

# Evaluating the Philippine educational system

An empirical analysis

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## Abstract

This research focuses on the impact of the Philippine educational system established during the American colonization. According to the Americans, the Philippines needed to be prepared for independence. Crucial for this goal was the introduction of a substantial educational system. This study describes what the Americans intended with the educational system and provides a clear overview of what they introduced. In conclusion, this study contends that the Philippines were on top regarding educational facilities and living standards in Southeast Asia by the end of the American domination.

The impact of this Philippine 'educational revolution' on welfare have not yet been empirically investigated. In order to examine how the educational revolution effects welfare, three research questions are formulated with corresponding hypotheses. Every hypothesis is tested by a fixed effects (FE) estimator. The applied model includes five educational variables which are tested on the level of *real estate per capita*. The first regression shows a positive significant relation between literacy rates and proportion able to speak English on wealth in terms of real estate, measured at province level. In addition, a second performed test implies that this effect is greater in densely populated provinces. The final regression points out that the effect of education on welfare is greater in provinces that are proximate to Manila. Although the results of the three tests confirm the hypotheses, the tests have some limitations.

Keywords: education, the Philippines, American colonization, welfare, economic growth

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## Chapter 1: Introduction

### Background

To understand the educational revolution of the Philippines the historical developments that shaped this revolution are outlined. The Philippines faced a long period of foreign dominance. In 1553, an expedition led by Miguel Lopez de Legazpi established the first Spanish settlement on the Filipino island Cebu. Spanish authority lasted for several hundreds of years and was never questioned seriously. This changed remarkably in 1896 when Cuba, another Spanish colony unsuccessfully fought for independence. The Cuban conflict reached the front pages of journals in the United States (US) and under pressure by the senate and the public, US president William McKinley took action against Spain. During the Spanish-American war in 1898, the Americans occupied the Spanish colonial territories of Guam, Puerto Rico and the Philippines. After mediation of France, a ceasefire was signed on August 12<sup>th</sup> 1898 and peace negotiations lead to the Treaty of Paris. The Treaty resulted in an independent Cuba while the Philippines together with the islands Guam and Puerto Rico became colonies of the US. In November 1935, the Tydings-McDuffie act granted the Philippines self-governance with the inauguration of the commonwealth. Moreover the act assigned full independence to the Philippines within a period of ten years. Although several US and Filipino politicians argued that it was not the right moment for full independence, due the havoc caused by the Second World War, the Philippines became an independent nation on July 4<sup>th</sup> 1946. In 1965, Ferdinand Marcos rose to power and gradually transformed the nation towards an authoritarian state. During Marcos' quarter of a century rule, poverty was widespread, inflation was soaring and corruption was blatant. Consequently, the Philippines did not manage to achieve a high-speed industrial growth like South-Korea or Taiwan during the last 40 years of the 20<sup>th</sup> century. Although the Philippines and the US always considered each other as allies, the relationship weakened. The reign of Marcos could be seen as closing point of the American political legacy.

In contrast to European colonial powers, the Americans intended to be a short term colonial dominator. The US considered its temporary control as a transition period. Unlike the policies of the Europeans, who (according to many Americans) viewed their colonies as economic assets to be exploited for the benefit of the mother nation, American policy in the Philippines was based on the goal to prepare the Filipinos for self-government and ultimately independence. Crucial to this strategy was the introduction of an education system. According to the US, a well-educated population would be able to govern its own country, a philosophy that stirred the nation's educational revolution.

The relationship between education and economic growth is widely acknowledged. Several studies indicate the positive relation between education and economic growth (Quiroga, 2003; Lau *et al.*, 1991; Mingat and Tan, 1988). The welfare effects of the Filipino educational revolution have not yet been examined. Therefore this study aims to test the education-welfare relation according a conducted model which relates to the literature discussed below.

## Literature review

This research is based on the assumed relation between education and welfare. This section provides an overview of conducted studies which show this relationship and therefore ratifies the supposition on which the research questions are based.

Education is one of the main factors to boost economic growth (Quiroga 2003: 601). Education makes people more productive and provides them with skills which improve their efficiency (Krueger and Lindahl, 2001: 1103). Thus, having a certain level of education generally results in better qualified workers, which may have a positive impact on people's income. In addition, the potential of a country to improve its economical position depends mostly on its capacity to increase its production per worker which can be established by education (Krugman, 1990: 9). Psacharopoulos (1994) argues that primary education is the main investment priority in developing countries, in order to reduce poverty levels.

In addition, education has the ability to increase a country's socio-economical position. Education leads to increased living standards and contributes to a country's social development and catalyses behavioral change (Booth, 2007). Several studies (Mingat and Tan, 1988; Nunez, 1992) have shown, that when education standards for women increase, successes are achieved on social objectives in fields such as birth rate control, crime rates and improvements in health and nutrition. Moreover, education is seen as one of the most important factors to lower infant mortality rates (Colclough, 1982).

Examining the impact of education on welfare empirically, several studies conducted on micro level find evidence for a strong positive correlation between 'training' and 'years of education' on the one hand and 'earnings' on the other. Psacharopoulos and Velez (1992) conclude for instance in their study conducted in Colombia, that earnings increase if an employee has at least eight years of formal education. In addition, Lau *et al.* (1991) executed a cross-national study in which the variable 'years of schooling' is used in an aggregate production function. Findings for Southeast Asia indicate that one additional year of schooling for the population as a whole contributes to an increase of 3% real GDP.

Apart from measuring years of schooling as an indicator of education level, literacy rate is also a commonly used indicator. More specifically, this indicator is often used to examine the quality and the impact of education since literacy is a direct return of education and improves somebody's cognitive ability (Colclough, 1982). Mingat and Tan (1988) investigated the economics of training. They argue that training is particularly effective when a country's educational system is at least on a moderate level. In their estimation, if half the adults are literate, the rate of return on training can reach up to 20 percent. The study of Mingat and Tan indicates that certain education levels are required for economic development, especially the diffusion and universality of literacy. Moreover, Quiroga (2003) argues that the scarcity or complete absence of literacy may be a constraint for economic growth. In addition, Nunez (1992) concludes that literacy levels below thirty to forty percent may be an obstacle to economic development, because literacy seems to be one of the components of labor productivity and absence of literacy is difficult to substitute.

Besides the fact that education has an impact on welfare on national level, some studies argue that demographical and geographical factors have an impact on the level of education and thus also on society. Caldwell (1968) investigated schooling access in Ghana. In his study he concludes that almost

75% of all secondary school graduates lived in urban areas. In addition, a study conducted by Sahn *et al.* (2003) investigated the relative importance of rural versus urban areas in terms of eight related living standards indicators including education. They find that living standards in rural areas lag far behind from those in urban areas. Moreover, Sahn *et al.* (2003) argues that developing countries show similar patterns of development. Development including the level of education kicks off from the economic heart of the country, which is often the capital or the main harbor city. If this city jumps forward in terms of development, the surrounding region benefits from this progress after a certain period. In other words, development spreads like an oil slick across a country.

The above mentioned studies conclude that education effects development positively and the lack of education can be a barrier to development. Especially the indicators ‘years of schooling’ and ‘literacy’ are popular to examine the impact of education on welfare. Moreover Caldwell (1968) and Sahn *et al.* (2003) argue the existence of regional differences according this relation. The impact of the Filipino educational revolution on welfare however, has not yet been empirically investigated. Therefore this research aims to examine the relation between education and welfare in the Filipino context.

### Objectives of the research

The main objective of this research is the empirical scrutiny of the economical impact of the Filipino educational revolution. The main research question is formulated as following:

‘Did the educational revolution during the period of American colonization between 1898 to 1946 have a positive effect on the welfare levels of the Philippines?’

Moreover, two sub research questions are defined in order to gain a deeper insight in the hypothesized relationship between education and welfare, concerning demographic (first sub question) and geographic (second sub question) effects. The first sub research question is: ‘Was the impact of education on welfare greater in urban regions than in rural regions?’ The second sub research question is: ‘Was the impact of education on welfare greater in provinces proximate to the economic heart of the country than in provinces more distantly located from the economic heart?’

Accordingly, the corresponding hypotheses are formulated:

- $H_1$ : There is a positive relationship between education and economic growth in selected Filipino provinces during the American domination.
- $H_2$ : The impact of education on welfare levels in the Philippines was greater in urban regions than in rural regions.
- $H_3$ : The impact of education on welfare levels in the Philippines was greater in provinces proximate to Manila.

### Method

To test these three hypotheses, this study uses panel data techniques. Panel data techniques exploit the data structure with various cross-sectional units over time. Data is obtained from two sources: the census of the Philippine islands and the Philippine statistical bulletin. The census of the Philippine Islands is an extensive survey of the archipelago with relevant publications in 1903, 1918, 1939, 1948 and 1961. The Philippine statistical bulletin is a yearly documentation of social economical features

from 1918 till 1933. Educational and welfare indicators are extracted from these sources to construct a robust econometric model.

### Reading guide

This report consist of six chapters, starting with this introduction. Chapter 2 provides an overview of the level of education during the Spanish colonization. The third chapter outlines the American objectives of the educational revolution and provides an overview of what the Americans have achieved in the field of education. Furthermore, it describes the Philippine living standards in an international perspective. Chapter 4 describes the research design, data, model and model assumptions. The fifth chapter presents the results of the three performed tests. This report ends with a conclusion and discussion.



## Chapter 2: Education during the Spanish colonization

This research seeks to evaluate the Philippine educational system introduced by the US. To achieve this end, this chapter outlines the evolution of the education system in the Philippines and particularly the system that the Americans inherited from the Spanish. First of all, insight is given in the indigenous education system (set up before the Spanish colonial era), which mainly had a social and religious function. Subsequently, Spanish educational policy is discussed. Due to the fact that the Spanish colonization was primarily a crusade, education was mainly used to spread Christianity. In this conversion, education played a key role. Finally, the Spanish educational system will be evaluated in an international perspective.

### Education under native rule

The earliest Europeans in Southeast Asia, the Portuguese and the Spaniards, had much the same idea of education as the natives. In the Buddhist countries Cambodia, Burma and Thailand, children studied not for material advantage but education was seen as a necessary progress for adult social life (Furnival, 1943: 13-15). Buddhist clerics formed part of an education in the older sense, teaching the way of life, and equipping the child for social life in the adult world. The system had primarily a social and religious function and training did not encourage the intellect. As a matter of fact, it was an instrument of civilization, and the more children attending school, the better.

### The education system under Spanish colonization

All Southeast Asian colonial schools (Dutch, Spanish, French or British), however, were essentially similar to former Buddhist, Confucian or Muslim schools. In the Philippines, from the beginning, the Spanish establishment was a mission and education was based solely on Christian doctrine (Blair *et al.*, 1909: 155). The function of the school was to train pupils as members of a Christian society and not to help them improve themselves in the material world (Wyndham, 1933: 13). Stimulating and increasing the cognitive capacity of the Philippine population was of minor importance. Education, however, was a powerful tool in adapting the younger generation to the new environment, which could enforce stability. In conclusion, the essence of education did not change in the Philippines when the Spaniards came into power, only traditional religion was replaced by Christianity.

The secession of Mexico in 1823 had implications for the Philippines. Until then the archipelago had been governed from Mexico, but now they were brought in direct relation with the Spanish motherland (Agoncillo, 1990). This in combination with the opening of the Suez Canal in 1869, extended the number of Spanish residents in the Philippines (Halili, 2004).

These (new) Spaniards with their liberal ideas shook the old concept of education 'as the handmaid of religion and the university of Manila began to produce graduates with liberal views' (Furnival, 1942: 41). Moreover, In 1855, a commission was appointed to improve the quality of education, which main outcome was the extension of the Spanish language at all schools. In 1863, an Educational Code was introduced which required that every township have at least one primary boys school and one primary girls school. Moreover, the code dictated the introduction of extra schools in towns which exceed the number of 5.000 inhabitants (Nieuwenhuis, 1923). Attendance was to be compulsory in name and free to all poor.

The primary syllabus was prescribed as follows: Christian doctrine and sacred history, elementary Spanish, general history and geography of Spain, writing and reading in the vernacular, arithmetic, practical agriculture, vocal music and rules of deportment. For girls domestic training was to replace agriculture and Spanish geography and history (Bureau of census and statistics, 1903: 583-585). Furthermore, there existed 56 secondary schools by the end of the Spanish colonization. Some were dating from the 16<sup>th</sup> century and intended originally for Spanish pupils but later opened for Filipinos as well. The secondary schools comprised normal schools for both boys and girls, a school of agricultural practice, a college of medicine and pharmacy, a painting school, a nautical school and six seminaries for theological training (Bureau of census and statistics, 1903: 605). Higher education was given at the University of Manila. The university was founded in 1619 as the college of St. Thomas with the right to grant degrees in theology and philosophy. From 1734, students could graduate in law, medicine and mathematics as well.

### The Spanish colonial education system in perspective

How far the masses profited materially is questionable, but it is generally accepted that spiritually they were affected; the Eastern/traditional schools disappeared and with them native culture and religion. Spanish statesmen brought a new society into existence, which transformed the character of education. According to Blair *et al.* (1909) it was clear that that by the end of the 19<sup>th</sup> century the Philippines were more developed than any other country in Southeast Asia with respect to educational facilities. In addition, the archipelago pioneered in female education. During the last century of Spanish domination, Filipino girls did not have a schooling disadvantage, something unique in Southeast Asia. Table 2.1 indicates the number of schools for boys and girls, which suggests a minimal difference between them. Moreover, relatively to other Southeast Asian countries, many Filipinos had studied in Europe (Furnival, 1942: 41-42). Although improvements were made during the second half of the 19<sup>th</sup> century, access to education was still privileged. Most schools were located in the central village/city. Approximately 80% of the population lived in rural areas. Through logistical limitations alone, less than 4 percent of all children attended school (Nieuwenhuis, 1923).

**Table 2.1 Number of schools and pupils**

	<i>Boy's school</i>		<i>Girl's school</i>	
	<i>1866</i>	<i>1892</i>	<i>1866</i>	<i>1892</i>
Schools	841	1.087	833	1.050
Pupils	135.098	N.A.	95.260	N.A.

Source: Bureau of the Census and Statistics, 1903.

## Chapter 3: The introduction of the American education system

As a consequence of the treaty of Paris which was signed in 1898, the US officially became a colonial power and gained control over the Philippines. In contrast to European colonial powers, the Americans intended to be a temporary colonial dominator. After a transition period, the US vision was that the Philippines would be ready to continue as an independent state. To achieve this goal, the Americans introduced a substantial educational system. This chapter elaborates the educational developments. Firstly, the historical context of colonial policy with respect to education due to the shifting sense of moral duties is discussed. Subsequently, this chapter discusses the strategy towards an independent state, based on pacification as a short term goal and self-governance as a long term goal. The chapter continues by outlining how – in line with the strategy - the Americans revised the educational system introduced by the Spanish and details the scale of the American achievements. The efforts and achievements are placed in an international context comparing educational indicators among European colonies. Lastly, this chapter discusses the Philippine living standards in an international perspective based on several welfare indicators.

### Historical context of colonial policy with respect to education

Around 1900, European colonial powers increasingly felt obliged to live up to their moral duties towards their indigenous citizens after centuries of oppression. This shift is reflected by itself in various publications like for instance the British doctrine *The white man's burden* introducing a new philosophy of politics and ethical standards (Buchan, 1940: 125). In the Netherlands, the colonial statesman pleaded for ethical responsibility of the welfare of their colonial subjects, called *Ethische Politiek*. The *Ethische Politiek* aimed to foster the welfare of the indigenous population as long as it would not harm the interests of the mother nation (Ricklefs, 1993). This policy included the extension of education under the local inhabitants and limited (instead of no) participation of local politicians in the colonial government (Dobson, 1978). Moreover, in French colonial policy the word 'assimilation' was replaced by 'association', indicating the changing view on colonial policy (Peterecz, 2008).

### The American education philosophy

Although the European colonial powers did implement some changes to improve the living standard of their subjects, American colonial policy was fully focused on preparing the colony for self-governance which had far more radical implications on colonial policy in comparison to the European colonizers. This especially holds for education which played a key role in American colonial policy. As argued by American anthropologist Malcolm (1936: 250): 'the Spaniards came to the Philippines doubly armed with swords and missals: the Americans came with rifles and school primers'. According to Mayhew (1938: 142) the underlying philosophy was that 'education is a proven way to improve the wellbeing of the citizens and the community as a whole and to prepare them to the problems of modern life in a self-governing nation'. In short term, education was the strategy towards pacification. In the long run, education was the strategy towards a self-governing nation. The strategy will be elaborated in the next sections.

### Education as strategy to achieve pacification

In the early 20<sup>th</sup> century, the American army faced some resistance from the Filipino nationalists. To quell down Filipino nationalists, education was seen as an essential part of the military strategy (Agoncillo, 1990). Army leaders held that the best practice to promote pacification was to introduce a

school system, based on American ideals. As General Arthur MacArthur, the military Governor of the Philippines stated:

*"I know of nothing in the department of administration that can contribute more in behalf of pacification than the immediate institution of a comprehensive system of education. The matter is so closely allied to the exercise of military force in these islands that in my annual report I treated the matter as a military subject and suggested a rapid extension of educational facilities as an exclusively military measure"* (Paulet, 2007: 183)

MacArthur's view was widely supported among other high commanders in the military. General John Eaton noted for instance:

*"Every school organized proved a power for peace. It controlled so many children, interested so many mothers, and so many fathers were set against war. It operated as schools do among our Indians"* (Romero, 1976: 15-16)

In accordance with Eaton, David Prescott Barrows, General Superintendent of Education for the Philippines, expressed his belief that education was the means to let the indigenous people to accept the American authority and support their endeavors (Paulet, 2007: 202). Education became the successor of the military combat with the indigenous nationalists. It provided the opportunity to weaken the violent resistance of the people attempting to protect their freedoms by accentuating the benefits of American interference.

#### Education as a strategy to achieve self-governance

As the nationalistic resistance gradually diminished, the Americans introduced a new civil government system around 1902. This governmental body which was called 'the Second Philippine Commission' became the sole legislative body of the Philippines. From the beginning, the commission was governed by two ideals: 'the doctrine of efficiency in the interests of economic progress, and the principle of self-governance by the introduction of American institutions' (Keesing, 1937: 85). With the installation of the commission, the goal of education shifted from creating a peaceful society (pacification) to preparing the nation for self-governance. To ensure the success of a self-governing colony, the introduction of an extensive educational system was considered to be essential. President McKinley instructed the commission:

*"It will be the duty of the commission to promote and extend, and, as they find occasion, to improve the system of education already inaugurated by the military authorities. In doing this, they should regard as of first importance the extension of a system of primary education which should be free to all, and which shall tend to fit the people for the duties of citizenship and for the ordinary activities of a civilized community"* (May, 1967: 138)

Reflecting on the achievements towards self-governance, already in 1902, three of the eight seats of the executive body were reserved for Filipino citizens (Escalante, 2007: 132-133). The Filipinos gained practical experience in administration not merely as subordinates but as respected colleagues. In 1921, the majority of the heads and acting heads of departments were Filipinos and almost all the assistant chiefs were Filipinos (Keesing, 1937: 97).

## The revision of the education system

As the goal of education shifted to preparing the nation towards self-governance, including preparing the people to become active participants in an economically viable society, the Spanish educational system had to be revised to catalyze a societal breakthrough.

English was introduced as the official language of instruction. Besides the fact that the Americans did not speak any other language, introducing English as the official language was believed to spread American values among the people. In this way, education could cause a social transformation (Paulet, 2007: 199).

Furthermore, the Americans offered free education to all, in order to educate society as a whole. The European colonial powers, in contrast to the American philosophy, mainly focused on indigenous elites. An official of the Second Philippine Commission once mentioned: "Other countries fear the education and enlightenment of the people over whom they exercise sovereignty. The United States fears ignorance" (Paulet, 2007: 179).

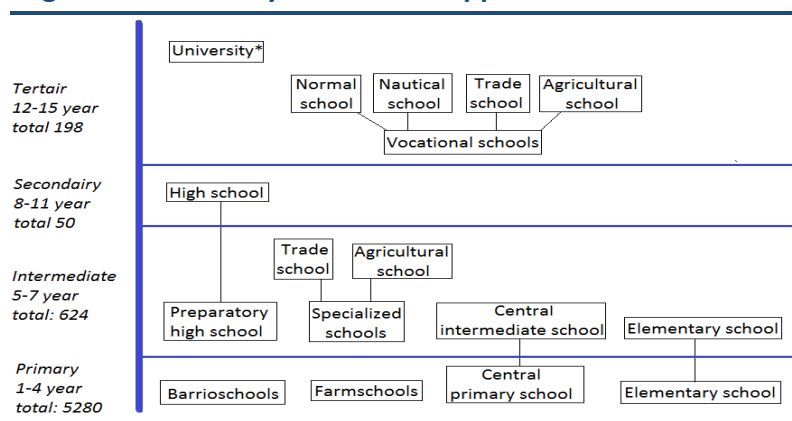
Another revision of the educational system was to remove religious elements from the education system. Learning was transformed from a social and religious asset into an individual and cultural asset. All subsidies on religious education disappeared. This revision was in contrast with the Spanish but also with the British system. In the British colonies for instance, almost half of the education funds were spent on religious education (Nieuwenhuis, 1923).

Lastly, there was no racial distinction, which resulted in Western pupils being classmates with Filipino children. This was different to the Dutch and British system where 'European' children often received education in colonial schools based on their own cultural background (Nieuwenhuis, 1923).

## The school system

The school system was built up by primary, intermediate, secondary and tertiary education. The elementary grade comprises primary schools with three standards and intermediate schools with four standards. After finishing intermediate school, students could apply for high school with four standards. After accomplishing high school, a student could apply for vocational school or university. The vocational schools can be divided into four main types. Normal school giving instruction in plumbing, carpentry and telegraphy, nautical school, trade school or agricultural school. In 1918, the Philippines had two universities at which students could apply for eight different courses (Nieuwenhuis, 1923: 95-97; Bureau of the census and statistics 1918: 90-91). Figure 3.1 provides an overview of the educational system.

**Figure 3.1 School system the Philippines 1920**



\* three to eight years, depending on course

Source: Nieuwenhuis, 1923: 95

### Financing of the educational system

As aforementioned, the Americans introduced an educational system which was free for all. The central government provided all materials including books and financed all salaries. The local government was responsible for the maintenance of school facilities (Kuijs, 2014: 48). The Bureau of education received an amount of Php 110,538,635.- out of taxes during the first twenty years of colonization. These taxes were withdrawn for 61 percent from the insular government and 31 percent from the municipal taxes. Provincial and voluntary contributions were small, respectively 4 and 3 percent. Although exact figures are not available, it is known that the American government provided several donations intended for the educational system, which probably exceeded Php 65 million (Bureau of census and statistics, 1903; Bureau of census and statistics, 1918).

The investments on education per capita were \$0.34 in 1908 and increased till \$0.44 in 1917 (Booth 2007: 73). During the late 1930s, the Philippines spent almost a dollar per capita on education. These investments were three times higher than Indo-China and almost four times as high in comparison to the Dutch Indies (Table 3.1). Moreover, one-fifth of the government expenses was earmarked for education, which was nearly four times as high as education budgets in the Dutch and British colonies.

**Table 3.1 Colonial expenditure on education late 1930's**

	<i>Philippines</i>	<i>Dutch Indies</i>	<i>Malaya</i>	<i>Burma</i>	<i>Indo-China</i>	<i>Thailand</i>	<i>Taiwan</i>
	1938	1938	1937	1938-1939	1936-1937	1939-1940	1937-1938
Percentage government expenditure on education	20	6	5	6	12	11	11
Education expenditure per capita in \$	0.99	0.27	0.83	0.21	0.30	0.41	1.52

Converting Furnival's calculations to Dollars. The Sterling Pound/ American Dollar exchange rate was fixed at 1:4.87 during 1935-1940

Sources: Furnivall, 1943: 112

Exchange rate: United Nations stats, 1960

### Educational achievements during the American colonization

The investments in education helped the educational system flourish. During the first five years of American colonization, the military opened more than 2,000 schools (Bureau of census and statistics, 1903 Vol. III: 677). After pacification was realized, qualified teachers replaced the military for educational activities. By 1903, 785 Americans worked as teachers on schools. Their number declined during the next decades and in 1939, out of nearly 40,000 teachers only 80 were American (Bureau of census and statistics, 1939).

Table 3.2 presents the educational achievements. The amount of children enrolled in public primary schools increased with 20 percent in the period 1903-1939. In the late 1930s nearly 40 percent of the population was able to write and read, while at the early stage of American colonization 20 percent of the population was literate. This percentage further increased under self-government, in 1961 about 72 percent of the population was literate. In 1903, the ratio students per teacher was 1:70. This ratio decreased to 1:39 in 1961. This decrease can imply that the quality of education increased. After a few years of American colonization half percent of the Filipinos was able to speak the English language. In the late 1930s, this amount increased to 27 percent and after fifteen years of

independence, 39 percent of the Philippine population was able to speak English. The number of schools multiplied almost five times till 9.675 during 1903-1939. By 1948, the number of schools decreased till 5.389. The decrease can be explained by the havoc during the Second World War.

**Table 3.2 Comparison educational impact 1903-1961**

	1903	1918	1939	1948	1961
Enrolment rate (public primary schools)	17	28	37	38	N.A.
Literacy rate	20	48	49	59	72
Students per public teacher	70	48	N.A.	51	39
Able to speak English (%)	0.5	9	27	37	39
Number of schools	1.996	4.200	9.675	5.389	N.A.

N.A. not available

Sources: Bureau of the Census and Statistics, 1903

Bureau of the Census and Statistics, 1918

Bureau of the Census and Statistics, 1939

Bureau of the Census and Statistics, 1948

Bureau of the Census and Statistics, 1961

Addressing enrollment rates in an international perspective, one can conclude that the Philippines and Taiwan recorded the highest enrolment rates in primary education (table 3.3). Although Taiwan's tertiary education was less developed (Booth, 2007: 145). Literacy rates in the Philippines were higher compared to Burma and the Dutch Indies. However, male literacy in Burma is a bit higher than in the Philippines. Literacy rates between men and women in the Philippines are more or less on the same level, while in both the Dutch Indies and Burma five times more males were literate than women in the 1930s. These estimates again indicate the relative privileged position of Philippine females compared to other Southeast Asian countries. Interestingly, comparing table 3.1 and 3.3, countries with the highest education expenditure per capita had the highest enrollment rate.

**Table 3.3 Colonial educational indicators late 1930s**

	<i>Philippines</i>	<i>Dutch Indies</i>	<i>Malaya</i>	<i>Burma</i>	<i>Indo-China</i>	<i>Thailand</i>	<i>Taiwan</i>
	1938	1938	1938	1936-1937	1936-1937	1939	1938
Enrolment rates on total population	11.54	4.01	7.76	5.45	2.47	10.65	11.36
Literacy rate							
Male	53.4	11.9*		56.0			
Female	46.2	2.6*		16.5			
<b>Total</b>	<b>48.6</b>	<b>7.2*</b>		<b>36.8</b>			

\* Estimates accounted for 1930

Sources: Population at school: Furnival, 1942: 111

Literacy rate: Philippines: *Bureau of census and statistics*, 1939

Dutch Indies: *Indisch Verslag*, part II, 1938

Burma: *Statesman Yearbook*, 1941



Without directly concluding on causal relationships, it is interesting to examine the development of the Philippines. Especially, because this study aims to examine the relation between education and welfare. Therefore the next subsections discusses the Philippine living standards in an international perspective.

### Poor GDP growth during the 1930s

GDP per capita is one of the most commonly used indicators to examine a country's welfare. During the first half of the 20<sup>th</sup> century, the Philippines had the highest GDP per capita of all Southeast Asian colonies (table 3.4). However, poor growth can be discerned during the 1930s in the Philippines, the Dutch Indies and to a lesser extent Thailand. The Philippine stagnation was a consequence of the high export rates of primary products to international markets, which became under quota agreements due to the Great Depression (Booth, 2007: 121). Moreover, the exchange rate of two peso to the dollar was overvalued, which resulted in a poor bargaining position for exporters. In response, preferential access to the American market was introduced (Hooley, 1996: 296). Owen (1972) pointed out that the free trade agreement with the US in combination with the overvalued peso, resulted in unprofitable investments for almost every sector during the 1920s and 1930s.

**Table 3.4 GDP per capita for Southeast Asian colonies and Thailand**

	1913	1929	1938
Philippines	1.053	1.502	1.522
Dutch Indies	904	1.170	1.175
Malaya*	943	1.170	1.361
Burma	685	N.A.	740
Taiwan	747	1.146	1.302
Korea	820	1.014	1.459
Thailand	841	793	826

\* Singapore included

Source: Madison, 2013: 180-184

### Food consumption and household budgets

Although the GDP indicator is widely used, it is also broadly acknowledged that GDP per capita in itself is not reliable for examining a country's welfare. A study concerning living conditions and food consumption in the Ilocos region of Northwest Philippines, found that an average family (three adults and two children) were consuming on average 5,700 calories per day which is substantially lower than the calorific intake of prisoners. Prisoners had regular supplies as coffee and tea, something considered as a luxurious product by Ilocano farmers (Lava, 1938: 24-25). In addition, Runes (1939: 30) stated that food shares of household budgets among Philippine sugar workers was 82 percent and that a regular family spent almost their entire income on food and clothing of the lowest quality.

In exception of Indo-China, per capita rice consumption decreased in every colony during the first half of the 1930s. In contrast to the Philippines, most countries however, approaching 1925-1929 levels during the late 1930s (table 3.5). Due to that the Philippine economic development stagnated, it could be that household budgets became under pressure, resulting in a downfall of per capita rice consumption. Moreover, the Philippine statistical bulletin provides no evidence of substitution for rice by other crops (Philippine statistical bulletin, 1925-1933). Although these studies (Runes, 1930; Mears *et al.*, 1974; Lava, 1938) imply a poor purchasing power, starvation barely existed during the American colonization and living conditions in the Philippines have been better than for the poorest people of Japan (Lava: 1938: 81).



**Table 3.5 Southeast Asian rice consumption per capita**

	<i>Philippines</i>	<i>Java</i>	<i>Malaya</i>	<i>Burma</i>	<i>Taiwan</i>	<i>Indo-China</i>	<i>Korea</i>
1915-1919	87	N.A	93	139	98	91	138
1920-1924	99	99	91	105	100	99	123
1925-1929	100	100	100	100	100	100	100
1930-1934	84	96	94	91	88	107	87
1935-1939	80	94	99	100	70	109	125

Sources Philippines, Java, Malaya, Burma and Indo-China: Mears *et al.*, 1974: appendix 4.2,  
Taiwan and Korea: Ho, 1978: table 6.2,

### Human development indicators

As addressed, in comparing nations development, it is ill-considered to draw conclusions from a single indicator. Booth (2007) presented a comparison of human development indicators, which comes near to the indicators of contemporary Human Development Index (HDI). The outcomes are summarized in table 3.6.

**Table 3.6 Development indicators Southeast Asia late 1930s**

	<i>GDP Per capita</i>	<i>Infant mortality rate</i>	<i>Crude death rate</i>	<i>Educational enrollment as percentage of total population</i>
Philippines	1,522	139	23	11.5
Dutch Indies	1,057	250	28	4.0
Malaya	1,361	147	21	7.8
Burma	740	232	30	5.4
Indochina	N.A.	190	24	2.5
Taiwan	1,440	142	21	11.4
Korea	904	N.A.	23	5.8
Thailand	826	N.A.	22	10.7

Source: Booth, 2007: 138

There is little doubt that all colonial governments paid a major contribution to increased access to modern health facilities and better provision of postnatal care (Booth, 2007: 141). According to table 3.6, the Philippines and Taiwan had the lowest infant mortality rate and crude death rate. In addition, these two countries were ahead in both GDP per capita and educational enrollments. There is evidence that the economic development that occurred during the American colonization had not benefited all parts of the population, but based on these four characteristics, one can conclude that the Philippines and Taiwan had the highest living standards in Southeast Asia during the late 1930s.

### Independence and fast postwar recovery of the Philippines

On July 4<sup>th</sup> 1946 the Philippines received full independence. Although the new republic had to recuperate from the Second World War, the Philippines recovered quickly, mainly due to substantial American assistance (Karnow, 1989: 334). Moreover, Paauw (1963) stated that the Philippines returned to prewar GDP per capita levels by 1950 and this level more than doubled during the period 1946-1956. This was the fastest postwar recovery of every part of Asia. Recovery is observable in agricultural production as well. Mears *et al.* (1974) found evidence that the rice production of 1949 was already higher than in the pre-war peak. By 1960, the rice production was 1.5 times higher than in 1938 (Bureau of census and statistics, 1961: Vol. II).

## Chapter 4: Research design, data, model and model assumptions

This chapter starts with an overview of the data sources and goes on to discuss which variables are obtained to conduct the model. Subsequently, the estimation technique is discussed. In order to do a panel data analysis, this research uses a main research question and two sub research questions with corresponding hypotheses. To test the hypotheses, three different tests are executed. This chapter describes which models will be used to perform the tests. The last section of this chapter discusses the model assumptions. In order to examine which estimation technique is most appropriate, several tests will be executed.

### Data collection and construction of the variables

Data is obtained from two historical sources, namely the censuses of the Philippine islands and the Philippine statistical bulletins. As these data sources are over a century old, not all data is available digitally. In order to collect the data several trips were made to *Centraal Bureau voor de Statistiek* (CBS) in The Hague (The Netherlands) and *Deutsche Zentralbibliothek für Wirtschaftswissenschaften* (ZWB) in Kiel (Germany). Although both statistical sources provide detailed data on multiple aspects of the Philippines, there are limitations in their use for constructing a model to test this study's hypotheses. Four main restrictions with respect to data availability affected the quality and amount of regressions:

First of all, not all indicators were consistently included among the various editions of the consulted archives. Aiming for a complete dataset, the absence of observations for a certain variable was considered to make a variable unsuitable for inclusion in the dataset.

Secondly, due to the retrospective (historic) nature of this research, only the reported data can be used in the analysis. The fact that it is not possible to obtain (extra) data by means of interviews limits the analysis.

Thirdly, some data could not be taken into account, because it is only available in the UK, the US and/or the Philippines, which could not be visited due to time and budget restrictions.

Lastly, the regressions use provinces as observable units. Some variables were only available on a national level and therefore could not be included in this analysis.

Using the aforementioned archives, several indicators were directly obtained or constructed based on the available data. The independent variable real estate was transformed to the relative indicator *real estate per capita* (the absolute values were divided by the amount of people per province). Testing correlations between the absolute value of real estate and welfare indicators may indicate larger provinces with high population numbers as wealthier and thus as more developed. Using relative values, a more representative indication about the provinces welfare is given.

*Literacy rate, proportion of the population able to speak English and number of (public primary and secondary) schools* are directly extracted from the data sources and used as variables. Additionally, *enrollment rate* is calculated by dividing the amount of people enrolled in school by the amount of people in the age range of 5-17 years old (which is the range of age in which the children are supposed to attend school). Dividing the indicator *number of public students* by *number of public teachers* results in the variable *students per teacher*. Table 4.1 provides an overview of the variables included in the model.

**Table 4.1 Description of variables included in the model**

Variable	Description
real estate	reported value of property per capita (in Philippine pesos)
literacy	literacy rate
english	Proportion of the population able to speak English
enrollment	enrollment rate (in the age of 5-17 years)
students per teacher	ratio the number of students per teacher
schools	number of schools
yearcode	time trend

#### The strengths and restrictions of the variables

Besides the time trend, the created model contains five explanatory variables. The variables *literacy rate* and *proportion of the population able to speak English* are especially valuable to include in the model, because these variables indicate to some extent the quality of education. Literacy and learning another language expand the intelligence of an individual and is therefore the best option to indicate human capital per inhabitant (Nunez, 1992: 80). In theory, the variable *enrollment rate* provides insight into the quality of education. In this research, the problem occurred that enrolment rate only states how many children are registered. It does not address how many children exactly attended school on a daily basis. The variable *students per teacher* may explain something about the quality of education. In theory, less students per teacher indicates smaller classes, which may imply that a teacher has the opportunity to spend more time with a child individually, resulting in the possibility of an increase in learning performance and therefore in the quality of education. But this assumption cannot be verified by the obtained data. The same holds for the variable *schools*. More schools suggests an easier access to education which may result in more schooled children and therefore in an enhanced education system. Again this assumption cannot be verified.

#### Demarcations

The following demarcations apply for this research:

- The timeframe of the analysis consists of 58 years (1903 to 1961), and is chosen due to the following reasons. The census of the Philippine islands edition 1903 is the earliest census conducted. In addition, American rule started in 1898. Therefore the census of 1903 is a logical starting point. The census of 1961 is used as ending point for the analysis; although, the Philippines became independent in 1946, extension of the time frame is a suitable way to analyze whether a trend continued after independence. 1961 is chosen as a cut-off point since this is the last year of which a census is available before the Philippines was ruled by the dictatorial regime of Ferdinand Marcos during the period 1965-1986. Marcos' jurisdiction was highlighted by abuse of power, bribing and large scale corruption (Hawes, 1987). As a result using data from this period is not appropriate for this research.
- The empirical analysis purely includes the Philippines. An international empirical analysis is not addressed in this research.
- The empirical analysis only explores the relation between economic growth and education. Other welfare indicators like healthcare and crime rates are not analyzed.
- Apart from the fact that only educational variables are taken up in the model, the model is not set up to conclude on whether - or to which extent - education is fully responsible for the fact that one province is wealthier than the other. There are factors other than education,

both internal and external in nature, which may have a greater impact on regional differences in welfare. Describing these relations is beyond the scope of this research.

- This research opens a chicken and egg discussion. Does a higher welfare affects an advanced education system, or does an advanced education system results in a higher welfare? This research aims to test the last assumption according to the following reasons. The introduction of the substantial education system was intended to prepare the Philippines for self governance, which suggests that the US provided the Philippines with educational facilities. Moreover, the US were mainly responsible for the (financial) efforts regarding the educational system. This implies that external investments are liable for the expansion of the education system. Therefore the conducted model uses the educational indicators as independent variables.
- In order to construct the dataset, several geographical changes appeared in the analyzed timeframe. Some provinces were split up or merged over time. The dataset includes 43 provinces, for which all values of every variable could be obtained, resulting in a balanced dataset.

### Construction of the empirical model

The analysis is conducted using panel data techniques. Panel data analysis is a type of econometric modeling and can be described as a combination of cross-section analysis and time series analysis. In cross-section data, values of one or more variables are collected for sample units (e.g. households, firms, provinces) at the same point in time. In time series data, the values of one or more variables over a period of time are observed. In panel data analysis various cross-sectional units are surveyed over time (Dougherty, 2007: 513-514).

The possibility of analyzing repeated observations allows one to specify and estimate more complicated and realistic models compared to a single cross-section or a single time series analysis (Verbeek, 2012: 372). Unfortunately, when analyzing repeated observations, one can't assume that the observations are independent. Moreover, panel data sets suffer mostly from missing observations (Dougherty, 2007: 515). Likewise in this research, panel data sets are often set up for a longer period of time, whereby the possibility occurs that an observational unit drops out. As mentioned, several provinces were merged or split up overtime.

### Introduction of lag values

If there is an effect on welfare by education, the effect would be noticeable after 10 to 15 years. Because of this, lag values are introduced. This implies that the dependent variable of a certain year is tested on the values of the independent variables in previous years. The gaps of missing data differ in length and therefore the lagged values differ in length as well. All observation points of the independent variables have a lag value in the range between 9-15 years.

### Models to test H<sub>1</sub>, H<sub>2</sub> and H<sub>3</sub>

The main research question is formulated as ‘Did the educational revolution during the period of American colonization between 1898 to 1946 have a positive effect on the welfare levels in the Philippines?’

In order to answer this research question the following hypothesis is formulated:

- H<sub>1</sub>: There is positive relationship between education and economic growth in selected Filipino provinces during the American domination

To test this hypothesis, a model was constructed with the following econometric specifications:

$$\begin{aligned} real\ estate_{it} = & \beta_0 + \beta_1 literacy_{it-1} + \beta_2 english_{it-1} + \beta_3 enrollment_{it-1} \\ & + \beta_4 students\_per\_teacher_{it-1} + \beta_5 schools_{it-1} + \beta_6 yearcode_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

where the outcome variable  $real\ estate_{it}$  for province  $i$  (where  $i = 1, \dots, 43$ ) at time  $t$  (where  $t = 1903, 1918, 1933, 1939, 1948, 1961$ ), is determined by five educational variables. The model implies that the intercept  $\beta_0$  and the slope coefficients in  $\beta_k$  are identical for all provinces and time periods. The error term ( $\varepsilon_{it}$ ) vary over provinces and time and capture all unobservable factors that affect  $real\ estate_{it}$ .

To test the first sub research question, the following hypothesis is formulated:

- H<sub>2</sub>: The impact of education on welfare levels in the Philippines was greater in urban regions than in rural regions.

To test this hypothesis, the above mentioned model (1) is adjusted to include a demographic distinction on provincial level (the level of the observation units). In order to differentiate urban provinces from rural provinces, provinces with more than 300 inhabitants per square mile in 1939 are considered as urban and provinces with less inhabitants per square mile in 1939 are considered as rural provinces. Initially, a dummy variable was added to the model, but the dummy variable appeared to be insignificant. Therefore, two separate regressions are executed: one only including the ‘rural’ provinces and one only including ‘urban’ provinces. This provides insight in whether the coefficients differ for rural and urban provinces.

To test the second sub research question, the following hypothesis is formulated:

- H<sub>3</sub>: The impact of education on welfare levels in the Philippines was greater in provinces proximate to Manila

To test this hypothesis, model (1) is used. This time adjusted with a geographical distinction on provincial level. This geographical distinction on provincial level is based on the three major groups of islands of the Philippines, namely Luzon, Visayas and Mindanao. The economic heart, Manila, is located on the Luzon group of islands. The other two groups of islands (respectively Visayas and Mindanao) are not considered to be in the economic heart of the Philippines. In order to execute this test, a dummy variable was created regarding the geographical position of the province. Once again, running a regression including a geographical dummy resulted in an insignificant dummy parameter. Therefore, it was decided to run two separate regressions: one regression including all the provinces located on Luzon and the other regression including all provinces located on Visayas and Mindanao.

The island groups Visayas and Mindanao are not included in the regression as two separate groups, since Mindanao consisted only of six provinces. In case Visayas and Mindanao would have been taken up as two separate groups, this would lead to insignificant parameters due to the limited amount of provinces taken up per island group. Therefore the provinces of Visayas and Mindanao are combined as one group.

#### Model assumptions: testing on multi-collinearity, heterogeneity and Hausman test

To estimate the specifications of the panel dataset, a test of multi-collinearity, heterogeneity and a Hausman test are applied and addressed below.

Firstly, it is checked whether there exists multi-collinearity among the independent variables. As a general rule, if the variance inflation factors (VIF's) of the independent variables exceed 10, it indicates the presence of severe multi-collinearity. The reported values in table 4.2 are lower than the threshold level. Therefore it is not likely that the estimation results are affected by multi-collinearity.

If there is heterogeneity among the provinces, a Fixed/Random effects model is more appropriate to apply than Ordinary Least Squares estimates (OLS). Performing a F-test, provides an indication of which estimation technique is most suitable for this panel data analysis. The null hypothesis (one single intercept for all provinces) is rejected according the p-value of zero (table 4.2). Therefore a model with only one intercept neglecting heterogeneity would be too restrictive.

In choosing whether the Fixed or Random effects model is suitable, the Hausman test is applied. The test provides insight into whether to use the efficient Random Effects (RE) model instead of the less efficient but consistent Fixed Effects (FE) estimator. The probability value of  $\chi^2$  is less than 0.05, which implies that the test statistic is significant and that  $H_0$  is rejected, meaning that the RE estimator is inconsistent (due to non-zero covariance between residuals and explanatory variables). Therefore, we have to rely upon the FE estimator (table 4.2).

The three tests discussed in previous subsections are tabulated as follows:

**Table 4.2 Tests for panel data estimation techniques**

Test for multi-collinearity			Selection of panel data estimation technique			
Variable	VIF	1/VIF	FE F-test for heterogeneity		General Hausman test	
literacy	3.02	0.331	[H <sub>0</sub> all μ <sub>i</sub> =0] H <sub>0</sub> : No panel effect		Hypothesis:	
english	9.34	0.096			H <sub>0</sub> : Difference in coefficients not systematic	
enrollment	2.09	0.478			H <sub>A</sub> : Difference in coefficients systematic	
schools	1.90	0.526	F(42, 123)	3.61	Value	Decision
students per teacher	1.37	0.731	p-value > F	0.000	p-value	Since p-value > χ <sup>2</sup> > 0.05
yearcode	8.77	0.113			>χ <sup>2</sup> =0.001	<i>Fixed Effects is preferred</i>
mean VIF	4.58	-				

Concluding that the FE estimator is the most appropriate estimator, appearances like cross-sectional dependence, serial correlation and heteroskedasticity are checked.

### Testing for cross-sectional dependence, serial correlation and heteroskedasticity

As the model includes many cross-sectional units and few time-series observations, it is relevant to test the presence of cross-sectional dependence (also called contemporaneous correlation) in panels. According to Baltagi and Pesaran (2007), cross-sectional dependence is a problem in macro panels with long time series (over 20-30 years). The Pesaran Cross-sectional Dependence (CD) test is used to examine whether the residuals are correlated across entities. Cross-sectional dependence can lead to bias in tests results (Hoechle, 2007: 281). The null hypothesis states that the residuals are not correlated. Table 4.3 indicates that on average, the (absolute) correlation between the residuals is 0.587, indicating moderate cross-sectional dependence (Evans, 1996). Therefore, the Pesaran's CD test rejects the null hypothesis of spatial independence at any standard level of significance. Hoechle (2007) suggests to use Driscoll-Kraay standard errors if cross-sectional dependence is present. Driscoll-Kraay standard errors are heteroskedasticity consistent and robust to general forms of cross-sectional (spatial) and temporal dependence when the time dimension are large. However, in this model a time-dimension of  $t=4$  is relatively short if one considers the fact that Driscoll-Kraay standard errors rely on large  $T$  asymptotics. Although Driscoll-Kraay standard errors tend to be slightly optimistic, their small-sample properties are considerably better than other alternative covariance estimators when cross-sectional dependence is indicated (Hoechle, 2007: 282).

Serial correlation can be described as the relationship between a given variable which correlates over various time intervals. Serial correlation is often found in repeating patterns when the current level of a variable affects its future level (Drukker, 2002: 172). Serial correlation causes the standard errors of the coefficients to be smaller than they actually are and have a higher  $R^2$  (Torres-Reyna, 2007). Table 4.3 shows that the null hypothesis cannot be rejected ( $p\text{-value} > 0.05$ ). It can be concluded that there is no serial correlation among residuals and no first-order autocorrelation.

"The error term  $\varepsilon$  can be heteroskedastic if variance of the conditional distribution of  $\varepsilon_i$  given  $x_i$  [ $\text{var}(\varepsilon_i | X_i)$ ] is non-constant for  $i = 1, 2, \dots, n$ , and specifically does not depend on  $X$ ; else,  $\varepsilon$  is homoscedastic. Heteroskedasticity can result in wrong estimates of standard errors for coefficients and hence of their  $t$ -values" (Mehmood and Mustafa, 2014: 7).

While the estimates of OLS might not be biased in this case, estimates are inefficient and standard errors may be incorrect. Results show that the null hypothesis is rejected ( $p\text{-value} < 0.05$ ) and it can be concluded that the residuals are not homogeneous. Consequently, the estimates of the standard errors and therefore their  $t$ -values are unlikely to be incorrect. Therefore a regression using panel corrected standard errors (PCSE) for robust inferences can be performed (Stata, 2015).

The results of the above mentioned tests are presented by table 4.3.

**Table 4.3 Tests for cross-sectional dependence, serial correlation and heteroskedasticity in FE regression**

Pesaran's test of cross sectional independence		Woolridge test for serial correlation		Modified Wald test for heteroskedasticity	
$H_0: \gamma_i = 0; \text{ for all } i$		$H_0: \text{No first order serial correlation}$		$H_0: \sigma_i^2 = \sigma^2 \text{ for all } i$	
Average absolute value of the off-diagonal elements	0.587	F(1, 23)	0.251	$\chi^2(43)$	7.2e+05
p-value	0.000	p-value>F	0.619	p-value> $\chi^2$	0.000

Overall, we can conclude that the model does not contain serial correlation. However, cross sectional dependence and heteroskedasticity are indicated. In line with what the literature suggests regarding these finding, the model can be presented using PCSE as well as Driscoll-Kraay standard errors.



## Chapter 5: Results

This chapter presents the results of the analysis described in the previous chapter. In order to test  $H_1$ , a model is drafted. A modified version of the drafted model aims to test  $H_2$  and  $H_3$ . Before presenting the regression results, the descriptive statistics are shown.

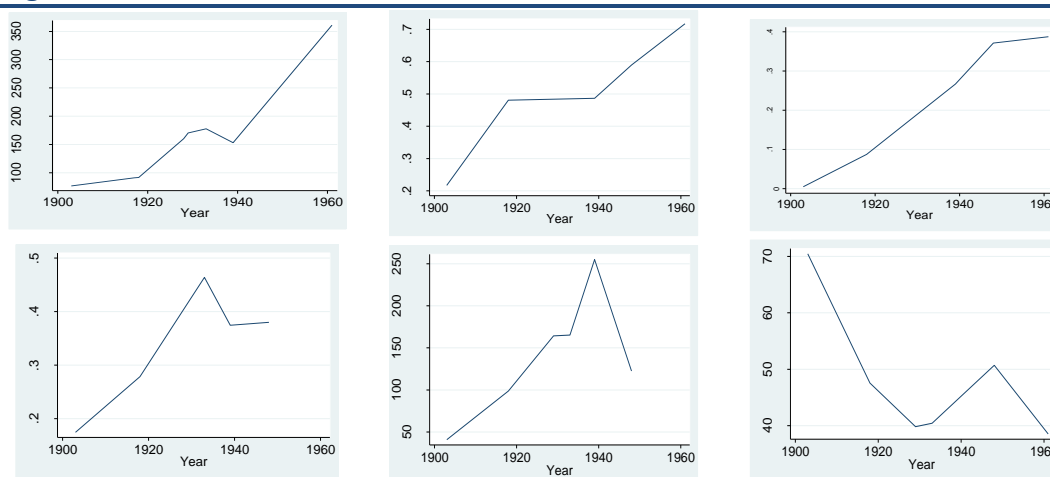
### Descriptive statistics

The characteristics of the used variables are presented in table 5.1 and figure 5.1 below:

**Table 5.1 Descriptive statistics**

Variable	Number of observations	Number of observable units	Number of time dimensions	Mean	Standard deviation	Min	Max
real estate per capita	172	43	4	217.61	238.98	6.00	1766.00
literacy	172	43	4	0.44	0.18	0.09	0.89
english	172	43	4	0.18	0.16	0.00	0.56
enrollment	172	43	4	0.30	0.16	0.05	0.80
schools	172	43	4	146.89	131.62	2.00	669.00
students per teacher	172	43	4	52.17	18.05	19.38	173.50

**Figure 5.1 Trends on a national level based on five education indicators**



Sources: Bureau of the Census and Statistics, 1903  
 Bureau of the Census and Statistics, 1918  
 Bureau of the Census and Statistics, 1939  
 Bureau of the Census and Statistics, 1948  
 Bureau of the Census and Statistics, 1961  
 Philippine Islands Bureau of Commerce and Industry (1918-1933)

Figure 5.1 indicates trend about *real estate per capita* on national level. During the period 1903-1933 an increase of Php 100.- is noticeable, till Php 177.- per capita. Hereby the steepest rise occurred for the period of 1918-1929. During the 1930s a decrease of *real estate per capita* is observed. An upward trend is perceptible during the 1940s and 1950s. By 1960, the *real estate per capita* amounted to Php 353.-

During the period 1903-1918, the *literacy rate* doubled (21-48%). The trend stagnated for the period 1918-1939. During 1940-1960 the fraction increased, resulting in almost 70% of the Philippine population becoming literate by 1960. The *proportion of the population able to speak English* also increased overtime. In 1903, less people spoke English, because the US ruled the Philippines only for several years. In 1918, about 14% of the population had English language skills. By 1948, the fraction rose till 37%. After independence 39% of the population had English language skills. In the period 1903-1948 the *enrollment rate* increased with 21%, resulting in 40% of the pupils in the age range 6-17 years were enrolled. Taking the *number of schools* into consideration an enormous increase is noticeable. During the first 40 years of American colonization the number of schools exceeded five times, resulting in an average of 250 schools per province. In the 1940s a downfall is perceptible. In 1903, the *number of students per teacher* is on average 70 students per teacher. The ratio decreased to 40 in 1929. During the 1940s and 1950 the number increased till 50. By 1960, the pupils per teacher was 40 and on the same level as 1929.

In summary, between 1903-1939 educational improvements are made. During the 1930s and 1940s a stagnation or even a downfall in several educational indicators is perceptible, in all probability caused by the Great Depression and the devastations of the Second World War. As indicated in chapter 3, this is in line with the stagnation of growth in terms of GDP per capita and the observed stagnating trends in food consumption and household budgets.

#### Results of test 1 (T1)

Table 5.2 presents the results of the executed test concerning  $H_1$ . The test results provide insights into which extent the independent variables do have an impact on the level of real estate. By conducting this test, the research question can be answered as motivated in the theoretical framework. As presented in the previous chapter, the FE estimator is appropriate to test the model. In addition, the model indicates the existence of cross-sectional dependence and heteroskedasticity and suggests the absence of serial correlation. In line with what the literature suggests regarding these finding, the model is presented using PCSE as well as Driscoll-Kraay standard errors.

**Table 5.2 Regression model estimations**

Dependent variable is real estate per capita				
Regressors	<i>Fixed Effects Estimations</i>		<i>Panel-corrected standard error estimates (PCSE)<sup>1</sup></i>	
	Coefficient	p-value	Coefficient	p-value
literacy	102.54 (149.75)	0.495	413.20 (205.89)	0.045
english	667.18 (310.04)	0.033	1169.41 (311.46)	0.000
enrollment	-29.63 (140.21)	0.833	58.01 (138.15)	0.675
schools	-0.23 (0.18)	0.213	-0.22 (0.06)	0.000
students per teacher	0.74 (0.82)	0.367	-0.29 (0.88)	0.743
yearcode	0.89 (3.15)	0.778	-7.00 (2.62)	0.008
constant	17.09 (98.71)	0.863	127.84 (88.99)	0.151
	R <sup>2</sup> (within)	0.4228	R <sup>2</sup> (within)	0.4333
	F(6,123)	15.02	Wald $\chi^2(6)$	68.88
	p-value > F	0.000	p-value > $\chi^2$	0.000

<sup>1</sup> Correlated panels, corrected standard errors

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

According the FE estimator, the parameter *proportion of the population able to speak English* shows a statistically significant result at 5% level of significance, while the other parameters are insignificant. The fixed effects model using PCSE indicate the estimates of the variables *literacy rate*, *proportion of the population able to speak English*, *schools* and *yearcode* as significant at 5% level of significance. The FE estimator using Driscoll-Kraay estimates presents only the significance of the parameter *schools* at 5% level of significance. Therefore a model using Driscoll-Kraay standard errors will not be presented.

Due to the fact that the FE estimator using PCSE shows the most significant parameters, this model is further explained. R<sup>2</sup> indicates a value 0.4333, indicating that 43% of variation in the dependent variable is explained by the explanatory variables and the remaining by variables not included in the model. An 1% increase in the *proportion of people able to speak English* leads to an increase per capita real estate of Php 11.69. 1% increase in *literacy rate* results to an increase of Php 4.13 *real estate per capita* respectively. These finding are in line with empirical literature. Such indicators are found in Mingat and Tan (1988), who find that returns of education can reach to 20%, if half of the population is literate. According to the model, there is a positive association between education and welfare.

## Results of test 2 (T2)

In order to test  $H_2$ , if the impact of education on welfare was greater in urban regions than in rural regions, Philippine provinces are divided in two groups. To differentiate urban provinces from rural provinces, provinces with more than 300 inhabitants per square mile in 1939 are considered as urban, provinces with less inhabitants per square mile in 1939 are considered as rural provinces. Furthermore, a Chow test is performed to determine if the two groups have different parameters. The FE estimator is tested using PCSE. Table 5.3 shows the results of the two separate regression: one only including the 'rural' provinces and one only including 'urban' provinces.

**Table 5.3 Regression model (PSCE) using demographical distinction**

Dependent variable is real estate per capita				
Regressors	<i>Rural provinces</i> <i>(Density &lt; 300)</i>		<i>Urban provinces</i> <i>(Density &gt; 300)</i>	
	Coefficient		Coefficient	
literacy	270.82** (117.64)		518.54 (362.62)	
english	304.64** (148.35)		2567.68*** (670.33)	
enrollment	56.07 (106.10)		120.22 (284.77)	
schools	0.18** (0.08)		-0.42 (0.26)	
students per teacher	0.03 (0.50)		-0.20 (1.17)	
yearcode	-0.69 (1.12)		-20.87*** (7.32)	
constant	1.02 (43.69)		351.90 (266.71)	
	N	120	N	52
	R <sup>2</sup>	0.3087	R <sup>2</sup>	0.6879
	Wald $\chi^2(6)$	312.55	Wald $\chi^2(6)$	48.94
	p-value > $\chi^2$	0.000	p-value > $\chi^2$	0.000
Model Specification	Chow test:		F(5, 119)	4.33
Test	H <sub>0</sub> : all $\beta$ 's are the same		p-value > F	0.001

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

According to the model (table 5.3), an increase in both *literacy rate* and *proportion of the population able to speak English* results in a higher value of real estate. An increase of 1% in *literacy rate* correlates with a *real estate per capita* growth of Php 2.71 at sparsely populated provinces. A greater effect is observed at densely populated provinces: an increase of 1% in *literacy rate* correlates with a growth of *real estate per capita* of Php 5.19. The same holds for the variable *proportion able to speak English*. An increase of 1% correlates with a *real estate per capita* growth of Php 3.04 at the sparsely populated provinces, while the effect at provinces with a higher population density is much larger. An increase of 1% of the *proportion of the population able to speak English* reflects to a *real estate per capita* growth of Php 25.68. In evaluating these results it should be taken into account though, that the parameter *literacy rate* is not significant ( $p\text{-value} > 0.05$ ) for urban provinces. In addition, the standard errors are large.

### Results of test 3 (T3)

The last executed regression is used to test  $H_3$ . In order to test if the impact of education on welfare levels in the Philippines was greater in provinces proximate to Manila, Philippine provinces are segregated in two groups. The first group of provinces contains all provinces located on the main island Luzon, where also Manila is situated. The second group consists all other provinces which are located on the islands groups Visayas and Mindanao. Once again a Chow test is performed to test if the two groups have different intercepts. The FE estimator is tested using PCSE.

**Table 5.4 Regression model (PSCE) using geographical distinction**

Dependent variable is real estate per capita				
Regressors	Visayas/Mindanao		Luzon	
	Coefficient		Coefficient	
literacy	80.18 109.84)		667.50** (310.02)	
english	547.68** (246.91)		1632.64 *** (363.91)	
enrollment	-127.41** (58.51)		161.32 (196.91)	
schools	-0.05 (0.03)		-0.13 (0.13)	
students per teacher	-0.11 (0.59)		0.51 (1.32)	
yearcode	0.28 (1.57)		-14.59*** (4.37)	
constant	76.63 (96.93)		-14.59 (4.37)	
	N	64	N	108
	R <sup>2</sup>	0.5586	R <sup>2</sup>	0.4802
	Wald $\chi^2(6)$	365.49	Wald $\chi^2(6)$	45.94
	p-value > $\chi^2$	0.000	p-value > $\chi^2$	0.000
Model Specification	Chow test:		F(5, 119)	0.55
Tests	H <sub>0</sub> : all $\beta$ 's are the same		p-value > F	0.736

\* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

The following trends are observed. An increase of 1% in *literacy rate* results into a *real estate per capita* gain of Php 0.80 at the provinces located on Visayas or Mindanao and Php 6.68 per capita at the provinces located on Luzon. Although it should be noted, the parameter *literacy rate* is not significant at 5% significance level for the provinces situated at Visayas and Mindanao. An increase of 1% of the *proportion of the population able to speak English* correlates with an increase of Php 5.47 *real estate per capita* at provinces located on Visayas or Mindanao, while the effect of the same parameter at the provinces located on Luzon results in a *real estate per capita* gain of Php 16.32. Parameters of both regressors show significant estimates at 5% significance level. However, the Chow test shows a insignificant result (p-value > 0.05), indicating that the coefficients of the two linear regressions on are not equal.

## Chapter 6: Conclusions

During the Spanish colonization, education in the Philippines was based solely on Christian doctrine. Although the educational amenities in the Philippines were extended massively during the American colonization, the level of education was not poor during the Spanish domination. We can conclude that the Philippines were more developed than any other Southeast Asian country which respect to educational facilities by the end of the 19<sup>th</sup> century. This suggests that education was already imbedded in Philippine society. This likely worked in the favor of the Americans. By 1898, the Philippines became under American rule. The Americans started directly with the revision of the education system. The introduction of the new education system had two aims, namely pacification and preparation for self-governance. The colonial government provided a major financial contribution. In 1938, around 20% of the total government expenditure was spent on education, which was by far the highest amount in Southeast Asia. As a result, the country faced the highest literacy and enrollment rate throughout Southeast Asia. In addition, evidence is found that the Philippines faced one of the highest living standards, based on indicators which come close to the contemporary HDI.

The main objective of this study is to examine the relation between educational indicators and welfare. According to the research questions corresponding hypotheses are formulated. The hypotheses and the results of the regressions are discussed below.

H<sub>1</sub>: 'There is a positive relationship between education and economic growth in the selected Filipino provinces during the American domination.'

The model examined five educational indicators on the level of real estate per capita. The outcome of the first test concluded that provinces which include higher *literacy rates* and a higher *proportion of the population able to speak English* are wealthier in terms of *real estate per capita*. These finding are in line with the theoretical framework which is inter alia based on comparable findings by Mingat and Tan (1988). They found that returns of education on welfare can reach to 20%, if half of the population is literate. Although different dependent variable is used in this model, the results of this study support the findings of Mingat and Tan (1998). Therefore we confirm the hypothesis: There is positive relationship between education and economic growth in selected Philippine provinces.

H<sub>2</sub>: 'The impact of education on welfare levels in the Philippines was greater in urban regions than in rural regions'

In order to test H<sub>2</sub> the same model is applied. The provinces (units of observations) are split up in two groups to obtain a demographical distinction regarding density. The results of the test indicates that the effect of *literacy rate* and *the proportion of the population able to speak English* on *real estate per capita* is greater in urbanized regions. However, the parameter *literacy rate* is not significant (p-value > 0.05) for urban provinces, which can be attributed to the limited amount of observations. Therefore it is difficult to confirm the hypothesis that the effect of education on welfare is greater in urban regions.

H<sub>3</sub>: 'The impact of education on welfare levels in the Philippines was greater in provinces proximate to Manila'

To test H<sub>3</sub>, the provinces are split in two groups on geographical location. The outcome of test shows that the effect of *literacy rate* and *proportion of the population able to speak English* on *real estate per capita* is greater in provinces proximate to Manila. This result is in line with the study conducted by Sahn *et al.* (2003), which concludes that development starts in the economic heart of the country and spreads across the country. However, once again, the parameter *literacy rate* is not significant ( $p\text{-value} > 0.05$ ) for provinces located on Visayas or Mindanao. Therefore it is difficult to confirm the hypothesis that the effect of education on welfare is greater in provinces proximate to Manila

## Chapter 7: Discussion

In the discussion the availability of the data, the experimental set up, and the results will be discussed. Additionally, suggestions of further research are provided.

As elaborated in the theoretical framework, this research is based on the theory that economic development is partly affected by education (Quiroga, 2003; Lau *et al.*, 1991; Mingat and Tan, 1988). To examine whether a relation exists between education and welfare in the Philippines during the period of American colonization, three regression analyses are executed. The first regression shows a positive significant relation between education and welfare. The second regression indicates that this effect is greater in densely populated provinces. The final regression points out that the effect of education on welfare is greater in provinces that are proximate to Manila. In comparison to the first regression, the second and third regression show less significant parameters.

### Availability of data

As indicated in the description of the selection process, the indicators available for selection were limited. The same holds for the amount of available observations within the selected timeframe (of almost 60 years). With the inclusion of lagged values only four observations per province were available within this timeframe. As a consequence major gaps exist between points of observation. Consequently, this does not allow for solid trends to be observed among the variables. Although T1 shows significant results, it should be acknowledged that the analysis was only conducted on 172 observations. If the test was based on more observations, the outcome would have been more substantiated.

### Discussion on the experimental set up of the model(s)

- The selection of the independent variables

To examine the level of education, the constructed model mainly relies on the indicators *literacy rate* and *the proportion of the population able to speak English*. These indicators are a direct effect of the level of education and from this perspective well chosen. Although the censuses provide detailed descriptions about the number of literate people, it does not provide a description of whether a person is considered as literate or not. In other words, is a person literate when he/she is able to completely understand what he/she reads and writes or is he or she considered to be literate when he/she can spell their own name? The lack of a clear definition of literacy rate and the ability to speak English makes it unclear whether these indicators are measured the same way, across censuses and within. Although literacy rate is a good indicator in measuring the level of education (as is it generally used in other studies: Mingat et al., 1988; Quiroga, 2003; Nunez, 1992), the fact that it is impossible to verify the measurement technique, negatively impacts the trustworthiness of the outcomes of the models tested.

- The selection of the dependent variable

This study described the welfare levels of the Philippines in the late 1930s inter alia by means of GDP, food security levels and HDI. On a national level some of this data is available, and consequently it is used to provide an overview of the welfare levels from an international perspective. These indicators are not available on provincial level and could therefore not be used as a dependent variable in the



tested models (since the provinces are the observation units). If GDP levels would have been available on a provincial level, then GDP could have been chosen as a dependent variable for welfare as it is a more common used indicator of welfare. The consulted archives include two indicators on a province level, which are considered to be welfare related and are evaluated for its usability to include in the model. These indicators are 'value of agricultural production' and 'real estate'. This research could have used the value of agricultural production as dependent variable, but was decided against because of the following reason. Datasets indicate that smaller, high populated provinces are less dependent on agriculture as a source of income than other provinces. If the value of agricultural production would have been used as a dependent variable, it could occur that rural areas would automatically be (wrongly) assumed as more developed according to the preformed tests. So the tested models use *real estate per capita* as the indicator of welfare. Although this indicator is the most welfare related indicator available on provincial level, the level of welfare is more comprehensive than real estate only. Preferably other indicators, like GDP at a provincial level would have been included if data would have been available.

#### Discussion on the overlap between demographic and geographical differences

Hypothesis 2 and 3 are tested on two regressions each. The regression analyses are based on the same dependent as independent variables. The dataset is split up in order to do two regressions per hypothesis. To test  $H_2$ , the dataset is split based on demographic differences, to test  $H_3$  the dataset is split based on geographical differences. It should be acknowledged that splitting up the datasets based on population density and proximity to Manila resulted in homogenous datasets since the urban regions were most often close to Manila (10 of 13 provinces). This suggests that there is a relationship between densely populated provinces and provinces proximate to Manila. With respect to the  $H_2$  and  $H_3$ , the homogeneity of the datasets makes it difficult to identify which cause-effect relationship is stronger.

#### Discussion on the results

In conclusion the outcomes of the performed tests (T1, T2, T3) are in line with the hypotheses, although not all parameter in the second and third test show significant results. However, due to the limited availability of data and the trustworthiness of used variables in the model, the reliability of the outcomes are questionable. Therefore it is not possible to draw a firm conclusion from the analysis. The outcomes favor  $H_1$  but giving a straight answer with great conviction on the main research question is not possible. Therefore we cannot confirm that the educational revolution during the period of American colonization between 1898 to 1946 had a positive effect on the welfare levels of the Philippines.

#### Further research

Further research can use the same type of analysis in an international comparison. Hereby an international comparison can be conducted to evaluate whether differences exist between the effect of education on welfare. Moreover, the American colonial period can be evaluated on other aspects such as health care or criminality.

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