LUND UNIVERSITY
School of Economics and Management

Master programme in Economic Demography

The Demographic Dividend and Institutions:

A Comparison of Asia and Latin America

by

Angelica Harryson

ede15aha@student.lu.se

Abstract: This thesis investigates the relationship between the demographic dividend and institutions. The aim is to make an attempt of attaining further knowledge about the requirements for obtaining a demographic dividend. This is done through the comparison of Asian countries and South American countries.

The obtained results confirm the positive effects of an increase in the working-age population relative to the total population, increased health, as well as the benefits of a reduced agricultural sector. It also finds support for the conditional convergence hypothesis.

However, the results obtained from the institutional variables are, with few exceptions, found lacking statistical significance. The conclusion of this thesis is thus that it does not obtain any further knowledge about the relationship between the demographic dividend and institutions. However, it is successful in confirming previous literature.

Key words: Demographic dividend, Economic growth, Demography, Institutions

EKHM51
Master thesis (15 credits ECTS)
June 2016
Supervisor: Kirk Scott
Examiner: Björn Eriksson
Word Count: 14843

Table of Contents

List of Tables

List of Figures

1.Introduction

The effect of population growth on economic growth[1] has been a much-debated topic that reaches back to Robert Malthus work in 1798. The topic grew popular again with the large population increases that followed World War II and has been characterised by two opposing schools of thoughts. The population pessimists claim that increased population sizes have negative effects on economic growth by reducing the positive effects of technological progress and leading to capital dilution (Bloom & Williamson, 1998). Meanwhile, the population optimists claim that increased population sizes can lead to increased efficiency (Kelley & Schmidt, 2005), increased chances of scale economies, and promotion of innovations, all of which have positive effects on economic growth. However, the produced results were neither conclusive nor robust and studies often contradicted each other (Bloom & Williamson, 1998).

In the early 1990s, the discussion changed slightly with the introduction of the convergence framework pioneered by Robert Barro (1991) to the models. The framework divides population growth into the fertility and mortality rate and the results showed that high fertility is significantly negatively related to economic growth while mortality has no significant effect (Kelley & Schmidt, 2007). Another change in the discourse came in the late 1990s, when Bloom and Williamson (1998) combined the demographic transition with empirical growth models.

The demographic transition is usually divided into four stages and described in terms of changes in the fertility and mortality rate. The first stage is usually described as pre-industrial and is characterised by stable fertility and mortality rates at high levels apart from short-term fluctuations that cancel out over longer periods. This creates a stable population size and thus a stable age-structure of the population (Eastwood & Lipton, 2011).

In the second stage, the mortality rate starts to decrease while the fertility rate remains high. This signalises the beginning of the actual transition (Eastwood & Lipton, 2011). The fall in mortality creates changes in the age-structure since the initial decrease in mortality is associated with decreased infant- and child-mortality driven by improved health (Bloom & Williamson, 1998). Since the fertility rate is now higher than the mortality rate, there is population growth in the form of a baby boom (Bloom, et al., 2015). Consequently, the age-structure of the population shifts towards the younger ages (Bloom & Williamson, 1998).

[1] The terms economic growth and growth will be used exchangeable within this study and, unless otherwise stated, have the same meaning

The reduced infant- and child-mortality creates incentives to the parents to reduce their fertility since they need fewer births to reach their desired number of surviving children. However, the reduction in fertility occurs after a time lag and the decrease is often a slow process. The onset of the fall of the fertility rate indicates the initiation of the third stage where both rates are decreasing. The rate of decrease of the mortality rate is falling continuously during this stage and after roughly half of the third stage the mortality rate will stabilise at a much lower level than the initial one. Nonetheless, since the fertility is still higher than the mortality the population continues to grow during the third stage but with steadily falling growth rates. The fourth and final stage is once again characterised by stable mortality and fertility, which means that the size of the population will stabilise again as well and the baby boom will end (Bloom & Williamson, 1998).

What Bloom & Williamson (1998) did when they combined the demographic transition and growth models was that they introduced the concept of the demographic dividend, even though they called it “the demographic gift” (Bloom & Williamson, 1998, p. 422). The demographic dividend is an idea that economic growth is associated with increases in the working-age population[2], which is the share of the population that are between 15 and 64 and thus could belong to the labour force (Bloom, et al., 2015). It has been defined as the additional growth a country might experience due to increasing working-age shares (Eastwood & Lipton, 2011).

The demographic dividend builds on the lifecycle theory, which describes how the individual consumption and production differs over a lifetime. At young and old ages, people consume more than they produce. These times roughly correspond to the ages outside of the working-age. During the working-age, on the other hand, individuals produce far more than they consume. A stylised graph of this would have consumption more or less stable over the lifecycle while production would create a u-shape with its tails below the level of consumption. During the periods where consumption is larger than production, individuals are dependent on others to provide for them, in the form of both public and private transfers. It is therefore possible to divide the population into two groups, the dependent population, and the working-age population (Bloom, et al., 2015).

The demographic situation at the end of the transition is therefore a population whose age distribution is largely consisting of dependents with fewer non-dependents to support them. This situation is economically taxing since the dependent population needs supporting, which means diverting resources from possibly growth enhancing activities. However, within 15 to 20 years of the start of the second phase of the transition, the baby boom generation begins to enter the working-ages. The results of this are that the age distribution starts to shift towards the working-ages and the working-age share increases. Another consequence is that mechanically, a country’s potential labour supply will increase, which increases the productive capacity of that country. This is the main feature of the demographic dividend.

[2] The terms working-age population, working-age share and the acronym WAS will be used interchangeably with the same meaning in this thesis, unless otherwise stated.

However, the increase in the working-age share is also associated with increased female labour force participation and savings, which increases the productive potential even further.

Nonetheless, the dividend is not guaranteed outcome of the demographic transition and a country might pass through the window of opportunity without any effects on growth at all or even gain negative effects from the demographic changes occurring, such as large unemployment that might even result in social unrest (Bloom, et al., 2015; Drummond, et al., 2014).

1.1 Research Problem

Asia, and especially East Asia, is often used as the main example for a successful generation of a demographic dividend. Latin America went through the demographic transition during the same time, but did not obtain any significant dividends.

Figure 1 shows the development of the working-age population as a share of the total population for East Asia and the Pacific, South Asia, and Latin America and the Caribbean. Visible here is that the three regions follow roughly the same development in the growth of the working-age share. East Asia and Latin America have approximately the same slope, even though East Asia had a period of faster growth between 1975 and 1985.

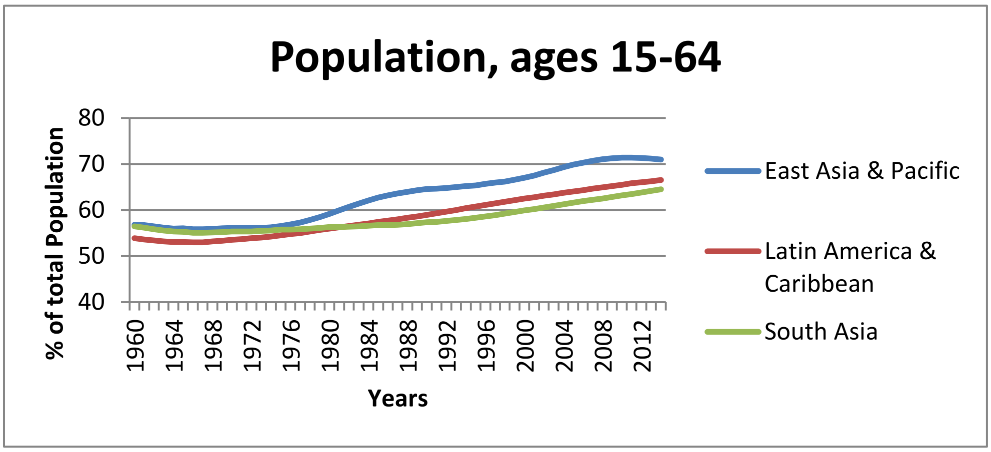

Figure 1: Working-age share of population over time (World Bank, 2016f)

The entire period for a possible demographic dividend is actually visible in Figure 1. All three regions have their minimum values around 1965-1970, which constitutes the start of the entrance of the baby-boom generation into the working-age population. The end of the baby-boom generation is visible for East Asia in the peak of its line around 2010. The other two regions have not yet reached their peak, but are likely to do so in the close future.

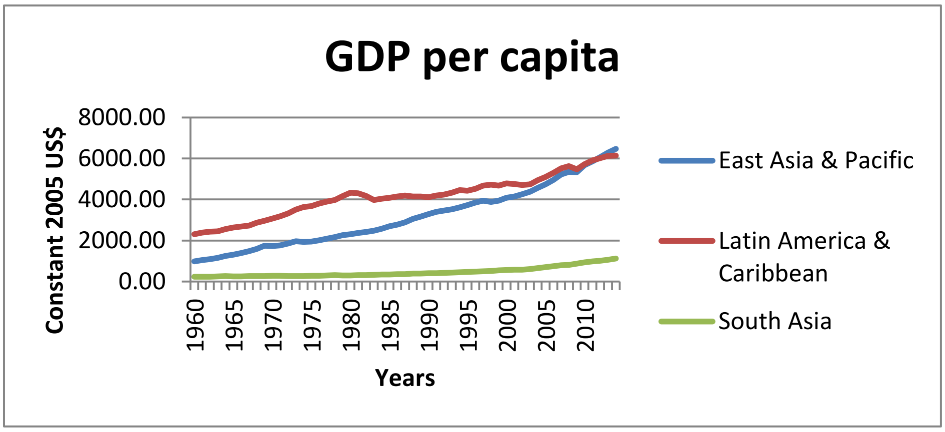

Figure 2: GDP per capita over time (World Bank, 2016b)

Figure 2 the GDP per capita levels in constant 2005 US$ plotted over time. Noticeable here is that even though Latin America's GDP per capita started out 1300 dollars above East Asia's GDP in 1960, East Asia has a much faster growth over the period that result in East Asia having a higher GDP per capita than Latin America in 2014. This is even clearer in Figure 3 below.

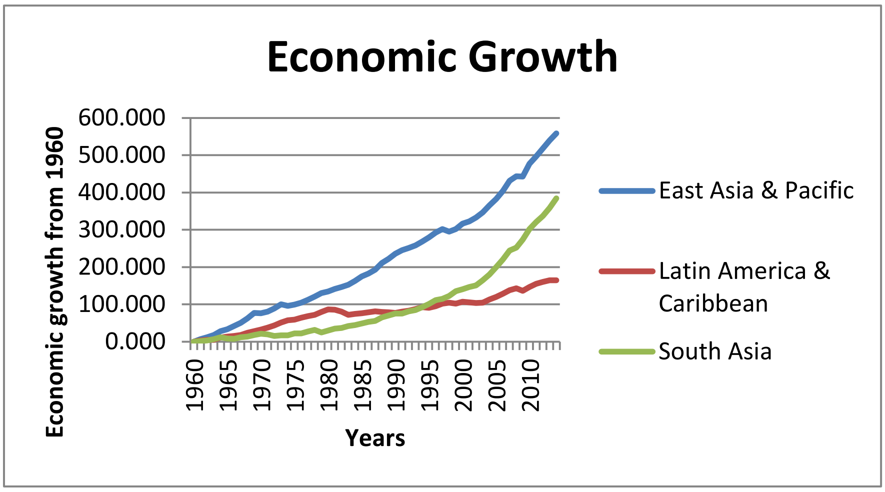

Figure 3: Economic growth over time (Own calculations; (World Bank, 2016b))

Figure 3 shows the total amount of growth a region has experienced since 1960. It was calculated by taking $\left(\left(\frac{GDP_{year\ t}}{GDP_{1960}}\right) - 1\right) \times 100$. Thus, the growth depicted for 1985 above was calculated by replacing "$\text{GDP}_{\text{year t}}$" with the GDP per capita level in 1985 using the same data as in Figure 2 above. It is therefore the economic growth a region has had from 1960 until year t.

East Asia's steeper slope, that was visible in Figure 2, is even more clear in this figure. This figure also clearly shows Latin America's lack of growth compared to the two other regions. Even South Asia, which was very much below the other two regions in Figure 2, has higher growth than Latin America. These three graphs show both the potential economic effects of a demographic dividend and underline that the dividend is not an automatic result of the demographic transition. Naturally, not all of the growth depicted in Figure 3 can be attributed to the demographic dividend and age-structure. However, Bloom & Williamson (1998) concluded that up to 33% of East Asia's annual growth between 1960 and 1990 could be attributed to the effects of changing age-structure.

The often-suggested reason behind the difference is differing institutions that affect a country's ability to utilise the increased potential for economic growth into actual growth. Bloom, et al. (2015) contributed Latin America's lack of growth to inflexible labour markets, lack of economic openness and weak governance.

The aim of the study is thus to attempt to obtain further knowledge about the requirements for being able to use the demographic transition to obtain a demographic dividend. This will be done through a comparison of Asia and South America with a focus on the role of institutions. The research question is therefore:

- What is the relationship between institutions and the demographic dividend?

This explicit focus on institutions has not been done before, as far as the author knows, in the literature regarding the demographic dividend. Institutional variables have been included as control variables, but often little focus was given to them other than as control variables, with a few exceptions. This focus is thus the contribution of this thesis to the existing literature.

1.2 Outline of the Thesis

The thesis starts with a review of the previous literature on the demographic dividend and institutions and continues with presenting some theories on how the demographic dividend affects growth as well as the role of institutions in the dividend.

The following chapter presents the model and the method and do a thorough description of the variables used as well as possible problems with the data. The last two chapters present the results and draw the conclusions.

2. Theory

This chapter will start with a review of the previous literature. The review starts with a focus on the demographic dividend and continues with literature on institutions and their role in the dividend. Following that is the theory section where background information and theories are presented. These theories are necessary to know in order to understand the relationship between the demographic dividend and growth as well as the role of institutions.

2.1 Previous Research

As stated above, Bloom and Williamson (1998) coined the concept of the demographic dividend. They concluded that demography did not affect growth through population growth, nor directly through fertility and mortality rates, but through changes in the age-structure. Furthermore, they concluded that the effect of age-structure changes was potentially very large. They estimated that up to one-third of the “miracle growth” in East Asia could be explained by changing age-structure and thus declared population dynamics to be the most important variable for East Asia’s growth.

These results have been confirmed in many subsequent articles, using different samples and estimation techniques. Most, if not all, articles published after Bloom and Williamson (1998) followed their method of using a global sample of countries covering all the years with global aggregate data, which mostly means from 1960 to the closest year that can complete a 5-year period. However, while Bloom and Williamson (1998) used a cross-section covering 1965-1990 the following articles have used panel data along with 5-year periods to estimate their data (Bloom, et al., 2007; Bloom, et al., 2010a; Bloom, et al., 2015; Drummond, et al., 2014; Kelley & Schmidt, 2005).

The estimation techniques, however, have not differed much. Bloom and Williamson (1998) used OLS along with IV to estimate their results. The IV was used as a robustness check to control for potential possible reverse causality. This method has been widely used in the following articles as well, that the results are estimated using pooled OLS and then checked using 2SLS/IV (Bloom, et al., 2007; Bloom, et al., 2010b; Bloom, et al., 2015). The exceptions include using only OLS (Kelley & Schmidt, 2005) and fixed effects checked by system GMM (Drummond, et al., 2014).

Results confirming the demographic dividend have been produced repeatedly ever since Bloom and Williamson (1998). The log of the working-age share of total population has been shown to be consistently positive and statistically significant (Bloom, et al., 2007; Bloom, et al., 2010a; Bloom, et al., 2015; Drummond, et al., 2014; Kelley & Schmidt, 2005). The growth of the working-age population over the period has not been shown to be as robust and does seem to depend on the specification and estimation technique, but it is still significant more often than not (Bloom, et al., 2007; Bloom, et al., 2010a; Drummond, et al., 2014).

Kelley and Schmidt (2005; 2007) differ from the other articles in that they claim that the model used by Bloom does not measure demography's effect on productivity, but merely shows the simple translation effect of growth per worker to growth per capita, also called the arithmetic demographic dividend (Eastwood & Lipton, 2011). However, while they use different modelling and use dependency ratios as their main demographic variables, they still confirm the strong effect of age-structure changes on economic growth (Kelley & Schmidt, 2005; 2007).

Institutional variables have been included as controls ever since the beginning. Some articles have included institutional variables simply as control variables, while others have interacted them the demographic variables to investigate how much of the demographic dividend depends on the institutional environment. The results from such interactions most often show that the interaction itself is significant and positive while the base effect loses its significance and sometimes even turn negative. These results have commonly been interpreted to indicate that only countries with high quality institutions are able to use the potential growth of the demographic transition and turn it into actual growth (Bloom, et al., 2007; Bloom, et al., 2010a). However, interactions with education and the growth of the working-age share have shown similar results in that countries with higher education are able to benefit from the demographic dividend much more than countries with lower education (Drummond, et al., 2014).

Regarding the literature on the economic effect of institutions on economic growth, the results are varied. Some studies have found strong positive effects direct on economic growth from institutions (Bloom, et al., 2015); others have found only indirect effects through human and social capital, and democracy (Glaeser, et al., 2004; Rodrik, 2000). A different branch of the literature has found that better institutions have less volatile growth rates and are better at managing economic shocks (Jerzmanowski, 2006; Rodrik, 2000). This would lead to democratic countries having higher average growth over longer periods than autocratic countries would have. Autocratic countries, on the other hand, are also capable of high growth, but have been found to be less able to sustain it over longer periods (Jerzmanowski, 2006).

2.2 Theory

2.2.1 Convergence theory

An underlying theory of the demographic dividend is the theory of conditional convergence. Bloom & Williamson (1998) assumed that both economic growth rates and demographic variables would converge over time and thus created their model to consider this effect.

The convergence theory is neoclassical theory based on the Solow-Swan model with technological progress (Bloom & Williamson, 1998). In that model, the steady state/equilibrium level of output per worker is determined by the following parameters: the savings rate, the capital depreciation rate, the population growth rate, and the exogenously determined technological progress.

The unconditional convergence hypothesis, the stronger version of the conditional convergence, states that poorer countries will grow faster than richer countries because they are further from the equilibrium. It assumes identical parameters for all countries over the long run and thus that all countries in the world share a common steady state. This hypothesis is not very realistic and has very low support from the empirical literature (Carlin & Soskice, 2006; Ray, 1998)

The conditional convergence theory assumes convergence of growth rates over time, but allows the steady states to differ between countries. This means that initially poorer countries will not necessarily grow faster than richer countries if the poorer country is closer to its steady state than the richer country. However, assuming the rich and the poor country share a common steady state with identical parameters and the poorer country, by definition, is further away from the steady state, the poorer country will grow faster until it has "caught up" to the rich country (Carlin & Soskice, 2006).

2.2.2 Potential channels from age-structure changes to economic growth

Savings and Investment

In a neoclassical theoretical world, investment would flow unhindered within and across countries towards the highest return. The highest return would be found where the gap between potential and current labour productivity is the largest. This would cause convergence since all investment in the world would go to the country farthest away from its steady state. This would continue until that country converged with its steady state or until another country took its place as the country furthest away from equilibrium (Kelley & Schmidt, 2007).

The opposite scenario would be a country completely closed to all outside financial influences such as trade, remittances, foreign direct investment, or aid. In this scenario, domestic savings would act as a constraint to investment since that country would follow the Solow-Swan model, which would mean that the savings rate would equal the investment rate. The real world is somewhere in-between those polar opposites, with countries differing in their openness to capital flows and attractiveness to foreign capital (Kelley & Schmidt, 2007).

The demographic dividend theory, as stated above, is based on the convergence theory. Since the dividend model is an open world model, this means that the underlying assumption is the first scenario above. However, since it is known that the real world does not conform to that scenario, empirical models add variables that modify the convergence rate. These variables include domestic savings and investment, migration and institutional variables (Kelley & Schmidt, 2007).

In the Solow-Swan model, the number of workers is assumed the same as the size of the population; hence, output is measured in output per worker and not output per capita. If the number of workers increases in the model, then output is negatively affected since, *ceteris paribus*, the level of capital per worker decreases, which is the same as capital dilution. However, if the age - structure were incorporated into the model, an increase in the working-age share would increase the savings rate. If the increase in savings is larger than the increase in the number of workers, the capital dilution would be compensated and the resulting effect would be zero or even positive (Bloom & Williamson, 1998).

The reason behind the increase in savings is based on the lifecycle theory previously mentioned. As before, the population can be divided into two groups: the working-age population, and the dependent population. When the lifecycle includes savings as well as consumption and production, the dependent population takes the role of dissavers while the working-age population becomes savers. The reason is quite simple knowing that the working-age population produce more than they consume. The difference between consumption and production thus becomes savings. For the dependent population, the situation is the opposite and they lack any surplus to save, which forces them to dis-save (Eastwood & Lipton, 2011).

If the economic lifecycle is aggregated to total population level and per capita levels of consumption and production in each age group is multiplied by the total population in that age group, it is possible to see the total lifecycle deficit or surplus (see Bloom, et al., 2015). If a country has a large young population, such as during a baby boom, it is possible that the deficit produced by the young dependent population is larger than the surplus produced by the working-age population. That would mean that on the aggregate level the population would dis-save rather than save which would have a direct influence on the level of investments and through investments indirectly negatively influence the economic growth. However, with the increase in the working-age population that follows a baby boom, that aggregate lifecycle deficit would become a lifecycle surplus and the dis-saving would become saving (Bloom & Williamson, 1998; Bloom, et al., 2015; Kelley & Schmidt, 2005). If the savings that follow the rise in the working-age share are efficiently invested in a way that takes both the current and future demographic situation into consideration, a country have a higher chance of obtaining a demographic dividend and sustaibably increase the living standards (Bloom, et al., 2015; Drummond, et al., 2014; Kelley & Schmidt, 2007).

Age-structure can also affect savings through the life expectancy. The latter stages of the demographic transition are associated with increased longevity because the mortality is decreasing, initially for infant- and child-mortality but later on also for the older ages. This increase in the life expectancy at birth creates higher incentives to save for a future retirement (Bloom, et al., 2010a; Bloom, et al., 2015; Kelley & Schmidt, 2005). Increased life expectancy also has the added benefit of increasing the returns to investment in human capital, which has positive effects on economic growth (Bloom, et al., 2010a).

Increased labour supply and female labour force participation

The simplest reason for why changes in the age-structure should affect the economic growth is through the arithmetic age-structure dividend. It states that an increase in the working-age share of the population means that a given growth of GDP per worker translates into a higher rate of GDP per capita, *ceteris paribus*. This is because the increase in the working-age population means that it simply is fewer non-workers per worker in the population (Bloom, et al., 2007; Eastwood & Lipton, 2011).

Age-structure can also affect growth through the labour supply because the increase in the working-age population means a proportional increase in the labour force, taking the participation rate into account and assuming it is fixed at its pre increase level. However, in order for this to have a positive effect on growth, the proportion of new workers that become part of the labour force have to become productively employed. The number of people that have to be employed might, depending on the country and the size of the generation of new workers, be very large. As an example, it has been estimated that Nigeria will need to create 24 million new jobs in order to realise its potential demographic dividend (Bloom, et al., 2015). The requirements to create enough jobs to absorb the additional workers include, among other things, good macroeconomic policies, an effective labour legislation, a good level of human capital and well-functioning institutions (Bloom, et al., 2010a; Bloom, et al., 2015).

However, it is often stressed in the literature that just because a country has the potential for much growth during the demographic transition, that growth may not be realised and the absorption of the additional workers into employment is a crucial part of a successful dividend. The potential consequences of not absorbing the extra workers include a lack of growth or even reduced growth, unemployment, and social and political unrest including increased criminality (Bloom, et al., 2007).

In the discussion above about the potential increase in the labour force, the participation rate was assumed to be fixed. However, female labour force participation is closely associated with reductions in the fertility. If the female labour force participation increased at the same time that the baby boom generation entered the working-ages the potential increase in the size of the labour force would be even larger and thus also the positive economic effects. However, this would exert even higher stress on the ability of the labour market to absorb the additional workers and would heighten the need for good economic policies. Moreover, it assumes that gender equality in the labour market, and society in general, is good enough that women are able to take available jobs (Bloom, et al., 2007; Crespo Cuaresma, et al., 2014; Eastwood & Lipton, 2011).

2.2.3 Institutions, age-structure and growth

There are two broad theoretical approaches to the causal relation between institutions and economic growth. The institutional view claims that in order to obtain growth a country needs secure property rights and in order to have those, it needs democracy and other governmental checks. After a country has these things, it is expected that investments in human and physical capital will follow and because of them economic growth will be obtained. This approach has the most support in the literature; however, it cannot explain how many countries manage to grow despite lacking democracy (Glaeser, et al., 2004).

The other approach is the development view and claims that investments in capital start the process of acquiring economic growth. Similar to the institutional view, economic growth follows the investments, but democracy and good institutions are seen as a consequence of increased wealth and education and not as the precursor. This approach can explain what the other approach cannot, how autocracies such as China and South Korea, among others, have managed to maintain fast economic growth despite their lack of good institutions and democracy (Glaeser, et al., 2004). Empirical results on the determinants of growth accelerations would support the second approach since they have not been able to connect institutions to any kind of growth accelerations (Hausmann, et al., 2005; Jones & Olken, 2008).

Regarding the relationship between age-structure and institutions, institutions are generally seen as having a comparable role in obtaining the demographic dividend as education has. They enable the country and its economy to make the necessary changes to earn the dividend, but they are generally not seen as the main variables.

The main argument is that high quality institutions increase the efficiency of the working-age population along with many other inputs into economic growth (Bloom, et al., 2007) (Bloom, et al., 2010a). As an example, it has been claimed that a country with better bureaucratic quality will gain more from growth in its working-age population, compared to a country with lower bureaucratic quality (Bloom, et al., 2010a). It has also been claimed that the efficiency losses from low-quality institutions are higher than the potential gains from an increased working-age population (Bloom, et al., 2007).

Dividing institutions into their components, poor rule of law, and a lack of political freedoms and risk of expropriation has been concluded to influence investments negatively. Poor rule of law weakens investments for the same reasons that property rights are often held among the most important institutional variables; without property rights and a good rule of law, contracts are not enforceable, which decreases the motivations to invest (Bloom, et al., 2007).

Deficient political freedoms and high risks for expropriation are associated with shortsighted behaviours, which undermine long-term investments (Bloom, et al., 2007). This could also be connected to the studies that claim that democracies have more stable economic growth than autocracies (Jerzmanowski, 2006; Rodrik, 2000).

As stated above, job creation is a vital part of obtaining a demographic dividend. Corruption and inefficient bureaucracy thus harm the possibilities of a country to earn a dividend by increasing the difficulties and uncertainties in setting up companies, and gaining and keeping employment (Bloom, et al., 2007).

3. Method and Data

This chapter will start with setting up the model and then continue with a description of the method used in this study. Following that is a detailed description of the variables and the data with a discussion of possible problems with the data.

3.1 Model set-up

The model used in this study is based on the model used in (Drummond, et al., 2014), which in turn is based on (Bloom, et al., 2010a). The model set-up starts with defining the relation between income per capita and income per worker. This relationship is important because it is the translation from most economic theory, which is often measures output per worker, and most empirical models, which most often use output per capita (Bloom, et al., 2010a).

Defining Y as total GDP, N as total population, L as total labour force, and WAS as the working-age population gives output per capita the definition of Y/N and output per worker the definition of Y/L. Thus, their relationship can be described as the following equation:

$$\frac{Y}{N} = \frac{Y}{L}\frac{L}{WAS}\frac{WAS}{N} \quad (1)$$

Equation 1 states that output per capita (Y/N) is the product of output per worker (Y/L) times the participation rate (L/WAS) times the ratio of the working - age population to total population (WAS/N), where the participation rate is defined as the ratio of the working-age population that is a part of the labour force.

Since the interest of this study is in economic growth, equation 1 can be further defined as $y = \frac{\log Y}{N},\ z = \frac{\log Y}{L},\ p = \frac{\log L}{WAS},\ w = \frac{\log WAS}{N}$ and differentiate it to obtain the growth rates as follows:

$$\dot{y} = \dot{z} + \dot{p} + \dot{w} \quad (2)$$

Equation 2 states that the growth of GDP per capita ($\dot{y}$) is equal to the sum of the growth of the output per worker ($\dot{z}$), growth of the participation rate ($\dot{p}$), and the growth of the working-age share ($\dot{w}$). The growth of output per worker can in turn be defined as the difference between the steady state growth per worker (z^*) and the initial level of per worker GDP (z_0), times the speed of convergence (γ), as shown in equation 3. The subscript zeroes denote the initial value.

$$\dot{z} = \gamma(z^* - z_0) \quad (3)$$

Equation 3 emphasises that the dividend model is based on the convergence theory and thus, indirectly on the Solow model. As mentioned above, it therefore assumes that countries will converge over time according to the convergence theory, conditional on the characteristics of their steady state.

Including equation 3 in equation 2, we receive equation 4 below. This is based on rewriting equation 2 into initial levels, which gives $\mathrm{y}_0 = z_0 + p_0 + w_0$. Rearranging this gives $-\mathrm{z}_0 = p_0 + w_0 - y_0$, where $p_0 + w_0 - y_0$ substitute $-\mathrm{z}_0$ in equation 4.

$$\dot{y} = \gamma(z^* + p_0 + w_0 - y_0) + \dot{p} + \dot{w} \qquad (4)$$

The steady state growth per worker is determined by a set of variables (X), which means that equation 4 can be rewritten as:

$$\dot{y} = \gamma(X_0 + p_0 + w_0 - y_0) + \dot{p} + \dot{w} \qquad (5)$$

Equation 5 is the basis of the estimation model used in this study. However, the participation rate is excluded from the estimation model because of the lack of reliable data for that variable. This is based on a discussion in Bloom et al (2010a, p. 22) where they discuss a previous attempt to include the participation rate into empirical models with very implausible results. Bloom et al conclude that since the participation rate data contains very large measurement errors it is not possible to capture the effect of the participation rate in empirical models. The expectation is thus that any effect of increased labour force participation will be captured by the growth in the working-age share. Thus, the final version of the growth equation looks like the following:

$$\dot{y} = \gamma(X_0 + w_0 - y_0) + \dot{w} \qquad (6)$$

The equation connects the growth of per capita GDP to a set of determinants of growth and the initial level of GDP per capita, as well as the initial level of the working-age share of the population and its growth over the period. It is thus possible to specify the empirical model as follows:

$$y_{it} = \beta_0 lnWAS_{it} + \beta_1 \Delta WAS_{it} - \beta_2 lnGDP_{it} + \beta' X_{it} + c_i + \pi_t + \varepsilon_{it}$$

Where *i* is the country index, *t* is the period index, c_i denotes country fixed effects, and π_t represents period fixed effects. $lnWAS_{it} = w_0$, $\Delta WAS_{it} = \dot{w}$ and $lnGDP_{it} = y_0$. The content of X mostly follows Drummond (2014) and includes variables measuring trade, investment, agriculture, life expectancy, inflation, education, as well as four institution variables (for a brief description of the variables, see Table 1). These variables will be explained in more detail further down. Out of those variables inflation and the four institutional variables were not included in Drummond (2014). They initially included a different measure of investment in their model, but did not find any significance and thus did not present their results for the investment variable.

With the exception of the growth of the working-age population and agriculture, all explanatory variables are taken from the first year of the period while the growth rates (including the GDP growth rate) range from the second year of the period to the first year of the next period. The reason behind this is that endogeneity is a known issue when using this kind of model (Bloom & Williamson, 1998; Bloom, et al., 2010a; Drummond, et al., 2014;

Kelley & Schmidt, 2007). By taking the explanatory variables from one year before the start of the growth rates, the explanatory variables can be treated as predetermined to the economic growth of that period. The assumption is that by following this practice, reverse causality in the form of GDP growth affecting the explanatory variables can be avoided. However, since the growth of the working-age share and the growth of the agriculture variable are measured over the same period as the GDP growth variable, it is possible that not all of the possible reverse causality can be avoided (Bloom, et al., 2010a; Drummond, et al., 2014).

3.1.1 Method

The method used in this study is the fixed effects method. The choice when it comes to panel data models are often a choice between three different models, pooled OLS, random effect and fixed effects. Which model to choose depends on the structure of the data and the assumptions made about it.

The pooled OLS is the most efficient method, but it assumes that all observations are completely uncorrelated both over time and between cross-sections and therefore can be treated as homogenous. Furthermore, all observations have to be utterly uncorrelated with the error component. This method might not be a good choice in this study because it is based on the difference between Asia and South America in their reaction to the demographic transition. Pooled OLS assumes that all observations are as good as random, which fails already in the distinction between Asia and Latin America. Moreover, this method assumes that all observations are uncorrelated with time, which also is unlikely since a number of global and regional crises have happened during the 54 years this study covers. (Gujarati & Porter, 2009).

Random effects are less efficient than Pooled OLS if the assumptions of Pooled OLS hold, however, as already argued; it is very unlikely that they hold in this study. Random effects assume that the error components can be divided into three components, one cross-sectional component that is time-invariant, one time effect that is constant over all cross-sections, and a time-varying random error component. The country and time fixed effects are assumed random parameters independent from all explanatory variables over all periods. This is very improbable to hold unless the sample is a randomised sub-sample from a much larger sample (Angrist & Pischke, 2009). As proven above, the sample used in this study cannot realistically be treated as random in any way. To verify this assumption further, a Hausmann test[3] was done to test the reliability of the estimates using random effects compared to using fixed effects. It was possible to reject the null hypothesis of non-systematic differences between the two methods at 1% significance level.

That leaves fixed effects as the best available method. Fixed effects make the same assumption about being able to divide the error component into three parts. However, it does not assume that all explanatory variables are independent from the country fixed effects since

---

[3] Not presented. Results are available upon request

the fixed effects method use within estimation to control for all time invariant variables, no matter if they are included or not. It therefore controls for omitted variable bias as long as the omitted variables are time invariant. However, it still assumes that omitted time-varying variables are either controlled for, or independent from all included explanatory variables (Angrist & Pischke, 2009).

Fixed effects thus controls for commonly used variables such as countries being in the tropics and if they have access to ports (Bloom & Williamson, 1998; Bloom, et al., 2015). It also controls for things such as the history of the country and its colonial history, which has been used as an instrument for the institutional quality today (Glaeser, et al., 2004). However, the question remains, are there any time-varying variables that are not controlled for in this model? This question will be discussed after the data and variables have been presented.

3.2 Data

The empirical model is estimated using a cross-country panel of 43 countries covering the time of 1960-2014 in five-year periods. The sample consists of countries included in the World Bank regional categories East Asia and Pacific, South Asia, and Latin America and Caribbean.

Originally, those three categories include 85 countries, out of which eight countries are in South Asia, 36 countries are in East Asia and Pacific, and 41 countries are in Latin America and Caribbean. The final sample of 43 countries is divided among the regions accordingly: 7 countries from South Asia, 14 countries from East Asia and Pacific, and 22 countries from Latin America and Caribbean. Thus, if both Asian regions are treated as one, 21 countries are in Asia and 22 are in South America.

The original sample size was 770 observations, but after removing the countries with an insufficient amount of data, setting a minimum number of observations to one observation per variable and country, the sample consisted of 43 countries and 11 periods. This gives the sample 473 observations in total.

The choice of using five-year periods is quite standard in the dividend literature. Most articles use five-year periods (Bloom, et al., 2007; Bloom, et al., 2015; Drummond, et al., 2014) while some use ten-year periods (Kelley & Schmidt, 2005). The reason behind this is that many of the variables included in the studies and especially age-structure, are slow moving variables whose effect probably would not be captured if the periods were shorter than five years.

All the variables were tested for stationarity. However, because the panel data used is an unbalanced panel with a relatively small sample and has more cross-sections than periods, the number of available unit root tests was reduced down to two tests, the Im-Pesaran-Shin test (IPS), and the Fisher-type tests. Furthermore, because of the relatively small sample size and the unbalances in the data, only four out of thirteen variables were testable using the full sample (the democracy dummy was not tested). The other variables had too few common variables over the cross-sections to be testable.

The solution to this was to reduce the sample down to a minimum number of 10 periods per country and variable out of the possible 11 periods. Every country was thus allowed to lack one observation for a period per variable. This reduced the sample down to 154 observations ($T \geq 10$, $N=14$). It was assumed that if the sample showed stationarity in the reduced sample, it should be stationary using the full sample.

The tests were all performed controlling for a time trend and cross-sectional dependence, either including three lags, or allowing the Akaike Information Criterion to choose the number of lags, when that option was available. The results from this robustness test showed that all variables were stationary at 10% level in at least two out of the three specifications tested. The 10% significance level was chosen as the threshold because unit root tests are known to have low power and are thus more likely to not reject the null hypothesis of a unit root than the reject it. However, only four out of thirteen variables rejected the null hypothesis at the 10% level, the other variables were able to reject it at 5- or 1% level.

Furthermore, it should be noted that unit root testing and stationarity is not something that is mentioned in the dividend literature and the methods used does not indicate stationarity problems either. A possible reason for this is that the structure of the data is often a panel with a relatively small T with a larger N. Thus, the structure of the panels used is more similar to micro-panels than macro-panels and non-stationarity is often not an issue in micro-panels (Baltagi, 2013). Furthermore, it has been claimed that by using panel data it is possible to avoid the problem of spurious regressions because the estimator is averaged over several individuals, unlike in the time-series case where there is only a single individual as the source (Baltagi, 2013).

3.2.1 Variables

Table 1 below shows a description of all the variables used in the regressions. Following it will be a more detailed description about the variables.

Table 1: Description of variables and their sources

Variable	Description	Source
Average GDP Growth	Annual average economic growth in the log real GDP per capita over 5 years	World Bank (2016b)
Log WAS	Log of the population ages 15-64 as a percentage of the total population	World Bank (2016f)
WAS Growth	Five year growth of the log of the population ages 15-64 as a percentage of the total population	World Bank (2016f)
Log Real GDP	Log real GDP per capita in constant 2005 US$	World Bank (2016b)
Log Trade	Log of exports plus imports as a share of GDP	World Bank (2016g)
Agriculture Growth	Log of the net output of the agriculture sector as a share of GDP	World Bank (2016a)
Education Quartiles	Average years of total schooling divided into quartiles	Barro & Lee (2016)
Log Investment	Log of gross capital formation as a share of GDP	World Bank (2016c)
Log Life expectancy	Log of the life expectancy at birth	World Bank (2016e)
Log Inflation	Log of the inflation measured by the growth in the GDP deflator	World Bank (2016d)
Corruption	"Corruption index that is the average of public sector corruption, executive corruption index, the indicator for legislative corruption and the indicator for judicial corruption" (The QoG Institute, 2016, p. 115)	Coppedge et al (2015) and Dahlberg et al (2016)
Egalitarian democracy index	Index measuring the protection of rights and freedoms and the equality of resource distribution while also taking the level of electoral democracy into account (The QoG Institute, 2016, p. 115). Divided into quartiles	Coppedge et al (2015) and Dahlberg et al (2016)
Liberal democracy index	Index measuring civil liberties, strong rule of law, an independent judiciary, and effective checks and balances that, together, limit the exercise of executive power while also taking the level of electoral democracy into account (The QoG Institute, 2016, p. 117). Divided into quartiles	Coppedge et al (2015) and Dahlberg et al (2016)
Democracy dummy	Democracy dummy, takes the value of 1 if a country is deemed a democracy, 0 if not. "Authors define a country as democratic if it satisfies conditions for both contestation and participation. Specifically, democracies feature political leaders chosen through free and fair elections and satisfy a threshold value of suffrage" (The QoG Institute, 2016, p. 35).	Boix et al (2014) and Dahlberg et al (2016)

As previously mentioned, the dependent variable is the growth of real GDP per capita. It was calculated by taking the natural log of the real GDP per capita. The growth rate was then calculated by taking the first year of the next period minus the second year of the time period times 100 averaged over five years. As an example, the economic growth for the period 1960-1965 was calculated as follows: $\left(\frac{100}{5}\right) * (GDP_{65} - GDP_{61})$. As mentioned above, this leaves the first year of the period free so that the explanatory variables can be treated as predetermined. The last period, 2010-2014, is an exception to the equation above, since the data for 2015 was not available. That means that the growth rates were calculated for 2011-2014 and that the economic growth is averaged over 4 years for that period. The growth rates for the working-age share and agriculture variable were calculated in the same manner, but those two variables were not averaged over the period. This decision was based on the methodology of Drummond et al. (2014), which I wanted to follow as much as possible.

As mentioned above, the variables included in X determine the steady state of a country and thus its production potential. Trade is included in there. It is defined as the log of exports plus imports as a share of GDP. It is a common variable to include in the X vector since trade has a direct effect on GDP on its own. Additionally, it is sometimes used as a proxy for institutions and policies. As an example, Bloom et al (2010a) hoped that their trade variable (defined in the same manner) would pick up early results for reforms in China when they lacked institutional data for that period. It is therefore expected to have a positive influence on a country's steady state.

The agriculture variable is, as mentioned above, used in growth rates instead of its initial value. It is defined as the growth in the net output of the agriculture sector as a share of GDP. It was called sectoral change in Bloom (2010) and Drummond (2014) and used as a proxy for productivity growth. This is because labour productivity is often lower in agriculture than in other sectors, which means that labour transfers out of agriculture and into other sectors increases the labour productivity, which increases aggregate output (Bloom, et al., 2010a). The expected sign in the regressions is therefore negative since an increase in the value added from agriculture is assumed a loss of efficiency. A negative sign is thus assumed an indicator of a movement into higher productivity sectors.

In the descriptive statistics (Table 2 below), the agriculture variable has very extreme maximum and minimum values. As an example, the minimum value is -100.7 percent growth over the five-year period. This value is the agriculture value in Trinidad and Tobago for the 2000-2005 period. In non-logged values, the 100% growth came from going from 1.3 percent of the GDP in 2001 to 0.5 percent of the GDP in 2005, a difference of 0.8 percentage points of GDP. The extreme values can thus be explained as a consequence of the way they are measured. Since the underlying changes in the original variable are so small, even though they produce extreme values, it is assumed that these out of proportion values will not cause any bias to the regression results.

The education variable used in this study is based on the average total number of years of schooling from the Barro and Lee dataset (Barro & Lee, 2016). Education has been used a proxy for human capital and for labour productivity (Bloom, et al., 2010a), apart from measuring the pure effect of education. However, a common problem with the kind of models used in the dividend literature is that the results for the education variable very often come out as both negative and insignificant. Theoretically, the education coefficient should not be negative and should have a strong influence on economic growth (Bloom, et al., 2010a; Crespo Cuaresma, et al., 2014).

A number of potential reasons have been suggested for this puzzling result, such as outliers and overall low quality of the data (Crespo Cuaresma, et al., 2014), measurement errors, and high degrees of collinearity, especially with life expectancy and the initial income level (Bloom, et al., 2007; Bloom, et al., 2015). Other suggestions have been that education actually lacks a real impact on growth, however theoretically improbable it might be. Potential reasons behind this are very low quality of education, that very rapidly rising level of schooling activate diminishing returns, and that the market fails to employ educated workers so the returns to education are very low (Bloom, et al., 2010a).

A method to avoid these issues was suggested in Drummond (2014), who measured education using dummies and categorical variables instead of continuous variables in levels of growth rates. This method will not correct any measurement errors or bad quality data; however, it might make it easier to spot any outliers. This study follows their reasoning and divides the original education variable from Barro and Lee, defined above, into quartiles, which produces four, more or less evenly distributed, categories (for more detailed information about their distribution, see Table 2 below). By transforming the variable into categories, the simple correlation coefficients between education and a number of other variables were reduced and thus the potential bias from imperfect multicollinearity was reduced.

As mentioned above, Drummond (2014) included investment in their regression, but did not find any significance and thus did not present any results for the variable. Investment is closely connected to savings and is therefore one of the main channels age-structure may affect economic growth. However, most often it is not included in the models used to measure the demographic dividend. It has been argued that if the model is properly designed the investment variable should not be significant since its effect is controlled for through other variables (Kelley & Schmidt, 2005). However, investment is included in this study because it is one of the main ways age-structure affects growth. It is believed that it should be controlled for even if its effects turn out to be statistically insignificant.

Life expectancy is defined as the log of the life expectancy at birth and is often used as a proxy for both health (Bloom, et al., 2010b) and human capital together with education. It is expected to have positive effects on economic growth through decreased mortality, which increases the number of working-age years the average person will experience. It is also expected to increase the returns to human capital, which also ought to have a positive effect on growth. This variable was not included in Drummond (2014) but has been included in most other articles done in the dividend and economic growth literature (Bloom & Williamson, 1998; Bloom, et al., 2015).

One of the variables that were included specifically for this thesis is inflation. It is measured as the natural logarithm of the percentage change in the GDP deflator. It is a variable not typically included in this kind of studies. However, since half the sample for this study consist of countries from South America that are known to have extreme values of inflation during the studied period. Even though the economic growth is measured in real GDP per capita and thus should not be affected by inflation, other parts of the economy might be affected by the inflation, and it therefore felt prudent to control for its potential effect on economic growth and the other included variables. Any captured effect ought to be negative towards growth.

The coverage for the original inflation variable for 1960 was quite poorly and thus as a result a total of 34 countries use the inflation value of 1961 instead as the initial value for that period. This is not believed to have any impact on the results, but do a lot to improve the coverage since without this change the coverage for the first period was so poorly that it was not used in regressions.

Corruption is the first of the included institutional variables and has previously been used as part of measures of institutional quality (Bloom, et al., 2007). The corruption variable used here is an index, ranging from zero to one, with one being the most corrupt and zero the least corrupt. It tries to capture all kinds of corruption, on all levels. Alternatively, as officially described; "the measures thus tap into several distinguished types of corruption: both 'petty' and 'grand'; both bribery and theft; both corruption aimed and influencing law making and that affecting implementation" (The QoG Institute, 2016, p. 115). Corruption is directly negatively associated with economic growth and has indirect negative effects through decreased investments in physical capital as well (Gyimah-Brempong, 2002).

The egalitarian and the liberal democracy indexes are two different measures of institutions. The egalitarian index focuses on equal rights, freedoms, and resource allocation while also controlling for the level of democracy in a country. It can thus focus as an imperfect proxy for property rights since they have been suggested to be important for growth (Glaeser, et al., 2004; Rodrik, 2000). The liberal index, meanwhile, focuses on the limits of executive power, such as the rule of law, the independence of the court system and civil rights. Just like the egalitarian index, it also controls for the level of democracy.

The final measure of institutions is the democracy dummy. It is, as the name suggests, a dummy variable that takes the value of one if a country is categorised as a democracy and zero if it is not. A country is considered a democracy if it fulfils a set number of conditions for contestation and participation (for further information see Boix, et al (2014)). A country being a democracy is expected to have a positive impact on growth.

Both of the indexes were transformed into categorical variables by dividing them into quartiles just like the education variable. This was because it was not possible to declare them stationary. This was due to high fluctuations from one period to another. It should be noted that depending on the definition of institutions used some researchers (Glaeser, et al., 2004) would not say that these two variables measure institutions. This is because institutions, according to that definition, are supposed to measure the constraints on the executive. These constraints are supposed to be either fixed or very slow moving. The high fluctuations in these two variables and to some extent the democracy dummy too, would act as motivation to claim that the included institutional variables measure the outcomes of the decisions of the rulers instead of the institutional environment. However, the amounts of alternative institutional variables that cover most countries, if not all of them, as well as all the years included in the study are not very high. Therefore, while the included institutional variables might not be ideal measurements of institutions, they are assumed good enough to fulfil the aims of this study.

Additionally, it should be noted that three out of four institutional variables measure democracy in some way. This might affect the results since there are many known empirical cases of countries not classified as democracies that have achieved high levels of growth, such as South Korea during part of the studied period, and China during the whole period. If the effect from this type of countries is strong enough to affect the coefficient, it would bias the coefficient downwards and possibly make it negative.

Table 2: Descriptive Statistics

Variable	**Observations**	**Mean**	**Std. Dev.**	**Min**	**Max**
Average GDP Growth	430	1.804	2.289	-7.663	8.905
Log WAS	473	4.053	0.099	3.858	4.309
WAS Growth	473	1.369	2.100	-7.267	8.763
Log Real GDP	428	7.561	1.189	4.773	10.499
Log Trade	426	3.887	0.690	1.612	5.882
Agriculture Growth	355	-8.190	17.503	-100.701	96.408
Education Quartiles	473				
1st Quartile	131	2.44	0.91	0.13	3.69
2nd Quartile	120	4.70	0.60	3.70	5.76
3rd Quartile	117	6.89	0.64	5.77	7.95
4th Quartile	105	9.55	1.18	7.96	12.05
Log Investment	419	3.039	0.363	1.223	4.140
Log Life expectancy	473	4.138	0.177	3.173	4.417
Log Inflation	399	2.188	1.403	-3.317	9.420
Corruption	452	0.528	0.258	0.018	0.943
Egalitarian democracy index	473				
1st Quartile	112	0.093	0.033	0.027	0.146
2nd Quartile	112	0.196	0.033	0.147	0.268
3rd Quartile	115	0.372	0.067	0.269	0.490
4th Quartile	113	0.685	0.119	0.491	0.849
Liberal democracy index	473				
1st Quartile	113	0.071	0.022	0.016	0.107
2nd Quartile	113	0.201	0.064	0.108	0.320
3rd Quartile	113	0.428	0.068	0.323	0.558
4th Quartile	113	0.725	0.109	0.558	0.873
Democracy dummy	452	0.562	0.497	0	1

N=473

Note: The number of observations for both democracy indexes do not sum up to 473 but to 452. This is due to 21 missing observations that are not included in this table

Important to discuss is also the fact that the panel used here is an unbalanced panel. It was mentioned above in the discussion of the unit root testing that it affected the possibility to carry out the necessary tests. However, that the panel is unbalanced could potentially affect the regression results as well.

An unbalanced panel becomes problematic if the gaps in the data are not random (Angrist & Pischke, 2009). It is possible that the gaps in the data are due to one or several unobserved variables that, if they are correlated with any of the included explanatory variables, will cause omitted variable bias. On the other hand, if the attrition is completely random it will not cause any kind of bias and only cause a loss of efficiency because of the reduced sample size (Angrist & Pischke, 2009). Since the data used in this study are second-hand data, it is impossible to know the reasons behind the attrition. However, the most likely reason for the data not to be available for certain years is that there were unobserved variables that hindered the data collection for that country and year. On the other hand, all the data sources, with the exception of the institutional variables, are from well-known and widely used data sources. This would reduce the risk of omitted variable bias due to the attrition, but would not eliminate that risk since not all countries have good quality data.

The included institutional variables are all from relatively new datasets and are thus not as widely used. However, they do not have the same problem with "gaps" in the data as the World Bank variables have, as an example. Either the institutional variables have full coverage for all the covered years for a certain country or they do not have any data for that country. This kind of attrition would not cause any problems in this study since the countries without data would simply not be used and it has already been concluded that the sample used here is not random in any way.

Nevertheless, a problem connected to the institutional variables is the general problem with finding data over institutions that cover relatively long periods, as in this study. This means that the data that is used might not be the ideal data for the purpose of the study and might not have been chosen had the coverage for other variables been better. The possible consequences of this is once again potential omitted variable bias since the variables the ideally should have been included are not included in the study.

4. Results and Discussion

The estimation strategy is the following, the first regression will recreate column 1 from Drummond et al (2014) with the exception that the education quartiles will be added to the regression. Drummond et al (2014) included an education variable in their third regression, but, it is interacted with the growth of the working-age population and is thus not a good comparison to a non-interaction.

The second regression will introduce the variables that are specific to this study and thus not used in Drummond et al. (2014). Those variables are investment, life expectancy, and inflation. Lastly, the institutional variables are introduced to the model. The corruption variable will be included in all regressions with institutional data, but due to high correlations between the different democracy variables, they cannot be included in the same model. They will therefore be included one after the other.

In all regressions, the main variables of interest are the two demographic variables: log WAS and WAS growth. Furthermore, all regressions will be estimated using robust standard errors. The robust standard errors take care of any correlation within the countries, but still assume that the country-series are independent from each other.

Table 3: Main regression results

VARIABLES	(1) **GDP Growth**	(2) **GDP Growth**	(3) **GDP Growth**	(4) **GDP Growth**	(5) **GDP Growth**
Log WAS	8.199*	8.858*	10.030**	9.749**	9.531**
	(4.100)	(4.614)	(4.751)	(4.515)	(4.715)
WAS Growth	0.216***	0.180**	0.160*	0.123	0.123
	(0.078)	(0.086)	(0.093)	(0.093)	(0.092)
Log Real GDP	-1.978***	-2.229***	-2.563***	-2.338***	-2.320***
	(0.688)	(0.753)	(0.648)	(0.620)	(0.644)
Log Trade	1.279**	0.961	0.751	0.937	0.887
	(0.619)	(0.645)	(0.594)	(0.560)	(0.599)
Agriculture Growth	-0.021***	-0.020***	-0.017**	-0.018**	-0.018**
	(0.006)	(0.006)	(0.006)	(0.007)	(0.007)
Education Quartiles					
2nd Quartile	-0.745*	-0.944**	-0.802*	-1.026***	-1.074***
	(0.399)	(0.444)	(0.427)	(0.377)	(0.389)
3rd Quartile	-1.748***	-1.810**	-1.519**	-1.769**	-1.791**
	(0.607)	(0.747)	(0.715)	(0.724)	(0.753)
4th Quartile	-1.414*	-1.188	-1.001	-1.192	-1.224
	(0.748)	(0.861)	(0.845)	(0.863)	(0.884)
Log Investment		0.024	0.137	-0.125	-0.156
		(0.534)	(0.527)	(0.491)	(0.488)
Log Life expectancy		7.662***	9.845***	9.595***	9.540***
		(2.301)	(2.432)	(2.384)	(2.314)
Log Inflation		0.012	-0.049	-0.045	-0.063
		(0.089)	(0.102)	(0.094)	(0.095)
Corruption			0.033*	0.024	0.031*
			(0.017)	(0.018)	(0.016)
Egalitarian democracy index					
2nd Quartile			-0.831*		
			(0.474)		
3rd Quartile			-0.410		
			(0.589)		
4th Quartile			0.174		
			(0.602)		
Liberal democracy index					
2nd Quartile				0.117	
				(0.486)	
3rd Quartile				-0.255	
				(0.614)	
4th Quartile				-0.142	
				(0.742)	
Democracy dummy					0.083
					(0.397)
Constant	-21.52	-51.61**	-63.20***	-62.62***	-61.76***
	(15.30)	(19.51)	(21.95)	(20.35)	(21.21)
Observations	343	317	306	306	306
Number of countries	43	43	43	43	43
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes

Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.268	0.288	0.324	0.309	0.306

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The overall results in column one is good, every variable is significant, and almost all of them have the expected sign. Both of the age-structure variables are positive, as expected, and significant at 10- and 1% significance level respectively. The initial level of GDP per capita is strongly significant and negative, which supports previous research and is consistent with the conditional convergence hypothesis. Overall, the sizes of the coefficients differ compared to previous research. Even compared to Drummond et al (2014) who also used fixed effects, the sizes of the coefficients differ, sometimes greatly.

The education variable is the only variable that did not have the expected sign. However, as previously mentioned, it is not uncommon for the signs the education variables to turn out negative. One major difference compared to previous research (Bloom, et al., 2010a; Bloom, et al., 2015) however, is that the coefficients here are significant and negative, which they usually are not. The results here suggest that improving the average years of schooling, for a given country and year, from the first quartile, which has an average years of schooling of 2.44, to the third quartile, with an average years of schooling of 6.89, decreases the average economic growth over the period with 1.7 percentage points. This result is statistically significant at 1% significance level.

The possible reasons for these results, which are contradictory to economic theory, have been discussed above, but among the mentioned reasons concerning the data, measurement errors seem like the most likely cause of these strange results. This is because of the within transformation that is the basis for the fixed effect model. If there are any measurement errors, the relative fraction of the variation in the data that is there because of the measurement errors might increase when fixed effects are used (Angrist & Pischke, 2009).

Another possibility is the case of diminishing returns to schooling. Many of the countries in the sample have increased their level of education quite a lot over the period and if the labour markets have not adapted fast enough to utilise the additional level of education in efficient ways, possibly because of lack of high quality institutions, diminishing returns to education would set in.

The overall results for column 1 recreate the results from Drummond et al (2014) fairly well. The sizes of the coefficients differ, but that can be explained by Drummond et al having almost three times as large a sample as the sample used here as well as different countries in their sample.

Column 2 introduces the three variables that were not included in Drummond et al but are not institutional variables. The only variable of the three variables that was significant was life expectancy at birth. The coefficient of 7.662 indicates that for a given country and year, a one percent increase in the life expectancy at birth is associated with a 0.077 percentage points increase in the average economic growth. In real years, a one percent increase of the life expectancy at them mean is equivalent to an increase of almost 3 years, which is a rather large increase. This coefficient is slightly higher than the results produced in other studies, but not very much higher (Bloom, et al., 2015; Kelley & Schmidt, 2007).

The investment and inflation variables are not significant and the inflation variable is even positive, which theoretically it should not be. The lack of significance for the investment variable can be explained by the claim that it should not be significant if the set of variables controlling for a country's steady state is complete and correctly modelled (Kelley & Schmidt, 2005). The lack of significance can thus be interpreted as an indication that the model contains all the variables needed to control for a country's steady state.

As previously mentioned, the inflation variable is not usually included in these kinds of models and was only included here because of the known volatility of the inflation rates in many South American countries during many of the included years. That it lacked significance can thus be interpreted as proof that it did not exert any influence on the economy that was not corrected for by using the real GDP per capita as the dependent variable. It could also be a sign that it does not have influence five years forward in time. The usual assumption regarding monetary policies is that they have their full effect around two years after their implementation. It could thus be possible that the effect of the initial level of the inflation is felt around the middle of the period and thus not entirely captured by the coefficient.

Regarding the already introduced variables, introducing the three additional variables did not change anything considerably. Trade and the fourth educational quartile lose their significance and WAS growth and the third education quartile reduced their level of significance from the 1% to the 5% level. Apart from that, all the variables kept their signs and significance levels.

Column 3 introduces the corruption variable and the first of the democracy variables that act as the proxies for institutions in this study. The corruption variable is significant at the 10% significance level but it is positive, which is contradictory to theory. The egalitarian democracy index that, as previously mentioned, acts as an imperfect proxy for property rights while also measuring democracy is only marginally significant. Only the second quartile is significant at the 10% significance level. However, it is negative, which would indicate that an improvement of property rights and democracy would have a negative impact on economic growth. This is theoretically unfeasible. Yet, it has been suggested with significant results to support it, that the effect of democracy should be quadratic because at higher levels of democracy reallocation was claimed to dampen economic growth (Kelley & Schmidt, 2005). These effects should have been picked up by this variable. However, at least the second quartile would have been positive for that reasoning to hold.

Introducing the institutional variables did not cause any major changes. The significance level of WAS growth was reduced once again, while the significance level for the initial level of the working-age share increased from the 10- to 5% level and its coefficient increased in size. This change could indicate support for the idea that high quality institutions are necessary to obtain a demographic dividend, as proposed by Bloom et al (2007; 2010).

Column 4 changed the institutional variable to the liberal democracy index. None of the quartiles was statistically significant and two out of three were negative. This would suggest that improved executive constraints, such as rule of law and civil rights are bad for economic growth. Rule of law has previously had positive coefficients in articles (Kelley & Schmidt, 2007) so it is unlikely that the true effect really is negative. Regarding the other variables, changing institutional variable did not affect most of the other variables.

Column 5 replaced the democracy index with a dummy variable for democracy. The results indicate that all else being the same, being a democracy is associated with 0.08 percentage points higher economic growth. However, the results lack statistical significance and the effect might thus be zero as well.

Seen over all the columns, a few of the variables stand out as having robust coefficients that seem independent from impact form the other variables. These are log WAS, log real GDP, agriculture and life expectancy. The second and third educational quartiles could be included in that list as well, both of their coefficients and significance levels are stable over all regressions. However, since they suggest that education has a negative impact on growth, they should not be treated as robust as the negative coefficients probably indicate some underlying problem.

The results for the agriculture variable confirms the previous results that moving away from the agriculture sector (here measured as decreasing the value added to the GDP from the agriculture sector) has a beneficial effect on economic growth (Bloom, et al., 2010a; Drummond, et al., 2014).

The other variable of interest, WAS growth, cannot be labelled robust. Its significance level decreases steadily until it disappears in column 4. However, these results are not that surprising since it is measured over the same time as the dependent variable and is thus more likely to suffer from endogeniety. Moreover, it has proved to be sensitive to specification in previous articles (Bloom, et al., 2010a).

Conversely, even though the effect of the growth of the working-age share could not be proven robust the effect of the initial level of the working-age share was proven so. Therefore, it can be concluded that the positive effect of age-structure changes on economic growth associated with the demographic dividend have been supported in this thesis.

In total, column three has to be concluded to be the preferred model. Both of the variables of interest are significant, along with several of the control variables as well. It is also the only model that has any significant results for the institutional variables. Furthermore, it has the highest R-square value out of all five models, which indicates that it is the model with the best fit to the data.

Table 4: Regional regression results

VARIABLES	Asia **GDP Growth**	Latin America **GDP Growth**
Log WAS	7.327	10.95
	(6.175)	(8.793)
WAS Growth	0.134	0.104
	(0.0968)	(0.166)
Log Real GDP	-2.550***	-4.216***
	(0.747)	(1.369)
Log Trade	1.245*	0.0486
	(0.667)	(0.820)
Agriculture Growth	-0.0171	-0.0150
	(0.0108)	(0.00978)
Education Quartiles		
2nd Quartile	-0.404	-1.915***
	(0.665)	(0.557)
3rd Quartile	-0.908	-2.887**
	(1.256)	(1.057)
4th Quartile	-0.353	-2.396*
	(1.443)	(1.201)
Log Investment	0.433	-0.433
	(0.728)	(0.467)
Log Life expectancy	7.348**	7.263
	(3.262)	(5.360)
Log Inflation	0.0688	0.0895
	(0.142)	(0.104)
Corruption	3.553	-0.715
	(2.466)	(2.209)
Egalitarian democracy index		
2nd Quartile	-0.634	-0.0947
	(0.729)	(0.617)
3rd Quartile	-0.141	-0.620
	(0.747)	(0.924)
4th Quartile	0.248	0.441
	(0.942)	(0.887)
Constant	-47.74	-36.92
	(29.53)	(49.18)
Observations	127	160
Number of countries	18	22
Country Fixed Effects	Yes	Yes
Time Fixed Effects	Yes	Yes
R-squared	0.437	0.405

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4 displays the model from column 3 above, but with the sample restricted to only the countries within a region. The model “Asia” contains all the countries from both East Asia and Pacific and South Asia minus the Australia, Japan, and New Zealand because they acted as outliers in this restricted sample. South Asia and East Asia are treated as one because South Asia only contains seven countries and are thus too small to estimate on its own.

Generally, there are not many significant variables in both models. None of the demographic variables is significant for either region, which, according to previous research, at least the coefficients for Asia should be (Drummond, et al., 2014). It is possible that the small sample sizes inflate the standard errors too much for most variables to obtain significant results. Add the known endogeneity issues in these kinds of models to it and it is not unforeseen that the coefficients are no longer significant in a smaller sample.

The only variable that is significant in both models is the initial level of GDP per capita. The education variables are highly significant for Latin America while they lack significance for Asia. These results are surprising because investments in human capital, in the form of education and health, have been suggested as one of the main explanations for Asia’s good economic performance over the whole period. Furthermore, the Latin American coefficients are much larger than the corresponding ones for Asia. The strong negativity of the coefficients can partly be explained by the fact that seen over the whole period, countries in the second and third educational quartile has lower average economic growth than both the first and fourth quartile. However, just looking at averages ignores the impact of every other variable so this is not a full explanation, but as stated; it could explain some of the negativity of the coefficients.

A number of interactions were tried in order to investigate if the demographic dividend is dependent on either education or institutional quality, as has been suggested by the previous literature (Bloom, et al., 2007; Bloom, et al., 2010a; Drummond, et al., 2014). The results are available in Appendix A. Six interactions were made interacting education, the egalitarian-, and the liberal democracy index with both log WAS and WAS growth. In general, the results were not significant. The only interaction that was significant was education interacted with log WAS. In that interaction both the base effect of the education variable and the interaction in itself was significant at the 1% level. However, the coefficients of both the base effects and the interactions were extremely large and the suggested combined effect was highly unrealistic. The conclusion drawn is thus that the results are in no way dependable.

These results lead to the question of the quality of the institutional data used. It was mentioned above that the measurements of institutions used in this study were not ideal, but assumed good enough to act as proxies. However, previous studies that have included institutional data have all received positive and significant coefficients for their variables (Bloom, et al., 2007; Bloom, et al., 2010a; Bloom, et al., 2015; Kelley & Schmidt, 2007). It could be that the institutional variables are of bad quality and thus cause the negative coefficients. However, then the democracy dummy ought to be significant since it is from a different source than the indexes and the corruption variable and it is not. It could also be that the indexes are attempting to measure too many things and that the effects of all the components cancel out each other. However, as before the democracy dummy ought to be significant, in addition to the corruption variable since it only measures corruption.

However, as mentioned above, endogeneity is a known problem with these kinds of models and as previously discussed, the risk of omitted variable bias cannot be excluded. If there are omitted variables, this could explain the significant unexpected signs since omitted variables bias the coefficients. However, an often-discussed problem regarding the demographic dividend models is the problem of simultaneity. This is when there is a feedback loop from the dependent variable to the independent variables. If this were combined with high simple correlations, which there are between several variables, the effect of each variable would be very hard to distinguish from other variables and could produce some unexpected results.

5. Conclusion

This thesis has investigated the relationship between the demographic dividend and institutions. The aim was to make an attempt of obtaining further knowledge about the requirements for obtaining a demographic dividend. This was done through the comparison of Asian countries and South American countries since Asia is a famous example of a region that managed to use the demographic transition fully and thus obtain high economic growth during it. South America, meanwhile, went through the demographic transition during the same period, but grew much less than Asia.

The main results confirmed the positive influence of the working-age population on economic growth as well finding support for the conditional convergence hypothesis that is the basis for the dividend theory. Furthermore, the agriculture variable showed stable results that all confirmed the previous results that reducing the size of the agriculture sector is beneficial to economic growth. Meanwhile, the results for the life expectancy variable confirmed the positive effects of improved health. However, the main results also produced several unexpected coefficients. Most noteworthy is the significant negative effect of the education variable.

Regressions measuring the regional effect of the demographic dividend were also done. However, these results did not find any significant effects of the demographic variables and in general found very few significant results at all. The possible suggestions for these surprising results were that the sample sizes had become too small because the sample was more or less halved, and endogeneity.

The results produced here in this thesis have differed in many cases from the results of previous research and in some cases been contradictory to economic theory. The possible reasons for these results that have been mentioned are omitted variables, measurement errors, simultaneity, and endogeneity in general. Because of the often-surprising results, it has to be concluded that only the results from the variables that have been proven robust in several models can be trusted. These are the variables mentioned above in the second paragraph. Unfortunately, since it is only possible to conclude that there is some underlying problem with the data and not possible to know what that problem is, it would be inadvisable to trust any other results presented here.

The thesis has to be concluded not to fulfil its aim of obtaining further knowledge and the requirements for the demographic dividend. It has been able to confirm previous results of the positive effects of age-structure on economic growth along with some other results. However, the institutional variables were largely found to lack statistical significance and since they were what this thesis intentioned to contribute with to the existing literature, the thesis cannot be said to obtain further knowledge.

The answer to the research question asked in the beginning is therefore very unclear. Based on the results presented here, there is no relationship between the demographic dividend and institutions since very few of the coefficients for the institutional variables were statistically significant. The tested interactions were also proven insignificant. However, previous research has shown significant institutional variables and interactions between them and demographic variables, so these results are not credible.

The suggestion for future research is thus to do another study of the demographic dividend with a focus on the role of institutions, but using models that can control for simultaneity and omitted variable bias, which have to be considered the most serious possible problems in this study.

References

- Angrist, J. D. & Pischke, J.-S., 2009. Mostly Harmless Econometrics: An Empiricist's Companion. Princeton: Princeton University Press.

- Baltagi, B. H., 2013. Econometric Analysis of Panel Data, 5th ed. Chichester: John Wiley & Sons, Lts..

- Barro, R. J., 1991. Economic Growth in a Cross Section of Countries. *The Quarterly Journal of Economics*, 106(2), pp. 407-443. Available online: http://www.jstor.org/stable/2937943?seq=1#page_scan_tab_contents

- Barro, R. & Lee, J.-W., 2016. Barro-Lee: Education Attainment for Population Aged 15 and Over. [Online] Available online: http://www.barrolee.com/

- Bloom, D. E., Canning, D., Fink, G. & Finlay, J., 2007. Realizing the demographic dividend: Is Africa any different?.Working paper, PGDA Working Paper No. 23. Harvard University, Program on the Global Demography of Aging. Available online: http://dspace.africaportal.org/jspui/bitstream/123456789/32559/1/Bloom_Canning_et_al_Demographic_Dividend_in_Africa.pdf?1

- Bloom, D. E., Canning, D., Hu, L., Liu, Y., Mahal, A., Yip, W., 2010a. The contribution of population health and demographic change to economic growth in China and India. *Journal of Comparative Economics,* 38(1), p. 17–33. Available online: http://www.sciencedirect.com/science/article/pii/S0147596709000869

- Bloom, D. E., Finlay, J., Humair, S., Mason, A., Olaniyan, O., Soyibo, A., 2010b. Prospects for economic growth in Nigeria: a demographic perspective. *IUSSP Seminar on Demographics and Macroeconomic Performance*. Available online: http://www.ntaccounts.org/doc/repository/BFHMOS2010.pdf

- Bloom, D. E., Finlay, J., Humair, S., Mason, A., Olaniyan, O., Soyibo, A., 2015. Prospects for Economic Growth in Nigeria: A Demographic Perspective. Working paper, PGDA Working Paper no. 127. Harvard University, Program on the Global Demography of Aging. Available online: https://cdn1.sph.harvard.edu/wp-content/uploads/sites/1288/2012/11/PGDA_WP_127_Bloom-et-al.pdf

- Bloom, D. E. & Williamson, J. G., 1998. Demographic Transitions and Economic Miracles in Emerging Asia. *The World Bank Economic Review*, 12(3), pp. 419-455. Available online: http://wber.oxfordjournals.org/content/12/3/419.short

❖ Boix, C., Miller, M. K. & Rosato, S., 2014. Boix-Miller-Rosato Dichotomous Coding of Democracy, 1800-2010. Harvard Dataverse, V1. [Online] Available online: http://dx.doi.org/10.7910/DVN/28468

❖ Carlin, W. & Soskice, D., 2006. Macroeconomics: Imperfections, Institutions & Policies. Oxford: Oxford University Press.

❖ Coppedge, M., Gerring, J., Lindberg, S. I., Skaaning, S.-E., Teorell, J., Altman, D., Bernhard, M., Fish, S. M., Glynn, A., Hicken, A., Knutsen, C. H., Marquardt, K., McMann, K., Miri, F., Paxton, P., Pemstein, D., Staton, J., Tzelgov, E., Wang, Y., Zimmerman, B., 2015. Varieties of: V-Dem [Country-Year/Country-Date] Dataset v5. [Online] Available online: https://v-dem.net/en/data/data-version-5/#

❖ Crespo Cuaresma, J., Lutz, W. & Sanderson, W., 2014. Is the Demographic Dividend an Education Dividend?. *Demography,* Volume 51, p. 299–315. Available online: http://search.proquest.com/openview/52e8856871bf0f347760539bd07f8163/1?pq-origsite=gscholar

❖ Dahlberg, S., Holmberg, S., Rothstein, B., Khomenko, A., Svensson, R., 2016. The Quality of Government Basic Dataset, version Jan16. University of Gothenburg: The Quality of Government Institute. [Online] Available online: http://qog.pol.gu.se/data/datadownloads/qogbasicdata

❖ Drummond, P., Thakoor, V. & Yu, S., 2014. Africa Rising: Harnessing the Demographic Dividend.Working paper, IMF Working Paper No. 14/143. International Monetary Fund. Available online: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2487901

❖ Eastwood, R. & Lipton, M., 2011. Demographic transition in sub-Saharan Africa: How big will the economic dividend be?. *Population Studies,* 65(1), pp. 9-35. Available online: http://www.tandfonline.com/doi/abs/10.1080/00324728.2010.547946#.V02d7b7G9dM

❖ Glaeser, E. L., La Porta, R., Lopez-de-Silanes, F. & Shleifer, A., 2004. Do Institutions Cause Growth?. *Journal of Economic Growth,* Volume 9, pp. 271-303. Available online: http://link.springer.com/article/10.1023/B:JOEG.0000038933.16398.ed

❖ Gujarati, D. N. & Porter, D. C., 2009. *Basic Econometrics.* 5th ed. New York: McGraw-Hill Higher Education.

❖ Gyimah-Brempong, K., 2002. Corruption, economic growth, and income inequality in Africa. *Economics of Governance,* Volume 3, p. 183–209. Available online: http://link.springer.com/article/10.1007/s101010200045

❖ Hausmann, R., Pritchett, L. & Rodrik, D., 2005. Growth Accelerations. *Journal of Economic Growth,* Volume 10, pp. 303-329. Available online: http://link.springer.com/article/10.1007/s10887-005-4712-0

- ❖ Jerzmanowski, M., 2006. Empirics of hills, plateaus, mountains and plains: A Markov-switching approach to growth. *Journal of Development Economics*, Volym 81, p. 357–385. Available online: http://www.sciencedirect.com/science/article/pii/S0304387805000787

- ❖ Jones, B. F. & Olken, B. A., 2008. The Anatomy of Start-Stop Growth. *The Review of Economics and Statistics*, 90(3), pp. 582-587. Available online: http://www.mitpressjournals.org/doi/abs/10.1162/rest.90.3.582#.V02hC77G9dM

- ❖ Kelley, A. C. & Schmidt, R. M., 2005. Evolution of recent economic-demographic modeling: A synthesis. *Journal of Population Economics*, Volume 18, p. 275–300. Available online: http://link.springer.com/article/10.1007/s00148-005-0222-9

- ❖ Kelley, A. C. & Schmidt, R. M., 2007. A Century of Demographic Change and Economic Growth: The Asian Experience in Regional and Temporal Perspective. In: A. Mason & M. Yamaguchi, eds. *Population Change, Labor Markets and Sustainable Growth: Towards a New Economic Paradigm.* Bingley: Emerald Group Publishing Limited, pp. 39-74. Available online: http://www.emeraldinsight.com/doi/abs/10.1016/S0573-8555%2807%2981002-9

- ❖ Ray, D., 1998. Development Economics. Princeton, New Jersey: Princeton University Press.

- ❖ Rodrik, D., 2000. Institutions for High-Quality Growth: What They Are and How to Acquire Them. *Studies in Comparative International Development*, 35(3), pp. 3-31. Available online: http://link.springer.com/article/10.1007/BF02699764

- ❖ The QoG Institute, 2016. The QoG Basic Dataset 2016: Codebook,[pdf] Available online: http://qog.pol.gu.se/data/datadownloads/qogbasicdata

- ❖ World Bank, 2016a. World Development Indicators: Agriculture, value added (% of GDP). [Online] Available at: http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GDP.PCAP.KD&period=

- ❖ World Bank, 2016b. World Development Indicators: GDP per capita (constant 2005 US$). [Online] Available at: http://data.worldbank.org/indicator/NY.GDP.PCAP.KD

- ❖ World Bank, 2016c. World Development Indicators: Gross capital formation (% of GDP). [Online] Available at: http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GDP.PCAP.KD&period=

- World Bank, 2016d. World Development Indicators: Inflation, GDP deflator (annual %). [Online] Available at: http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GDP.PCAP.KD&period=

- World Bank, 2016e. World Development Indicators: Life expectancy at birth, total (years). [Online] Available at: http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GDP.PCAP.KD&period=

- World Bank, 2016f. World Development Indicators: Population ages 15-64 (% of total). [Online] Available at: http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GDP.PCAP.KD&period=

- World Bank, 2016g. World Development Indicators: Trade (% of GDP). [Online] Available at: http://databank.worldbank.org/data/reports.aspx?source=2&country=&series=NY.GDP.PCAP.KD&period=

Appendix A

Table 5: Interaction results

VARIABLES	(1) GDP Growth	(2) GDP Growth	(3) GDP Growth	(4) GDP Growth	(5) GDP Growth	(6) GDP Growth
Log WAS	6.449	-11.44	9.162*	10.79	8.884*	3.976
	(5.082)	(6.994)	(4.622)	(6.734)	(4.791)	(7.655)
WAS Growth	0.0285	0.144	0.149	0.0807	0.308	0.0713
	(0.123)	(0.101)	(0.129)	(0.0971)	(0.223)	(0.0980)
Log Real GDP	-2.250***	-2.991***	-2.445***	-2.552***	-2.171***	-1.948**
	(0.693)	(0.610)	(0.652)	(0.653)	(0.686)	(0.739)
Log Trade	0.566	0.555	0.518	0.458	0.590	0.662
	(0.607)	(0.515)	(0.580)	(0.575)	(0.638)	(0.611)
Agriculture Growth	-0.0160**	-0.0144**	-0.0152**	-0.0177**	-0.0170**	-0.0178**
	(0.00633)	(0.00666)	(0.00645)	(0.00674)	(0.00675)	(0.00680)
Log Investment	-0.263	-0.118	-0.229	-0.163	-0.481	-0.590
	(0.480)	(0.413)	(0.492)	(0.516)	(0.453)	(0.477)
Log Life expectancy	6.254**	7.052***	7.749***	8.108***	6.571***	7.929***
	(2.462)	(2.390)	(2.458)	(2.525)	(2.194)	(2.419)
Log Inflation	-0.196*	-0.0764	-0.188*	-0.184*	-0.159	-0.178*
	(0.101)	(0.104)	(0.107)	(0.103)	(0.101)	(0.0972)
Corruption	3.136*	2.682*	3.341*	3.317*	2.230	2.978
	(1.712)	(1.491)	(1.754)	(1.673)	(1.894)	(1.894)
Egalitarian democracy index						
2nd Quartile	-0.666	-0.276	-0.737	23.27		
	(0.505)	(0.489)	(0.630)	(20.06)		
3rd Quartile	-0.392	-0.0645	0.147	-16.14		
	(0.512)	(0.484)	(0.668)	(23.97)		
4th Quartile	0.0401	0.289	0.127	4.569		
	(0.465)	(0.540)	(0.635)	(28.95)		
Education Quartiles						
2nd Quartile	-1.138	-61.55***	-0.724	-0.653	-0.879**	-0.898*
	(0.707)	(21.29)	(0.505)	(0.509)	(0.427)	(0.461)
3rd Quartile	-0.928	-129.6***	-1.374	-1.323	-1.545*	-1.529*
	(0.979)	(28.58)	(0.839)	(0.843)	(0.768)	(0.801)
4th Quartile	-1.401	-94.50***	-0.810	-0.799	-0.950	-1.041
	(1.227)	(30.43)	(0.933)	(0.972)	(0.851)	(0.924)
2nd Edu Quartile*WAS Growth	0.191					
	(0.197)					
3rd Edu Quartile*WAS Growth	-0.192					
	(0.189)					
4th Edu Quartile*WAS Growth	0.306					
	(0.249)					
2nd Edu Quartile *Log WAS		15.38***				
		(5.377)				

3rd Edu Quartile *Log WAS		31.94***				
		(7.146)				
4th Edu Quartile *Log WAS		23.50***				
		(7.511)				
2nd Quartile Egal*WAS Growth			-0.0287			
			(0.205)			
3rd Quartile Egal *WAS Growth			-0.273			
			(0.220)			
4th Quartile Egal *WAS Growth			-0.0102			
			(0.213)			
2nd Quartile Egal*Log WAS				-5.963		
				(5.041)		
3rd Quartile Egal*Log WAS				3.844		
				(5.960)		
4th Quartile Egal*Log WAS				-1.113		
				(7.115)		
Liberal democracy index						
2nd Quartile					0.764	-22.08
					(0.696)	(24.99)
3rd Quartile					0.658	-20.91
					(0.696)	(27.86)
4th Quartile					0.129	-25.51
					(0.725)	(28.77)
2nd Quartile Liberal*WAS Growth					-0.280	
					(0.254)	
3rd Quartile Liberal*WAS Growth					-0.457*	
					(0.254)	
4th Quartile Liberal*WAS Growth					-0.166	
					(0.243)	
2nd Quartile Liberal*Log WAS						5.613
						(6.206)
3rd Quartile Liberal*Log WAS						5.219
						(6.923)
4th Quartile Liberal*Log WAS						6.319
						(7.074)
Constant	-43.53	54.20	-16.98	-17.67	-36.90	7.726
	(47.04)	(37.68)	(41.42)	(47.56)	(42.14)	(40.02)
Observations	306	306	306	306	306	306
Number of countries	43	43	43	43	43	43

Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.229	0.281	0.213	0.223	0.212	0.202