



UNIVERSITI PUTRA MALAYSIA

***HUMAN CAPITAL INEQUALITY, INCOME INEQUALITY AND
CONVERGENCE IN DEVELOPED AND DEVELOPING COUNTRIES***

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CONVERGENCE IN DEVELOPED AND DEVELOPING COUNTRIES**

By

SURAYA MAHMOOD

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in
Fulfilment of the Requirements for the Degree of Doctor of Philosophy**

December 2015

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DEDICATION

This thesis is dedicated to my family members, they will always be in my heart. Without their patience, understanding, support, and most of all love, this thesis would not have been completed. I also would like to thank my friends, who have always given me advice and support, making it possible for me to complete this research



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

HUMAN CAPITAL INEQUALITY, INCOME INEQUALITY AND CONVERGENCE IN DEVELOPED AND DEVELOPING COUNTRIES

By

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December 2015

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The investment in human capital measured through the average years of education is one of the most important instruments, especially in the 21st century. But the equal distribution of human capital in the country is also important in analysing the country's economic performance, as well as reducing income inequality. There are two sides of driving forces in the determinants of human capital inequality that influence human capital inequality. One is the demand of education and the other is the supply of education. These determinants are important to be analysed towards reducing the human capital inequality in the world. In addition, the persistent and increasing income inequalities in most developed and developing countries since the 1980s have had a negative effect on the economies. Theoretically, the human capital inequality and income inequality are positively correlated. This study also examines the effect of human capital inequality on income inequality in the developed and developing countries using the Gini coefficient as a consistent measurement. This study adds several control variables, such as the Globalization Index, the GDP per capita, the GDP per capita squared and trade. The issue of inequality convergence in human capital inequality is also investigated, to see whether the distribution of inequality in human capital will achieve equalization or polarization in the future. For first and second objective, this study uses the dynamic panel data and the Generalized Method of Moment (GMM) two step method for the first and second objectives. Data from 92 countries over the period 1970 to 2010 with 5-year intervals (1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, and 2010) are applied in this study. For the third objective, this study uses the Ordinary Least Squared (OLS) and Generalized Method of Moments (GMM) methods to analyse data from 92 countries over the period 1965 to 2010 with 10-year intervals (1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, and 2010).

The empirical results show that the average years of education and lagged one year human capital inequality are significant in influencing human capital inequality in the world, developing and developed countries. For emigration rates by skill (low skill), only found low skill emigration in developed and high skill and medium skill in developing countries to be significant. However, total emigration rates, life expectancy and fertility rates are found to be not significant in influencing the human capital inequality in the developed and developing countries. For public expenditure, this study only finds significant impact on human capital inequality in developed countries. For the second objective, this study finds that human capital inequality, one-year lagged income inequality and initial income inequality are significant in influencing income inequality in the developed and developing countries. However, the GDP per capita and GDP per capita squared are consistently found to be negatively affecting income inequality in the developing countries. Generally, other control variables are found to be statistically insignificant. The last result of this study finds that the gap of international inequality of human capital (average years of education) from 1965 to 2010 in the developing and developed countries as a measured by the Gini Coefficient has consistently declined, despite the increasing trend of the gap in the average years of education in the developing and developed countries. Using the Generalized Method of Moments (GMM) and Ordinary Least Squared (OLS) methods, this study also finds absolute and conditional convergence in the developed and developing countries, but the speed of convergence in the developed countries is higher than the developing countries.

The GMM results show that the developed countries tend to converge to a steady state growth rate of human capital Gini with the speed of convergence between 28.0 per cent and 29.0 per cent, compared to only 7.0 per cent and 25.0 per cent in the developing countries. The OLS results also show that the speed of absolute convergence and conditional convergence in the developed countries is high between 7.7 per cent and 8.8 per cent, while the speed of convergence in the developing countries are between 1.5 per cent and 3.2 per cent, respectively. Using Ordinary least Squared (OLS), this study also finds the emigration rate by low skill workers promote the convergence process in Developing Countries. By using Generalized Method of moment (GMM), this study finds emigration rate of low- skill workers, medium skill workers and trade promote convergence in developing countries. Additionally, the effect of emigration by low-skilled workers is found to enhance the convergence process in the developed countries.

The results of this study provide an important understanding on the main determinant of human capital inequality across countries. Based on this finding, policy makers can formulate appropriate policies to reduce human capital inequality and indirectly reduce income inequality. The governments, policy makers and politicians in the developing and developed countries need to invest in human capital and improve the distribution of human capital by increasing the average year of education, as it has the potential effect in reducing income inequality. In addition, identifying the factors of human capital inequality is also important in understanding the gap between countries. In the past, most policy makers did not consider education as their top priorities. The human capital and education policies are very important because education could enhance both personal and national advancement. The result of this study further highlights the importance of reducing human capital inequality in reducing income inequality in the developed and

developing countries. The positive relationship between human capital inequality and income inequality provide a clear-cut supporting evidence on using a consistent measurement for both human capital inequality and income inequality in future research. The data set of human capital Gini that has been computed in the developed and developing countries for the period 1960 to 2010 can be used by future researchers to investigate the relationship between human capital inequalities with other variables. Finally, this study offers an additional conclusion on the human capital inequality convergence, by using the GMM and OLS estimators on comprehensive panel data from the developed and developing countries. This study finds human capital inequality tend to converge across countries in the future.



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KETAKSAMAAN MODAL INSAN, KETAKSAMAAN PENDAPATAN DAN CONVERGENCE DI NEGARA MAJU DAN NEGARA SEDANG MEMBANGUN

Oleh

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Pelaburan di dalam modal insan melalui purata tahunan pendidikan adalah salah satu alat yang paling penting terutama dalam abad ke 21. Namun begitu, pengagihan yang sama dalam modal insan di sesebuah negara juga penting bagi menggambarkan prestasi sesebuah ekonomi negara dan secara tidak langsung dapat mengurangkan ketaksamaan pendapatan. Terdapat dua faktor yang mempengaruhi ketaksamaan di dalam modal insan. Faktor pertama adalah permintaan untuk pendidikan dan faktor kedua ialah penawaran pendidikan. Faktor-faktor ini penting dianalisis dalam mengurangi ketaksamaan modal insan di seluruh negara. Tambahan, ketahanan dan peningkatan ketaksamaan pendapatan di kebanyakan negara maju dan sedang membangun semenjak 1980an sehingga kini memberi kesan negatif kepada ekonomi sesebuah negara. Secara teori, ketaksamaan modal insan dengan ketaksamaan pendapatan adalah berkorelasi positif. Oleh itu, kajian ini adalah untuk mengenalpasti kesan ketaksamaan modal insan keatas ketaksamaan pendapatan di negara maju dan negara sedang membangun mengguna Gini koefisien sebagai pengukuran yang konsisten untuk kedua dua ketaksamaan tersebut. Kajian ini juga, melibatkan beberapa pembolehubah lain seperti indek globalisasi, Kdnk Percapita, kdnk percapita kuasa dua dan perdagangan. Disamping itu juga, isu ketaksamaan convergence dalam ketaksamaan modal insan turut disiasat, ini adalah bertujuan untuk mengetahui samada pengagihan dari ketaksamaan dalam modal insan cenderung kearah persamaan atau polarisasi di masa hadapan. Untuk objektif pertama dan kedua, kajian ini mengguna Dynamic panel Data iaitu proses kedua. Data kajian merangkumi sebanyak 92 negara dengan tempoh 1965 hingga 2010 dengan selang tempoh 5 tahun (1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, and 2010). Untuk objektif ketiga, kajian ini mengguna *Ordinary Least Squared (OLS)* dan *Generalized Method Of Moment (GMM)* dengan 92 negara dengan tempoh 1960- 2010 dengan 10 tahun tempoh (1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, dan 2010). Keputusan kajian menunjukkan, purata tahunan dari pendidikan dan lag satu tahun pendidikan modal insan adalah signifikan dalam mempengaruhi ketaksamaan modal insan di dunia, negara membangun dan negara maju. Untuk kadar migrasi keluar mengikut kemahiran, kajian ini mendapati kemahiran

rendah signifikan di negara maju dan kemahiran tinggi serta kemahiran sederhana signifikan di negara membangun.

Bagi pembolehubah lain seperti jumlah migrasi yang keluar, jangkaan hayat dan kadar kelahiran tidak mempengaruhi ketaksamaan modal insan di dunia, negara membangun dan negara maju. Manakala kajian ini hanya mendapati perbelanjaan awam untuk pendidikan mempengaruhi ketaksamaan modal insan di negara membangun sahaja. Untuk objektif kedua, keputusan kajian mendapati ketaksamaan modal insan, lag satu tahun ketaksamaan dalam pendapatan dan tahun asas bagi ketaksamaan pendapatan adalah signifikan dengan ketaksamaan pendapatan untuk negara maju dan negara sedang membangun. Secara umumnya, pembolehubah lain adalah tidak signifikan dengan ketaksamaan pendapatan. Hasil keputusan terakhir mendapati perbezaan dari ketaksamaan dari modal insan (purata tahunan dari pendidikan) daripada tahun 1965 ke 2010 di negara sedang membangun dan negara maju dengan mengguna Gini koefisien secara konsistennya berlaku penurunan dalam tren, meskipun berlaku tren peningkatan dalam perbezaan di dalam purata tahunan dari pendidikan antara negara maju dan negara sedang membangun. Dengan mengguna *Generalized Method of Moments (GMM)* dan *Ordinary Least Squared (OLS)*, kajian ini juga mendapati proses *convergence* berlaku secara absolute dan tambahan di negara membangun dan negara maju, tetapi, had laju *convergence* di negara maju adalah lebih tinggi berbanding negara sedang membangun. Keputusan dari *Generalized Method of Moments (GMM)* menunjukkan negara maju cenderung untuk *convergence* ke titik keseimbangan kadar pertumbuhan modal insan dengan kelajuan antara 28.0 peratus dan 29.0 peratus berbanding dengan negara membangun hanya 7.0 peratus dan 25.0 peratus. Keputusan kajian ini adalah sama dengan mengguna *Ordinary least Squared (OLS)*, dimana kelajuan di negara maju adalah lebih tinggi berbanding negara membangun iaitu antara 7.7 peratus dan 8.8 peratus. Manakala, kelajuan proses *convergence* di negara membangun antara 1.5 peratus dan 3.2 peratus untuk absolute dan *conditional convergence* masing masing.

Dengan mengguna kaedah, *Ordinary least Squared (OLS)*, kajian ini juga mendapati kadar migrasi keluar pekerja yang berkemahiran rendah hanya mempengaruhi *convergence* di negara membangun. Dengan mengguna *Generalized Method of moment (GMM)*, kajian ini mendapati kadar migrasi dengan pekerja berkemahiran rendah, sederhana dan perdagangan mempengaruhi proses *convergence* di negara membangun. Manakala, kesan migrasi yang berkemahiran rendah hanya mempengaruhi proses *convergence* di negara maju. Hasil keputusan dari kajian ini dapat membantu memahami faktor faktor utama yang menyumbang ketaksamaan dalam modal insan semua negara. Berdasarkan keputusan ini, pembuat dasar boleh memformulasi polisi yang betul untuk mengurangkan ketaksamaan dalam modal insan seterusnya akan mengurang ketaksamaan pendapatan. Oleh itu, kerajaan negara sedang membangun dan negara maju, pembuat dasar dan para ahli politik perlu memberi perhatian ke atas pelaburan modal insan dan pengagihan modal insan menerusi peningkatan purata tahunan pendidikan sebagai komponen yang boleh mengurangkan ketaksamaan pendapatan. Tambahan pula, faktor faktor yang mempengaruhi ketaksamaan modal insan adalah juga penting dalam memahami perbezaan antara sesebuah negara. Ini kerana, kebanyakan pembuat dasar tidak mengambil kira pendidikan sebagai perioriti yang utama dalam polisi yang lepas. Modal insan adalah penting kerana ia peneraju pertumbuhan bagi sesebuah negara.

Hasil keputusan dari kajian ini juga menekankan kepentingan ketaksamaan modal insan dalam mengurangi ketaksamaan pendapatan di negara maju dan negara membangun. Hubungan positif antara ketaksamaan modal insan dengan ketaksamaan pendapatan dapat memberi bukti yang jelas di negara maju dan negara membangun dengan mengguna pengukuran yang konsisten untuk kedua dua ketaksamaan seterusnya membantu penyelidikan akan datang. Selain itu juga, dataset dari modal insan yang telah dikira di negara maju dan negara membangun (1960-2010) boleh diguna oleh penyelidik pada masa akan datang untuk mengenalpsti hubungan ketaksamaan modal insan dengan pembolehubah lain. Akhir sekali, kajian ini dapat menambah lagi keputusan berkaitan dengan proses convergence keatas ketaksamaan modal insan, dengan mengguna *Generalized Method of Moments (GMM)* dan *Ordinary Least Squared (OLS)* estimator secara komprehensif di negara membangun dan negara maju. Keputusan kajian ini menunjukkan ketaksamaan modal insan cenderung untuk polarisasi di semua negara pada masa akan datang

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I certify that a Thesis Examination Committee has met on 23 December 2015 to conduct the final examination of Suraya Mahmood on her thesis entitled "Human Capital Inequality, Income Inequality and Convergence in Developed and Developing Countries" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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LIST OF ABBREVIATIONS

AYS	Average years of education
EU	European Union
GDP	Gross Domestic Product
GE	Generalized Entropy
GINI	Gini Coefficient
GMM	Generalized Method of Moments
LSDV	Least squares dummy variable
MDG	Millennium Development Goal
UNESCO	United Nations Educational, Scientific and Cultural Organization
OLS	Ordinary Least Square

CHAPTER ONE

INTRODUCTION

1.1 Introduction

In recent decades, economists have paid more attention to human capital and consider it as the third important input in the production function, in addition to physical capital and labor. The huge benefit of human capital is significantly observed for a long time, not only in terms of its economic impact, such as equalizing income distribution and economic growth, but also its noneconomic effects, such as increasing democracy, reducing crime and increasing life expectancy. The issue of human capital is included in the Millennium Development Goals (MDGs). Nowadays, an equal access to education is a basic human right that everyone should have. Therefore, the public is pushing towards enforcing the compulsory attendance in primary and lower secondary schools around the world. However, inequality in human capital remains a global issue. There are two driving forces that influence human capital inequality. One is the demand for education and the other is the supply of education (Checchi, 2006). Since achieving equality in human capital markets between developed and developing countries requires government intervention, policy makers should take all significant determinants of human capital inequality into account. This study analyses the determinants of human capital inequality in both developed and developing countries. The determinants examined in this study include the past of human capital inequality, average years of education, migration by skill and education, public expenditure and other significant control variables such as life expectancy and fertility rate. Identifying the significant determinants of human capital inequality is important because human capital inequality has a positive effect on income inequality, and a decrease in human capital inequality can indirectly lead to a decrease in income inequality.

The rising income inequality in most countries has attracted the interest of philosophers, economists and other social scientists. According to Checchi (2001), an increasing income inequality initially occurred in the developing countries, but now it is also affecting the industrialized countries (Milanovic, 1999). Atkinson (1998) commented that a large increase in income inequality occurred in both developed and developing countries during the 1980s and early 1990s, and the trend continues until today in most countries. To reduce income inequality, the investment in human capital important is important especially in the 21st century. The endogenous growth theory has also emphasized the human capital as an important endogenous factor in economic growth and economic development (Barro, 1996, 2001; Bassanini and Scarpetta, 2002; Benhabib and Spiegel, 1994; Romer, 1986). Additionally, an increase in human capital, especially through the increase in average years of education, can make the income distribution less inequitable. This is parallel with the second goal of the United Nation's Millennium Development Goal (MDG), which aims at achieving a universal primary education, and the third MDG that aims at promoting gender equality and empowering women. If human capital is unequally distributed, it cannot contribute to reduce income inequality. Previous studies that have estimated the effects of the distribution in human capital on income inequality found contradictory or inconclusive results. The inconsistency could be due to the different measurements used in the

various literatures, such as standard deviation, Theil index and distribution of education. The standard deviation of education is not a suitable measurement to be used as a proxy for human capital inequality. Firstly, this is because the distribution of human capital that measures human capital inequality is in relative terms instead of absolute terms. Secondly, the standard deviation tends to be volatile, misleading outlook, whether not provide a consistent outlook whether the distribution of education in a country is improving (Thomas, Whang and Fan, 2003). Therefore, it is important to examine and use the appropriate measurement for both human capital inequality and income inequality. Following Castello and Domenech (2002) and Thomas et al. (2001), this study uses the Gini coefficient, which is found to be a better measurement for inequality. The data set for the period 1970 to 2010 is from Castello and Domenech (2002), which is further extended with the author's own calculation for the period 2005 to 2010, where the raw data is based on the updated data set from Barro and Lee (2010).

In addition, the issue of inequality convergence has recently attracted researchers to investigate whether the distribution of inequality will lead to equalization or polarization in the future. In other words, the uncertainty refers to whether the poor countries will experience a decrease in inequality or rich countries will experience an increase in inequality over time. This issue has become a huge debate among researchers. In essence, the concept of inequality convergence is borrowed from growth convergence (Solow, 1956). The convergence in inequality was first applied in income inequality and health inequality (Benabou, 1996; Clark, 2011; and Ravallion, 2003). It can be extended to human capital inequality and this study looks at the effect of skilled migration and trade on human capital inequality convergence. Suitable migration and trade policies can be drawn based on the outcome of this study.

This chapter provides an overview of this study. The background of the study is provided in Section 2. Section 3 discusses the issues and problem statements. Section 4 elaborates the objectives of the research. Section 5 provides the significance of the study and Section 6 reports the scope of this study. Lastly, Section 7 presents the organisation of the thesis.

1.2 Background of the study

1.2.1 Definition and measurement of inequality in human capital

Firstly, this study starts with the definition and measurement of inequality in human capital. As the concept of inequality in human capital is generally broad, the meaning of inequality in human capital needs to be clearly defined. There are many familiar economic terms that are overlapped definitions such as inequality in education and inequality in human capital. Wamock (1975) simply described the difference between the two terms as "everyone has an equal right to education and everyone has a right to equal education". According to previous studies, the definition of inequality in human capital varies based on which educational factor variables were used. Economists defined equality in education as the rights to education for all citizens. Wamock (1975) described an equal right as two different things that citizens should be entitled

to, which are “to a certain amount of education” and “the chance or opportunity to get more than this if they want it”. Both balances between ‘what people want’ and ‘what they need’. However, in terms of measurement, this study is unable to completely capture these aspects. Thomas et al. (2000) mentioned that there are three indicators to measure inequality in human capital, from both quantity and quality perspectives. The first is the flow variables, such as the enrolment ratio. The second is the stock variables, such as the average years of schooling. The third is the quality of education by two elements, which are the input approach education resources and the output approach through the test score cognitive performance.

This study utilises the concept of inequality in human capital by Wamock (1975). However, due to data unavailability, the measurement of the years of schooling is selected to measure inequality in human capital. This measurement has two advantages compared with other indicators. First, the number of years of schooling can explain the distribution of education better than enrollment ratios. Secondly, the education factor can be applied to the workforce-age population at the time, which covers a larger group of population compared to enrollment ratio that can only capture school-age population. The concept of Gini coefficient is applied in the human capital inequality through the human capital Gini, based on the average years of education of the population aged 25 to 64. The larger the human capital Gini is, the less equal the distribution of human capital. The coefficient ranges from zero (perfect equality) to one (perfect inequality). The human capital Gini can also be graphically displayed using a Lorenz curve¹. An alternative measurement for human capital inequality is the standard deviation of education, which is measured in absolute terms. Other measures for inequality are the Theil index, the distribution of education by quintiles and the generalized entropy (GE). The values of GE range from zero to infinity, where zero represents an equal distribution and any higher value represents a higher level of inequality. The detailed explanation for the measurement of human capital inequality is further explained in Chapter 2.

1.2.2 Definition and measurement of income inequality

According to Milanovic (2005), there are three concepts of income inequality. The first concept (Concept 1) is the unweighted international inequality. This concept takes multiple countries as the unit of observation, uses its income or GDP per capita and disregards its population. It takes representative individuals from all the countries in the world. The second concept (Concept 2) is defined as a population-weighted international inequality, where it assumes that everyone in the country receives the same amount of income and the number of representative individuals from each country reflects its population size. This concept is grouped under international inequality because it compares the mean income among nations, except that it is

¹ The Lorenz curve is a graphical way to display the education Gini coefficient. If all individuals hypothetically have equal educational attainment, the Lorenz Curve will be a straight diagonal line (where x% of the population have reached x% level of educational attainment). It is called the line of equality. The y-axis (vertical axis) shows the cumulative percentage of the educational attainment held by the relevant percentage of the population that lies on the x-axis (horizontal axis).

weighted by the population of each country. The difference between the first concept and the second concept is that the number of representatives from each country in our fictional assembly is proportionate to the population. Each representative carries a sign with the GDP per capita of his or her country and income ranks. Concept 2 assumes that the “within-country” distribution is perfectly equal. The third concept (Concept 3) is where inequality is calculated across all individuals in the world. In this concept, everybody is the same and that means that there are no representatives from any country. All individuals are arranged from the poorest to the richest, regardless of which country they originate from. This concept goes back to the individual as the unit of analysis and it ignores the country boundaries. Meanwhile, Firebaugh (2000) defined income inequality as the income disparity between the richest and poorest regions in the world. On the other hand, the Social Report (2010) defines income inequality as an extent of the disparity between the high income and the low income among households. In this study, the third concept of income inequality as defined by Milanovic (2005) is used to explain income inequality in both developing and developed countries.

To measure income inequality, there are a few measurements such as the median share of income, the Theil index, the Atkinson index, the Robin Hood index, the coefficient of variation (CV) and the Gini coefficient. The Gini coefficient is the most widely used and popular measurement in the literature. The coefficient ranges from zero to one, where zero is defined as perfect equality and one is defined as perfect inequality. Recently, the Gini coefficient was expressed in percentage terms between zero and 100 (Chackravorty, 2006). The detailed explanation for the measurement of income inequality is further discussed in Chapter 2.

1.2.3 Trend of human capital and human capital inequality in developed and developing countries

Most countries around the world face the persistent and rising income inequality over the past two decades. It presents a great challenge for the economic policy makers in both developed and developing countries. In the 20th century, some of the developed countries have managed this challenge through proactive public welfare policies, such as social insurance, public spending on education, health services and progressive taxation. Meanwhile, many developing countries have not been successful in managing this issue. According to World Bank (2009), human capital is one of the most powerful instruments for reducing income inequalities, acts as a foundation for a sustained economic growth and is a core element in both developed and developing countries in the 20th century.

To achieve these goals, every country must increase their human capital through investment in education because education is part of human capital. An average year of education for the population aged 25 to 64 is the best measurement for human capital (Bergheim, 2005). Based on the data set from Cohen and Soto (2007) (Figure 1.1), most of the selected developed and developing countries experienced an increase in average years of education from 1960 until 2010. For example, in Australia, the average years of education increased steadily from eight years in 1960 to 12 years in 2010. An increasing trend in the average years of education was also observed over

time in other countries, including Italy, United Kingdom, United States, Japan, Malaysia, China, Brazil, Argentina and Thailand.

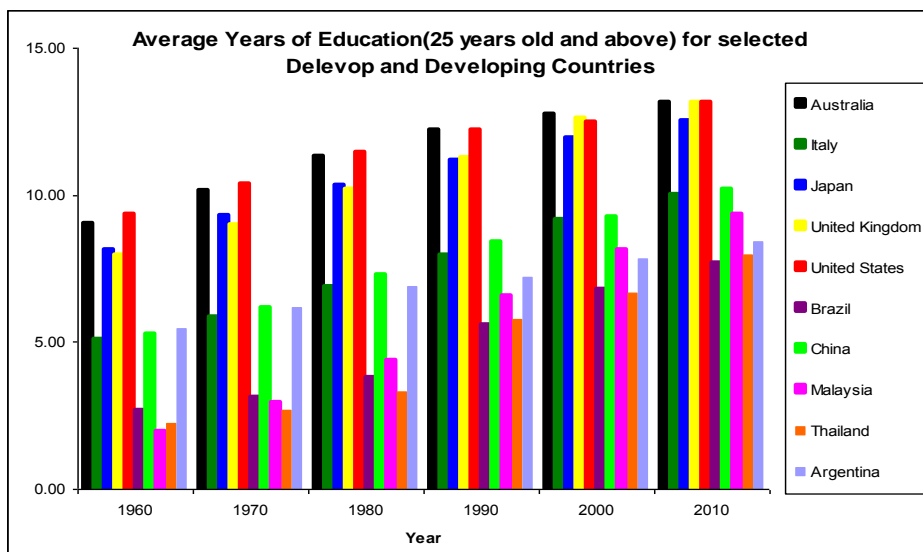


Figure 1.1: Average years of education for selected developed and developing Countries

Source: Author figure based on Cohen and Soto dataset, 2007

The average year of education is one of the most important measures for human capital and it is widely used as a proxy to measure human capital inequality. Castello and Domenech (2002) computed new measures of inequality in human capital using the concept of Gini coefficients by taking the attainment level from Barro and Lee (2000) and by following the method of Thomas et al. (2001). They computed these new measures for a broad panel of 108 countries over a five-year interval from 1960 to 2000. The human capital Gini inclined for most developed countries, including Canada, Brazil, Singapore, Cyprus, Greece, Hungary, Italy and Sweden. However, the human capital Gini was found to be fluctuated in the United States, Japan, Australia, Germany, Belgium, Finland and France. Singapore showed the fastest decline in human capital Gini. It dropped from 0.66 in 1960 to 0.14 in 2000. Cyprus also had a sizeable decline in the distribution of human capital, where the Gini index declined from 0.38 in 1960 to 0.24 in 2000. This is followed by Sweden, where the human capital Gini moderately declined from 0.24 in 1960 to 0.14 in 2000. For developing countries, the trend of human capital Gini also showed a decline for all countries from 1960 to 2000. Zambia showed the fastest decline in human capital inequality with a decreasing human capital Gini from 0.68 in 1960 to 0.30. South Africa and Iran also showed a decline in human capital Gini from 0.54 and 0.91 in 1960 to 0.27 and 0.54 in 2000, respectively (refer to Appendix 1.1 and 1.2)

1.2.4 Trend of income inequality in developed and developing countries

Based on World Income Inequality Database (2012), there was an increasing trend of income inequality as measured by the Gini coefficients for both developed and developing countries from 1960 to 2010. In Figure 1.2 below, we can see clearly that the Gini coefficients in selected developed countries increased from 1980 to 2000. In Singapore, the Gini coefficient increased slowly and steadily from 45 per cent in 1980 to 50 per cent in the early 1990s. Subsequently, the trend increased dramatically from 2000 to 2010 where it almost reached 60 per cent. In fact, Singapore showed the highest level of inequality among all developed nations. The United Kingdom and the United States also displayed an increase in income inequality from 1980 to 2010. In contrast, the Gini coefficient for Japan declined slightly in 1980 from 30 per cent to 28 per cent in 1990. However, the Gini coefficient increased sharply to 40 per cent in 2000 and 45 per cent in 2010. Similarly, Canada also experienced a decline in the Gini coefficient prior to 1980 and recorded the lowest value at 35 per cent, before it gradually increased to 40 per cent in 2010.

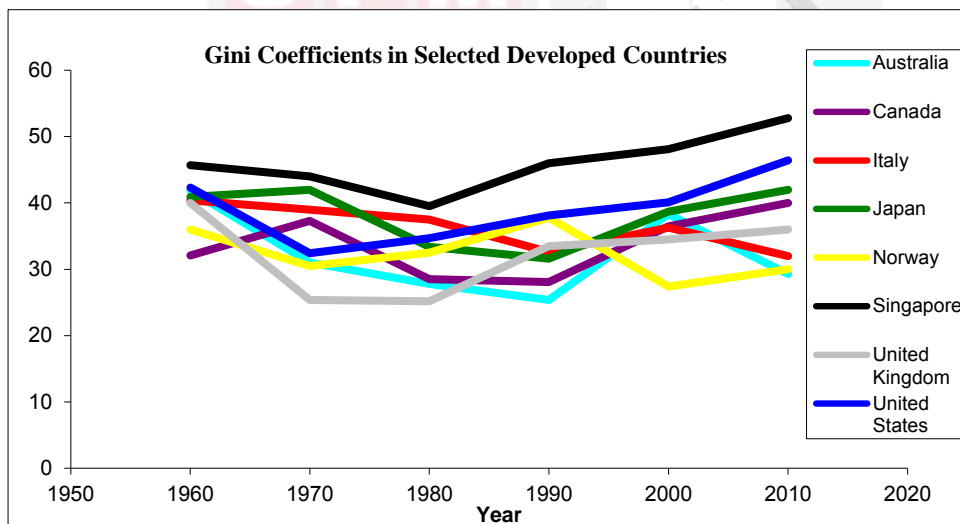


Figure 1.2: Gini Coefficients for selected developed countries (1960-2010)

Source: Author figure based on World Income Inequality Database (2012)

In the developing countries, income inequality was as high as in the developed countries. For instance, Brazil has one of the highest levels of inequality among all developing countries, and all around in the world. In 1960, the Gini coefficient increased steadily from 55 per cent to 60 per cent in 1970. After this point, the level of inequality decreased until 1980 and increased again in 1990 and 2000. In 2010, it increased sharply to almost 70 per cent. Similarly for China and Chile, both countries showed an increase in income inequality from 1960 to 2000, as shown in Figure 1.3 below. There are several potential causes that contribute to a greater income inequality, such as the reduction of the redistributive role of the state, the decline in union presence in the workplace, the increased competition at international level and technological progress (Milanovic and Squire, 2005; Easterly, 2007).

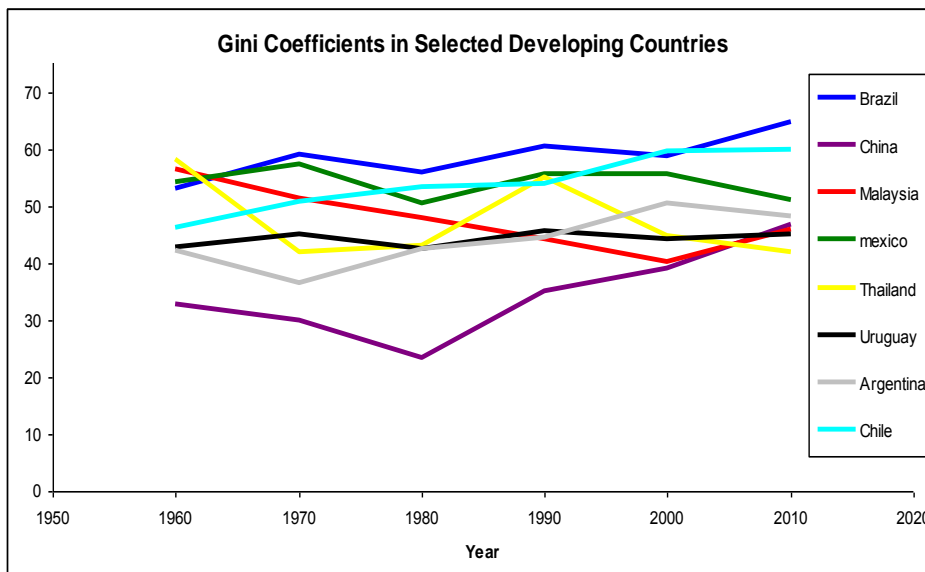


Figure 1.3: Gini coefficients for selected developing countries (1960-2010)

Source: Author figure based on World Income Inequality Database (2013)

1.2.5 The relationship between human capital inequality and income inequality in selected developed and developing countries

Theoretically, human capital inequality and income inequality are positively correlated (Chakraborty and Das, 2005; Fields, 1980). The relationship between these variables can be seen clearly from the Gini coefficients in quadrant Q1 to Q4 (refer Figure 1.4). According to World Income Inequality (2009), the value of Gini coefficient is considered high if it is 0.5 and above, and it is regarded as low if it is below 0.5. In Q1, where human capital Gini is low and income Gini is high, Q1 shows that most countries in this quadrant are developing countries. These countries include Brazil, Ecuador, Haiti, Kenya, South Africa, Chile and Columbia. Only one developed country falls in Q1, which is Singapore. However, in Q2, where human capital Gini and income Gini are both low, there is a balanced combination of developed and developing countries. The developed countries in this quadrant are the USA, the UK, Canada, Denmark, Norway, Australia, Greece, Spain, Cyprus, Finland, Paraguay, Sweden and Ireland. The developing countries found in Q2 are Argentina, Malaysia, Malawi, Senegal, Tunisia, Turkey, Indonesia and Mexico. In Q3, where both human capital Gini and income Gini are high, it is observed that all countries in this quadrant are developing countries, namely Mali, Sudan, Togo and Pakistan. In Q4, where human capital is high and income Gini is low, it is noted that all countries in this quadrant are developing countries, namely Bangladesh, Sierra Leone, Nepal and India. From Q2, the relationship between human capital inequality and income inequality in most developed countries agree with the theoretical argument, where developed countries tend to have low human capital Gini and low income Gini. However, the relationships for both of Gini coefficients for developing countries are found to be inconsistent. Some of the developing countries are located in Q1, while others are found in Q2, Q3 and Q4.

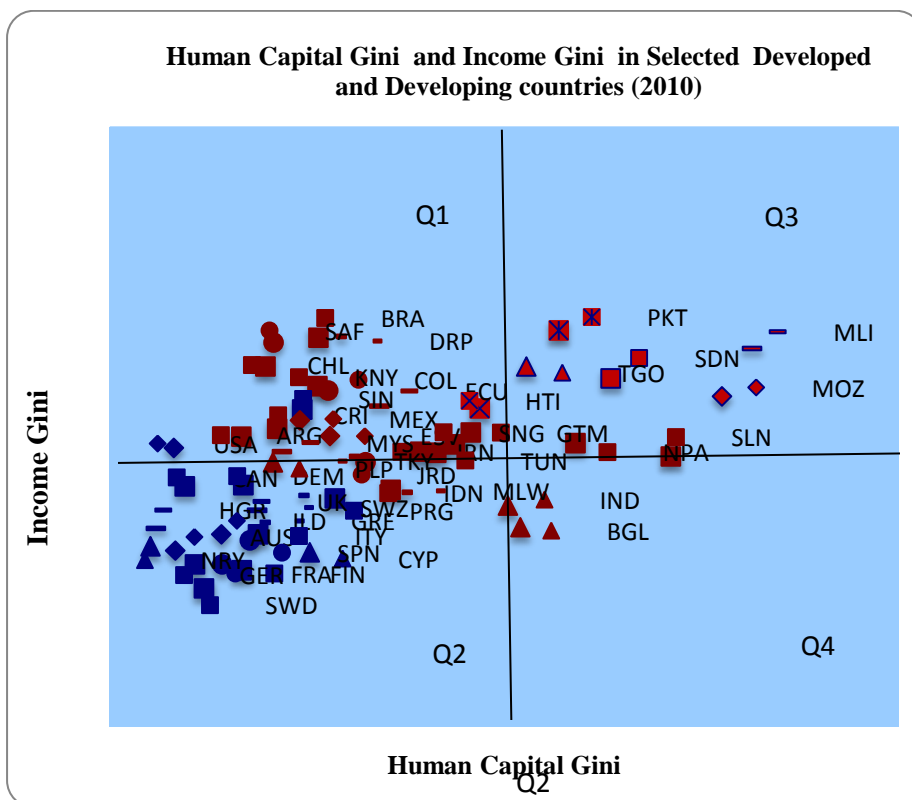


Figure 1.4: Human capital Gini and income Gini coefficients for selected Developed and Developing Countries

Source: Author's own calculations based on the data set from Barro and Lee (2010).

1.2.6 Determinants of human capital inequality

There are many determinants of human capital inequality identified in the literature². Studies by Black et al. (2005) concluded that international migration is one of the factors influencing inequality at the regional, cross country and world levels. The migration in Mexico was found to reduce human capital inequality, especially for girls, by perversely reducing schooling at the top of the human capital distribution (McKenzie and Rapoport, 2007a). Various studies have been conducted on the effects of international migration on human capital inequality in the source countries. By

² Some of them have identified gender inequality as one of the main factors that contribute to human capital inequality (Buchmann et al., 2008; Stromquist, 2005; and UNESCO; 2010), while Carrier (1986) and Peters (2003) reported that disability has an influence on human capital inequality. Studies by Erikson and Goldthorpe (1992), Jonsson et.al. (1996), Persell (1977) and Stromquist (2004) concluded that social class also influenced human capital inequality. Other studies have reported other factors that have influenced human capital inequality, such as the effect of political economy, natural disasters, poverty, privatization, race or ethnicity, religion, language, corruption, trade and globalization.

theory, high skilled emigration and low skilled emigration should have shown a negative impact of international migration on the distribution of human capital at source countries. This is also supported by most endogenous theories that believe human capital as one of the major determinants of economic growth. Thus, migration with high education is expected to have a negative impact on human capital inequality in source countries.

Recently, there has been an increasing trend of migration from the developing to developed countries. This situation is precipitated by reasons such as higher wages, better living conditions and better job opportunities. Figure 1.5 shows the increasing trend of international migration by region of destination from 1960 to 2000. In the developed countries, the total migration in 1960 was 25 million, reached almost 45 million in 1980, and increased to 110 million in 2000. In the developing countries, the total migration also increased from 40 million in 1960 to 60 million in 2000. According to United Nations (2002), the number of international migrants increased from 75 million in 1960 to 190 million in 2005 for all countries. Defoort (2008) and Docquier and Marfouk (2005) provided the total emigration rate for a panel database encompassing both developed and developing countries for the period 1975-2000. They estimated the total emigration rates by educational level for aged 25 above and further divided this to low skill (primary education), medium skill (secondary education) and high skill (higher education). Most developing and developed countries showed an increase in the emigration rates, where ‘high skill’ and ‘higher education’ emigration rates showed a higher increase compared to ‘low skill’ and ‘medium skill’.

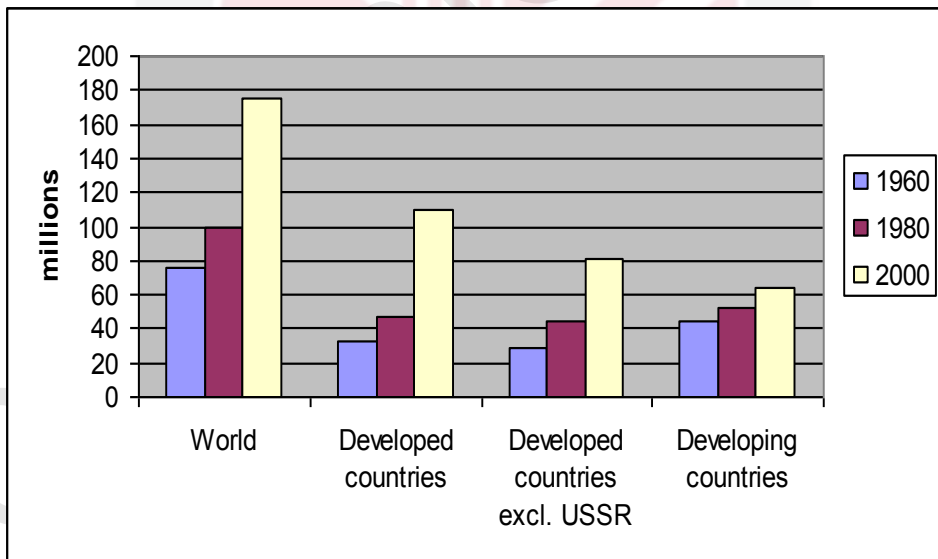


Figure 1.5: International migrants by region of destination

Source: World Economic and Social Survey (2010).

Apart from examining the effect of migration on human capital inequality, the effective allocation of financial resources through public expenditure on education is also necessary in reducing human capital inequality, especially in the 21st century. Some theoretical models, such as in Eskstein and Zilca (1994) and Zhang (1996) found that public education is a significant factor to influence income inequality as well as human capital inequality. Figure 1.6 shows that public expenditure on education increased from 2000 to 2005 in the United Kingdom, the United States, Italy, Australia, Argentina, Thailand, Malaysia and Brazil. However, the public expenditure in Japan declined from 3.7 per cent in 2000 to 3.5 per cent in 2005.

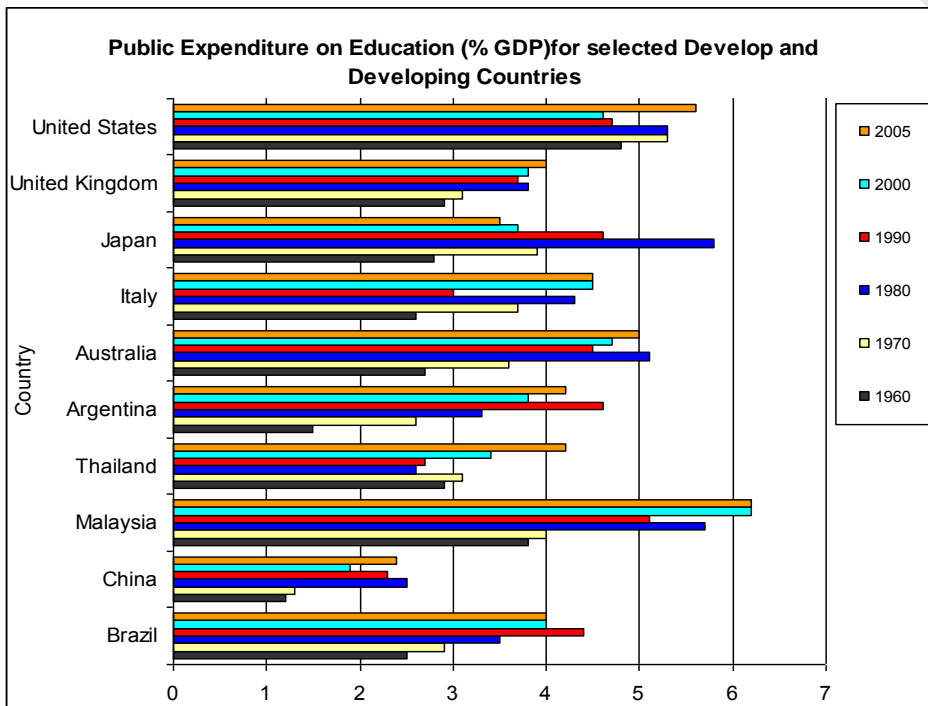


Figure 1.6. Public expenditure on education (% of GDP) for selected countries
 Source: Author's calculations based on UNESCO (2014).

1.2.7 The concept of convergence, inequality convergence and human capital inequality

There is a wide gap between the richest and the poorest countries around the world. It is evident through the average per capita income (GDP) and standard of living, also the level of human capital and its distribution. Policy makers face big challenges to reduce the gap at both domestic and international levels. Therefore, the issue of convergence has remained an important question and has become popular among researchers. The main idea of convergence is based on the neoclassical growth models developed by Cass (1965), Koopmans (1965) and Solow (1956). Sala-i-Martin (1991) was the first to introduce the two concepts of convergence in literature. It can be categorized as β (*Beta*) convergence and σ (*Sigma*) convergence. σ convergence is concerned with the

disparity around the mean of per capita income, or a related variable in a group of economies, such as the disparity of human capital inequality. It is also related to the equalization of income per capita across countries. A σ convergence does not necessarily imply the presence of β convergence (Sala-i-Martin, 1996a). β convergence refers to the relative growth performance of rich and poor countries. β convergence occurs when there is an inverse relationship (negative coefficient of β) between the initial value of a given variable (such as per capita income or productivity) and subsequent GDP growth. If poor countries with lower initial values of this variable grow faster, it implies that the poor countries will catch up with richer countries. The two approaches of β convergence, namely the absolute β convergence and the conditional β convergence are normally examined. The details of the absolute β convergence and the conditional β convergence are further discussed in Chapter 2.

The concept of convergence can also be extended to inequality convergence. Inequality convergence occurs when high inequality countries (developing countries) tend to reduce inequality over time and low inequality countries (developed countries) tend to rise over time. Inequality convergence looks at the correlation across countries, between the variance in measured inequality from its initial levels. The first method was applied in income inequality (Benabau, 1996). The concept of convergence mainly discussed in literature is where the output per capita is usually measured in terms of GDP per capita, and the Gini coefficient of income inequality is used as a proxy for income inequality convergence (income Gini).

It can also be applied to human capital inequality (Norbakshah, 2006). Human capital inequality (human capital Gini) convergence can be measured using the same concept as the distribution of income (income Gini), where the human capital Gini is applied for human capital inequality. In empirical literature, running a cross-section regression on the changes of average human capita Gini growth rate and the level of human capital Gini in the initial period sample. A negative sign for the respective coefficient reflects the existence of a convergence. According to Castello and Domenech (2002), human capital inequality tends to decrease in the developing countries over time and can converge with the developed countries. They also showed that the variability of human capital inequality has been greater across countries than within each country.

1.2.8 Graphical analysis of convergence or divergence in human capital inequality

A scatter plot in Figure 1.7 provides a preliminary indication of human capital inequality (human capital Gini) convergence or divergence in all countries for the period 1965-2010. The graphical analysis shows a negative relationship between the log of human capital inequality ($\ln HC_gini$) in 1965 and the average growth rate of human capital inequality ($Avggrowth_lnHCgini$). This indicates that β convergence existed within the sample period. This pattern is consistent for the developed countries (refer to Figure 1.8) and the developing countries (refer to Figure 1.9) within the sample period 1965 to 2010. The trend line shows a negative relationship between the average growth rates of human capital Gini ($avggrowth_lnHCgini$) and initial human capital ($initial_lnHCgini$) in 1965. The trend line for most developed and developing countries became narrow over time. Based on the convergence theory and data

gathered, it is forecasted that the poorer countries will grow faster than the rich countries.

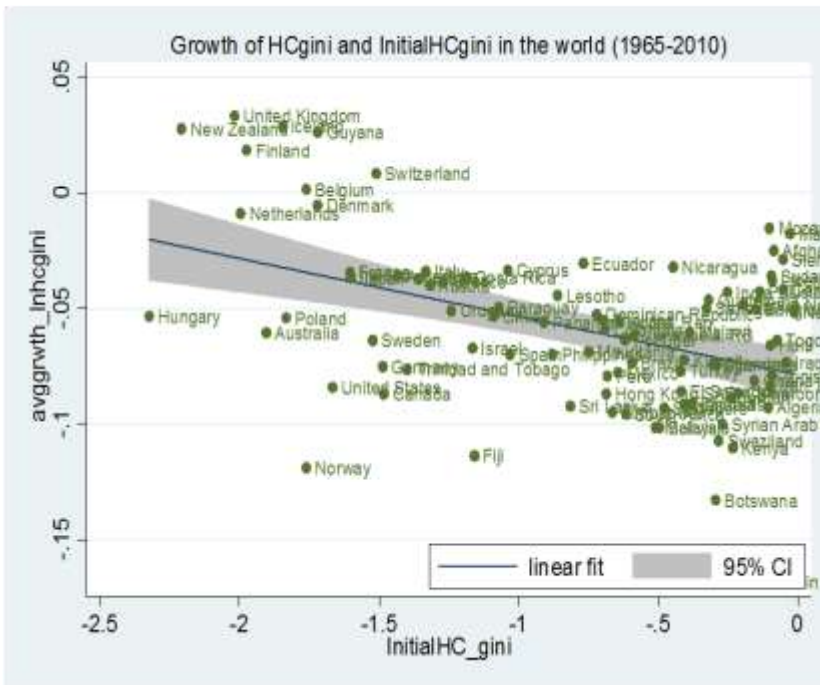


Figure 1.7: Growth of human capital Gini and initial human capital Gini for all Countries
 Source: Author's calculations.

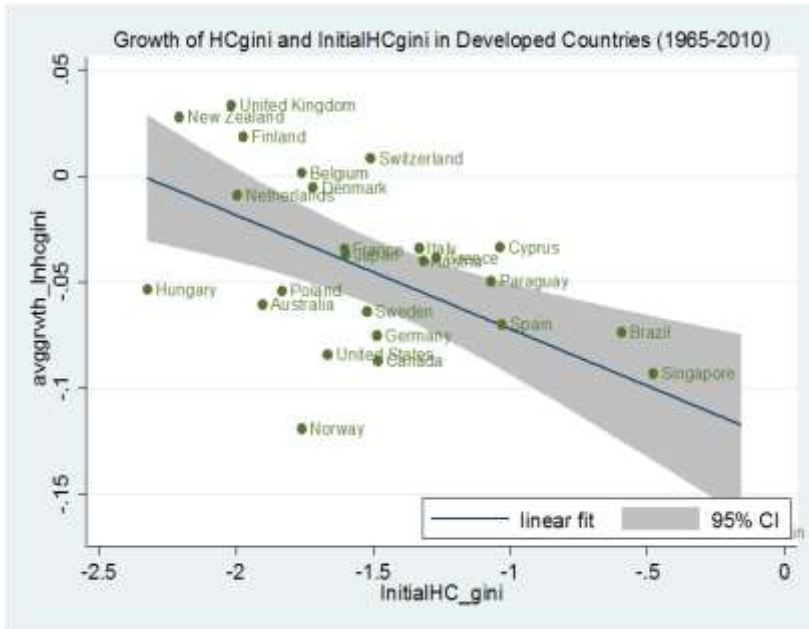


Figure 1.8: Growth of human capital Gini and initial human capital Gini in Developed Countries
 Source: Author's calculations.

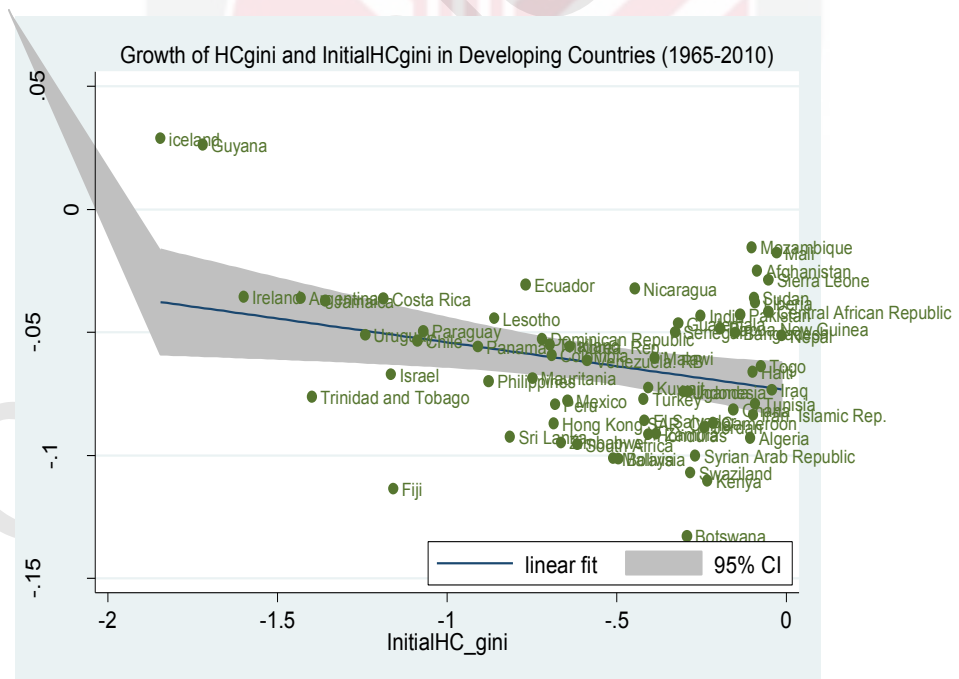


Figure 1.9: Growth of human capital Gini and initial human capital Gini in Developing Countries
 Source: Author's calculations.

1.2.9 The effect of skilled migration and trade on human capital inequality convergence

Skilled migration and trade are also affecting the welfare, growth, convergence or divergence in the source countries (developing countries) and the destination countries (developed countries). The possible effects of skilled migration and trade on the convergence process in income inequality, wage inequality and human capital inequality are frequently debated among researchers (Bhagwati and Rodriquez, 1975). Economists, researchers and politicians are interested to know whether the degree of inequality in human capital is rapidly increasing in the developed countries or decreasing in the developing countries over time, with the effect of skilled migration and trade. The World Development Report (2009) stated that labour mobility helps to exploit the economies of scale and may reduce spatial disparities in human capital across countries. The neoclassical approach to migration emphasizes how interregional migration can reduce regional human capital inequality. Human capital differentials are likely to be self-correcting through migration. As a result of the labour supply effect, migration accelerates human capital convergence. Barro and Sala-i-Martin (2004) provided a detailed explanation in the context of the neoclassical growth model. They concluded that if migration is an important source of convergence and if the endogeneity of migration in growth regressions is corrected by instrumental variables, the estimated β convergence coefficient (the effect of initial human capital on growth) should be smaller in regressions that include a migration variable.

Apart from the effect of migration, the effect of trade is also one of the main factors in accelerating growth as well as reducing disparities in human capital (Ben David, 1996). The contribution of trade towards accelerating growth in developing countries should come through the efficiency gains associated with greater uniformity in factor prices and the advantages of specialization. Moreover, according to traditional trade theory, even in the absence of capital and labour mobility, convergence of factor prices should lead to greater openness, where workers with comparable skills are equally paid in both developed and developing countries and likewise, the owners of capital can obtain the same rate of return on their investment. As a consequence, trade contributes to accelerating growth and human capital inequality convergence. Over the past two decades, growing cross-border linkages have exerted powerful influences on the shape of the world economy. From 1973 to 1994, the volume of world exports grew at an average annual rate of 4.5 per cent. However, since 1985, the difference between the export growth and world output growth has significantly increased. As a consequence, the world output of goods and services in relation to the world output rose from 12.1 per cent to 16.7 per cent over this period (Trade and Development Report, 1997).

1.3 Problem statements

Equalizing human capital through education is widely recognised as the main approach for social advancement and better life opportunities. In the perspective of opportunity of equality, human capital should be equally distributed in the population. Thus, it is important to achieve equality of distribution in human capital and it will indirectly reduce income inequality. This is also parallel with the Millennium Development Goal (MDG) that aims to reduce human capital inequality on a global scale and to provide a benchmark for educational standard (MDG, 2009). In addition, most developing and developed countries try to achieve equality in human capital in the 21st century. However, in the literature, a large body of empirical research pointed to the persistence of inequality in human capital across countries (Breen and Jonsson 2005; and Breen, et al. 2009). There are many determinants that lead to human capital inequality as reported by researchers in previous studies³. One part of the determinants is the two divided driving forces, one describes the household behaviour (the average years of education and the past inequality) that represent the demand for education and the other describes the government provision for education and skilled migration in the labour market that represent the supply of education. In relation to the demand of education, the average years of education and the previous human capital inequality serve as proxies for previous educational inequality. This is one of the factors influencing the distribution in human capital inequality. Most previous studies found a negative relationship between the average years of education and its inequality, also a positive relationship between the previous human capital inequality and its inequality.

The current increase of the migration flow from developing to developed countries have attracted researchers to investigate the effect of migration on growth, development and inequality. Beine et al. (2001) and Vidal (1998) found that the migration prospects have a positive and significant impact on human capital formation, especially for countries with low initial GDP per capita level in a cross-section analysis of 57 developing countries. However, researchers have given less attention to the study of the migration effect on human capital inequality. In Mexico, McKenzie and Rapoport (2007) investigated how migration affects human capital inequality. The results show that migration reduces human capital inequality. This is significant because the effect of migration on human capital inequality should be addressed in the literature towards achieving the equality in human capital, as well as to reduce income inequality in the future. The effectiveness of allocating resources by the government provision for public expenditure on education should also be addressed as it affects the human capital inequality. This important issue on the supply factor for education needs to be investigated and addressed because opportunity of equality is a key development in achieving human capital equality. There are also very few studies on the effectiveness of public expenditure on education in reducing human capital inequality.

³ For example, gender inequality (Buchmann et al., 2008; Stromquist; 2005 and UNESCO; 2010) disability carrier (Peters, 2003), and social class (Erikson and Goldthorpe, 1992; Jonsson et al., 1996; Persell, 1977; and Stromquist, 2004). Other reported factors that influence human capital inequality are the effect of political economy, natural disasters, poverty, privatization, race or ethnicity, religion, language, corruption, trade and globalization.

Can the demand and supply factors of education affect the human capital inequality in most countries, especially the developed and developing countries?

The second issue refers to how the persistently increasing income inequalities in most developing and developed countries since 1980 have negatively affected the economy. Some of these effects are political, social and economic in nature, such as political instability, unhappy society, pressure for higher wealth redistribution, high crime rates, fewer investment opportunities, low productivity and skill levels, lack of domestic demand and low growth rates⁴. To reduce income inequality and its effect, the role of human capital through education is one of the most important instruments, especially in the 21st century as reported by the World Bank (2009). In addition, the level of human capital plays a very crucial role in economic development and improving income distribution. However, the economic performance and production outcome do not only depend on the level of human capital, they also depend on the distribution of human capital. It has been mentioned by Solow that the economic performance of a country should not depend on its average level of human capital alone, since the asset of human capital is not freely traded in any market. The equal distribution of human capital in the country is also important in analysing the country's economic performance as well as reducing income inequality. This is because human capital is one of determinants that influence income inequality.

Theoretically, there is a positive correlation between human capital inequality and income inequality. If human capital inequality is high, income inequality can be expected to be high. However, unequal distribution of human capital can affect economic growth and income distribution. In Figure 1.4, the relationship between human capital inequality and income inequality shows different results for the developed and developing countries. For the developed countries, most are low in income Gini and human capital Gini, as shown in quadrant Q2. As a result, the economic growth is high in developed countries. For the developing countries, on the other hand, the implication is ambiguous. Developing countries are scattered in quadrant Q1 (low human capital Gini and high income Gini), quadrant Q3 (high income Gini and human capital Gini) and quadrant Q4 (low income Gini and high human capital Gini). This is also supported by previous studies, where the relationships were shown as mixed results with different measurements. For example, Gregoria and Lee (2002) used the standard deviation of education to measure human capital inequality and income share for income inequality for cross-country data. They found that higher human capital inequality leads to higher income inequality. Conversely, other studies found that human capital inequality has no significant effect on income inequality when they used the standard deviation for human capital inequality. Some studies discovered a positive relationship when they used the Theil index for both inequalities (Pose and Tselios, 2009). Based on Figure 1.4 and previous studies, it can be concluded that there is no conclusive relationship between income inequality and human capital inequality. This could be caused by the unsuitable measurement for human capital inequality. According to Thomas et al. (2003), they found that the

⁴ Barro (2000), Brush (2007), Kelly (2000), Persson and Guido (1994) and Thorbecke and Charumilind (2002).

standard deviation of education tends to be volatile and can be a misleading indicator. It also does not provide a consistent picture of whether the distribution of education in a country is improving or otherwise. Furthermore, the standard deviation of schooling is also deemed as not suitable to measure the dispersion of human capital inequality as the distribution of education is in relative terms instead of in absolute terms. Thus, it does not control the differences in the mean of the distribution. The education Gini seems to be an appropriate measure as it is consistent, robust and a good measurement for the distribution of education. As such, this study applies the Gini coefficient for human capital inequality (human capital Gini) and income inequality (income Gini) as a consistent measure for the developed and developing countries.

The last issue in this study is about inequality convergence of human capital inequality. This concept originates from the concept of convergence introduced by Cass (1965), and Solow (1956), who discussed the growth convergence. The inequality convergence is important to identify whether the developing countries will decrease in inequality and the developed countries will increase in inequality in the future. In other words, can the developing countries converge with the developed countries? This issue has been widely debated and explored by policy makers, researchers and international development agencies. In the literature, the concept of inequality convergence was first applied in the convergence in income inequality by Bénabou (1996), followed by Ravallion (2003). Convergence has also been tested in health inequality by Clark (2011). The results supported the convergence hypothesis. However, the issue of inequality convergence in human capital has received less attention compared with the convergence in income inequality and health inequality. Human capital inequality is also one part of human development index (HDI), combined with health inequality and income inequality. Thus, the increase and decrease in human capital inequality in the developing and developed countries should be addressed. In addition, Castello and Domenech (2002) suggested that the human capital inequality tends to decrease in the developing countries over time and can converge with the developed countries. This study takes the challenge that was proposed by Castello and Domenech (2002) to test human capital inequality convergence. This needs to be examined in order to identify whether the distribution of human capital between the rich and poor countries is moving towards equalization or polarization. In addition, it is also helps policy makers and international development agencies to draw appropriate policies in the future to reduce the gap of inequality between poor countries and rich countries. So, is there a convergence in human capital inequality in the developing and developed countries?

In examining the convergence in human capital inequality in the developed and developing countries, the effect of skilled migration and trade on the convergence process in income inequality, wage inequality and human capital inequality are frequently questioned in international debates. According to the neoclassical theory, migration is expected to speed up the convergence process between countries (Barro and Sala-i-Martin, 2004). The flow of labour from low-wage countries to high-wage countries should bring lower wage differentials, and income per capita would likely to decrease in immigration countries and increase in emigration regions. Recent literature has been looking for additional insights for the consequences of migration. The neoclassical framework considers labour mobility as the source of human capital inequality convergence, where human capital levels remain far below their steady state in many regions. However, many previous studies found a mixed effect of migration on

human capital. Several studies reported that the effect of migration on the disparities of human capital convergence is strong between regions, while other studies found no effect of migration in reducing disparities in human capital (Geizi and Hewings, 2004). Apart from the migration effect, the role of trade is also important in investigating whether trade can promote convergence or divergence in human capital inequality. In previous studies, there are mixed results on the role of international trade in the convergence process. Several authors⁵ found that there is a convergence between trade and distribution of human capital. In contrast, other researchers⁶ found that there is a divergence between trade and human capital. The literature produced a range of conclusion with regards to the effects of migration and trade, depending on the study characteristics, research methodologies, types of data and the spatial scales at which the research was conducted. In previous studies, less attention was given to the effect of skilled migration by education level and trade on human capital inequality convergence, particularly using new methods and variables. This study analyses the effect of skilled migration by education level and the effect of trade on human capital inequality convergence using the Generalized Method of Moments (GMM) and the Ordinary Least Squared (OLS) methods in long period, where all the samples cover both developing and developed countries. Can skilled migration and trade promote convergence in human capital inequality? In other words, can human capital inequality convergence in the long run and can skilled migration and trade contribute to the speed of convergence in human capital inequality?

In conclusion, the purpose of this study is to examine the determinants of human capital inequality, focusing on demand and supply factors, especially the effect of skilled migration and public expenditure on education in developed and developing countries. Most previous studies hardly discussed the migration factor and only used the public expenditure on education for specific countries. Furthermore, migration is also believed as a new variable in determining human capital inequality. Secondly, this study provides additional empirical results to the existing literature to provide a clear direction and to examine the extent of association between income inequality and human capital inequality for the period 1970-2010 in the developed and developing countries.

Thirdly, this study examines the convergence in human capital inequality and analyses the effect of skilled migration and trade on the progress of convergence in the developed and developing countries. This is conducted to fill up the gap of supporting empirical results in the existing literature. Many previous studies paid less attention in analysing the convergence in human capital inequality and its effects. The researchers focused more on income inequality, health inequality and other social indicators.

⁵ Ben –David and Kimhi (2000), Bohara (1997) and Sloughter (2001)

⁶ Dollar (1992), Edwards (1993), Harrison (1996) and Sachs and Warner (1995)

The research questions can be summarized as follows:

1. Can demand and supply factors of education affect human capital inequality?
2. Can inequality in income be explained by human capital inequality?
3. Is there convergence in human capital inequality and what is the role of skilled Migration (low, medium and high skill) and trade in driving convergence of human capital inequality in the developed and developing countries?

1.4 Objectives of the study

The general objective of this study is to investigate the determinants, relationship between human capital inequality and income inequality as well as convergence of human capital inequality in both developed and developing countries.

The specific objectives are:

- 1) To analyse the determinants of human capital inequality
- 2) To investigate the effect of human capital inequality on income inequality based on the Gini coefficients
- 3) To examine human capital inequality convergence with the effect of skill of migration and trade in both developed and developing countries.

1.5 Significance of the study

The purpose of this study is to analyse the determinants of human capital inequality in the developed and developing countries. From the results, we can identify the main determinants of human capital inequality across countries. Based on these results, policy makers can formulate appropriate policies to reduce human capital inequality and indirectly reduce income inequality.

Secondly, this study is conducted to examine the effect of human capital inequality on income inequality. This study considers the importance of human capital inequality in reducing income inequality in developed and developing countries, where a decrease in human capital inequality is expected to reduce income inequality. Additionally, our analysis can provide a clear direction and extent of association between income inequality and human capital inequality for the period 1970-2010 in the developed and developing countries using a consistent measure for both types of inequality.

Thirdly, this study computes and extends the data set for human capital inequality for the period 2005-2010 using the human capital Gini for developed and developing countries, based on the latest data set from Barro and Lee (updated in 2010). Castello and Domenech (2002) computed the human capital Gini for the period 1960-2000 using the model from Thomas et al. (2000) and the data set from Barro and Lee (2000). This study analyses a larger sample size and a longer time frame.

Finally, this study examines the convergence in human capital inequality and the effect of skilled migration and trade. The results can help policy makers to establish whether human capital inequality will converge or diverge in the future. This finding is vital because the reduction of gap between countries can also reduce income inequality. This study differs from previous studies as it comprehensively employs the GMM and OLS estimators in analysing the panel data for developed and developing countries.



1.6 Scope of the study

This study focuses on human capital inequality and income inequality in developed and developing countries. There are 92 samples countries, where 27 are developed countries and 66 are developing countries. The full list is provided in Table 1.1 below.

Table 1.1: List of developed and developing countries

Developed countries	Developing countries	
Australia	Algeria	Mauritius
Austria	Afghanistan	Nepal
Belgium	Argentina	Nigeria
Canada	Bangladesh	Nicaragua
Cyprus	Barbados	Panama
Denmark	Bahrain	Paraguay
Finland	Bolivia	Pakistan
France	Botswana	Peru
Germany	Brazil	Philippines
Greece	Burma (Myanmar)	South Africa
Hungary	Cameroon	Sierra Leone
Ireland	Central Africa	Senegal
Italy	Chile	Sri Lanka
Japan	Colombia	Sudan
Netherlands	Costa Rica	Syria
New Zealand	Dominican Republic	Taiwan
Norway	Ecuador	Thailand
Portugal	El Salvador	Tunisia
Singapore	Fiji	Turkey
South Korea	Ghana	Togo
Spain	Guatemala	Uganda
Sweden	Guyana	Uruguay
Switzerland	Haiti	Venezuela
United Kingdom	Honduras	Zambia
United States	India	Zaire
Iceland	Indonesia	Zimbabwe
Poland	Iran	Trinidad & Tabago
Hong Kong	Iraq	Liberia
Korea	Israel	Malaysia
	Jamaica	Malawi
	Jordan	Mali
	Kenya	Mozambique
	Kuwait	Mexico
	Lesotho	

Source: World Bank (2012)

1.7 Organisation of the study

The first chapter explains the introduction, background of study, problem statements, objectives, scope and significance of the study. Chapter Two presents the theoretical and empirical review based on previous studies related to the main subject of this study. It starts with the theoretical frameworks related to human capital inequality determinants, followed by the theoretical review on income inequality, human capital inequality and convergence. The last part of this chapter reviews the measurement of human capital inequality and income inequality. Various measurements, such as the median share of income, Gini coefficient, Theil index, Atkinson index, Robin Hood index, and coefficient of variation (CV) are discussed in detail.

In Chapter Three, a detailed explanation of the methods chosen to accomplish the objectives of this study is presented. The chapter starts with the theoretical framework and model specification for the determinants of human capital inequality. It also discusses the model specification for income inequality and human capital inequality based on the human capital theory by Psacharopoulos (1977, 2004) and uses the original model from Gregorio and Lee (2002). After the theoretical and model specification deliberation, the measurement of human capital inequality using the Gini coefficient is employed on the updated data set from Barro and Lee (2010) using a model suggested by Thomas et al. (2001) for the period 2005-2010. For the period 1960-2000, this study uses the data set from Castello and Domenech (2002). They computed the human capital Gini using the data set from Barro and Lee (2000) with the same model from Thomas et al. (2001). The choice to use this index to analyse inequality in the distribution of human capital is mainly due to the fact that it is commonly used for international comparisons of income distribution. The third section explains the theoretical framework and model specification for inequality convergence in human capital inequality. The final section discusses the research methodology for model specification estimation and the last section of this chapter discusses the description and sources of data. Chapter Four presents the empirical results of the analysis and the interpretation for each estimation result. Lastly, Chapter Five provides the conclusion of this study, policy implications and recommendations.

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