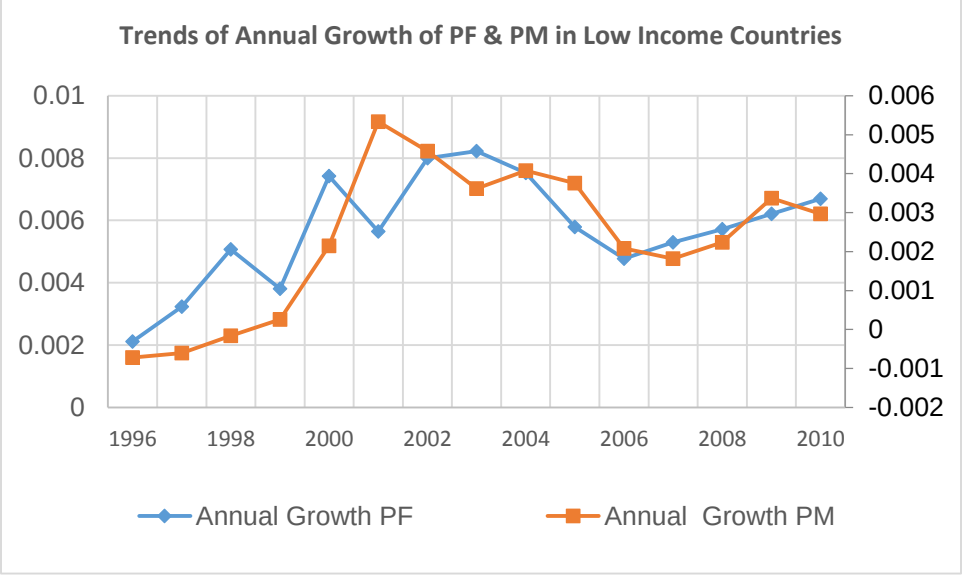

Figure 22. Trends of annual growth of PFT and PMT in low-income countries. *Source:* The World Bank.

Therefore, the trends of low-income countries' labor force participation rates in terms of ages indicate that the rates are moving toward child labor, especially after 2006, due to the declining rates of ages 15-64 and rising rates of ages 0-14. In terms of gender, the trends indicate that the rates are moving toward male labor rather than

female due to the declining female rates and rising male rates. These findings can be connected to the influences of health expenditures on the labor force. In next section, I investigate the effects of health expenditure on the population and labor force in low-income countries.

4.3.3 Effects of Health Expenditures on the Population and Labor Force in Low-Income Countries

Regarding the effects of health expenditures on population and labor force in low-income countries, I summarize the trends of population and labor force. In section 4.3.1 and regarding the population age distribution, I found that in low-income countries population is moving toward a baby boom and a declining rate of productive ages 15-64 due to the high rate of ages 0-14. In section 4.3.2 and regarding the labor force, I found that the labor force in low-income countries is moving toward a child labor and a declining rate of workers ages15-64. I also found that low-income countries have a lower and rising female labor rate while, they have a greater and declining male labor rate. The main cause of the rising female labor rate is the declining rates of birth and ages 0-14. According to these findings and due to the correlation between health expenditures, population, and labor force as I explained in section 4.2.3, I investigate the effects of health expenditures on population and labor force in low-income countries to find out if the influences are positive or negative by computing the annual averages and growth of HX, FR, BR, DR, and MR.

Table 15 and Figures 23 and 24 show the trends of HX, FR, BR, DR, and MR in low-income countries. We can see that before 2006, the health expenditures had been decreasing while after 2006 it was increasing. The increasing health expenditures after 2006 did not influence DR and MR because they continue steadily declining. Also, the increasing health expenditures led to improving FR and BR because they had been declining by decreasing rates. The influences of health expenditures are considered as

negative because they lead to a rising rate of population ages 0-14 and a declining rate of population ages 15-64.

Due to the high correlation between the trends of FR, BR, DR, and MR and the trends of population age distribution and labor force, we see that health expenditures has negative influences. Regarding the population, as I explained in section 4.3.1, continued high FR and BR lead to continued high proportion of population ages 0-14, and continued high DR is leads to continued low proportions of population ages 15-64 and 65+. Regarding to labor force as, I explained in section 4.3.2, a high proportion of ages 0-14 and low proportion of ages 15-64 lead to a declining labor force rate ages 15-64 and rising child labor rate. Also, health expenditures negatively influences the labor force ages 15-64 as percentages of total ages because the increasing HX is associated with declining P 15-64. Therefore, health expenditure must be reconsidered to change these influences to positive by increasing and reallocating it as I explain later.

Table 15

Rates and Annual Growth of HX, FR, BR, DR, and MR in Low-Income Countries

Year	HX	FR	BR	DR	MR	Annual Growth HX	Annual Growth FR	Annual Growth BR	Annual Growth DR	Annual Growth MR
1996	1.22	3.55	2.55	1.11	2.68	-0.040	-0.014	-0.014	-0.017	-0.016
1997	1.17	3.50	2.52	1.09	2.64	-0.040	-0.014	-0.014	-0.017	-0.015
1998	1.14	3.45	2.49	1.08	2.60	-0.022	-0.014	-0.012	-0.011	-0.015
1999	1.10	3.41	2.46	1.06	2.53	-0.038	-0.012	-0.012	-0.011	-0.027
2000	1.04	3.40	2.44	1.05	2.45	-0.054	-0.003	-0.008	-0.015	-0.030
2001	0.98	3.32	2.40	1.03	2.35	-0.060	-0.024	-0.015	-0.014	-0.041
2002	1.00	3.28	2.38	1.03	2.26	0.027	-0.012	-0.010	-0.007	-0.040

Table 15—Continued

Year	HX	FR	BR	DR	MR	Annual Growth HX	Annual Growth FR	Annual Growth BR	Annual Growth DR	Annual Growth MR
2003	0.94	3.25	2.36	1.02	2.16	-0.065	-0.010	-0.006	-0.009	-0.044
2004	1.03	3.22	2.35	0.99	2.06	0.099	-0.009	-0.007	-0.028	-0.045
2005	1.04	3.19	2.33	0.98	1.97	0.005	-0.011	-0.009	-0.009	-0.044
2006	1.06	3.17	2.32	0.96	1.89	0.023	-0.005	-0.003	-0.019	-0.040
2007	1.06	3.15	2.31	0.95	1.81	0.001	-0.006	-0.004	-0.013	-0.043
2008	1.06	3.14	2.31	0.93	1.74	-0.001	-0.004	-0.002	-0.017	-0.040
2009	1.08	3.10	2.29	0.91	1.67	0.016	-0.012	-0.009	-0.018	-0.037
2010	1.10	3.07	2.26	0.90	1.63	0.020	-0.010	-0.009	-0.014	-0.025

Source: The World Bank.

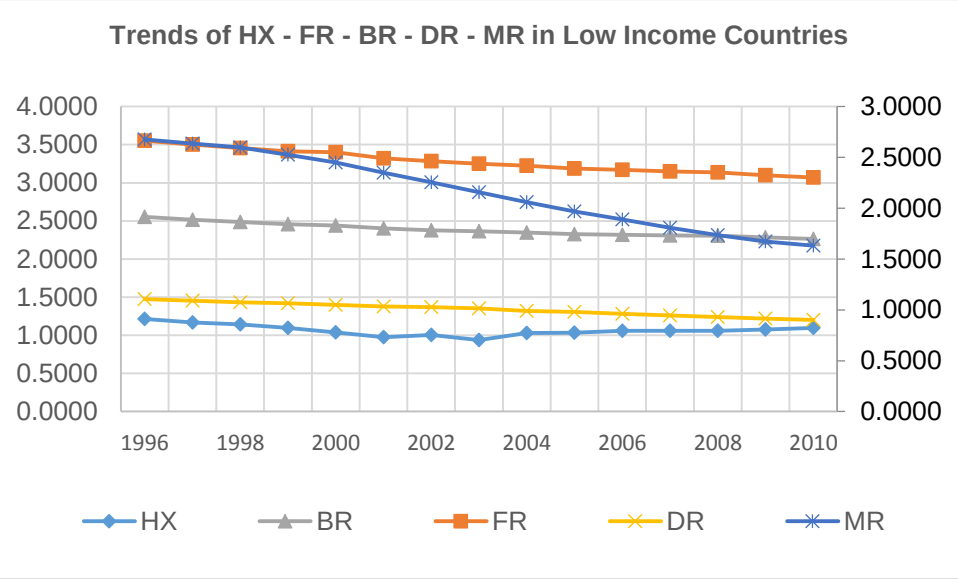

Figure 23. Trends of HX – FR – BR – DR – MR in low-income countries. *Source:* The World Bank.

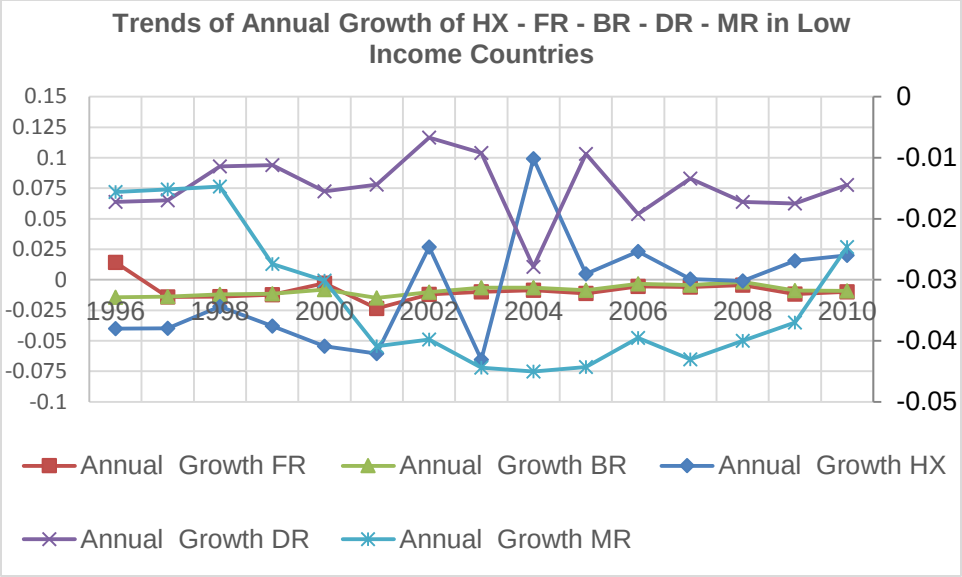

Figure 24. Trends of annual growth of HX – FR – BR – DR – MR in low-income countries. *Source:* The World Bank.

4.4 Trends of Population and Labor Force Participation Rates in High-Income Countries

4.4.1 Trends of Population in High-Income Countries

Using the same approaches in sections 4.2.1 and 4.3.1, Table 16 and Figures 25 and 26 show the annual averages and growth of the population high-income countries.

Table 16 and Figures 25 and 26 show that the population in high-income countries over the period 1996-2010 was distributed as 18%-22% ages 0-14, 66%-69% ages 15-64, and 11%-13% ages 65 and above. They also show that high-income countries have a higher proportion of ages 15-64 and 65 and above than the world and low-income countries respectively, and a lower proportion of ages 0-14. Regarding the population trends, we can see that before the stationary year 2006, the rate of population ages 0-14 had been declining by increasing rates, while after 2006 it had been declining by decreasing rates and tending to rise. The rate of population ages 15-64 before 2006 had been rising by increasing rates, while after 2006 it had been rising by decreasing rates and tending to decline. The rate of population ages 65 and above

before 2006 had been rising by decreasing rates, while after 2006 it had been rising by increasing rates. Comparing the trends of population in high-income countries with the world trends in section 4.2.1, and low-income countries in section 4.3.1 indicates three main findings: first, a baby boom cannot be found in high-income countries as seen in the small but rising rate of population ages 0-14; second, the declining rate of population ages 15-64 also can be found in high-income countries as seen in the declining rate of growth, especially after 2006; and third, the population aging trend can be found in high-income countries as seen in the high and rising rate of population ages 65 and above, the low rate of population ages 0-14, and a declining rate of population ages 15-64. Therefore, the population in high-income countries is older but productive due to the high proportions of ages 15-64 and 65 and above and low proportion of ages 0-14.

Table 16

Age Distribution and Annual Growth of Population in High-Income Countries

Year	Ages 0-14 % of Total Population	Ages 15-64 % of Total Population	Ages 65+ % of Total Population	Annual Growth Ages 0-14	Annual Growth Ages 15-64	Annual Growth Ages 65+
1996	22.776	66.223	11.001	-0.01156	0.00171	0.01247
1997	22.517	66.348	11.136	-0.01139	0.00188	0.01228
1998	22.251	66.481	11.269	-0.01181	0.00200	0.01192
1999	21.979	66.627	11.400	-0.01220	0.00220	0.01167
2000	21.691	66.818	11.531	-0.01310	0.00286	0.01150
2001	21.378	66.958	11.664	-0.01443	0.00210	0.01154
2002	21.071	67.130	11.799	-0.01438	0.00257	0.01159
2003	20.743	67.324	11.933	-0.01554	0.00289	0.01131
2004	20.383	67.557	12.060	-0.01735	0.00346	0.01062

Table 16—Continued

Year	Ages 0-14 % of Total Population	Ages 15-64 % of Total Population	Ages 65+ % of Total Population	Annual Growth Ages 0-14	Annual Growth Ages 15-64	Annual Growth Ages 65+
2005	20.000	67.822	12.178	-0.01881	0.00393	0.00978
2006	19.610	68.105	12.285	-0.01949	0.00416	0.00882
2007	19.241	68.373	12.387	-0.01886	0.00393	0.00830
2008	18.915	68.589	12.497	-0.01694	0.00316	0.00885
2009	18.648	68.722	12.630	-0.01411	0.00195	0.01067
2010	18.444	68.758	12.798	-0.01093	0.00053	0.01327

Source: The World Bank.

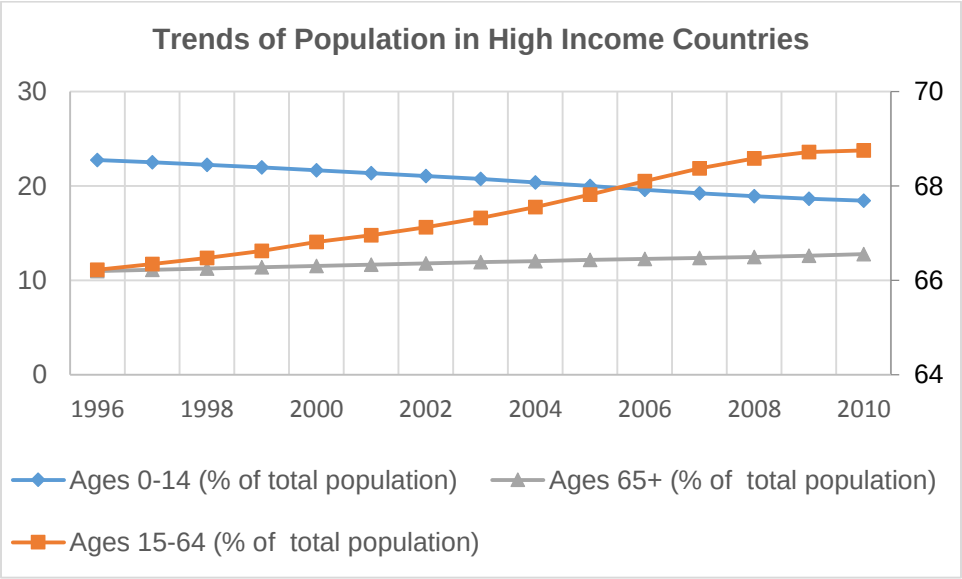

Figure 25. Trends of population in high-income countries. *Source:* The World Bank.

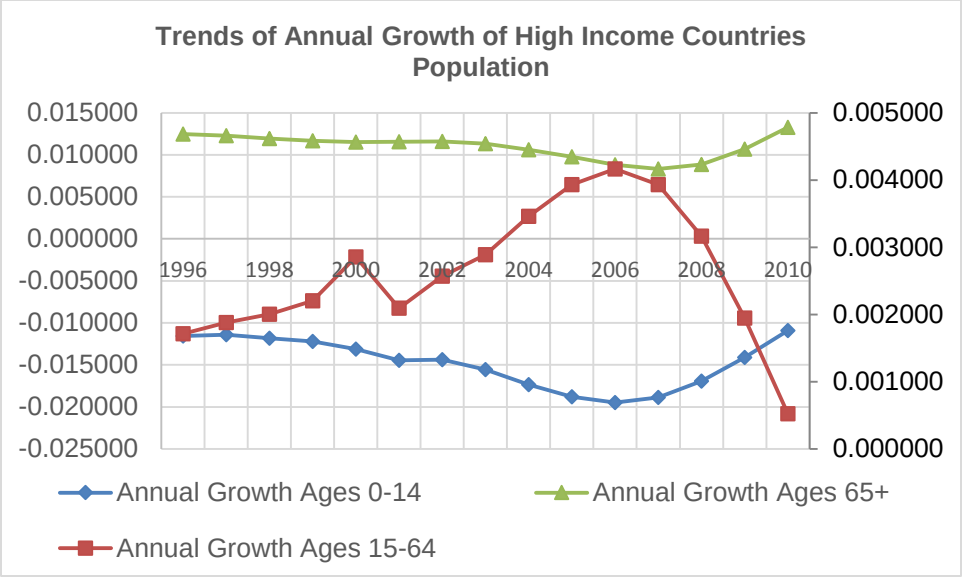

Figure 26. Trends of annual growth of population in high-income countries. *Source:* The World Bank.

4.4.2 Trends of the Labor Force Participation Rates in High-Income Countries

To investigate the trends of labor force participation rates in high-income countries, I am going to use the same approach as in sections 4.2.2 and 4.3.2 by measuring the rates in terms of ages and gender. In terms of ages and as the first measurement, Table 17 and Figures 27 and 28 show the annual averages and growth of high-income countries' PTs.

Table 17 and Figures 27 and 28 show that the labor force in high-income countries is composed of 0.5%-1.1% ages 0-14, 95%-96% ages15-64, and 3%-3.5% ages 65 and above. They also show that high-income countries have a higher PT15-64 than the world average and low-income countries, but lower PT 0-14 and PT 65+. Comparing the PTs in high-income countries with corresponding PTs in low-income countries indicates that high-income countries have less child labor but more elderly people labor due to the fact that high-income countries have high proportions of population ages 65 and above and low proportion of population ages 0-14. Regarding the trends of PTs, from the table and figures, we can see that before the stationary year

2006; PT15-64 had been rising, and PT 0-14 and PT 65+ declining, while after 2006; PT15-64 had been declining, and PT 0-14 continued declining, PT 65+ rising. The findings indicate that the labor force in high-income countries is moving toward more elderly people in the labor force especially after 2006 because the declining rate of labor force ages 15-64 is compensated by ages 65+. Also, the findings prove that there is a high correlation between the population and labor force in high-income countries. The declining rate of population ages 15-64 leads to a declining rate of labor ages15-64, and the rising rate of population ages 65+ leads to a rising rate of labor ages 65+.

Table 17

Distribution and Annual Growth of PTs in High-Income Countries

Year	PT-14 % of Total Labor Force	PT 15-64 % of Total Labor Force	PT 65+ % of Total Labor Force	Annual Growth PT 0-14	Annual Growth PT15-64	Annual Growth PT 65+
1996	1.090	95.711	3.257	-0.07118	0.00021	0.00038
1997	1.029	95.740	3.255	-0.05561	0.0003	-0.00056
1998	0.999	95.759	3.251	-0.02963	0.0002	-0.00123
1999	1.009	95.874	3.246	0.01056	0.0012	-0.00148
2000	0.894	95.877	3.237	-0.11446	0.00003	-0.00288
2001	0.876	95.881	3.239	-0.01979	0.00005	0.00074
2002	0.863	95.905	3.240	-0.01458	0.00025	0.00019
2003	0.841	95.920	3.248	-0.0254	0.00015	0.00256
2004	0.836	95.935	3.244	-0.00586	0.00016	-0.00135
2005	0.832	95.988	3.245	-0.00493	0.00056	0.00037
2006	0.727	96.000	3.268	-0.12592	0.00012	0.00706
2007	0.701	95.938	3.317	-0.03599	-0.00064	0.01516
2008	0.633	95.880	3.356	-0.09701	-0.0006	0.01169
2009	0.630	95.761	3.367	-0.00493	-0.00125	0.00334
2010	0.597	95.572	3.435	-0.05266	-0.00197	0.0201

Source: The World Bank.

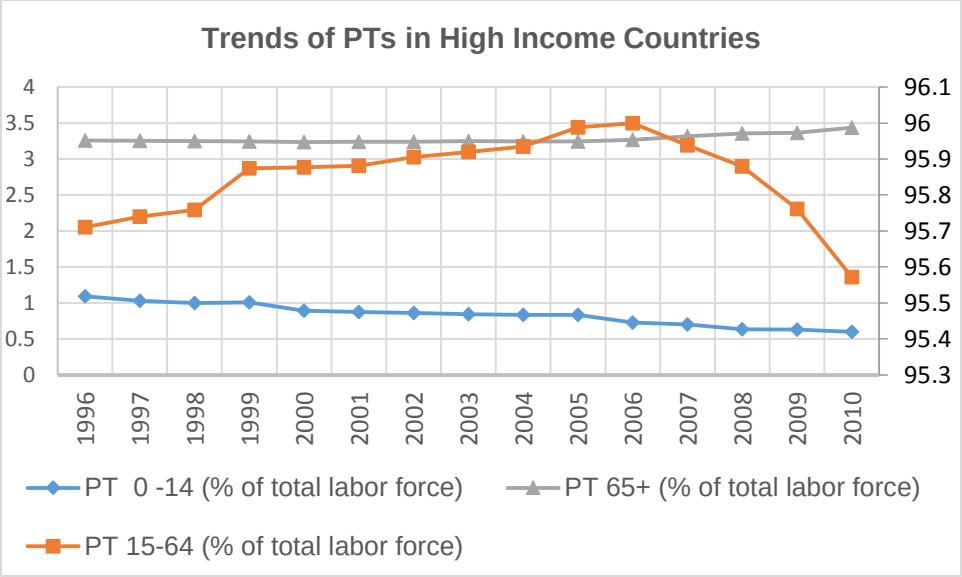

Figure 27. Trends of PTs in high-income countries. *Source:* The World Bank.

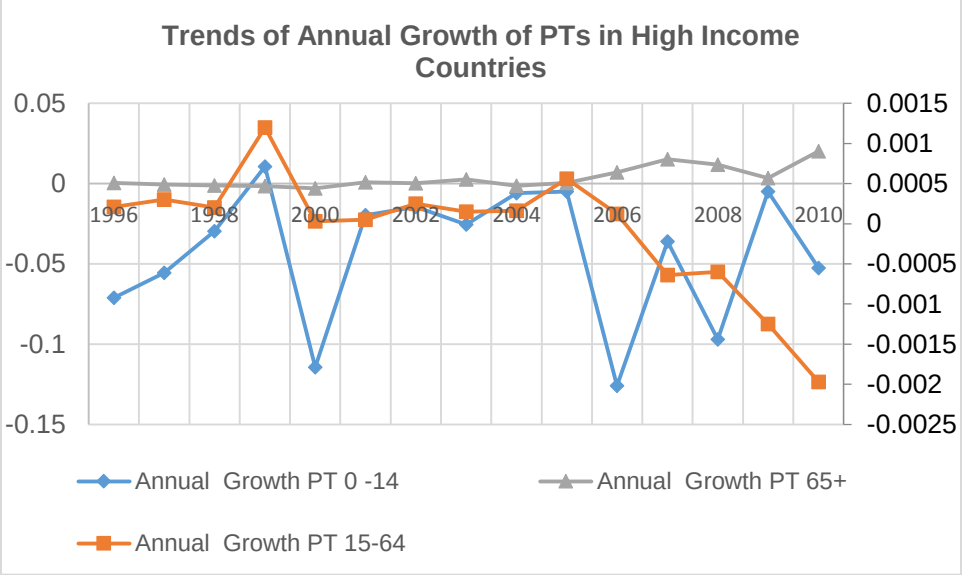

Figure 28. Trends of annual growth of PTs in high-income countries. *Source:* The World Bank.

As the second measurement of the labor force participation rates in terms of ages, Table 18 and Figures 29 and 30 show the annual averages and growth of Ps in high-income countries.

From Table 18 and Figures 29 and 30 we can see that the labor force in high-income countries in terms of ages includes 1.3%-1.7% of ages 0-14, 69%-73% % of ages 15-64, and 12%-14% of ages 65 and above. High-income countries have lower Ps than the world average rate and low-income countries. Also, we can see that before the stationary year 2006; P15-64 had been rising and P 0-14, P 65+ declining, while after 2006; P15-64, P 0-14 had been declining and P 65+ rising. The declining P15-64 represents an additional decline to the declining PT 15-64. The finding provides further evidence that the labor force in high-income countries is moving toward elderly people in the labor force. To determine the precise level of elderly people in the labor force in high-income countries, we have to take into account the rate of population ages 65 and above. Despite the low P 65+ in high-income countries, the high rate of population ages 65 and above means that high-income countries have a higher number of elderly people in the labor force than low-income countries.

Table 18

Distribution and Annual Growth of Ps in High-Income Countries

Year	P 0 -14 % of Total Ages 0-14	P 15-64 % of Total Ages 15-64	P 65+ % of Total Ages 65+	Annual Growth P 0-14	Annual Growth P15-64	Annual Growth P 65+
1996	1.694	69.912	14.052	-0.00336	0.00021	0.00458
1997	1.686	69.938	14.098	-0.00467	0.00037	0.00329
1998	1.676	70.038	13.145	-0.00588	0.00143	-0.0676
1999	1.659	70.324	11.654	-0.01051	0.00408	-0.11342
2000	1.644	70.512	10.322	-0.00916	0.00267	-0.11436
2001	1.628	70.524	10.781	-0.00943	0.00017	0.0445
2002	1.611	70.63	10.936	-0.01029	0.0015	0.01435

Table 18—Continued

Year	P 0 -14 % of Total Ages 0-14	P 15-64 % of Total Ages 15-64	P 65+ % of Total Ages 65+	Annual Growth P 0-14	Annual Growth P15-64	Annual Growth P 65+
2003	1.594	70.828	11.591	-0.01099	0.0028	0.0599
2004	1.574	71.088	10.604	-0.01227	0.00367	-0.08513
2005	1.552	71.298	10.652	-0.01432	0.00295	0.0045
2006	1.523	71.838	11.11	-0.0186	0.00757	0.04304
2007	1.486	72.15	11.211	-0.0244	0.00434	0.00908
2008	1.442	72.488	11.415	-0.02912	0.00468	0.01818
2009	1.4	72.526	11.873	-0.02941	0.00052	0.04012
2010	1.356	72.69	12.103	-0.03152	0.00226	0.01943

Source: The World Bank.

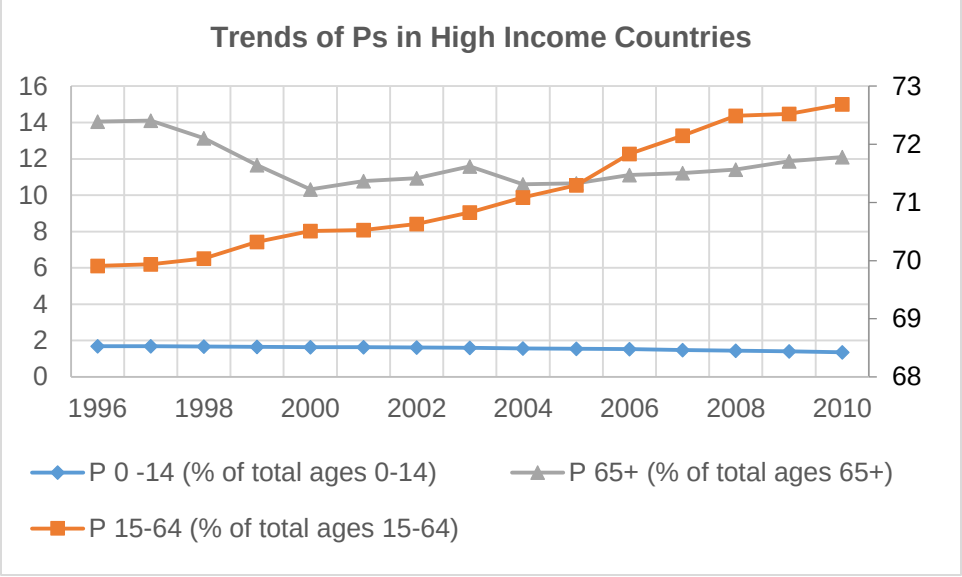

Figure 29. Trends of Ps in high-income countries. *Source:* The World Bank.

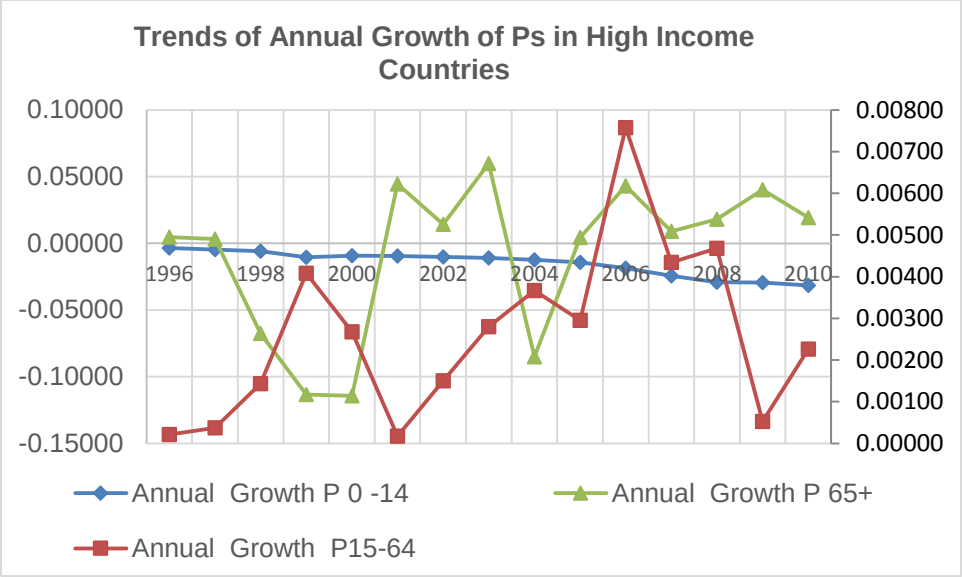

Figure 30. Trends of annual growth of Ps in high-income countries. *Source:* The World Bank.

In terms of gender and as the first measurement, Table 19 and Figures 31 and 32 show the annual averages and growth of PFT and PMT in high-income countries over the period 1996-2010.

From Table 19 and Figures 31 and 32, we can see that high-income countries also have more male labor than female. The trends of PFT and PMT indicate that before 2006 PFT had been rising and PMT declining, while after 2006 PFT had been declining and PMT rising. Connecting the trends of PFT and PMT with the trends of population in section 4.4.1 indicates that the trends of population influence the trends of PFT and PMT. Due to the increasing population ages 0-14 after 2006, PFT declined and PMT rose because of the rising rates of population ages 0-14 and birth, and child rearing. I develop this finding to investigate the effects of health expenditures on population and labor force participation rates in high-income countries.

Table 19

Distribution and Annual Growth of PFT and PMT in High-Income Countries

Year	PFT % of Total Labor Force	PMT % of Total Labor Force	Annual Growth PFT	Annual Growth PMT
1996	39.591	60.409	0.00689	-0.00492
1997	39.846	60.154	0.00644	-0.00422
1998	40.052	59.948	0.00516	-0.00342
1999	40.374	59.626	0.00804	-0.00537
2000	40.629	59.371	0.00634	-0.00429
2001	40.759	59.241	0.00318	-0.00217
2002	40.931	59.069	0.00423	-0.00291
2003	41.142	58.858	0.00516	-0.00358
2004	41.225	58.775	0.00201	-0.0014
2005	41.378	58.622	0.00372	-0.00261
2006	41.466	58.534	0.00213	-0.00151
2007	41.401	58.599	-0.00159	0.00113
2008	41.365	58.635	-0.00085	0.0006
2009	41.252	58.748	-0.00275	0.00194
2010	41.109	58.891	-0.00346	0.00243

Source: The World Bank.

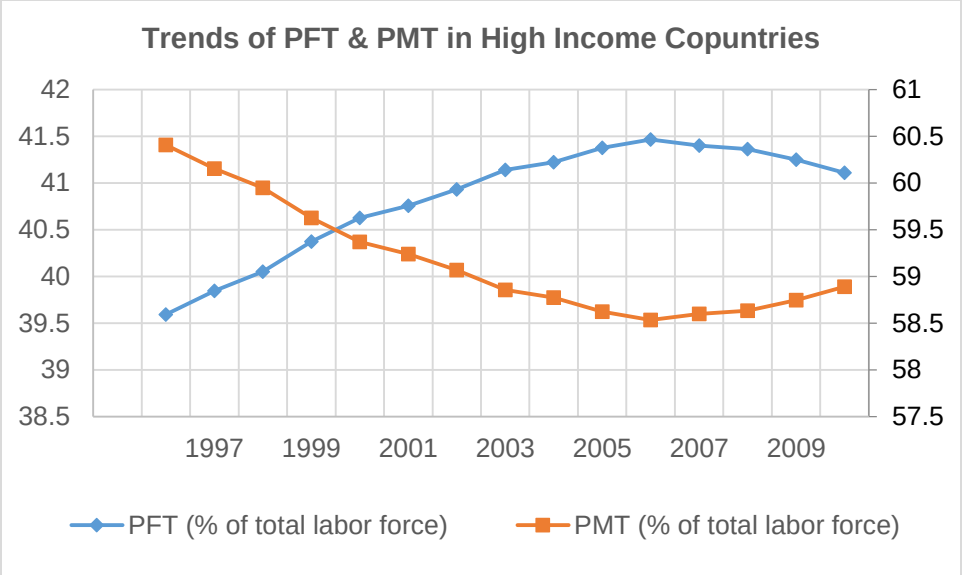

Figure 31. Trends of PFT and PMT in high-income countries. *Source:* The World Bank.

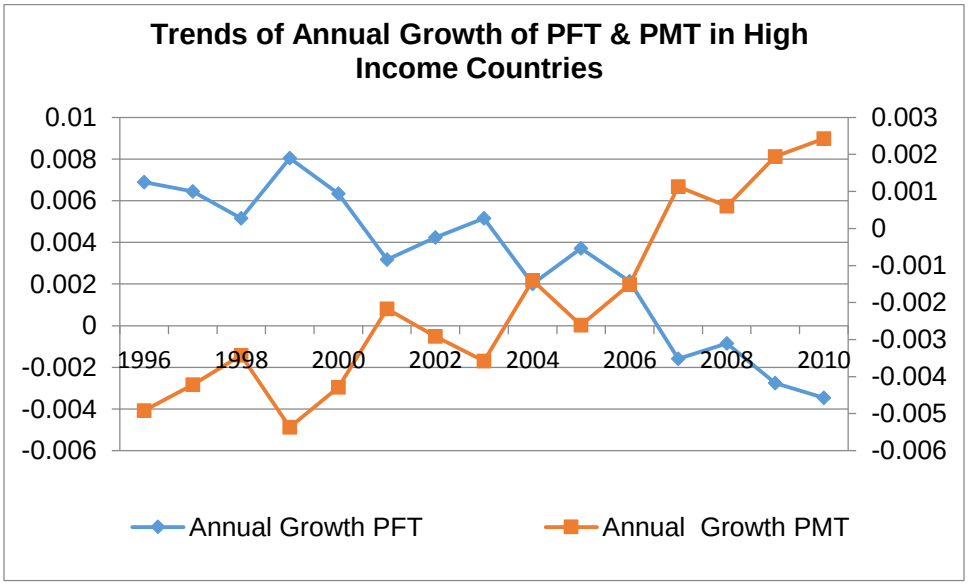

Figure 32. Trends of annual growth of PFT and PMT in high-income countries. *Source:* The World Bank.

The second measurement of labor force in terms of gender is the percentage of total gender. I compute the annual averages and growth of PF and PM in high-income countries over the period 1996-2010.

Table 20 and Figures 33 and 34 show that in high-income countries, 37%-40.5% of the total females and 56%-59% of total males are in the labor market and working. The trends of PF and PM indicate that before 2006 PF had been rising and PM declining, while after 2006 PF had been declining and PM rising. Comparing the trends of PF and PM with trends of PFT and PMT, and the trends of population in section 4.4.1, we can see that there is a relationship between these trends. Before 2006 and as a result of declining rates of birth and ages 0-14, PFT and PF had been rising and PMT and PM declining, while after 2006 and as a result of rising rates of birth and ages 0-14, PFT and PF had been declining and PMT and PM rising. This finding indicates that there is a high correlation between health expenditures and labor force participation rates through its factors.

Table 20

Distribution and Annual Growth of PF and PM in High-Income Countries

Year	PF % of Total Females	PM % of Total Males	Annual Growth PF	Annual Growth PM
1996	37.59	56.015	0.00628	-0.00346
1997	37.851	55.883	0.00693	-0.00235
1998	38.137	55.917	0.00757	0.00061
1999	38.664	56.028	0.01382	0.00199
2000	39.092	56.112	0.01107	0.0015
2001	39.357	56.168	0.00678	0.00099
2002	39.696	56.259	0.0086	0.00163
2003	40.127	56.368	0.01086	0.00193
2004	40.499	56.666	0.00927	0.00529
2005	41.042	57.017	0.01342	0.0062
2006	40.861	57.58	-0.00442	0.00987
2007	40.82	57.904	-0.001	0.00562
2008	40.743	58.409	-0.00189	0.00872
2009	40.652	58.504	-0.00223	0.00163
2010	40.513	58.658	-0.00343	0.00263

Source: The World Bank.

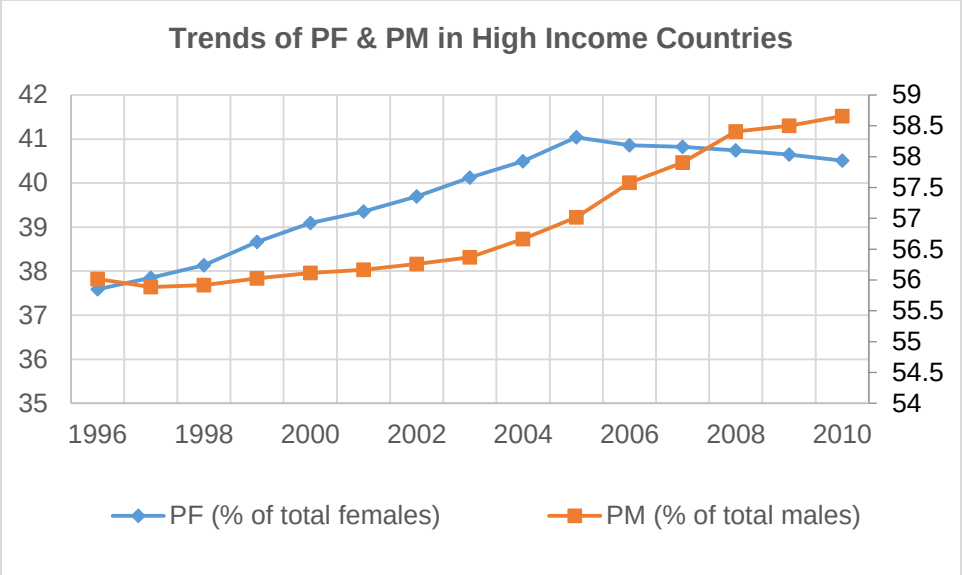

Figure 33. Trends of PF and PM in high-income countries. *Source:* The World Bank.

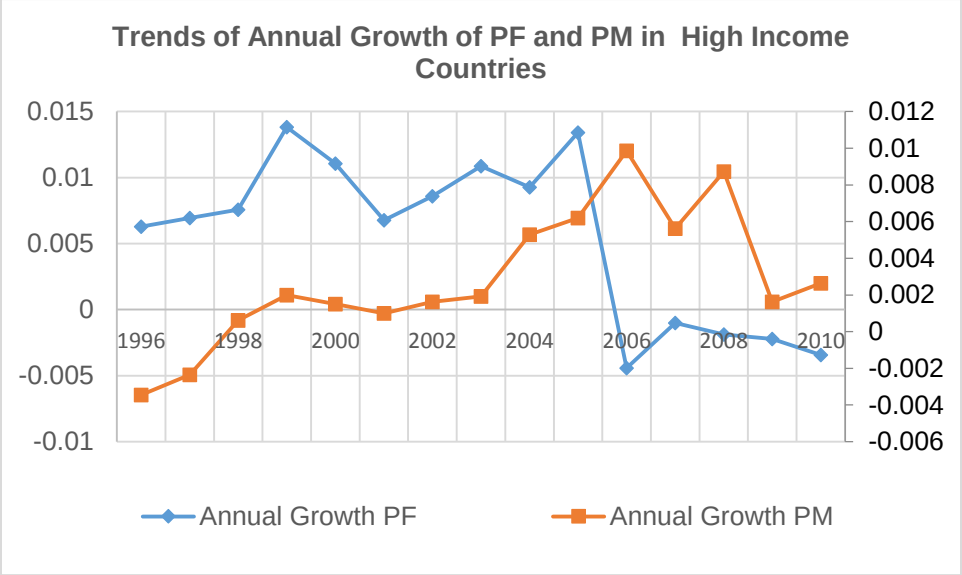

Figure 34. Trends of annual growth of PF and PM in high-income countries. *Source:* The World Bank.

Therefore, in high-income countries, the trends of labor force participation rates in terms of ages indicate that the rates are moving toward elderly people labor, especially after 2006 due to the declining rates of ages 15-64 and 0-14, and rising rate of ages 65 and above. In terms of gender, the trends indicate that the rates are moving

toward male labor rather than female due to the declining female rates and rising male rates. These findings can be connected to the influences of health expenditures on the labor force. In the next section, I investigate the effects of health expenditures on the population and labor force.

4.4.3 Effects of Health Expenditures on the Population and Labor Force in High-Income Countries

Regarding the effects of health expenditures on the population and labor force in high-income countries, I summarize the trends of population and labor force as follows. In section 4.4.1 and regarding the population age distribution, I found that in high-income countries, the population is moving toward aging and a declining rate of productive population, which is ages 15-64 and a rising rate of ages 65 and above. In section 4.4.2 and regarding the labor force, I found that the labor force in high-income countries is moving toward elderly people in the labor force and a declining rate of workers ages 15-64. I also found that high-income countries have less and declining female labor, but more and rising male labor. The main reason of declining female labor rate is the rising rate of ages 0-14. According to these findings and due to the fact that there is a high correlation between health expenditures and population and labor force, I investigate the effects of health expenditures on population and labor force in high-income countries.

Table 21 and Figures 35 and 36 show the trends of HX, FR, BR, DR, and MR in high-income countries. We can see that before 2006, health expenditures had been steadily rising while after 2006 also rising. The rising health expenditures led to rising FR and BR and rapidly declining DR and MR. Due to the high correlation between the trends of FR, BR, DR, and MR and the trends of population age distribution and labor force, we see that health expenditures has negative influences. Regarding the population, as I explained in section 4.4.1, continued low FR and BR lead to a continued low proportion of ages 0-14, and a continued low DR leads to continued high proportions

of ages 15-64 and 65 and above. Regarding the labor force, as I explained in section 4.4.2, a high rate proportion of ages 65 and above and a low rate proportion of ages 0-14 lead to declining rates of the labor force ages 15-64 in terms of ages and gender, and a rising rate of elderly people in the labor force labor. Also, health expenditures negatively influences the labor force ages 15-64 as a percentage of total ages because the increasing HX is associated with declining P 15-64.

Table 21

Rates and Annual Growth of HX, FR, BR, DR, and MR in High-Income Countries

Year	HX	FR	BR	DR	MR	Annual Growth HX	Annual Growth FR	Annual Growth BR	Annual Growth DR	Annual Growth MR
1996	6.818	2.035	1.500	0.850	0.003	0.010	-0.019	-0.221	-0.009	0.011
1997	6.690	1.996	1.466	0.842	0.003	-0.019	-0.020	-0.023	-0.010	0.014
1998	6.823	1.958	1.437	0.843	0.002	0.020	-0.019	-0.020	0.001	-0.249
1999	6.846	1.928	1.411	0.843	0.002	0.003	-0.015	-0.018	0.000	-0.056
2000	6.765	1.930	1.402	0.834	0.002	-0.012	0.001	-0.006	-0.012	-0.030
2001	6.973	1.871	1.363	0.827	0.002	0.031	-0.031	-0.028	-0.008	-0.027
2002	7.236	1.847	1.344	0.829	0.002	0.038	-0.013	-0.014	0.003	-0.014
2003	7.373	1.839	1.336	0.835	0.002	0.019	-0.005	-0.006	0.007	-0.029
2004	7.323	1.836	1.330	0.809	0.002	-0.007	-0.002	-0.005	-0.031	-0.001
2005	7.333	1.824	1.319	0.815	0.002	0.001	-0.006	-0.009	0.007	0.006
2006	7.301	1.838	1.324	0.807	0.002	-0.004	0.008	0.004	-0.011	-0.067
2007	7.307	1.851	1.330	0.808	0.002	0.001	0.007	0.005	0.002	0.001
2008	7.540	1.876	1.337	0.804	0.002	0.032	0.014	0.005	-0.006	-0.024
2009	8.303	1.888	1.346	0.798	0.002	0.101	0.006	0.007	-0.007	-0.025
2010	8.699	1.899	1.356	0.795	0.002	0.048	0.006	0.008	-0.003	-0.091

Source: The World Bank.

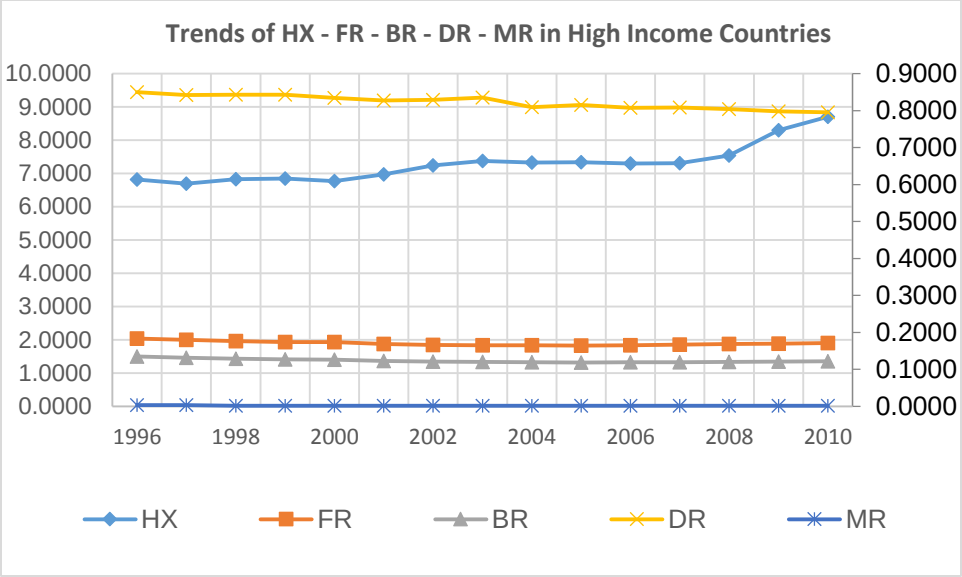

Figure 35. Trends of HX, FR, BR, DR, and MR rates in high-income countries. *Source:* The World Bank.

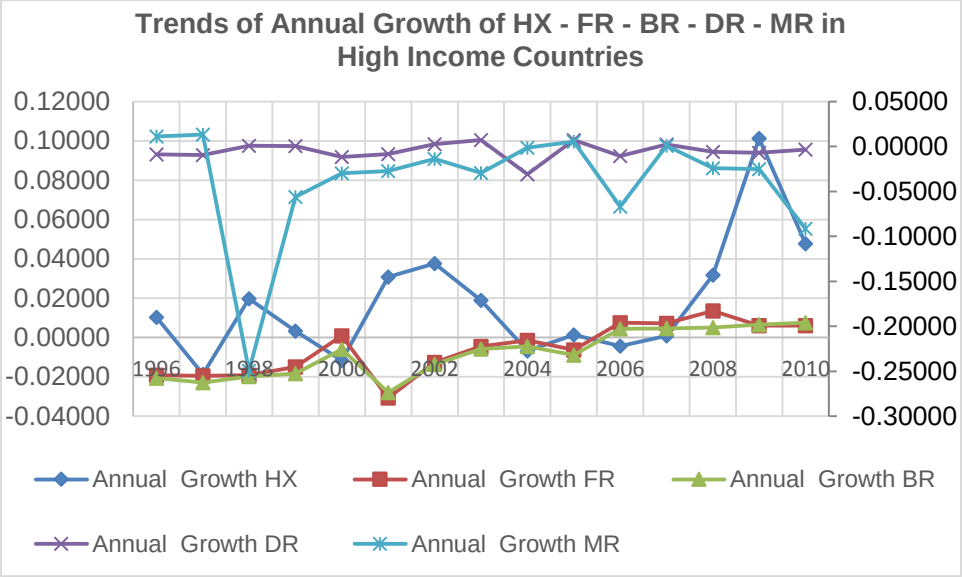

Figure 36. Trends of annual growth of HX – FR – BR – DR – MR rates in high-income countries. *Source:* The World Bank.

4.5 Conclusion

To conclude this chapter, the trends of population and labor force participation rates in low and high-income countries are undesirable because they are moving toward

a baby boom, child labor, elderly people labor, aging, and declining rate of population ages 15-64. Health expenditures negatively influences these trends by lowering the rate of ages 15-64 and raising the rates of ages 0-14 and 65 and above.

In low-income countries, the population is moving toward a baby boom and labor force is moving toward a child labor. Regarding the population, the high fertility and birth rates are leading to a high proportion of people ages 0-14, and the high death rate is leading to low proportions of people ages 15-64 and 65 and above. Also, the increasing health expenditures especially after 2006 lead to steadily declining fertility, birth, and death rates. Therefore, health expenditures negatively influences the population in low-income countries.

Regarding the labor force participation rates, in terms of ages, despite the rate of ages 15-64 constitute more than 93% of labor force, child labor is still high and elderly people labor is low. Considering that the low-income countries have the highest proportion of ages 0-14 and lowest proportion of ages 65 and above, PT 0-14 and P0-14 represent a high rate of child labor, and PT65+ and P65+ represent a low rate of elderly people labor (see sections 4.3.1 and 4.3.2). In terms of gender, because of the changes in fertility and birth rates, the rate of PFT and PF had been rising especially after 2006, while the rates of PMT and PM had been declining. The negative influences of health expenditure on the labor force in low-income countries are the influences on the rates of fertility, birth, death, and mortality. It does not lead to a reduction of fertility and birth rates to raise the female labor force. It also does not lead to a reduction in the death rates to raise the rates of labor force ages 15-64.

In high-income countries, the population is moving toward aging and the labor force is moving toward elderly people labor. Regarding the population, the low fertility and birth rates lead to a low proportion of people ages 0-14, and the low death rate leads to a high proportions of people ages 15-64 and 65 and above. Also, the increasing

health expenditures, especially after 2006, is leading to a steadily rising fertility and birth rates, and a declining death rate. Therefore, health expenditure also negatively influences the population in high-income countries.

Regarding the labor force participation rates, in term of ages; despite the high rate of population ages 15-64, elderly people labor is high. Considering that the high-income countries have the highest proportion of population ages 65 and above, PT 65+ and P 65+ represent the high rate of older people in the labor force (see sections 4.4.1 and 4.4.2. In terms of gender, the low fertility and birth rates led to rising PFT and PF, while improving fertility and birth rates, especially after 2006, led to declining rates of PFT and PF. The negative influences of health expenditures on the labor force in high-income countries are also the influences on the rates of fertility, birth, death, and mortality. Improving fertility and birth rates lead to a declining rate female labor force, and declining death and mortality rates led to a rising rate of elderly people labor and a declining rate of labor force ages 15-64.

CHAPTER 5

EFFECTS OF HEALTH EXPENDITURES ON POPULATION AGE DISTRIBUTION AND LABOR FORCE PARTICIPATION RATES

5.1 Introduction

Health expenditures has an observable influence on population age distribution and labor force participation rates through its associated factors such as the rates of fertility, birth, death, and mortality. There are direct and indirect influences. The direct influence is that changes in these factors are influencing the labor force. The changes in birth and fertility rates are changing the rate of female labor and then the total labor force participation rate, and the changes in death and mortality rates are changing the rate of elderly people in the labor force and then the total labor force participation rate. The indirect influence is that the changes in these factors are changing the structure of the population and then labor force participation rates.

In this chapter, I estimate the effects of health expenditures on the population age distribution and labor force participation rates by using fixed effects multiple regression models through three sections for the world average, for low-income countries, and high-income countries. Each section includes two models of the effects of health expenditures on population age distribution and labor force participation rates. The data are panel data about 32 low-income countries and 50 high-income countries over the period 1996-2010 (annually) with 1320 observations: 480 observations for low-income countries and 750 observations for high-income countries. The models will be tested by T and F tests at a 5 percent level of significance to determine if the null hypothesis is rejected or not (null hypothesis states that the coefficients of explanatory variables are zero). The computed T and P values will be placed under each equation, T value between parentheses and P value between brackets and the F value. The adjusted R Square value will be placed at the right of each equation. For all models, the

two tails critical T value is 1.96 and the critical F value is 2.9957. Also, the variable survival to age 65 will be used as an independent variable with health expenditures because it reflects the life expectancy that is related to the all population proportions and labor force participation rates.

5.2 Effects of Health Expenditures on Population Age Distribution and Labor Force Participation Rates in the World

Regarding the influences of health expenditures on population age distribution, the model will include two estimates: the effects of health expenditures and survival to age 65 on population age distribution, and the effects of the rates of fertility, birth, death, mortality and survival to age 65 on population age distribution using panel data about the selected 82 low and high-income countries over the period 1996-2010 (annually) with 1320 observations omitting Uruguay as a reference country.

Estimate 1: In this estimation I estimate the effects of health expenditures per capita (HX_{it}) and survival to age 65 total + (ST_{it}) on the population ages 0-14 (% of total population) ($POP-14_{it}$), the population ages 15-64 ($POP15\_64_{it}$), and the population ages 65 and above ($POP65+_{it}$) to determine how heath expenditures is associated with population age distribution in the world and how it negatively influences the productive proportion which is ages 15-64.

$$y_{it} = B_0 + \sum_{i=1}^{n-1} \delta i\ di + x_{it}\ B + \varepsilon_{it}$$

Where

y_{it} : The explained variable of country i in the time period t

B_0 : The Intercept of omitted country in this model is Uruguay

$\sum_{i=1}^{n-1} \delta i\ di$: The dummy variable of country i that is subtracted or added to B_0 depending on its sign

$x_{it}\ B$: x_{it} is a vector of explanatory variables for a vector of country i in the time period t , and B is a vector of coefficients for the explanatory variable.

ε_{it}: The errors of country i over the time period t and the errors mean = zero

The estimate below show the effects of health expenditures (HX) and survival to age 65 (ST) on the population age distribution in the world.

$$POP-14_{it} = \underset{(38.58)}{0.463} + \underset{(9.615)}{0.524}\ HX_{it} - \underset{(-10.61)}{0.307}\ ST_{it} \qquad (1)$$

F Value = 978.15

{* 0.0001} {* 0.02} {* 0.0001} Adjusted R^2 = 0.984

$$POP15\_64_{it} = 0.555 - 0.528\,HX_{it} + 0.16\,ST_{it} \quad (2)$$

(37.00) (-4.05) (8.421) F Value = 230.15

{*0.0001} {*0.0506} {*0.0001} Adjusted R^2 = 0.93

$$POP65+_{it} = -0.019 + 0.004\,HX_{it} + 0.147\,ST_{it} \quad (3)$$

(-3.39) (4.0) (6.8) F Value = 236.75

{*0.0001} {*0.0276} {*0.0001} Adjusted R^2 = 0.938

Comparing the computed and critical T and F values shows that the computed T and F values are greater than the critical values. Also, the high value of adjusted R^2 shows the high correlation between dependent and independent variables, and the small P value indicates that the null hypothesis is rejected and the coefficients are not zero and statistically significant, and the estimation is useful.

The equations 1 and 2 indicate that HX negatively influences POP 15-64 while positively influencing POP0-14 and POP65+. ST positively influences POP15-64 and POP65+ while negatively influencing POP0-14, which is the logical relationship because increasing ST will increase POP15-64 and POP65+ and decrease POP0-14. The coefficients of HX indicate that HX should be increased and reallocated to reduce the baby boom and aging by reducing the rates of fertility, birth, deaths, and mortality. Reduced rates of fertility, birth, death and mortality would reduce the rate of population ages 0-14 and increase the rate of population ages 15-64. For POP0-14, +0.524 represents a high positive influence of HX and the need to reduce spending on these ages by limiting the number of new births per family. For ages 15-64, -0.528 represents a high negative influence of HX and the need to increase spending on these ages. For the ages 65 and above, +0.004 represents a low positive influence of HX and the need to increase spending on this age group for humanitarian purposes and to raise the number of working people ages 65 and above.

Estimate 2: Due to the high correlation between health expenditures and its factors (the rates of fertility (FR_{it}), birth (BR_{it}), death (DR_{it}), mortality (MR_{it})), I re-estimate the

effects of these rates and survival to age 65 total (ST_{it}) on the population ages 0-14($P-14_{it}$), the population ages 15-64($POP15\_64_{it}$), and the population ages 65+ ($POP65+_{it}$). The importance of this estimate is to find out how these factors influence age distribution as well as to obtain more precise determination about the effects of health expenditures.

$$POP-14_{it} = 0.487 + 0.037\,FR_{it} + 1.63\,BR_{it} - 2.56\,DR_{it} - 2.43\,MR_{it} - 0.37\,ST_{it} \quad (1)$$

(26.4) (12.3) (-3.06) (-6.45) (-12.13) (-20.34) F = 1296

{*0.0001} {*0.0001} {*0.0023} {*0.0001} {*0.0001} {*0.0001} Ad R^2= 0.99

$$POP15\_64_{it} = 0.83 - 0.045\,FR_{it} - 3.51\,BR_{it} - 9.24DR_{it} + 3.028\,MR_{it} + 0.046\,ST_{it} \quad (2)$$

(36.96) (-12.02) (5.41) (-19.15) (12.4) (2.08) F =340.95

{*0.0001} {*0.0001} {*0.0001} {*0.0001} {*0.0001} {*0.0381} Ad R^2=0.96

$$POP65+_{it} = -0.318 - 0.008\,FR_{it} - 0.188\,BR_{it} - 11.81DR_{it} + 0.596\,MR_{it} + 0.423\,ST_{it} \quad (3)$$

(-31.21) (-4.72) (6.4) (-53.89) (5.38) (41.4) F= 947.2

{*0.0001} {*0.0001} {*0.0001} {*0.0001} {*0.0001} {*0.0001} Ad R^2=0.98

Applying the hypothesis testing procedure shows that the estimate is useful and the coefficients of independent variables are statistically significant. Also, the equations indicate that there is a logical relationship between, FR, BR, DR, MR, ST and world population. Increasing FR and BR lead to an increasing rate of POP0-14 and decreasing rates of other age groups. Decreasing DR leads to an increase in all ages. Decreasing MR leads to increasing POP0-14, and implicitly decreasing POP15-64 and 65+. Increasing ST leads to increasing POP15-64 and POP65+, and implicitly decreasing POP0-14. Estimates 1 and 2 show that HX positively influences the baby boom and aging, while negatively influencing active and productive population.

Considering the correlation between HX and the rates of FR, BR, DR, and MR and the influences of the coefficients and signs of HX that I explained in estimate 1, HX should increase and be reallocated. To reduce POP 0-14, the world needs to reduce spending on FR and BR and continue spending to reduce DR and MR. Reducing FR by one child per woman or BR by 1% reduces the rate of ages 0-14 by 0.037 and 1.63

respectively and raises the rates of POP15-64 by 0.045 and 3.51 respectively and POP 65+ by 0.008 and 0.188 respectively.

Regarding the effects of health expenditures on the world labor force participation rates, the model includes one estimate. The estimate is about the effects on labor force participation rate in terms of ages and gender, as a percentage of the total labor force, and as a percentage of each age group. The main objectives of considering labor force participation rates in these terms are:

1. To determine which country has greater or smaller rates of child labor or elderly people in the labor force.
2. To determine which country has greater or smaller rates of female and male labor force.
3. To determine which country has greater or smaller labor force participation rate of each age group and gender.
4. To determine the effects of health expenditures on the labor force participation rates in terms of ages and gender.

Estimate 3: In this estimate, I estimate the effects of health expenditures on the labor force participation rates in terms of age and gender. The controlling variables include; total health expenditures per capita (HX_{it}), survival to age 65, female (% of total female)(SF_{it}), and survival to age 65, male (% of total male) (SM_{it}). The controlled variables include: total labor force participation rate (% of total population) (PT_{it}), labor force participation rate, ages 0-14 (% of total labor force)($PT-14_{it}$), labor force participation rate, ages 0-14 (% of total ages 0-14)($P-14_{it}$), labor force participation rate, ages 15-64(% of total labor force)($PT15\_64_{it}$), labor force participation rate, ages 15-64 (% of total ages 15-64)($P15\_64_{it}$), labor force participation rate, ages 65+ (% of total labor force)($PT65+_{it}$), and labor force participation rate, ages 65+ (% of total

ages 65+) ($P\ 65+_{it}$), female labor force participation rate (% of total labor force) (PFT_{it}), female labor force participation rate (% of total Female) (PF_{it}), male labor force participation rate (% of total labor force) (PMT_{it}) male labor force participation rate, (% of total male)(PM_{it}), labor force participation rate, ages 0-14 (% of total labor force) ($PT-14_{it}$).

$$PT_{it} = 0.468 - 0.262HX_{it} - 0.733\ SF_{it} + 0.884\ SM_{it} \quad (1)$$
(29.4) (- 2.165) (-16.2) (22.98) F Value = 259.47
{*0.0001} {*0.0276} {*0.0001} {*0.0001} Adjusted R^2=0.943

$$PT-14_{it} = 0.052 + 0.08\ HX_{it} - 0.164SF_{it} + 0.125\ SM_{it} \quad (2)$$
(14.15) (16.0) (16.4) (14.07) F Value = 692.95
{*0.0001} {*0.015} {*0.0001} {*0.0001} Adjusted R^2=0.978

$$P-14_{it} = 0.192 + 0.293HX_{it} - 0.726\ SF_{it} + 0.611\ SM_{it} \quad (3)$$
(12.8) (2.04) (-16.8) (16.97) F Value = 243.35
{*0.0001} {*0.0001} {*0.015} {*0.0001} Adjusted R^2=0.94

$$PT15\_64_{it} = 0.473 - 0.232\ HX_{it} - 0.769\ SF_{it} + 0.9\ SM_{it} \quad (4)$$
(29.56) (-2.23) (-17) (23.68) F Value = 252.09
{*0.0001} {*0.031} {*0.0001} {*0.0001} Adjusted R^2=0.942

$$P15\_64_{it} = 0.718 - 0.098\ HX_{it} - 0.636\ SF_{it} + 0.73\ SM_{it} \quad (5)$$
(51.28) (-4.66) (15.92) (21.77) F Value = 549.08
{*0.0001} {*0.04} {*0.0001} {*0.0001} Adjusted R^2=0.972

$$PT65+_{it} = - 0.02 + 0.067\ HX_{it} - 0.048\ SF_{it} + 0.012\ SM_{it} \quad (6)$$
(-4.52) (-4.46) (4.0) (6.0) F Value = 273.21
{* 0.0001} {* 0.032} {*0.0001} {* 0.0001} Adjusted R^2=0.946

$$P65+_{it} = - 0.07 + 1.456\ HX_{it} - 0.641\ SF_{it} + 1.03\ SM_{it} \quad (7)$$
(5.38) (5.57) (3.83) (3.21) F Value = 549.08
{*0.0001} {*0.04} {*0.0001} {*0.0001} Adjusted R^2=0.972

$$PFT_{it} = 0.026 - 0.534\ HX_{it} + 0.5\ SF_{it} - 0.271\ SM_{it} \quad (8)$$
(2.166) (-2.25) (11.23) (-7.19) F Value = 144.63
{*0.045} {*0.024} {*0.0001} {*0.0001} Adjusted R^2=0.903

$$PF_{it} = 0.043 - 0.9\ HX_{it} + 0.495SF_{it} - 0.09\ SM_{it} \quad (9)$$
(3.307) (-2.35) (6.91) (-3.0) F Value = 189.29
{*0.042} {*0.0001} {*0.013} {*0.0001} Adjusted R^2=0.924

$$PMT_{it} = 0.494 + 0.271\ HX_{it} - 1.233\ SF_{it} + 1.153\ SM_{it} \quad (10)$$
(22.82) (2.185) (-20.03) (22.09) F Value = 82.86
{*0.0001} {*0.0415} {*0.0001} {*0.0001} Adjusted R^2=0.842

$$PM_{it} = 0.695 + 0.068\ HX_{it} - 1.001\ SF_{it} + 1.03\ SM_{it} \quad (11)$$
(34.75) (2.2) (-17.29) (20.37) F Value = 210.93
{*0.0001} {*0.0412} {*0.0001} {*0.0001} Adjusted R^2=0.931

The estimate is useful and the coefficients are statistically significant due to the high computed T, F, and adjusted R^2 values and low P value.

Equation 1 indicates that the influence of HX on PT is negative and the influence of SF is negative while MF is positive, which indicates that the world has more male labor than female, as I explained in Chapter 4.

In terms of age, equations 2 through 7 indicate that HX negatively influences PT 15-64 and P15-64 while positively influencing PT0-14, P0-14, PT65+ and P65+. If HX increases by 1%, PT15-64 and P15-64 decrease by 0.232 and 0.098 while PT0-14, P 0-14, PT 65+, and P 65+ increase by 0.08, 0.293, 0.067, and 1.465 respectively. The outcomes of the equations indicate that HX positively influences the rates of child labor and elderly people in the labor force, while negatively influencing the standard labor ages 15-64.

In terms of gender, equations 8 through 11 indicate that HX negatively influences PFT and PF while positively influencing PMT and PM. Also, the negative influence on PFT and PF is higher than the positive influence on PMT and PM, which means that the total influence is negative. If HX increases by 1%, PFT and PF decrease by 0.534 and 0.9 respectively, while PMT and PM increase by 0.271 and 0.068 respectively.

Connecting the effects of HX on the labor force with the effects on population in Estimates 1 and 2 prove that HX should increase and be reallocated not just to modify the population age distribution, but also to increase the female labor rate and the rate of working people of ages 15-64.

5.3 Effects of Health Expenditures on Population Age Distribution and Labor Force Participation Rates in Low-Income Countries

I anticipate that there are many differences between the effects of health expenditures in low and high-income countries. The different populations and labor force structures have to be considered when estimating these effects. Low-income countries have the highest proportion of population ages 0-14 and the lowest ages 65 and above, while high-income countries have the lowest proportion of population ages 0-14 and the

highest ages 65 and above. Also, low-income countries have the highest rate of child labor and the lowest rate of elderly people in the labor force, while high-income countries have the lowest child labor and the highest rate of elderly people in the labor force.

To obtain more useful determinations about the effects of health expenditures on population age distribution and labor force participation rates, I estimate these effects on low and high-income countries separately. For low-income countries, two models are built: one for the effects on the population age distribution, and another for the effects on the labor force participation rates using panel data about the selected 32 low-income countries over the period 1996-2010 (annually) with 480 observations, omitting Zimbabwe as a reference country of low-income countries.

Regarding the effects on population age distribution, the model includes two estimates; the effects of health expenditures and survival to age 65 on population age distribution, and the effects of the rates of fertility, birth, death, mortality and survival to ages 65 on population age distribution.

Estimate 4: Using the same procedure as in section 5.2 Estimate 1, I estimate the effects of health expenditures and survival to age 65 on population age distribution in low-income countries, omitting Zimbabwe as a reference country of low-income countries .

$$y_{it} = B_0 + \sum_{i=1}^{n-1} \delta i\, di + x_{it}\, B + \varepsilon_{it}$$

$$POP-14_{it} = 0.45 + 0.03HX_{it} - 0.04\, ST_{it} \quad (1)$$

(75) (5) (-3.33) F Value = 68.11

{*0.0001} {*0.0002} {*0.0001} Adjusted R^2 = 0.796

$$POP15\_64_{it} = 0.51 - 0.02\, HX_{it} + 0.035\, ST_{it} \quad (2)$$

(10.2) (-4) (3.06) F Value = 54.78

{*0.0001} {*0.0001} {*0.016} Adjusted R^2 = 0.758

$$POP65+_{it} = -0.03 - 0.05HX_{it} - 0.0047\, ST_{it} \quad (3)$$

(-2.5) (-16.66) (-3.91) F Value = 127.15

{*0.0001} {*0.0001} {*0.0023} Adjusted R^2 = 0.88

The values of the statistics T, P, F, and adjusted R^2 indicate that the estimate is useful and the coefficients of independent variables are statistically significant. Also, equations 1, 2, and 3 indicate that HX negatively influences POP15-64 and POP65+, while positively influencing POP0-14. ST negatively influences POP0-14 and POP65+, while positively influencing POP15-64, which are the logical influences. The equations also indicate that HX in low-income countries has a smaller influence on population than HX in the whole world due to the smaller coefficients. The coefficients of HX indicate that HX should be increased and reallocated to reduce the baby boom by reducing the proportion of population ages 0-14 and increasing the proportion of population ages 15-64. For POP 0-14, + 0.03 represents the positive influence of HX, and the low-income countries need to reduce their spending on these ages by reducing fertility and birth rates. For ages 15-64, -0.02 represents the negative influence of HX and the need to increase spending on these ages. For the ages 65 and above, - 0.004 represents the low negative influence of HX and the need to increase spending on these ages for humanitarian purposes and to raise the rate of working people ages 65+.

Estimation 5: As I explained in Estimate 2, I re-estimate the effects of the rates of fertility birth, death, mortality, and survival to age 65 on population age distribution in low-income countries.

$$POP-14_{it} = 0.517 + 0.067FR_{it} + 6.98\,BR_{it} - 5.409DR_{it} - 0.209\,MR_{it} - 0.179\,ST_{it} \quad (1)$$

(34.76) (22.33) (-12.43) (-9.71) (2.04) (-10.63) F = 256.75

{*0.0001} {*0.0001} {*0.0001} {*0.0001} {*0.0001} {*0.0381} Ad R^2=0.94

$$POP15\_64_{it} = 0.424 - 0.068\,FR_{it} - 7.746\,BR_{it} - 5.675\,DR_{it} + 0.068\,MR_{it} + 0.185\,ST_{it} \quad (2)$$

(29.59) (-22.57) (14.31) (-10.58) (4.85) (11.56) F= 201.68

{*0.0001} {*0.0001} {*0.0001} {*0.0001} {*0.0501} {*0.0001} Ad R^2=0.93

$$POP\,65+_{it} = 0.059 - 0.009\,FR_{it} - 0.757\,BR_{it} - 0.296\,DR_{it} + 0.122\,MR_{it} - 0.005\,ST_{it} \quad (3)$$

(18.19) (-3.0) (-6.23) (-2.46) (3.89) (-2.27) F = 178.5

(0.0001) (0.021) (0.0001) (0.0285) (0.0001) (0.0381) Ad R^2=0.92

Taking into account that the estimate is useful and the equations indicate that there is also a logical relationship between FR, BR, DR, MR, and the low-income

countries' population as I explained in Estimate 2. Also, the equations indicate that due to the high rates of FR, BR, and DR in low-income countries, the influences of these rates on the population are higher than the world average. The low ST rate in low-income countries leads to a low influence on the population in low-income countries.

From the outcome of estimates 4 and 5, and due to the high correlation between HX and the rates of FR, BR, DR, and MR, we can determine how health expenditures should be increased and reallocated. Due to the high FR, BR, DR, MR in low-income countries, the countries should increase spending to reduce MR and DR, and reduce spending to reduce FR and BR. Reducing FR by 1 child per woman or BR by 1% would reduce the rate of POP0-14 by 0.067 and 6.98 respectively and raise the rate of POP 15-64 by 0.068 and 7.746 respectively and raise the rate of POP65+ by 0.009 and 0.757 respectively. Reducing DR by 1% would raise the rate of POP0-14 by 5.4009, the rate of POP15-64 by 5.675, and the rate of POP65+ by 0.269. Reducing MR by 1% would raise the rate of POP0-14 by 0.209 and reduce the rates of POP15-64 and POP65+ by 0.068 and 0.122 respectively.

Regarding the effects of health expenditures on low-income labor force participation rates, the model includes one estimate. The estimate is about the effects on the labor force participation rates in terms of ages, gender, as a percentage of total population, as a percentage of total labor force, and as a percentage of each age group.

Estimation 6: To estimate the effects of health expenditures and survival to age 65 on the labor force participation rates in low-income countries, I use the same procedure that I used in Estimate 3.

$$PT_{it} = \underset{\substack{(55.45)\\ \{*0.0001\}}}{0.416} - \underset{\substack{(-9.85)\\ \{*0.0001\}}}{1.459}HX_{it} - \underset{\substack{(-16.2)\\ \{*0.0001\}}}{0.495}\,SF_{it} + \underset{\substack{(9.38)\\ \{*0.0001\}}}{0.619}\,SM_{it} \qquad (1)$$

F Value = 178.59
Adjusted R^2=0.914

$$PT-14_{\ it} = \underset{\substack{(6.00)\\ \{*0.0001\}}}{0.006} + \underset{\substack{(2.99)\\ \{*0.029\}}}{0.092}\,HX_{it} - \underset{\substack{(-3.111)\\ \{*0.015\}}}{0.014}\,SF_{it} + \underset{\substack{(2.36)\\ \{*0.0001\}}}{0.03}\,SM_{it} \qquad (2)$$

F Value = 129.8
Adjusted R^2=0.991

$$P-14_{\ it} = 0.013 + 0.224HX_{it} - 0.031\,SF_{it} + 0.065\,SM_{it} \qquad (3)$$

(4.33) (3.55) (-115.5) (2.5) F Value = 447.29
{*0.0001} {*0.0005} {*0.031} {*0.014} Adjusted R^2=0.992

$$PT15\_64_{it} = \underset{(56.28)}{0.394} - \underset{(-9.05)}{1.258}\, HX_{it} - \underset{(-7.36)}{0.399}\, SF_{it} + \underset{(9.08)}{0.527}\, SM_{it} \quad (4)$$
{*0.0001} {*0.0001} {*0.0001} {*0.0001} F Value = 185.08
Adjusted R^2=0.917

$$P15\_64_{it} = \underset{(79.2)}{0.792} - \underset{(-15.62)}{3.14}\, HX_{it} - \underset{(-15.51)}{1.024}\, SF_{it} + \underset{(14.14)}{1.188}\, SM_{it} \quad (5)$$
{*0.0001} {*0.0001} {*0.0001} {*0.0001} F Value = 280.75
Adjusted R^2=0.944

$$PT65+_{it} = \underset{(15.00)}{-0.015} + \underset{(7.71)}{0.301}\, HX_{it} - \underset{(-7.58)}{0.091} SF_{it} + \underset{(6.5)}{0.104}\, SM_{it} \quad (6)$$
{*0.0001} {*0.0276} {*0.0001} {*0.0001} F Value = 33.91
Adjusted R^2=0.665

$$P65+_{it} = \underset{(6.8)}{-0.442} + \underset{(6.36)}{8.191}\, HX_{it} - \underset{(-8.145)}{3.476}\, SF_{it} + \underset{(7.635)}{4.131}\, SM_{it} \quad (7)$$
{*0.0001} {*0.0276} {*0.0001} {*0.0001} F Value = 259.47
Adjusted R^2=0.943

$$PFT_{it} = \underset{(49.25)}{0.197} - \underset{(-5.62)}{0.478}\, HX_{it} - \underset{(-15.64)}{0.438}\, SF_{it} - \underset{(15.14)}{0.53}\, SM_{it} \quad (8)$$
{*0.0001} {*0.0001} {*0.0001} {*0.0001} F Value = 340.19
Adjusted R^2=0.953

$$PF_{it} = \underset{(29.4)}{0.39} - \underset{(-2.165)}{1.002}\, HX_{it} - \underset{(-16.2)}{0.859} SF_{it} - \underset{(22.98)}{1.045}\, SM_{it} \quad (9)$$
{*0.0001} {*0.0276} {*0.0001} {*0.0001} F Value = 357.47
Adjusted R^2=0.955

$$PMT_{it} = \underset{(73.00)}{0.219} - \underset{(-12.89)}{0.98}\, HX_{it} - \underset{(-2.24)}{0.056}\, SF_{it} + \underset{(2.78)}{0.089}\, SM_{it} \quad (10)$$
{*0.0001} {*0.0001} {*0.0075} {*0.0057} F Value = 174.00
Adjusted R^2=0.912

$$PM_{it} = \underset{(63.28)}{0.443} - \underset{(-12.31)}{1.921}\, HX_{it} - \underset{(-2.49)}{0.128}\, SF_{it} + \underset{(2.9)}{0.19}\, SM_{it} \quad (11)$$
{*0.0001} {*0.0001} {*0.013} {*0.003} F Value = 182.1
Adjusted R^2=0.916

The computed T, P, F values and adjusted R^2 indicate that the estimate is useful. From equation 1, we can see that the influence of HX on PT in low-income countries is negative and higher than the world average due to the higher coefficient. Also, the influence of SF is negative while MF is positive which indicate that low-income countries also have more male labor than female as I explained in Chapter 4.

In terms of age, equations 2 through 7 indicate that HX negatively influences PT 15-64 and P15-64, while positively influencing PT0-14, P0-14, PT65+, and P 65+. If HX increases by 1%, PT15-64 and P15-64 would decrease by 1.258 and 3.14 respectively, while PT0-14, P0-14, PT65+, and P65+ would increase by 0.092, 0.22, 0.301, and 8.191 respectively. Therefore, the influences of HX on the labor force in low-income countries are positive on child labor and negative on standard labor ages 15-64. Also, the

equations indicate that the negative influence on PT 15-64 and P 15-64 in low-income countries is higher than the world average.

In terms of gender, equations 8 through 11 indicate that HX negatively influences both female and male labor force PFT, PF, PMT, and PM.

5.4 Effects of Health Expenditures on Population Age Distribution and Labor Force Participation Rates in High-Income Countries

The same approach will be used to estimate the effects of health expenditures on population age distribution and labor force participation rates in high-income countries. Two models will be built: one for the effects on population age distribution and one for the effects on the labor force participation rates using panel data for the selected 50 high-income countries over the period 1996-2010 (annually) with 750 observations, omitting Uruguay as a reference country of high-income countries.

Regarding the effects on population age distribution, the model includes two estimates: the effects of health expenditures and survival to age 65 on population age distribution, and the effects of the rates of fertility, birth, death, mortality and survival to ages 65 on population age distribution.

Estimate 7: To estimate the effects of health expenditures and survival to ages 65 on the population age distribution in high-income countries, I use the same procedures that I have used in Estimates 1 and 4.

$$y_{it} = B_0 + \sum_{i=1}^{n-1} \delta i\ di + x_{it}\ B + \varepsilon_{it}$$

$$POP\ -14_{\ it} = \underset{(13.04)\ \{*0.0001\}}{0.3} - \underset{(-17.0)\ \{*0.0001\}}{0.136\ HX_{it}} - \underset{(-5.0)\ \{*0.0001\}}{0.1\ ST_{it}} \quad (1)$$

F Value = 341.93
Adjusted R^2 = 0.955

$$POP\ 15\_64_{\ it} = \underset{(16.75)\ \{*0.0001\}}{0.67} - \underset{(-119.2)\ \{*0.0001\}}{0.596\ HX_{it}} + \underset{(25.33)\ \{*0.023\}}{0.076\ ST_{it}} \quad (2)$$

F Value = 54.78
Adjusted R^2 = 0.758

$$POP\ 65+_{it} = \underset{(8.66)\ \{*0.0001\}}{0.\ 026} + \underset{(14.6)\ \{*0.03\}}{0.73 HX_{it}} + \underset{(8.00)\ \{*0.0001\}}{0.024\ ST_{it}} \quad (3)$$

F Value = 54.78
Adjusted R^2 = 0.758

The estimate is useful due to the high computed T and F values and small P value. Equations 1, 2, and 3 indicate that HX negatively influences POP15-64 and POP 0-14 while positively influencing the POP65+. ST positively influences POP15-64 and POP 65+ while negatively influencing POP 0-14 which is the logical relationship because increasing ST will increase POP15-64 and POP65+ and decrease POP 0-14. The equations also indicate that the influences of HX in high-income countries are higher than those in low-income countries. The coefficients of HX indicate that HX should be increased and reallocated to reduce population aging by increasing the population ages 0-14 and 15-64. For POP 0-14, -0.136 represents the negative influence of HX, and high-income countries need to increase spending on these ages. For ages 15-64, -0.596 represents the high negative influence of HX and shows the need to increase spending on these ages. For ages 65 and above, + 0.73 represents the high positive influence of HX and show the need to increase spending on these ages for humanitarian purposes and to increase the rate of working people ages 65 and above.

Estimate 8: Due to the high correlation between health expenditures and its factors, I re-estimate the effects of the rates of fertility, birth, death, mortality, and survival to ages 65 on population age distribution in high-income countries by using the same procedure as in estimates 2 and 5.

$$POP-14_{it} = \underset{(26.6)}{0.798} + \underset{(10.75)}{0.043}\,FR_{it} + \underset{(14.31)}{3.168}BR_{it} - \underset{(-10.58)}{1.549}\,DR_{it} - \underset{(4.85)}{0.409}\,MR_{it} - \underset{(11.56)}{0.771}\,ST_{it} \quad (1)$$

{*0.0001} {*0.0001} {*0.0001} {*0.0003} {*0.022} {*0.0001} F = 381.22 Ad R^2=0.96

$$POP15\_64_{it} = \underset{(19.85)}{0.695} - \underset{(-14.0)}{0.056}\,FR_{it} - \underset{(4.476)}{3.483}\,BR_{it} - \underset{(33.78)}{16.688}\,DR_{it} + \underset{(4.769)}{2.356}\,MR_{it} + \underset{(13.0)}{0.208}\,ST_{it} \quad (2)$$

{* 0.0001} {*0.0001} {*0.0001} {*0.03} {*0.0001} {*0.0001} F = 102.14 Ad R^2=0.87

$$POP65+_{it} = \underset{(33.0)}{-0.495} - \underset{(-6.5)}{0.013}\,FR_{it} - \underset{(12.48)}{0.699}\,BR_{it} - \underset{(69.7)}{14.638}\,DR_{it} + \underset{(13.9)}{1.946}\,MR_{it} + \underset{(36.53)}{0.584}\,ST_{it} \quad (3)$$

{*0.0001} {*0.0001} {*0.03} {*0.0001} {*0.05} {*0.0001} F= 177.52 Ad R^2=0.99

Taking into account that the estimate is useful, the equations indicate that there is also a logical relationship between the rates of FR, BR, DR, MR, and ST and

population age distribution as I explained in Estimate 5. Due to the fact that high-income countries have the lowest rates of FR, BR, DR, and MR, the influence of these rates on the population is low while the high rate of ST is associated with a high influence.

From Estimates 7 and 8, and due to the high correlation between HX and the rates of FR, BR, DR, and MR, high-income countries need to increase spending on FR and BR to raise the rate of POP ages 0-14, and increase spending on DR to raise the rates of POP 15-64 and POP 65+. Also, high-income countries need to increase HX to increase the rates of working people in terms of ages and gender to avoid population aging.

Regarding the effects of health expenditures on labor force participation rates in high-income countries, the model includes one estimate. The estimate is about the effects on labor force participation rates in terms of ages and gender, as a percentage of total population, as percentage of total labor force, and as a percentage of each age group.

Estimate 9: In this estimate, I estimate the effects of HX, STF, and STM on labor force participation rates in high-income countries by using the same procedure as in Estimates 3 and 6.

$$PT_{it} = \underset{(11.46)}{0.573} - \underset{(-20.24)}{59.217}HX_{it} - \underset{(-10.95)}{1.03}\,SF_{it} + \underset{(18.27)}{1.06}\,SM_{it} \quad (1)$$

{*0.0001} {*0.0276} {*0.0001} {*0.0001}

F Value = 136.65

Adjusted R^2=0.896

$$PT-14_{it} = \underset{(26.875)}{0.215} - \underset{(-2.329)}{0.417}\,HX_{it} - \underset{(-29.0)}{0.435}\,SF_{it} - \underset{(-3.333)}{0.03}\,SM_{it} \quad (2)$$

{*0.0001} {*0.038} {*0.0001} {*0.0001}

F Value = 62.73

Adjusted R^2=0.798

$$P-14_{it} = \underset{(2.02)}{0.87} - \underset{(-3.461)}{3.68}\,HX_{it} - \underset{(-23.17)}{1.9}\,SF_{it} - \underset{(20.8)}{1.04}\,SM_{it} \quad (3)$$

{*0.0001} {*0.0176} {*0.0001} {*0.0001}

F Value = 41.81

Adjusted R^2= 0.723

$$PT15\_64_{it} = \underset{(13.24)}{0.662} - \underset{(18.138)}{53.145}\,HX_{it} + \underset{(12.968)}{1.219}\,SF_{it} + \underset{(19.81)}{1.149}\,SM_{it} \quad (4)$$

{*0.0001} {*0.0001} {*0.0001} {*0.0001}

F Value = 127.05

Adjusted R^2=0.89

$$P\ 15\_64_{it} = \underset{(15.369)}{0.707} - \underset{(-28.969)}{78.392}\,HX_{it} + \underset{(4.436)}{0.386}\,SF_{it} + \underset{(9.15)}{0.485}\,SM_{it} \quad (5)$$

{*0.0001} {*0.0276} {*0.0001} {*0.0001}

F Value = 264.62

Adjusted R^2=0.944

$$PT\ 65+_{it} = \underset{(-5.66)}{-0.068} + \underset{(7.673)}{5.64}\,HX_{it} - \underset{(-7.391)}{0.17}\,SF_{it} + \underset{(6.00)}{0.084}\,SM_{it} \quad (6)$$

F Value = 437.99

{*0.0001} {*0.0001) {*0.0001} {*0.0001} Adjusted R^2=0.966

$$P\,65+_{it} = \underset{(7.64)}{2.529} + \underset{(0.097)}{40.312}\,HX_{it} - \underset{(-7.474)}{4.649}\,SF_{it} + \underset{(5.6)}{2.134}\;SM_{it} \quad (7)$$

F Value = 42.93

{*0.0001} {*0.036} {*0.0001} {*0.0001} Adjusted R^2=0.729

$$PFT_{it} = \underset{(-26.59)}{-\,0.984} - \underset{(-25.477)}{55.489}\,HX_{it} + \underset{(30.571)}{2.14}\,SF_{it} - \underset{(7.635)}{0.53}\,SM_{it} \quad (8)$$

F Value = 223.86

{*0.0001} {*0.0001} {*0.0001} {*0.0001} Adjusted R^2=0.934

$$PF_{it} = \underset{(-23.371)}{-1.428} - \underset{(-30.989)}{110.043}\,HX_{it} + \underset{(25.736)}{2.96}\,SF_{it} - \underset{(13.242)}{0.927}\,SM_{it} \quad (9)$$

F Value = 254.43

{*0.0001} {*0.0001} {*0.0001} {*0.0001} Adjusted R^2=0.942

$$PMT_{it} = \underset{(25.524)}{1.557} - \underset{(-2.92)}{3.727}\,HX_{it} + \underset{(-27.565)}{3.17}\,SF_{it}\;\; \underset{(27.08)}{1.923}\,SM_{it} \quad (10)$$

F Value = 83.24

{*0.0001} {*0.029} {*0.0001} {*0.0001} Adjusted R^2=0.84

$$PM_{it} = \underset{(23.966)}{1.414} - \underset{(-2.636)}{9.084}\,HX_{it} - \underset{(-20.629)}{2.393}\,SF_{it} + \underset{(-23.632)}{1.607}\,SM_{it} \quad (11)$$

F Value = 96.1

{*0.0001} {*0.008} {*0.0001} {*0.0001} Adjusted R^2=0.859

The computed T, P, F values and adjusted R^2 indicate that the estimate is useful. Equation 1 indicates that the influence of HX on PT in high-income countries is negative and lower than in low-income countries due to the lower coefficient. The positive influences of SFT and SMT indicate that high-income countries there is effective female labor and at a higher rate than low-income countries.

In term of ages, equations 2 through 7 indicate that HX negatively influences PT -14, P -14, PT 15-64, and P 15-64 while positively influencing PT 65+, P 65+ and PT 65+, which means a positive influence on elderly people in the labor force and a negative influence on the standard labor ages 15-64. If HX increases by 1%, PT-14, P -14, PT15-64, and P15-64 would decrease by 0.417, 3.68, 53.145, and 78.392, while PT 65+ and P 65+ would increase by 5.64 and 40.312 respectively.

In terms of gender, equations 8 through 11 indicate that health expenditure negatively influences female and male labor. Also, the negative influence on female labor is higher than on male labor.

5.5 Conclusion

To conclude this chapter, health expenditures in low and high-income countries negatively influences the population age distribution and labor force participation rates

through its factors. Many differences between these influences in low and high-income countries can be found due to the different population and labor force structures.

In low-income countries, health expenditures has low influences on the population and labor force participation rates. It is also associated with declining rate of the active and productive population and labor force which is ages 15-64. High fertility and birth rates and a declining mortality rate lead to a high proportion of population ages 0-14. The steadily declining death rate leads to a slow increase in ages15-64 and 65 and above. The result is a declining labor force participation rate ages 15-64 and a rising rate of child labor. Female labor is also influenced by the high birth and fertility rates; they lead to a decreasing female labor force. Therefore, low-income countries need to increase and reallocate health expenditures. They need to reduce spending on fertility and birth rates in order to reduce the rate of population ages 0-14 and increase spending to reduce death rates to raise the rates of population ages 15-64 and 65 and above. In addition, reducing spending to reduce fertility and birth rates will raise the rate of female labor.

In high-income countries, health expenditures has a high influence on the population and labor force participation rates. It is also associated with a declining rate of population and labor force participation ages 15-64. Low rates of fertility, birth, and mortality lead to a low rate of population ages 0-14. The low and declining death rate leads to a rising rate of the population ages 65 and above. The results are a declining labor force participation rate ages 15-64 and a rising rate of elderly people in the labor force, especially male. Female labor force is declining but less than in low-income countries due to the lower fertility and birth rates in high-income countries. Therefore, high-income countries need to increase spending to increase fertility and birth rate to raise the rate of population ages 0-14. Also, they need to increase spending to increase

the female labor force by providing affordable childcare to encourage women that have children to enter the labor market.

CHAPTER 6

FINDINGS AND RECOMMENDATIONS

6.1 Findings

This study found that the current trends of the population and labor force participation rates in the world are not optimum due to the declining proportion of population and labor force ages 15-64 and the rising proportion of population ages 0-14 and 65 and above. It also found that health expenditures is associated with the trends through the high correlation between health expenditures and the rates of fertility, birth, death, mortality, and survival to age 65. Classifying the world into high and low-income countries, the trends of population and labor force are different. In low-income countries, they are moving toward a baby boom and child labor, while in high-income countries, they are moving toward aging and elderly people in the labor force. Therefore, it is important to consider the problem of undesirable trends and the influences of health expenditures in low and high-income countries separately. As an aggregate determination, the world trends cannot be used as a useful reference to analyze the reasons and results of these trends to develop plans and policies to modify and adjust them.

In low-income countries and regarding the population, this study found that the declining proportion of population ages 15-64 results from the high proportion of population ages 0-14 and small proportion of ages 65 and above. I also found that the high proportion of ages 0-14 results from high fertility and birth rates, and the declining rate of ages 15-64 results from the high death rate. Comparing the high fertility and birth rates with the high death and mortality rates gives a clear picture of the effectiveness of population policies in low-income countries. The rates indicate a contradiction and discarding of human capital and productivity development. Regarding the labor force participation rates, the study found that the rising child labor rate, especially after 2006

resulted from the declining rate of the labor force ages 15-64 and the small rate of the labor force ages 65 and above. The rate of female labor is low and related to the fertility and birth rates. The low rate of the female labor force in low-income countries resulted from the high fertility and birth rates.

For high-income countries, this study found that the declining proportion of population ages 15-64 is the result of the high proportion of ages 65 and above and small proportion of ages 0-14. It also found that the small and declining rate ages 0-14 results from low fertility and birth rates. The high and rising rate of ages 65 and above results from the low death rate. Regarding to labor force participation rates, the study found that high-income countries have limited child labor because of the small proportion of ages 0-14 and a low child labor rate. It also found that despite the rising rate of labor force ages 15-64, there is a rising rate of elderly people in the labor force that is greater than the ages 15-64. The female labor force in high-income countries is higher than low-income countries because of the low fertility and birth rates.

6.2 Recommendations

To adjust and modify the trends of population and labor force participation rates in low and high-income countries and regarding health expenditures I developed the recommendations below.

For low-income countries, I recommend that health expenditures should be increased to increase the influences of its factors on the population and labor force participation rates. It should also reallocate funds in a manner that helps to adjust and modify these trends by increasing the proportion of ages 15-64 and make them more healthy and productive. Low-income countries need to increase spending to reduce death and mortality rates for humanitarian purposes as well as to raise the life expectancy. They also need to reduce spending on birth and fertility rates to reduce the proportion of population ages 0-14. Providing costly healthcare to the families that

exceed a specific number of children per family will reduce the child boom in low-income countries. Regarding the labor force participation rates, low-income countries need to extend the working age up to ages 67 or 68 instead of 65 to compensate for the decreased labor force ages 15-64 and reduce child labor. Also, they need to provide affordable health care for ages 15-64 to raise the percentage of these ages in the labor market. In addition, low-income countries need to increase female labor force ages 15-64 by providing affordable healthcare and childcare that will allow females with children to enter the labor market.

For high-income countries and due to the high influences of heath expenditures on population and labor force participation rates, health expenditures need to be reallocated to modify the trends of population and labor force participation rates. High-income countries need to increase spending to raise the rates of population ages 0-14 by raising fertility and birth rates. High-income countries should provide affordable healthcare and childcare to encourage families to have children. They also need to continue spending to reduce death and mortality rates and to raise the productivity of older people. For labor force participation rates, high-income countries need to extend the working age up to 70 or 71 to encourage older people to enter the labor market. They also need to increase the female labor force by providing affordable healthcare and childcare that allow more females to enter the labor market.

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