



SCHOOL OF  
ECONOMICS AND  
MANAGEMENT

Master's in Economic Development and Growth

# Hints of Sustainable Development in the Philippines

Genuine Savings, 1902-2018

by

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## Abstract:

The Philippines is one of the most affected countries by climate change. Income levels do not say much about its national wealth as it leaves out depreciation and excludes other necessary types of capital but is still mainly used to report a country's economic standing regardless of its sustainability. This study uses Genuine Savings (GS) as an indicator of sustainable development and offers three main contributions to the field by (1) extending Philippine data back to 1902, (2) including fishery rents, and (3) incorporating total factor productivity (TFP) in its estimation of Philippine genuine savings. GS estimates using the current methodology have been extended by 75 years and at least 63 years worth of data has been improved with additional components. A long-run analysis is made out of the data extension while the effects of additional components are compared to the current estimation of GS. The incorporation of fishery rents more than doubles resource rents, while TFP, on the other hand, causes a large volatility in GS but shows a positive trend from the 1980s. The Philippine economy has been sustainable despite its quick-paced environmental degradation throughout the 20th century due to high levels of investments but the trend of sustainability has been decreasing ever so slightly in the last two decades. Future research must test the predictive power of GS as an indicator for future well-being and must include more environmental aspects that are relevant in the case of the Philippines, such as soil erosion, groundwater depletion and especially biodiversity.

**Keywords:** Economic History, Environment and Development, Green Growth, Sustainability, Genuine Savings, Adjusted Net Savings, Philippines, Sustainable Development

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# Table of Contents

1. Introduction	1
1.1. Research Question	2
1.2. Aim of the Study	2
2. Literature Review	5
2.1. Sustainability	5
2.2. Indicators of Sustainability	6
2.3. Green Accounting in the Philippines	6
2.4. Genuine Savings	6
3. The Philippine Context	8
3.1. Spanish Colonization Period, 1521-1898	9
3.2. American Colonization Period, 1898-1946	10
3.2.1. Changes in Power	10
3.2.2. Road to Actual Independence	10
3.2.3. American Education	11
3.3. Philippine Independence, 1946-present	12
3.3.1. Transition into Independence	12
3.3.2. The Marcos Administration	13
3.3.3. Recovery Period	13
4. Data and Methodology	15
4.1. Net National Savings	15
4.2. Education Expenditure	18
4.3. Resource Rents	21
4.3.1. Forestry	21
4.3.2. Minerals and Energy	23

4.3.3. Carbon Emissions	24
4.3.4. Fishery	26
4.4. Total Factor Productivity	27
5. Results	29
5.1. Genuine Savings and Adjusted Net Savings	29
5.2. Genuine Savings and Net National Savings	31
5.3. Genuine Savings and Fishery Rents	32
5.4. Genuine Savings and Total Factor Productivity	33
5.5. Genuine Savings, Fishery Rents, and TFP	34
5.6. A brief comparison with Latin America	34
6. Limitations of the Study	37
7. Discussion	39
7.1. Policy Implications	39
7.1.2. Beyond Economic Theory	39
7.1.3. Improving Education Expenditure Efficiency	39
7.1.4. Improving Resource Rents	40
7.2. Future Research	41
7.2.1. Migration	41
7.2.2. Predictive power	42
7.2.3. Data extension into the 19th century	42
7.2.4. Filling in the war years	43
7.2.5. Other environmental indicators	43
7.2.6. Regional estimation	44
8. Conclusion	45
References	47

# List of Figures and Tables

Figure 1. Visual representation of Genuine Savings

Figure 2. Net National Savings (log)

Figure 3. Education expenditure (log)

Figure 4. Resource Rents

Figure 5. Timber prices

Figure 6. Forestry, Minerals, and Energy rents

Figure 7. Carbon Emissions (log)

Figure 8. Fishery rents and other resource rents

Figure 9. Fish production

Figure 10. Present Value of Total Factor Productivity

Figure 11. Genuine Savings and Adjusted Net Savings

Figure 12. Genuine Savings and Adjusted Net Savings (% of GDP)

Figure 13. Net National Savings and Genuine Savings using Hodrick-Prescott Filter

Figure 14. Genuine savings with and without Fishery rents

Figure 15. Genuine Savings with TFP-adjustments using Hodrick-Prescott Filter

Figure 16. Genuine Savings with Fishery Rents and TFP-adjustments

Figure 17. Comparison with Latin American countries

Figure A.1. Net National Savings Index Comparison of Hooley (2005) and World Bank (2018)

Figure A.2. Education Index Comparison for Expenditure and Budget data

Table 1. Primary school enrollment rates in Southeast Asia



# 1. Introduction

Climate change and global warming are dawning upon us. Temperatures are becoming hotter than ever while the weather has been increasingly erratic, with three of the last five years having been recorded as the hottest years for the planet (NOAA, 2021). Beginning in the 1950s, the effects of the world's industrialization have caught up to man and the need for a more sustainable way of collective living has arisen. Some countries are unfortunately more affected by climate change than most and one of them is the Philippines with rising temperatures, frequent natural disasters, and a persistent need for economic development to raise the well-being of the Filipino people.

The need for sustainable development was formally recognized in the 1980s as the Brundtland Report defined it as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Since then, there has been a need to replace the gross domestic product (GDP) as the leading indicator for practically anything that has to do with economic development and growth. Apart from its insufficiency to measure well-being and sustainability, it can be a misleading goal for the 21st century to aim for a specific income level given the current challenges we face today.

Income levels can only explain so much about a growing economy, or any economy. Although a certain amount of income is needed to survive and progress, its source may not always be a quickly renewable one. Unsustainability emerges from selfish impulses and is applicable from the individual to the global level. The Tragedy of the Commons as applied by Hardin (1968) to human interaction, shows that when each individual has the incentive to act in self-interest at the expense of depleting as much commonly-accessible resources as possible, the resource would then be scarce and future generations will not have access to it. In the larger scale, when nations act as individuals do in the previous example, and when leaders prioritize economic growth above tending to its environment, the rate of environmental degradation may be so quick that its extraction could be limited to a number of years before its exhaustion. A possible solution to this unsustainability issue is to manage the extraction of these slowly renewable resources. However, a larger problem exists since not all resources are renewable. Products such as gold, silver, coal and oil are heavily extracted resources from the earth which cannot grow back in a span of a lifetime, or several ones.

The Philippines is a developing country with a long way to go to be able to catch up with greater nations if income was its basis for doing so. It is rich in forests, biodiversity, and human capital but these assets have been abused due to a need for economic stability. Forest area in 1900 was around 70% of the total land area which amounted to 21 million hectares. Its size has gone down to a third of what it once was, just a century after. The Philippines has also been called "the center of the center of marine shore fish biodiversity" because it is among its islands that the highest concentration of marine species per unit area is found (Carpenter & Springer,

2005). With a very high population of 108 million and an encouragement of the government to work abroad in the 1970s to the 1980s to alleviate the country's economic situation, it is now one of the top 10 countries that supply labor around the world (Pison, 2019). The government now incentivizes the return of Filipino scientists through the *Balik Scientist Program* to reverse the brain drain effect from the 1970s and to accelerate technological flow within the country (DOST, 2018).

It becomes clear how the limitations of GDP hinders any inference on the actual wealth of the Philippines with steadily increasing values despite the aforementioned deterioration of assets in the previous century. The trend of GDP overestimates Philippine development as it barely accounts for depreciation of physical capital, and neither does it account for the damage done to its environment and resources. To use national income as a basis for sustainable development goals and similar efforts would be misleading.

The use of a different indicator is needed if sustainable development is to be monitored and achieved. Genuine savings is a much better indicator of sustainability as it takes natural resource depletion and human capital formation into account but it has some more hurdles to overcome to be used as an instrument for national and international policies.

## 1.1. Research Question

A long-run analysis of Philippine genuine savings is needed to concretize the idea of sustainable development in the Philippines throughout the last century. With a deeper analysis of each of the indicator's components, ideas of how to improve sustainable development in the Philippines or the measurement for sustainability may be formed, hence the research question this study responds to is as follows:

*Is Philippine Economic Development geared toward sustainability?*

Given the harsher effects of climate change on the Philippine environment, one can assume that the government would actively be taking measures for the mitigation of environmental degradation issues out of necessity. With issues such as population growth and natural disasters persistently worsening by the year, policy makers would probably be more inclined to maximize the potential of the population through efficient education and to push forward the policies that are in line with sustainable practices. Out of optimism, Philippine development may be following a sustainable path.

## 1.2. Aim of the Study

The aim of the study is to address three main issues. Several events in the 20th century alone may have caused differences in the trend of sustainable development in the Philippines. First would be the Americans' formal take over of the Philippines and the systems they have established for government and education; second are the effects of the world wars and the Great

Depression on the Philippine economy since it was a U.S. protectorate at the time; third, the changes as soon as the Philippines was independent from any form of colonial power after the Second World War; and Fourth, the years preceding the turbulent years of the Marcos administration. These events make it important to estimate Philippine genuine savings throughout the 20th century as it has been filled with many socio-economic changes that have formed the Philippines as we know it today, but Philippine genuine savings data only goes back until 1977 and does not allow for long-run analysis.

There is also much room to improve the estimate of genuine savings through the scope of resources for the Philippine case. Fishery rent has been explicitly identified by the World Bank (2021a) as an important component of natural resource depletion that should be accounted for, and especially so for the Philippines as its marine life is very rich but fish resources have been overexploited in the last few decades. Fishery is particularly important to include in the estimation of genuine savings because of the role the sector plays in Philippine culture and its economy. Fish is the Filipino's staple food next to rice as each Filipino consumes 32.7kg of fish and fish products on average (FAO, 2014). It also contributes to GDP by around 2.5% on average from 1985 to 2012, and employs a little over 1 million Filipinos yearly. The Philippines was one of the major fish producing countries in 2012 but has then dropped in rankings in recent years (FAO, 2014).

Finally, an application of total factor productivity (TFP), which Weitzman (1997) finds to be closely linked to the ability to achieve long-term general sustainability, is not commonly accounted for in the current estimation of genuine savings when it causes a large difference in absolute terms as can be seen in Blum, et al. (2017) in their observed dataset. In growth accounting, TFP is an undetermined factor which increases (or decreases) the gains from a given amount of capital and labor which has also previously been called "technology" in the Solow growth model (Solow, 1956). The TFP of the Philippines fluctuates above and below zero, but has had an increasing trend since the 1980s. Cororaton (2002) interprets the very negative values of TFP in the 1980s as either a decline in education efficiency or the brain drain effect of mass emigration of Filipinos as these years coincide with a surge of Filipino emigration.

These three issues are targeted to analyze long-run sustainable development with an improved estimation of genuine savings, focusing on the Philippine case. The study aims to contribute to the growing literature of genuine savings by providing estimates for Philippine genuine savings from 1902 to 2018, by including fishery rents to its scope of natural resources, and by incorporating TFP into genuine savings to gauge the effects of productivity on the growth of capital accumulation.

The following chapter provides an overview of Philippine history to give some context on the dynamics of the data as components and as the composite indicator that genuine savings is. Chapter 2 provides an overview of the previous studies done on genuine savings or similar indicators both internationally and for the specific case of the Philippines. Chapter 3 explains the general methodology of calculating genuine savings estimates, the specific methodology used in this paper, and a discussion of each component and its trends. Chapter 5 presents the results in

comparison to World Bank (2021a) estimates, and a comparison with the inclusion and exclusion of either fishery rents, TFP, or both. A brief comparative analysis between the Philippines and some Latin American countries concludes the chapter. Chapter 6 discusses the limitations of the study and other methods or avenues the researcher could have taken under different circumstances. Chapter 7 goes through the policy implications of the study's results and discusses other topics yet to be covered and considered for the future improvement of genuine savings. Finally, Chapter 8 consolidates the highlights of the study and concludes.

## 2. Literature Review

### 2.1. Sustainability

Discussions about sustainable development can be traced back to the 18th century with von Carlowitz's (1713) *Sylvicultura Oeconomica* as he discusses the "sustainable use" of forests to allow for a period of regrowth of new trees after cutting some, and Malthus' (1798) *Essay on the Principle of Population* discussing the effects of continuous population growth on the earth's finite resources. These concepts have been repopularized in the 1970 when the trends of socio-economic progress have already started to reflect great changes in Earth-cycle trends as well (Steffen et al., 2011). The concept of intergenerational equity was raised to ensure that future generations are given equal resource opportunities (Dasgupta & Heal, 1974; Solow, 1974a; Solow, 1974b), while two paradigms of how to approach this have emerged.

Strong sustainability assumes that non-renewable resources may be substituted with renewable resources but a loss of natural capital cannot be substituted by other forms of capital (Daly, 1992). This is to say that the acquisition of advanced machines does not compensate for the deforestation of a certain land area. Given the urgent need to turn the current unsustainability of business practices and trade, environmentalists and ecological economists would plead for strong sustainability. Global goals would have to be aligned to prioritize the protection of natural capital to avoid resource abuse and risks of complete exhaustion, otherwise nature collapses with the society and the economy coming right after it (Michelsen et al., 2016). Indicators for strong sustainability often depend on physical measures such as total water use (Hüttler & Payer, 1994) and the like.

Entirely transforming the present economy immediately is not an easy task when the necessary implementation of strong sustainability concepts would lead to better practices for environmental protection but at the expense of the economic progress. A transition between the present situation and achieving strong sustainability is needed. Weak sustainability allows for resource depletion as long as other forms of capital replace it by a reinvestment into the economy. This concept is also called the "Hartwick rule" such that the depletion of one resource is reinvested into another form of capital into the economy (Hartwick, 1997). In this sense, Hamilton and Clemens (1999) frame the resource depletion as a "liquidation of an asset" (p. 334) that must be reinvested into the economy. This framework allows for businesses and nations to adapt to more sustainable practices without retracting the progress humanity has achieved through industrialization. This becomes especially important for developing countries which have yet to catch up to leading economies, but it reaches a point when natural capital cannot be substitutable by man-made capital anymore and this limit remains ambiguous (Boos, 2015).

## 2.2. Indicators of Sustainability

The main indicator used to proxy for human well-being and economic progress continues to be GDP, even when Kuznets (1934) himself as the formulator of the indicator, has explicitly mentioned that it will not do well in measuring development or welfare. The need to move forward from GDP by using an indicator that fits the goals of the 21st century must be realized. Hamilton and Clemens (1999) develop a model for genuine savings which may provide a common ground for policy makers and environmentalists to achieve sustainable development together. As a weak sustainability indicator, genuine savings allows for the substitutability of capital and sets monetary values as a standard of measurement of each capital form, and estimates national wealth as the summation of an economy's existing forms of capital. With the dependence of social well-being on total wealth, social well-being should be equal to genuine savings (Boos, 2015). Ferreira et al. (2008), using future consumption changes as a determinant of social well-being, test this theory and find (weak) evidence of genuine savings as an indicator of future well-being. They point out that capital stocks must be estimated better to improve genuine savings performance to gauge future well-being.

## 2.3. Green Accounting in the Philippines

Green national accounting is not new in the Philippines. In fact, it was one of the first countries to act on sustainable development from the Rio de Janeiro Earth Summit in 1992 (Bartelmus, 1999), but previous efforts on estimating sustainability were quite primitive until the estimations by the World Bank (2021a). Net domestic product (NDP) was already used at the time to account for the depreciation of produced capital from GDP and Bartelmus (1999) estimates an environmentally adjusted net domestic product (EDP) which also considers the costs of the consumption of produced and natural capital used in the production of goods and services. The results show that from 1988 to 1994, the trends of NDP and EDP converged, suggesting that Philippine development was becoming more sustainable. A second estimation of EDP that includes emissions and particulate damage showed similar trends as well. The EDP was an earlier form of green accounting and it did not include the environmental damage from other sources such as natural disasters. Literacy was also deemed to be "impossible to quantify in monetary terms unless one resorts to controversial methods of revealing and measuring individual preferences for these goals" (Bartelmus, 1999) which has later been substituted for national expenditures on education which would theoretically contribute to improving literacy rates.

## 2.4. Genuine Savings

The World Bank (2021a) has the widest scope of countries for genuine savings estimates, also called adjusted net savings, which is computed from gross national savings. Consumption or depreciation of fixed capital, net resource depletion, and carbon dioxide damage are then

deducted from gross national savings while public expenditure on education is added to it. Currently, resources taken into account by the World Bank are the following: timber, gold, silver, copper, iron, lead, nickel, phosphate, tin, zinc, bauxite, coal, crude petroleum, and natural gas. The scope of the World Bank's (2018) publication provides estimates for 120 countries with data reaching up to the 1970s.

A weakness of the current estimation of genuine savings is the calculation of resource rents (World Bank, 2006; 2011) and population growth (Arrow, 2003). Hamilton and Atkinson (2006), Dietz et al. (2007), and Hartwick (2003), and also find that it is a one-sided indicator which identifies unsustainability with negative values, but only gives signs of possible sustainability given a country's policies (Boos, 2015). Another caveat is that genuine savings assumes perfect competition as it uses world prices for resource rents and these may be different from its actual value when a depletion occurs since as one may recall from basic economic theory, a decrease in supply may cause an increase in prices given constant demand. Another weakness in its functionality that hinders genuine savings from replacing GDP is the lack of availability for long-run data. Recent research efforts have been progressing rapidly in estimating and testing genuine savings for the last century and even further (Rubio-Varas, 2007; Lindmark & Acar, 2013; Greasley et al., 2014; Oxley et al., 2014; Blum, Ducoing, & Mclaughlin, 2017), each of which have been able to infer the trends of sustainability through decades or centuries to be able to compare it to the present.

There is still room to improve estimations and theories supporting genuine savings, but it already goes a long way from using GDP as an indicator of economic development and growth. Its importance lies in bridging the gap between economic leaders, social- and environmental protectionists, businesses, and individuals to achieve sustainable development together.

### 3. The Philippine Context

In the waters of the Southeast Asian region lies an archipelago of 7,641 islands with over 108 million inhabitants full of rich and diverse cultures forming one nation. Despite its geographical location, the Philippines has a very westernized culture formed by its colonial past, resembling nations from the other side of the Pacific Ocean more than its neighboring countries. Remnants of the colonization period are still very present today and seep into the dynamics of the economy, especially in the aspect of government and education from the American period and the spread of religion from the Spanish period.

Currently, the World Bank reports that the Philippines has a large young population with a strong consumer demand. GDP growth has averaged 6.4% in the previous decade and has been transitioning from a lower middle-income country to an upper middle-income country just before the Covid-19 pandemic. The poverty headcount ratio at \$1.90 per day in 2011 PPP has been decreasing somewhat steadily but significantly from 13.7% in 2000 to 2.7% in 2018. Within the same time frame, the GINI coefficient has also improved from 47.7 to 42.3 which shows a better income distribution across the population. Total natural resource rents as estimated by the World Bank also show declining values over the past few decades while primary education completion has been doing relatively well in the last twenty years. Apart from the years of financial crises, trade has also been increasing greatly in the past years. Recent economic outcomes have been promising but it does not say much about how these indicators come together to show if the Philippines is developing sustainably.

Genuine savings estimates for the Philippines are available from 1977 to 2019 in the World Bank's Adjusted Net Savings database (2018). Four decades of data is impressive for a developing country such as the Philippines but data from the 1970s can barely give an idea about the progression of the Philippine situation through history. The twenty-year dictatorship of former President Ferdinand Marcos, which is a highlight in recent Philippine history for the accelerated progress of public infrastructure funded by foreign debt, an inflationary crisis leading to martial law, and the oppression of the Filipino people, started in the mid-1960s. Boosting the current economy has not just been a struggle for economic development but is also a struggle to free itself from the consequences of the Marcos dictatorship. In this sense, the analysis of sustainable economic development in the long run must cover the years preceding this dictatorship to have an idea how the Philippines has been developing in earlier years, how the shock of not only the Asian financial crisis of 1997 and the Great Recession in 2008, but also the turbulent times of the Marcos era.

A brief overview is presented to give context to the results of the estimation of Philippine genuine savings throughout the 20th century. The historical narrative aims to highlight the aspects that may contribute to the components of genuine savings such as foreign and domestic capital investments, national education, natural resource extraction, fossil fuel emission, and national or international policies that may have contributed to the trends of the indicator through time.

### 3.1. Spanish Colonization Period, 1521-1898

The analysis of Philippine genuine savings from 1902 would be biased without some context from the years directly preceding the beginning of the dataset. It was the year the Americans took over the Philippines from 333 years of Spanish governance which, as will be seen later on, caused considerable changes in national investments for education and possibly for other aspects as well.

From the Westerners' discovery of the Pacific Ocean and the first documented circumnavigation of the world, Ferdinand Magellan along with five ships arrived in the Philippines in 1521 with the objective to spread religion, find resources, and expand the Spanish empire. Up until the 18th century, there were no major changes in the political and economic aspects of pre-colonized Filipino life apart from changes from communal to individual land ownership and some new crops and techniques for agriculture (Pearson, 1969). While few minerals present in the Philippines were imported from South China and Malacca, the only mineral discovered and mined locally at the time was gold (Kroeber, 1928).

Forestry and mining had their own government body and recorded Philippine forests and mines from the 19th century. Some evidence shows that the Spanish government invested in the management of natural resources in the Philippines, possibly as if they treated Philippine resources as their own which they would need to protect, but evidence of an exploitation of resources for the residents of Madrid has been found in the Sevillian archives as well. These characteristics may have contributed to the relationship of the Filipino people with their natural resources leading up to the arrival of the Americans.

Tribal tutors who led pre-Hispanic education were replaced by Spanish missionaries who prioritized the spread of religion and catered only to the elite until the Educational Decree of 1863 which provided free primary education for boys and girls and mandatory instruction of the Spanish language (Department of Education, 2021). The better educated elite or *ilustrados* with more financial capacity sent their children to Europe to harness their skills and return to the Philippines to contribute to national progress. Meanwhile, the rest of the Filipino people impoverished by taxes, colonial exploitation, and limited opportunities for a better standard of living, simply submit to their dominance and control in both economic and intellectual aspects, as reported in the fourth volume of the Annual report of the Philippine commission (1903). It was reported in the same document that the missionaries who provided education at this time were "hostile to the enlightenment of the Filipino," (p.697) and hindered the Filipino people from leading their own people, pacifying them under Spanish leadership, which meant the poor were kept in their place through the education the Spaniards provided. This goes to show that investments in education are likely to be lower than it was in the beginning of this study's dataset in 1902.

Just before the Americans came into Philippine history, relations were not well between the Filipino and the Spanish after three centuries of colonization, as the Spanish government

refused the request of the Filipino for colonial government reformation. Not long after, the Spanish-American war broke out in 1898 with the explosion of USS Maine which resulted in Spain's defeat and the loss of their colonies to the United States, including the Philippines. Albeit Philippine independence is celebrated in 1898 on the 12th of June, events succeeding it only turns out to be a change in colonial powers.

## 3.2. American Colonization Period, 1898-1946

### 3.2.1. Changes in Power

With the changes in colonial powers, the Americans were not welcome as independence movements against Spanish colonization were strong and ongoing. A three-year war against the Americans followed the signing of the Treaty of Paris for the right of self-government. Although the Philippine-American war was ongoing, a commission to investigate the Filipino lands and people pushed through, wherein the final report of four volumes in 1900 stated that the Philippines is not ready for independent self-governance in the short term (U.S. Office of the Historian, 2018). This report set the tone of American governance over the Philippines such that the Americans were present to guide Filipinos towards a path of independence and were to be granted independence upon achieving some benchmark decided by the American government. Conveniently for economic historians, this report also contains extensive descriptive data and narratives on the situation of the Philippines at the time.

The U.S. declared their victory and claimed the Philippines as an American protectorate by the Philippine Organic Act of 1902. A second commission was led by W. H. Taft for the introduction of government institutions, the establishment of a civil service, the enactment of currency and tax programs, and the need for public infrastructure, educational reform, and capital investment (Stanley, 1974). The recommendations of Taft were implemented by the McKinley administration and a temporary civil government was placed in the Philippines to be replaced by a larger government body later on. It jump-started and boosted national investments, especially in human capital, and the Philippine Peso was also officially pegged to the U.S. dollar (two Philippine pesos to one dollar) until 1959. Although the Philippines had some sense of autonomy, U.S. authority was maintained by allowing the appointment of two Filipino representatives in Washington, also approved by Taft (U.S. Office of the Historian, 2018). These historical progressions pushed the Philippine economy forward through savings and investments and are crucial to its stability throughout the 20th century.

### 3.2.2. Road to Actual Independence

The Philippines was governed by the U.S. Insular Government from its annexation up until the mid-1930s. Brown (1992) notes however, that most literature on the Philippine economy states that the events in the United States did not directly affect the Philippine economy. The only effect Brown (1992) points out is that of the Great Depression as it gave the

United States a reason to give more power to the Philippines over itself since they had greater issues back home. Despite the establishment of the Commonwealth of the Philippines in 1935 leading up to actual independence in 1946, the economy was still dependent on the U.S. in succeeding years due to the Bell Trade Act of 1946<sup>1</sup> which required the Philippines to give preferential tariffs on imports from the United States, the continuation of the (2:1) fixed exchange rate, parity rights to Philippine natural resources, and no restrictions of currency transfers between the Philippines and the United States (Dolan, 1993). In exchange, the U.S. would provide war reparations to the Philippines. The act was eventually revised in the 1950s.

The U.S. was greatly involved in the recovery of the Philippines from World War II as its failure may cause a threat to the American position or prestige in the Pacific (Ventura, 1966). The Philippine-American relations following the world wars may have actually been key to the stability of the Philippine economy. The negative effects of the Second World War may have been much greater if the Philippines were not aided by the United States.

### 3.2.3. American Education

One of the most valuable contributions of the American colonization in the Philippines is the spread of mass education. Although public education existed in the Philippines since 1863, education was limited, suppressed and inadequate (Department of Education, 2021). Decades before the arrival of the Americans in the Philippines, mass education was flourishing in the West with Prussia spearheading the movement. The U.S. caught up to this trend in the mid 19th century, surpassing other global superpowers including Prussia, England, and Germany (Goldin, 2016). With an established public education system in place, the U.S. is not new to spreading education to further lands and mass education was, almost naturally, applied to the Philippines. Ships of American teachers were brought to the Philippines as early as 1901. The education system erected in the early 20th century is one “not essentially different from that developed in the United States” (Counts, 1925; p. 97). Because of this, the Philippines consistently led primary school enrollment rates in the Southeast Asian region by large margins. Table 1 shows the extent of the differences between the enrollment rates in the Philippines as compared to its Southeast Asian neighbors and the rapid progress through the early decades of the 20th century.

Table 1. Primary school enrollment rates in Southeast Asia, 1900-1940

Country	1900	1910	1920	1930	1935-1940
Burma	11.5	11.8	10.3	13.4	13.3
Indochina	0.5	1.0	2.8	6.9	10.8
Indonesia	2.5	7.0	7.0	12.2	13.3
Malaysia		7.5	8.9	19.4	24.6
Philippines	19.3	28.4	35.8	32.4	44.8

Source: Bassino and Williamson (2017; p.272, Table 7)

<sup>1</sup> See M. Cuaderno (1952) for an in-depth discussion of the Bell Trade Act and the Philippine Economy.

These investments in education play a role in the accounting for sustainable development as a type of human capital formation. In particular, it contributes to the current estimation of genuine savings since public expenditure on education is still the most widely used indicator for national investments in human capital.

### 3.3. Philippine Independence, 1946-present

#### 3.3.1. Transition into Independence

The Bell Trade Act which funded war reparations lasted until the mid-1956. The protectionist take of Cuaderno (1952) on summarizing the issues with this agreement between the Philippines and the U.S. especially given the economic framework of the Philippines at the time is not negligible. In addition to the fixed exchange rate of the peso to the dollar, the Philippines is a net importer with more than 70% of its imports coming from the United States. Given the parity rights from the Bell Trade Act, the economic loss of the Philippines from this act is equal to the supposed tariffs from its imported products which may have been an addition to national revenues. On the other hand, the stability of the Philippine economy may not have existed if these diplomatic relations did not occur. Years after the supposed independence of the Philippines from the United States, the Philippines has had to depend on its previous colonizer's market in exchange for stability from post-war damages, so much so that the Philippine market would be affected if any major shock were to hit the U.S. economy (Cuaderno, 1952). Fortunately contradictory to this, recessions in the United States in the beginning and end of the 1960s are not reflected on Philippine national savings, probably because of consistent reinvestments in recovering the Philippine economy to pre-war years. The Laurel-Langley Agreement replaces the previous arrangement to favor the Filipino people. The 2:1 fixed exchange rate has been lifted and the preferential tariffs for U.S. imports and Philippine exports have been adjusted to satisfy both parties. Suhrke (1975) discusses the events leading up to the end of the Philippines' intimate relationship with the United States. The Laurel-Langley Agreement was set to expire in 1974 and was not renewed or replaced with a similar treaty. National savings continued to increase steadily, which genuine savings greatly depended on and would go to show that Philippine economic development remained sustainable due to high levels of savings and investments.

By the early 1970s, the Marcos administration was already on its second term and it has taken a nationalistic position as it announced ending foreign property rights equal to those of Filipino nationals. Former President Ferdinand Marcos declared martial law at the end of his second term in 1972. The Philippines also prepared for the termination of the Laurel-Langley Agreement by applying for membership with the General Agreement on Tariffs and Trade (GATT) in 1973. It diversified foreign policy and steered away from a dependency on the United States, but much is yet to occur with the Marcos dictatorship.

### 3.3.2. The Marcos Administration

The Marcos era is a very controversial period in Philippine history because of the corruption, cronyism, plunder, and violation of human rights. Further criticism of the dictatorship will be reserved from discussion as it is a complex issue that remains unresolved in today's society. Sicat (2011) provides an analysis of the legacy of the administration, independent from the political mistakes of the dictator out of self-interest, and shows that significant economic accomplishments have been made. Some of these accomplishments include government reform, major infrastructure projects, industrial and trade reforms, agricultural and rural development reforms, foreign economic relations, and investments in rural social welfare. These accomplishments should have translated into an acceleration of investments in the Philippines which would have boosted economic growth by a great margin, but have totally turned around when the effects of the oil crises in the 1970s have risen. The government has been able to suppress the effects of the first oil crisis in 1973 as major infrastructure projects have been continued. It wasn't until the second oil shock a few years later when the Philippine economy collapsed due to large current account deficits, extremely high external debts, low commodity prices, and low trade exports.

The 1980s was a tough decade for the Philippines with the political crisis resulting from the assassination of one of Marcos' opposition leaders in 1983, a series of public demonstrations in 1986 to overthrow President Marcos from his 20-year presidency, and two attempts of military coups. The economic effects of the oil crisis and the decade of civil unrest were so great and it will be a recurring topic throughout the analysis of long-term genuine savings data. A further examination of the economic progression of the Philippines with respect to genuine savings will be discussed as each of the components are raised in the succeeding chapter.

### 3.3.3. Recovery Period

After the sudden recovery from the Marcos administration, the trend of savings was as if it simply continued the trend from the pre-oil crisis shocks. The Philippines was resilient to the Asian Financial Crisis of 1997 because of the strong and efficient economy which preceded the crisis, in addition to a large inflow of remittances from temporary and permanent Filipino migrants. Exports were growing rapidly, the financial system was able to cushion market volatility, investments were placed on productive sectors, and most especially, the said remittances cushioned the interest payments for external debt (Mijares, 1999). This, in turn, contributed to the sustained levels of genuine savings in the Philippines.

The succeeding government at the turn of the 21st century was taken over by former President Gloria Macapagal-Arroyo. The Arroyo administration lasted almost a decade and was filled with corruption and political scandals but the economy was kept relatively stable even through the Great Recession of 2008 (Batalla, 2016). The positive contributions of this administration followed through the next few years as the following administration has been able to focus on pro-poor growth. The recent years in the Philippines have been dedicated to inclusive growth with the current government's socio economic agenda, focusing on the maintenance of

current macroeconomic policies, investments in human capital through health and education and the development of agricultural and rural enterprise productivity, to name a few (Presidential Commission for the Urban Poor, 2016).

## 4. Data and Methodology

The components of genuine savings data in this study consist of net national savings, education expenditure, and natural resource depletion, including CO<sub>2</sub> damage. Two price levels for CO<sub>2</sub> are used for reporting genuine savings values. This composite data is then transformed to include fishery rents to improve the scope of the resource rents, and TFP to account for technological progress through time.

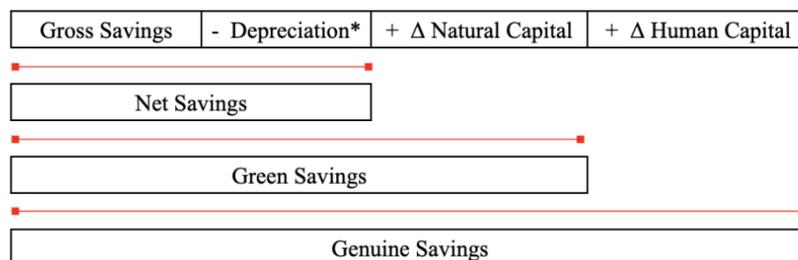


Figure 1. Visual representation of Genuine Savings (Barbier, 2015)

Hanley, et al. (2015) summarizes the studies which estimate genuine savings up to its own publication year. Generally, the indicator is calculated as seen in Figure 1 while some studies have added components to adjust for pollution, population growth, total factor productivity, trade, or some combination of these, genuine savings is simply net national savings adjusted for natural resource depletion or environmental degradation, and investments in human capital.

In this study, data for the Philippines is collected for each of the aforementioned components. It is then compiled in a single dataset for the estimation of genuine savings as seen in Figure 1, and a long-run analysis is made out of the created time-series data. It follows from Blum, Ducoing and McLaughlin (2017) on their contribution to extend datasets of 11 countries throughout the 20th century while incorporating TFP and using proposed values as an upper- and lower-bound to social costs for carbon emission (Pezzey & Bourke, 2014). This methodology also greatly depends on the World Bank's manual for calculating adjusted net savings (Bolt, et al., 2002) as a framework for its estimation. To understand the trend of the genuine savings data, each of the components will be discussed and analyzed in this section.

### 4.1. Net National Savings

Net national savings is defined as the gross national savings minus the depreciation of physical assets or more commonly known as the consumption of fixed capital (eq. 1). Through economic theory, one can derive gross savings from GDP estimates and component estimates in

two ways. The first being the deduction of consumption from income (eq. 2), the second as the deduction of net exports from the investment share (eq. 3).

$$\text{Net National Savings} = \text{Gross Savings} - \text{Consumption of Fixed Capital} \quad (1)$$

$$\text{Gross Savings} = \text{Income} - \text{Private Consumption} - \text{Public (Government) Consumption} \quad (2)$$

$$\text{Gross Savings} = \text{Investment} - \text{Net Exports} \quad (3)$$

Gross savings have been calculated in this study using both methods, with data derived from Hooley (2005) which presents GDP estimates from 1902 to 1990 along with its components. Net export values have been derived from Federico and Tena (2016) for data until 1938 and several annual yearbooks by the Philippine Statistics Authority. Both estimates produced equal values. The same procedure has been attempted using World Bank (2021a) estimates for income, consumption, and investments to produce values using a consistent methodology from 1960 onwards. However, outputs of neither equation 2 nor 3 matched the previous estimates using Hooley (2005) data nor the World Bank's estimates for gross savings. Neither did values for equation 2 and 3 match each other. A second attempt using net export data from World Bank has been done for equation 3 and has resulted in more similar estimates for equation 2 using World Bank data but still have differences too large to connect to estimates using Hooley (2005) and Federico and Tena (2019) which are extremely valuable on its own for providing gross savings estimates for 75 years predating World Bank's current gross savings dataset for the Philippines.

Consumption of Fixed Capital has been derived from the Penn World Table for 1950 to 2019. A depreciation rate of fixed capital has also been derived from the Penn World Tables for the same time period. Over five decades, the difference of the smallest and largest values of the depreciation rate in this time period amounted to 1.47% while the change in depreciation rate from 1950 and 2019 has only equaled 0.91%. With these small changes, the depreciation rate has been interpolated backwards to 1902 and has been applied to the investment share also derived from Hooley (2005). The investment share may include non-fixed capital, hence the trend of these estimates have been applied to the readily-available consumption fixed capital data from the Penn World Tables from 1950 upwards, assuming that the trend of fixed capital investments follow the trend of total investments.

Upon adding the gross savings values derived from Hooley (2005) and Federico-Tena (2019) earlier and consumption fixed capital values from the Penn World Table with backward interpolation, net national savings values from 1902 to 1990 have been achieved. However, out of unsuccessful attempts to derive a consistent value for gross savings using World Bank data, the researcher relies on the previous research done by the World Bank on adjusted net savings and takes the net national savings component as a well-established and better estimate of the said component. Indices made for both net national savings estimates (see Table A.1.) show similar

trends and the World Bank estimates have been interpolated backwards using the trend from Hooley (2005) and Federico-Tena (2019) estimates, with a 1985 benchmark. Much attention will be given to the analysis of the dynamics of this component as it is the main foundation of the genuine savings indicator.

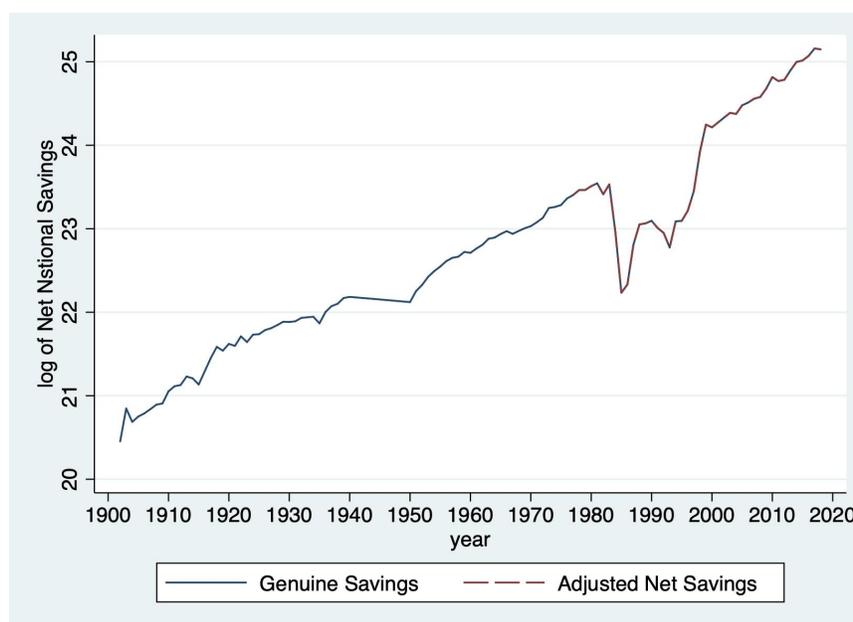


Figure 2. Net National Savings (log)

As can be seen in Figure 2, the net national savings from 1902 have increased steadily with some fluctuations. From the establishment of the American government after their victory from the Philippine-American war, the Philippines was then incorporated into the U.S. Insular Government led by American governor-generals until 1935, and was under the orders of the President of the United States. In this regard, the events in this time frame may have been closely linked to the simultaneous events in the United States.

From the mid-1910s to the mid-1920s, fluctuations in savings occurred which coincided with World War I going on at the time. Although the United States remained neutral in the first years of World War I, they eventually declared war against Germany in 1917. Years after the adjustment period from the effects of war, the average savings growth rate declined from 5.75% in 1903-1913 to 2.90% in 1924-1934. The Great Depression of the 1930s in the United States is not a major factor in the dynamics of the Philippine economy except for the support it coincidentally provided for the eventual inauguration of the Commonwealth of the Philippines in 1935 (Brown, 1992).

Estimated values for the 1940s have been linearly interpolated because of the scarcity of available data during the war years. It may be the case that these values overestimate true values due to capital loss from the war. With Philippine independence came the Bell Trade Act of 1946. In exchange for the conditions given by the U.S., the Philippines was aided with war reparations

which may explain the smooth transition and steady recovery of the Philippine economy in the years succeeding the transition into full independence and World War II.

The oil shock of 1973 does not reflect itself on Philippine net national savings because the Philippines benefitted from a worldwide increase of commodity prices wherein Philippine terms of trade also increased by 13%, but only served as a lag for what was yet to come (Dohner & Intal, 1989). The Marcos administration continued its expansion of fiscal policies, doubling the share of government expenditures on domestic investment. The Philippines' economic advisers had been confident that the economy would be able to adjust to external price changes, hence did not halt previously-planned operations. The effects of the expansionary fiscal policy were reflected in the current account deficit but was not regarded as an issue since the deficit was simply funded by foreign aid and direct investments. This external debt was well-managed throughout the 1970s since exports and gross national income were sustained at high levels (Dohner & Intal, 1989).

The second oil crisis in 1979 at the dawn of the Iranian Revolution caused a rapid deterioration of the Philippine economy, which the government responded in a similar manner to the previous oil crisis – increasing government expenditure. With the already-large current account deficit and the accumulated external debt of the Philippines from the previous years, the economy was not able to avoid the effects of the second oil crisis. The consideration of a moratorium was delayed an additional year as Marcos refused to have the Philippines compared to the national debt situation of Latin American countries, which intensified the severity of the following adjustment period. To name a few, there was an extreme shortage of foreign exchange, investment values were halved, GDP per capita reverted back to its level a decade earlier, and inflation rose up to 50% and was only pacified by monetary policy (Dohner & Intal, 1989).

The net national savings values dropped and fluctuated until the mid-1990s where savings started to accelerate again. By the beginning of the 21st century, the trend continued from its early 1980s level and has steadily increased since to the present as if the last two decades of the previous century did not occur.

## 4.2. Education Expenditure

The second component of genuine savings is one on human capital formation. Public expenditure on education remains to be the leading proxy for national investments in human capital. The choice of proxy in itself poses limitations previously identified by the World Bank which will be discussed in more depth in Chapter VI. Three data points have been found for education expenditure in the 19th century. The 1885, 1897, and 1899 values have been derived from<sup>2</sup> *Guia Oficial de Filipinas 1885*, Sawyer (1900), and Taylor (1971) respectively, and

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<sup>2</sup> This particular set of data may be found in similar references but are generally unavailable online and inaccessible during the current pandemic. For this reason, these three values are only used to contextualize the increase in

reported in Corpuz (1997). Data for the first quarter of the 20th century are collected from two sources. The first source by the Philippine Board of Educational Survey in 1925 on the educational system of the Philippines (Monroe, 1925), the second source by the Bureau of Education, later called the Department of Public Instruction, on annual reports regarding education in the Philippines. The data for the second quarter of the century were derived from more general reports of the United States High Commissioner to the Philippine Islands to the President of the United States.

Government expenditure data on education in the second half of the 1900s to the present are inconsistent. UNESCO provides data for Philippine expenditure on education for the years of 1980 to 2009 with some missing values which have been filled by linear interpolation. An assumption is made that the fluctuations between 1980 and 1995, where there has been particularly spotty data, has had a steady increase through time.

While education expenditure is not completely available, information about the government budget on education is completely available from 1951 to the present. Presented values for education expenditure, when available, are generally higher than reported values for the budget. In any case, an index to compare the trends of education expenditures and budget for education have shown to be very similar in value (see Figure A.2.), hence the available education expenditure data has been interpolated to match the trend of the budget on education for 1951-1979 and 1996-2020.

In Figure 3, we see that the public expenditure on education is boosted by the U.S. Insular Government is noticeably greater than investments in education in the last years of the previous century. The source of the data from 1908 to 1923, a document by the Philippine Board of Educational Survey (1925), does not explicitly mention the reason for a drop in education expenditure from the first to the second decade of the 20th century but may be due to two possible events. The first may have been an anticipation of the effects of World War I, while the second may have been due to an influx of Filipino migrants to the United States in the same period. Most of the migrants in this time were unskilled workers recruited to tend to the growing agriculture industry in the west coast and in Hawaii. There is a caveat to the second presented possibility: migrants at this time also consisted of Filipino students subsidized by the government to be educated in the U.S. but the expenditures for this subsidy are not clearly reported in the source of the education expenditure data from 1908 to 1923. Counts (1925) provides an overview of Education in the Philippines since the arrival of the Americans and comments that there has been a slowdown in the growth of education but funds were devoted to improving what had already been set from the previous period. He cites that the Three-Million-Peso Act is responsible for the reacceleration of the expansion of education after 1918.

In the interwar years, although still increasing, seemed to have slowed down or even stagnated relative to the years that came before and after it. Interestingly enough, some data was found around the war years, from an annual report (Department of Public Instruction, 1937) and

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education expenditures from the last few years of the Spanish colonization period to the American colonization period when education was boosted.

messages to the President of the United States (United States High Commissioner to the Philippine Islands, 1941; 1947). This gives a clearer idea of government spending during the war years than just simply interpolating through the 1940s. More fluctuation is seen in the latter decades probably in relation to the debt crisis of the 1980s as well, but the overall trend is increasing nonetheless.

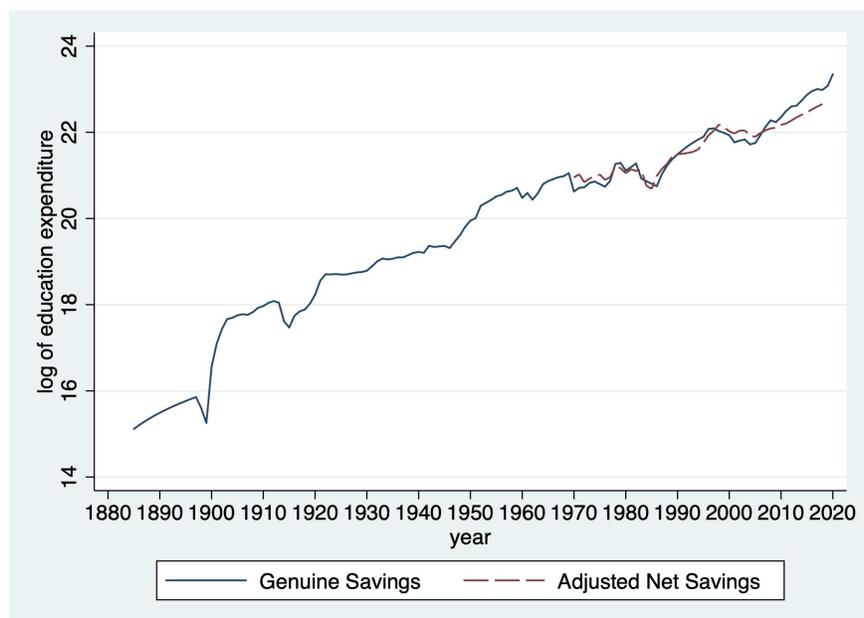


Figure 3. Education expenditure (log)

The education expenditure data of the Adjusted Net Savings database generally matches this study's estimates for the relevant time period which have been derived from trends in the government budget for education applied to spotty data from UNESCO Institute of Statistics (2018).

Like the education expenditure data, the resource rents of this dataset generally match the trends of the Adjusted Net Savings data. The resource rent level first swells around the 1940s to the 1950s which corresponds to probable damages from World War II. A second swelling of figures happened around the 1970s to the 1990s. The early 1970s may have been due to the large export volumes of primary commodities and high international commodity prices, especially those of copper, log, sugar and coconut (Dohner & Intal, 1989). Resource rents swell a third time in the first two decades of the 21st century.

These values are to be interpreted with caution and as a large overestimation of human capital in the Philippines. Despite these impressive levels of education expenditure, returns on these expenditures have been disappointing with the Philippines receiving one of the lowest scores on the Programme for International Student Assessment (OECD, 2019) which will be discussed further in the succeeding chapters.

### 4.3. Resource Rents

The World Bank accounts for Forestry, Minerals, and Energy rents and an estimation of CO<sub>2</sub> costs. This study contributes an addition of Fishery rents to the natural resource depletion component of its genuine savings estimation. In Figure 4, it can be noticed that trends with adjusted net savings' summation of resource rents are identical to that of the genuine savings in this study but are also slightly less costly in general. This undervaluing of natural resource depletion and environmental degradation is a common theme in the World Bank's estimation of adjusted net savings. This is not to say that the estimations in this study perfectly value resources, but to point out that the World Bank must improve its costing strategy to better reflect the social cost of environmental degradation in line with the urgency to mitigate climate change and global warming.

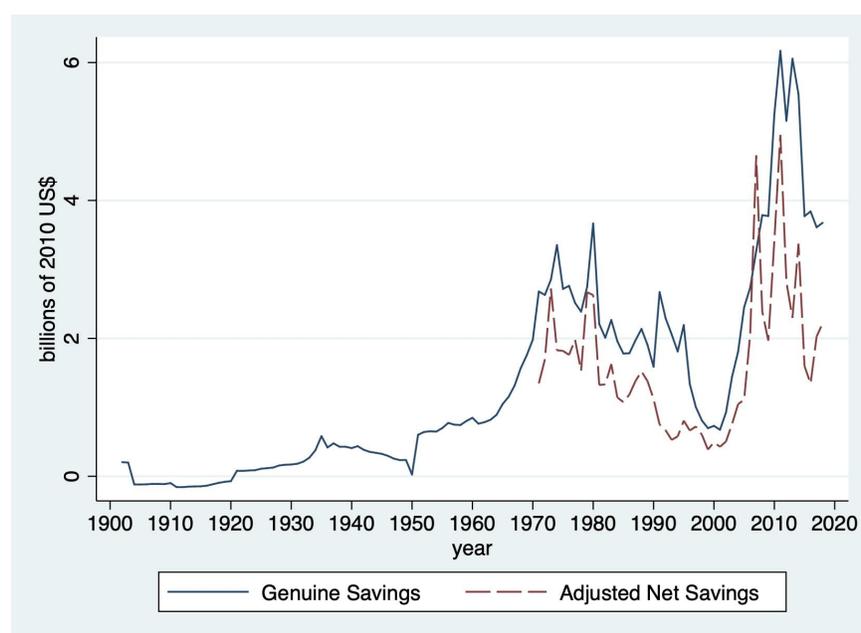


Figure 4. Resource Rents

#### 4.3.1. Forestry

For the calculation of Forestry rents, the change in amount of wood has been derived from the change of national forest area, multiplied to the forest volume in cubic meters per hectare as reported by the Food and Agriculture Organization (2000). This change in the amount of wood is then multiplied to the timber market price as reported by FAO (2010) and Forest Research (2021) with linear interpolation to fill in the data for missing years. Forest rents peaked in the 1970s and again around 2010.

Data for forest land in the Philippines have been collected from multiple sources. Two data points have been found for 1876 and 1890 from special reports of Captain George P. Ahern (1901) who was in charge of the Forestry Bureau at the time. Some more points in the first half of the 20th century have been found in the Annual report of the Director of Forestry (Bureau of Forestry, 1935) and from Bautista (1990) for a study on the forestry crisis in the Philippines. Values for the latter half of the century have been retrieved from Uitamo (1996), the Philippine Forestry Statistics throughout 1990 to 2018, and all other missing points have been interpolated.

It is important to note, however, that the component of resource rents in the genuine savings indicator is a monetary estimate based on the prices of the resource. In Figure 5, one can see a major spike in the prices of timber in the same time frame as the first and second swelling of values on Figure 4. The National Statistical Coordination Board (1998) describes in the summary of economic accounts that forest conversion and other volume changes occur despite a continuous decrease in forest depletion. One cannot directly infer the condition of a country's natural resources through its rents as it may be subject to the changes of the resources' price level. A non-changing level of depletion may simply follow the trend of prices despite no changes in actual resource extraction.

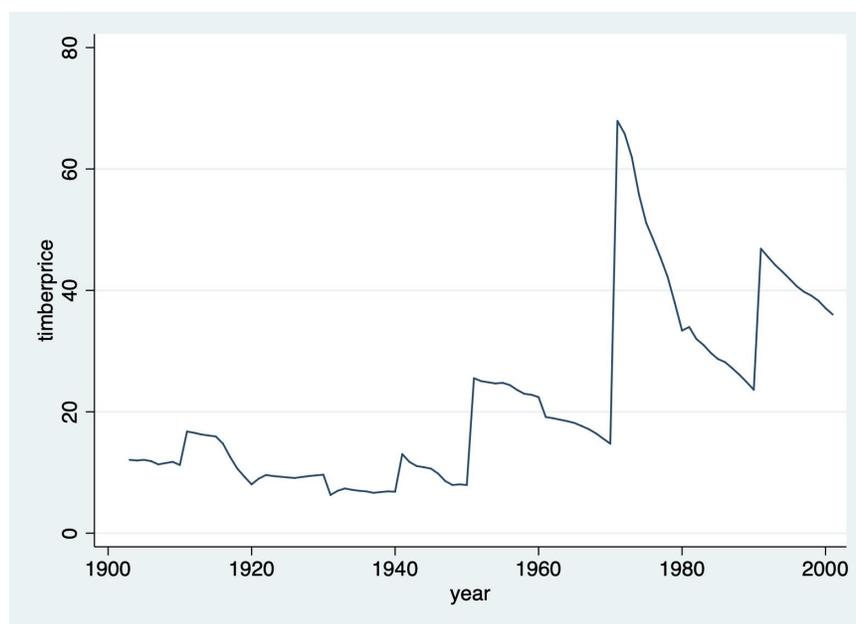


Figure 5. Timber prices, 1902 to 2000

The World Bank (2021a) estimates forest resources, specifically timber, by taking “the present discounted value of rents from the production of roundwood over the expected lifetime of standing timber resources” (Lange, et al., 2018; p. 213) where the interest rate used is assumed to be 4%, given the lifetime of timber resources. In this study, the forestry rent is computed such that the average forest volume is multiplied to the change in forest area, and again multiplied to timber prices per year to achieve the monetary value of forestry depletion.

Deforestation in the Philippines has been severe as what once was 70% forest area out of the total land area in 1900, declined to 50% in 1950 and to less than 19% in 1990 (Kummer, 1992). The forest area has been increasing after 2010 by a little over 3% (FAO, 2015) due to the National Greening Program implemented in 2011. A word of warning for future researchers regarding discrepancies in reporting of forestry values in the Philippines. In Uitam (1996), the differences in the land classification used in the Philippines and by the FAO is briefly mentioned, such that the incompatibility stems from Philippine statistics classifying forest land as the remaining land which has not been declared as “alienable and disposable”, whether or not the land has trees in it (Umali, 1981).

#### 4.3.2. Minerals and Energy

The Montevideo Oxford Latin American Database’s (MoxLAD, 2014) compilation of mineral prices have generally been used for the minerals accounted for in this study, particularly for copper, lead, silver, zinc. Other common minerals such as tin and bauxite are not produced in the Philippines. Gold prices have been collected from the National Mining Association (2021) and the World Bank (2014), and iron ore prices from the U.S. Geological Survey (2014).

Most of the data collected for mineral production has been taken from the earlier version of the previously mentioned statistical yearbooks, also called the Philippine Statistical Bulletin digitized and readily available online from the Southeast Asian Development in the Long Term (SEADELT), a collaborative effort by the Lyon Institute of East Asian Studies, Huma-Num, and the French National Center for Scientific Research. Other sources of mineral production data have been derived from Domingo (1993) and Cutshall (1942). Values for mineral production from 1902 to 1907 have been relatively small and have been interpolated backwards using the average growth rate from 1907 to 1912. The choice of minerals follows after the World Bank (Lange et al., 2018) but lead, tin, and bauxite were not produced in the Philippines in significant or in any amount hence have been excluded from the study.

Additionally, the labor costs of mineral production have been incorporated in mineral rents. The average wage of laborers has been taken from the International Labour Organization (ILO, 2020), the Philippine Bureau of the Census and Statistics, Philippine Statistical Yearbooks and Bulletins. Some data for recent years have been found on the average wages of employees in mining and quarrying. An assumption that the ratio of the average wages of mining and quarrying employees and the total average wage is maintained is made for the backwards interpolation of unavailable data for earlier years. This average wage of mining and quarrying employees is then multiplied to the number of employees in the said sector to be accounted for in the estimate of mineral rents as a cost for the labor invested in the production of minerals.

Energy production is limited to the production of crude petroleum and natural gas. Prices for crude petroleum have also been taken from MoxLAD (2014), while prices for natural gas were compiled from the U.S. Energy Information Administration. Crude petroleum was first discovered in the Philippines in 1896 but widespread exploration was only done in the latter half

of the century. Even then, the first significant oil find was only in 1975 (Reyes, 1997) after the “Oil Exploration and Development Act of 1972” was enacted. Crude petroleum production data is taken from the U.S. Energy Information Administration for 1980 onwards, taking the word of energy experts that oil production in the Philippines was barely significant throughout most of the 20th century. Natural gas was also just discovered in the Philippines in 1989 and values of its production were only reported from 1994 onwards by the Philippine Department of Energy (2021b) and only made significant production in the second half of the 2000s.. Since the discovery of natural gas is just five years before the earliest value reported, the values from 1989 to 1993 have been interpolated using the average growth rate of natural gas production from 1994 to 1999.

Going deeper into the resource rents component, Figure 6 shows some dominance of minerals and energy production in accounting for natural resource degradation over the forestry rents. The increases in mineral rents in the latter half of the century are due to increased mineral production volumes and prices, specifically in gold, silver and copper.

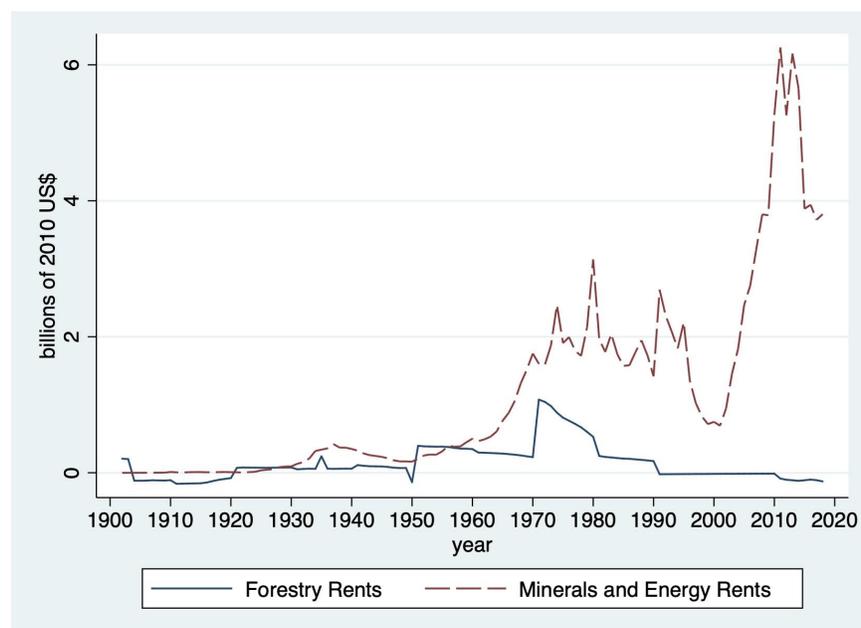


Figure 6. Forestry, Minerals, and Energy rents

#### 4.3.3. Carbon Emissions

Total fossil fuel estimates from 1907 are also available for the Philippines retrieved from Boden, et al. (2017). The CO<sub>2</sub> emissions for 1902 to 1906 have been set to zero due to very low emissions from the first decade of reported values ranging from 1 to 15 kilotons of carbon emissions compared to the thousands of kilotons of carbon emissions from the 1950s onwards. The Boden et al. (2017) dataset ends in 2012 for the Philippines but the Global Carbon Atlas (Friedlingstein et al., 2020) has carbon emission estimates until 2019. Also by creating an index

for 2012 as previously done for gross savings and education expenditure, the trend of the Global Carbon Atlas estimates has been followed for the remaining years until 2018.

The trend of carbon emissions as can be seen in Figure 7 shows that there have been fluctuations in the carbon emissions of the Philippines in the early 20th century. A steep increase occurred after the war years and has then been increasing at a steady rate until a slight drop in the 1980s and a stagnation in the 2000s. Apart from the effects of war and civil unrest, the stagnation of carbon emissions in the 2000s may be attributed to environmental protection laws from the late 1990s through the 2000s.

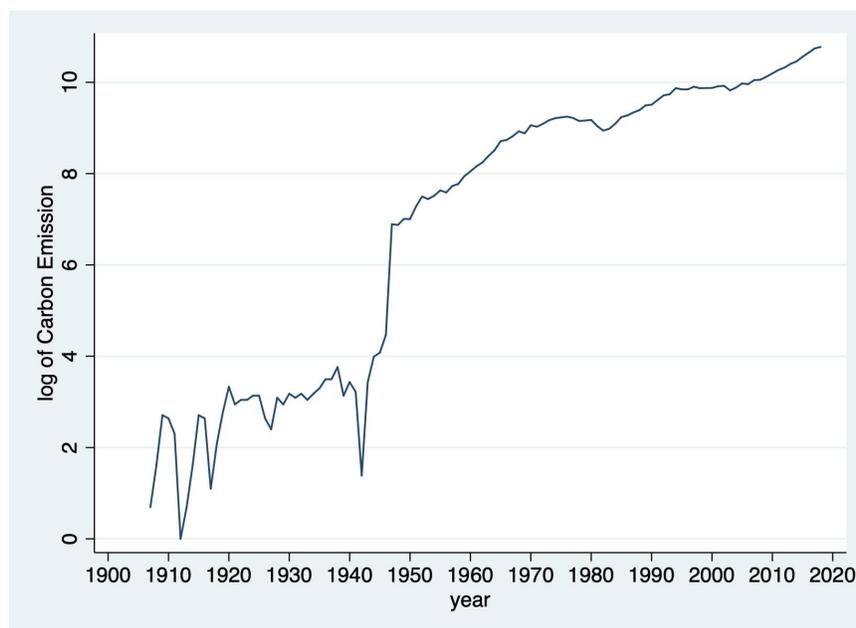


Figure 7. Carbon Emissions (log)

There is a lack of a consensus on a consistent price for carbon emissions. The social cost of carbon emissions has been estimated by the IWG (2010) using a discount rate of around 3% to adjust for the changes in its value through time while correcting for inflation and the emission year. A major revision to the social cost of carbon has almost doubled in 2013. On the other hand, a working paper by Tol (2021) illustrates that the social costs of carbon do not increase as we know more about the effects of carbon emissions on climate change based on a meta-analysis of its published estimates. Pezzey and Bourke (2014) has identified two estimates of the social cost of carbon when it is controlled versus when it is uncontrolled by using a Dynamic Integrated model of Climate and the Economy (DICE) model. The estimated social cost of carbon is then applied to adjusted net savings, and for this reason, the study uses the same estimates as Pezzey and Bourke (2014). A lower price index of \$131 per ton of carbon emissions assumes that emissions can be controlled so that global warming can be kept to 2°C, while a higher price index of \$1455 assumes that carbon emissions are not controlled. These carbon prices may show the path of the outcomes of genuine savings estimates when green policies such as carbon

emission controls are implemented, and if the Philippines is developing sustainably, given its carbon emission levels.

#### 4.3.4. Fishery

Finally, fishery rent is an additional component for the genuine savings estimate in this paper as it has not been incorporated into the adjusted net savings estimate of the World Bank (Lange et al., 2018). Fishery in the Philippines is an integral part of society, being an archipelago with access to some 2 million square kilometers of marine water area (FAO, 2014). Fishery rents have been computed similarly as mineral rents. Fish production and the value of total produced fish are reported in the Philippine Statistical Yearbooks from 1946 to 2019. The average wage of laborers in the fishing industry is only available for some recent years, while earlier reported average wages for fishing are combined with the wages of laborers in agriculture, forestry, and hunting. While this average labor cost is mixed with other laborers from a different industry, wages for work in agriculture, hunting and forestry also contribute to natural resource degradation. Furthermore, the average wage of fishermen does not deviate too far from the average wage of all laborers in agriculture, hunting, forestry and fishing, hence the latter estimate is used for the labor cost of fishery multiplied to the number of laborers in the fishing industry.

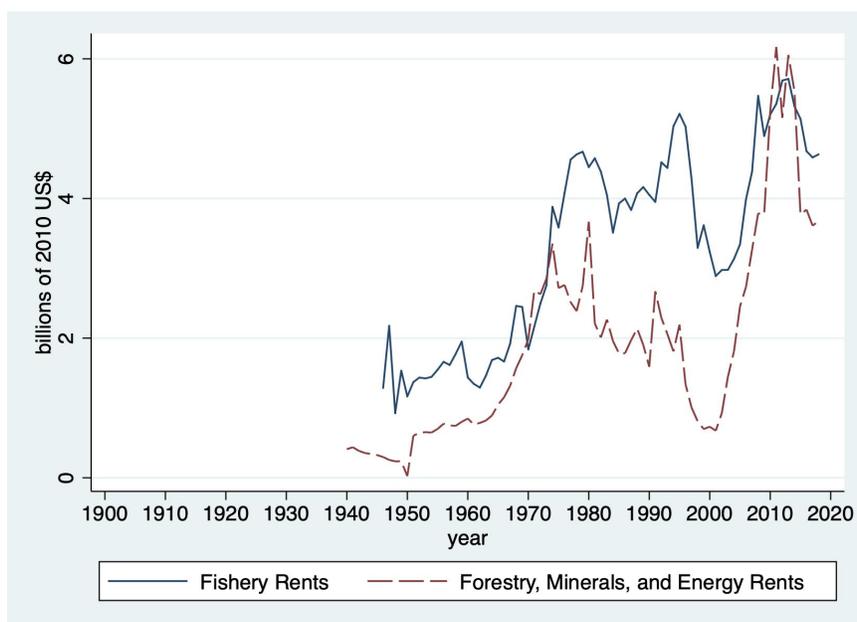


Figure 8. Fishery rents and other resource rents

As seen in Figure 8, the level of rents in the fish sector alone are comparable to the values of all the other rents that have already been accounted for by the World Bank. Fish production has been increasing steadily throughout the 20th century, only beginning to drop from 2010 (Figure 9). The drop in fishery rents is not reflected in the graph of fish production and a better

look into the data shows that the dropped figures begin from 1998 to 2010 which are the years that followed the National Fisheries Code of 1998 and are due to a drop in fish prices. In Section 4.45 of the code is the promotion of food security to ensure appropriate food at appropriate prices. As the second staple food of Filipinos next to rice, a steep drop in the prices of fish were bound to occur due to the Code.

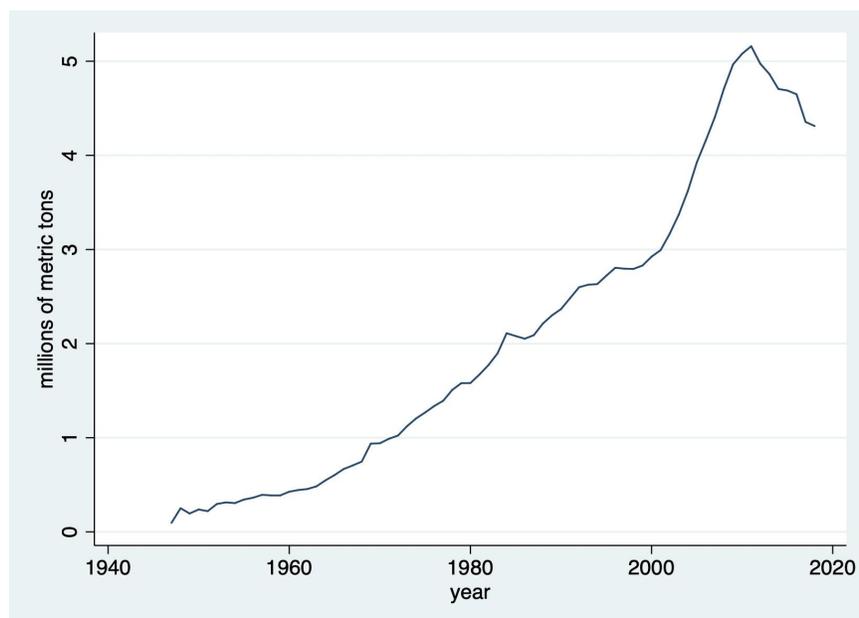


Figure 9. Fish production

#### 4.4. Total Factor Productivity

The incorporation of total factor productivity in genuine savings estimation is to acknowledge that the increase in national output, and consequently in savings, is due to technological advancement which increases the efficiency of the use of fixed capital as accounted for in the net national savings. The further extension of the TFP estimates beyond 1954 is beyond the scope of this research so the estimates from available data shall be used for the comparison of genuine savings estimates with and without TFP-adjustments for the years 1954 to 2018.

While Cororaton (2002) provides Philippine TFP data from 1967 to 2000, the TFP index used from the Penn World Tables (Feenstra et al., 2015) is available from 1955 to 2019. The base of the PWT index for TFP has been changed from 2017 to 2000 and since only the growth rate of TFP is necessary for the application into genuine savings, the growth rate can directly be computed from the TFP index with its base on 2000 values.

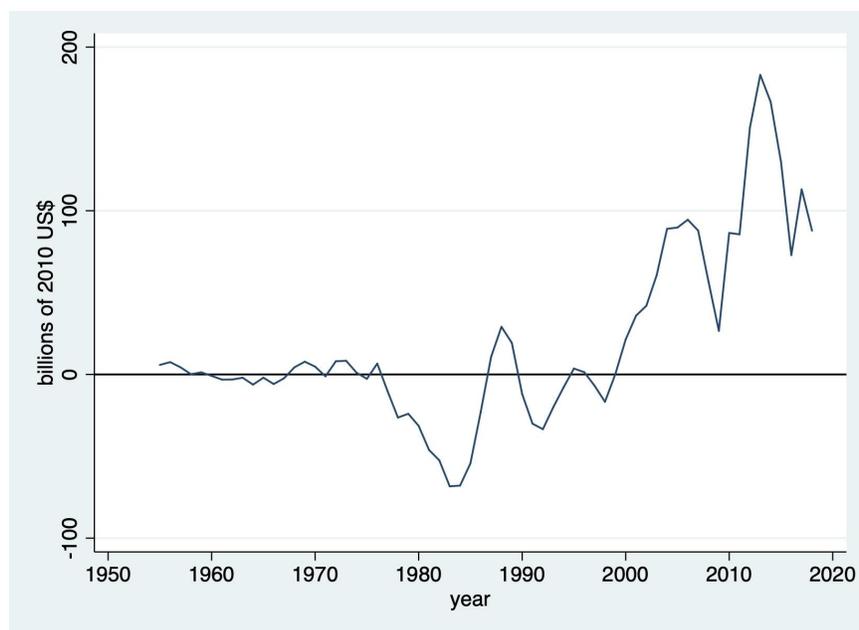


Figure 10. Present Value of Total Factor Productivity

Following Greasley et al. (2014) and Blum et al. (2017), the present value of TFP has been calculated over the 20-year horizon to take the length of its persistence into account. To obtain this, the Kalman filter has been applied to the TFP growth values derived from Cororaton (2002). The present value is then calculated with a 4% discount rate derived from the average interest rate of Philippine government bonds (PSA, 2019).

Philippine TFP, as can be seen in Figure 10, was stagnant in the post-war years since the Philippine economy “was being restored, not changed” (Cuaderno, 1952; p.325). A decrease in TFP occurred up until the early 1980s and during the martial law years of the Marcos dictatorship. This period was littered with human rights abuses and attacks on anyone who would go against the government (Abinales, 2005) and although empirical research is needed to confirm the relationship of the Marcos era on TFP, it is not a surprise to find low rates of productivity in this time. From the end of the said administration, TFP has gradually been increasing even if capital remains to be the largest contributor to Philippine economic growth (Cororaton, 2002).

## 5. Results

### 5.1. Genuine Savings and Adjusted Net Savings

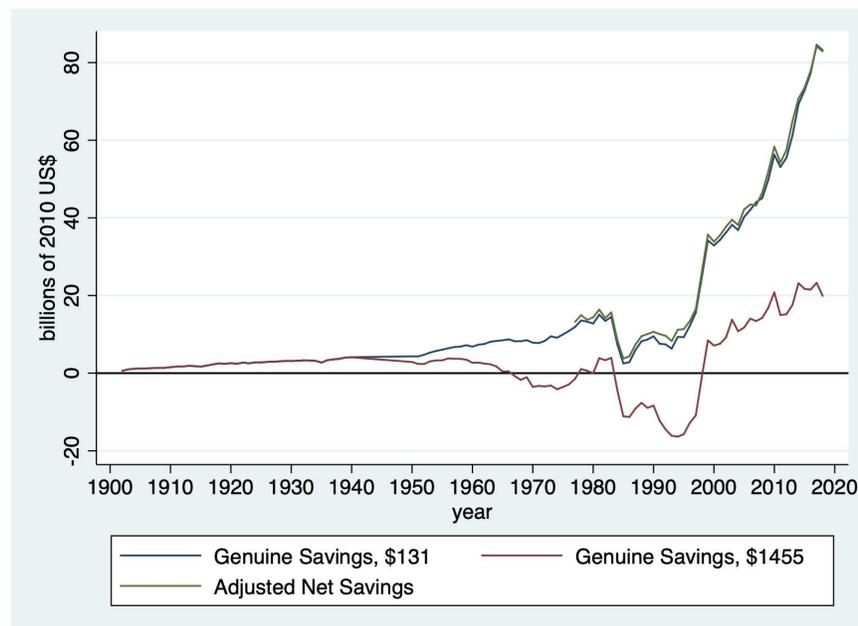


Figure 11. Genuine Savings and Adjusted Net Savings

Given that the estimation of adjusted net savings by the World Bank (2021a) is the most widely used form of genuine savings (due to its scope of 120 countries), it makes sense to compare this study's estimations to that of the World Bank, especially since they have available data for the Philippines up to 1977. From here onwards, genuine savings refers to the estimates of this particular study while adjusted net savings refers to World Bank estimates although they are essentially the same. Figure 11 presents the comparison of World Bank estimates of adjusted net savings and this study's estimates of genuine savings with only the carbon emission prices differing more than the other components.

Before 1947, carbon emissions in the Philippines were small and insignificant in causing a divergence from the \$131-per carbon ton estimation and the \$1455-per carbon ton estimation. The stagnation of genuine savings in the 1940s is due to dropped values since almost all the components of the genuine savings estimates were interpolated during this time and is barely representative of the actual situation during the war years. Apart from the last 15 years of the 20th century, the Philippine economy has been developing sustainably through its investments, at least based on the current measurement of genuine savings.

For both pricing levels by the World Bank (\$30 per ton of carbon) and when emissions can be controlled (\$131 per ton of carbon), Philippine genuine savings is positive throughout the 20th century to the present at a slightly decreasing rate, overall. The steep drop from the 1980s has recovered but values have again started gradually decreasing from 2000. When the social

cost of carbon used is \$1455 per ton though, genuine savings become negative from the late 1960s to the 2000, save for a brief period with positive genuine savings around 1980. This highlights the importance of national investments, carbon emission control and environmental protection in maintaining sustainable development of the Philippines. In the case that carbon emissions cannot be controlled and its social costs are much closer to \$1455, the outlook of Philippine sustainability would be a lot less impressive than it currently is.

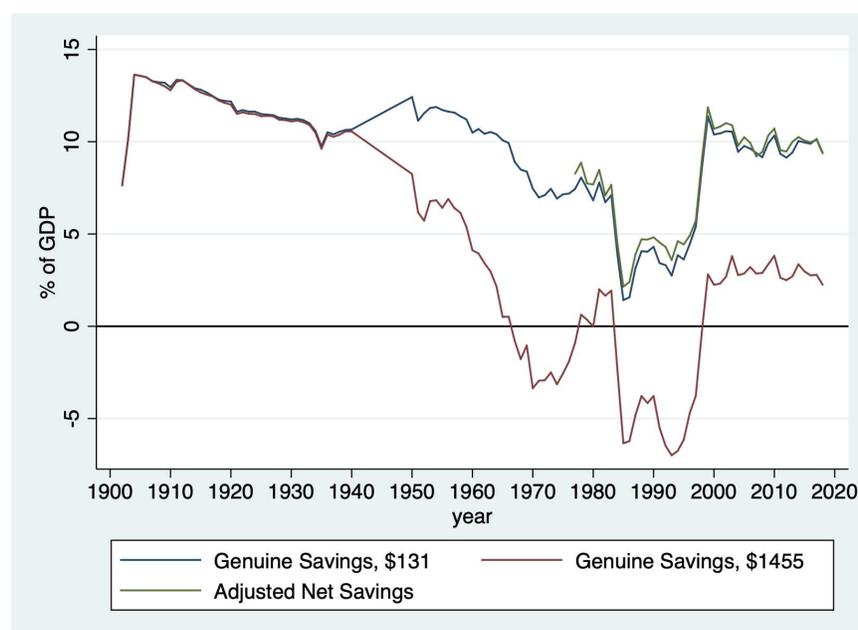


Figure 12. Genuine Savings and Adjusted Net Savings (% of GDP)

What is interesting however is the trend of genuine savings as a percentage of GDP shown in Figure 12 after the war as it decreased up until the early 1980s. This indicates that although income was increasing at the time, it was doing so less sustainably. Even more so in the 1980s before recovering a decade later. The trend of genuine savings then stabilizes in relation to GDP, meaning that it has been growing at around the same rate as GDP in the last two decades.

One major takeaway from studying the long-run trend of the Philippines is that the years succeeding the end of martial law in 1981 was detrimental to the progress of sustainability in the Philippines which has not shown signs of consistent recovery yet since then. As a silver lining, the quick recovery period has brought the Philippines back on its feet to pre-1980 levels of sustainability even if it is decreasing at a slow rate to date. Prompt actions are still possible to recover and accelerate sustainable growth from 1980 to counter the current downward trend in the genuine savings rate. Only then would the Philippines be developing sustainably.

## 5.2. Genuine Savings and Net National Savings

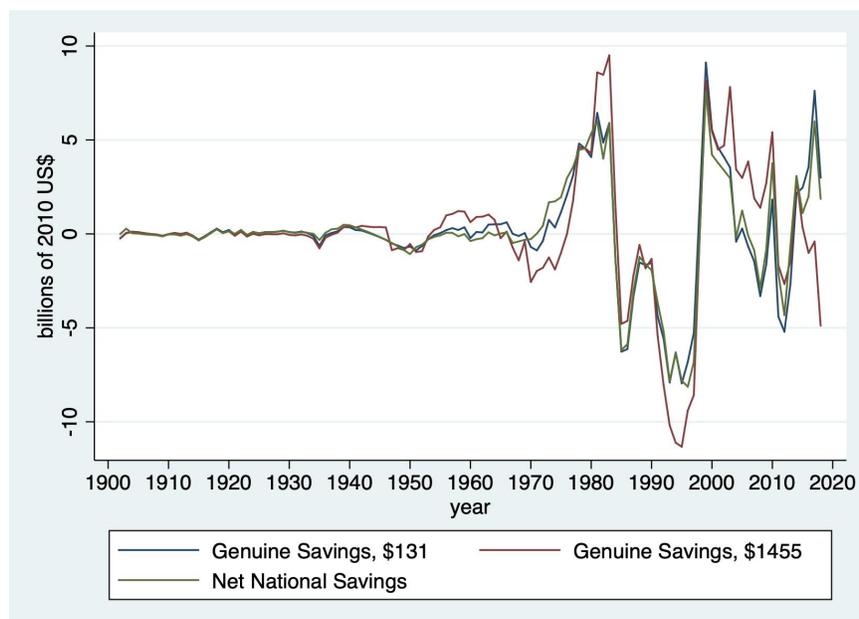


Figure 13. Net National Savings and Genuine Savings using Hodrick-Prescott Filter

Genuine savings trends greatly follow net national savings with little changes due to other components for human capital and natural capital (see Figure 13). The increase in carbon emissions in the latter half of the century causes a widening divergence in the data and maintains this difference until the present. The Hodrick-Prescott filter has been used for the purpose of analyzing trends in the long run as it rids the time-series data of short-term fluctuations, large trends, and seasonality. Genuine savings in the first half of the dataset were relatively stable and have been fluctuating stationarily. We can see a significant increase in genuine savings just before deep diving in the 1980s. This supports Sicat's (2011) narrative that the Marcos administration did very well for the Philippine economy and that the succeeding administrations failed to make use of this initial acceleration. The boost in the 1990s seems to be a momentary and fleeting recovery and has not been sustained, as genuine savings had a decreasing trend up until the early 2010s but has then started to increase. Unfortunately, this increasing trend is too short to make a hypothesis that Philippine sustainability is looking up once again, especially with the ongoing pandemic which would most probably pull any investment or savings downward in the coming years after the end of this dataset.

### 5.3. Genuine Savings and Fishery Rents

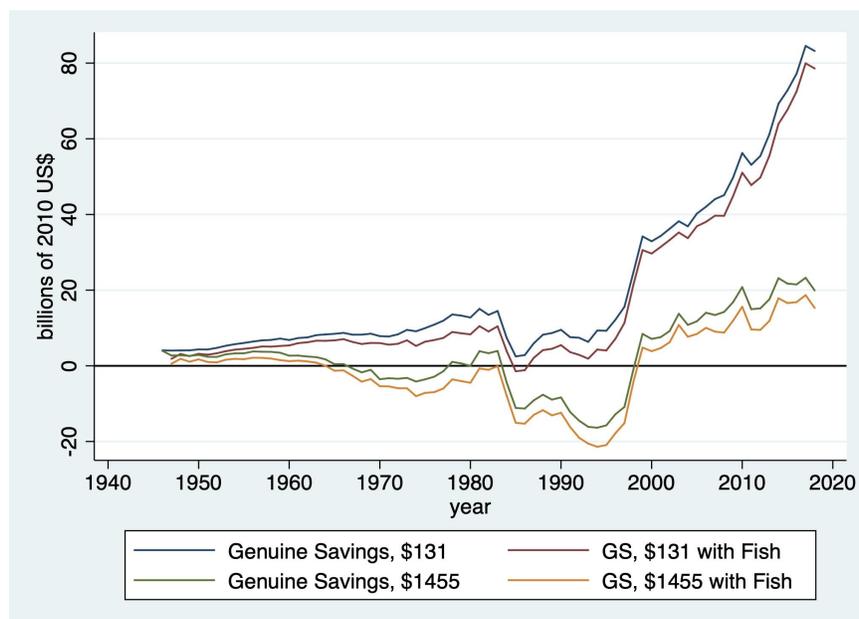


Figure 14. Genuine savings with and without Fishery rents

In Figure 14, the inclusion of fishery rents in the calculation of Philippine genuine savings makes a noticeable drop in the data where the estimation with \$131/tCO<sub>2</sub> of social cost of carbon becomes very slightly negative in 1985. With \$1455/tCO<sub>2</sub>, the values become even more negative in the same period as the previous case without fishery rents (see Figure 11). The fishery aspect of Philippine genuine savings seems to generally drag the estimates down due to the great supply of fish from the Philippine economy. Recalling Figure 9, fish production has been decreasing in the last years and an observation of the eventual trend of this component shall be observed, if it will be decreasing continuously or if it was a momentary decrease due to some particular reason.

This trend of lowering genuine savings estimates due to an additional resource depletion component is the case for the inclusion fishery rents and probably also for the inclusion of other excluded resource depletion measurements. Other possible components in relation to this would be biodiversity loss, and soil erosion. Both of which the Philippine islands are not doing well in. If this is true, the Philippines may be less sustainable than it looks from the estimates of this study.

## 5.4. Genuine Savings and Total Factor Productivity

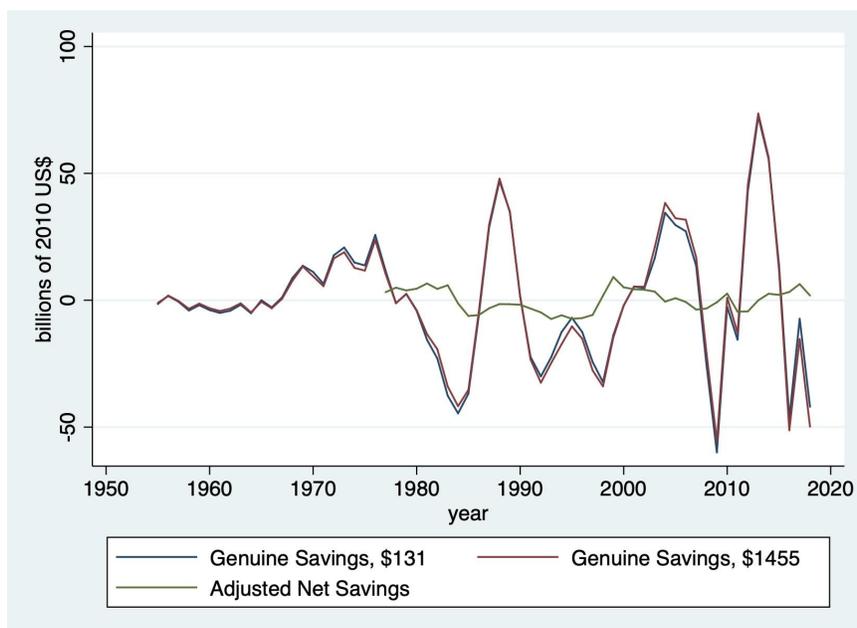


Figure 15. Genuine Savings with TFP-adjustments using Hodrick-Prescott Filter

Another contribution of this study is the incorporation of TFP on genuine savings. In Figure 15, TFP-adjusted genuine savings explodes with a much greater variance. The same exercise with the Hodrick-Prescott filter is done for the incorporation of fishery rents and TFP-adjustments to see long-run trends in the data. When TFP is accounted for, genuine savings generally adapts to its trend with very negative values in the 1970s to 1980s, and a second drop can be found in the 1990s still resonating with Sicat's (2011) analysis such that succeeding administrations following Marcos were inefficient in sustaining growth opportunities set out earlier. From this, one can infer that TFP is also correlated to financial and political shocks in the Philippine economy as another sharp drop is observed during the years of the Great Recession.

A negative TFP is a complex growth accounting issue that may not be easily interpreted but generally means that the economy's factors of production are underperforming or are very unproductive. A simple scenario may be such that capital and labor are acquired in a business but if the capital does not work or is not used, or the laborer is paid his wages but does nothing, the growth of the business would be negative for the succeeding time period and when accounting for TFP, it would be below zero. In the Philippine case, Cororaton (2002) points out that the negative TFP of the Philippines may be due to the decreased efficiency of education or the brain drain effect from the surge of Filipinos leaving the country as temporary or permanent migrants.

One more thing that can be noticed is the steep acceleration of genuine savings in the mid-1980s which may be due to the end of the Marcos dictatorship but this acceleration is not sustained. Nonetheless, the general trend to 2018 (although volatile) seems to be increasing.

## 5.5. Genuine Savings, Fishery Rents, and TFP

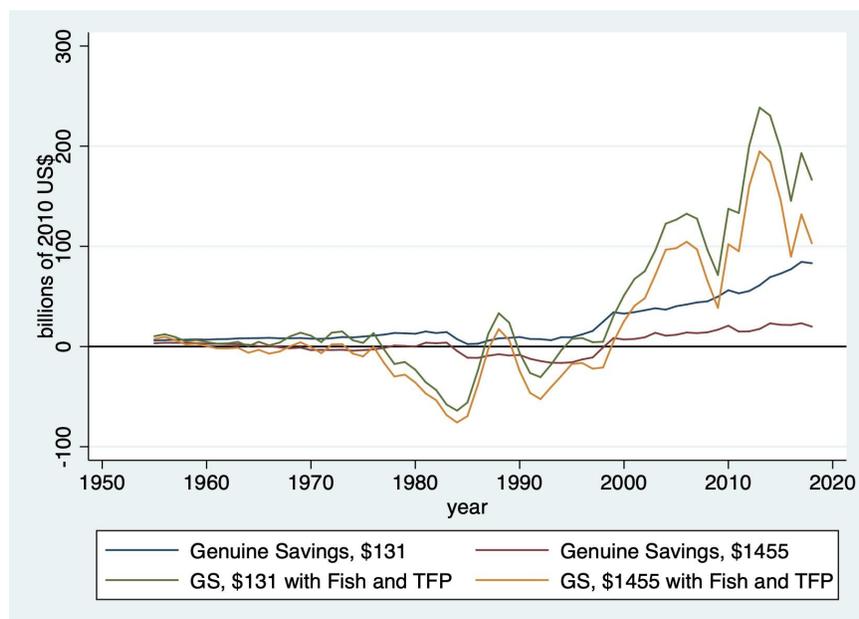


Figure 16. Genuine Savings with Fishery Rents and TFP-adjustments

With both fishery rents and TFP-adjustments included in the genuine savings estimation shown in Figure 16. Genuine savings with fishery rents and TFP-adjustments were lower than the estimation without the adjustments for years preceding 2000 but are then higher for years after. If carbon emissions were priced closer to \$1455/tCO<sub>2</sub>, then genuine savings would have been consistently negative for the last quarter of the 20th century with some exceptional years in the late 1980s when it would be slightly positive. Years affected by political instability and financial crises reflect recurrent dropping trends in all of the presented cases for comparison. TFP-adjustment greatly changes the values of genuine savings but generally gives similar interpretations as other transformations of the data.

## 5.6. A brief comparison with Latin America

Latin America is often the model case for economic development of developing economies with colonial roots. Often forgotten in the study of economic development of Latin America is the Philippines when it was also under Spanish control for 333 years. The effects of colonization on political and socio-economic structures and institutions could be considered between the Philippines and Latin American region, especially with several dictatorial leaderships in Latin America rising up in the latter decades of the 20th century as well as it did in the Philippines.

Blum, Ducoing and Mclaughlin (2017) estimated values for five Latin American genuine savings throughout the 20th century, specifically for Argentina, Brazil, Chile, Colombia and Mexico<sup>3</sup>. This study takes the opportunity to make a brief comparative analysis of the Philippines and these five countries to investigate common trends. Only the genuine savings estimate as a percentage of GDP is used to account for the different sizes of each country's economy.

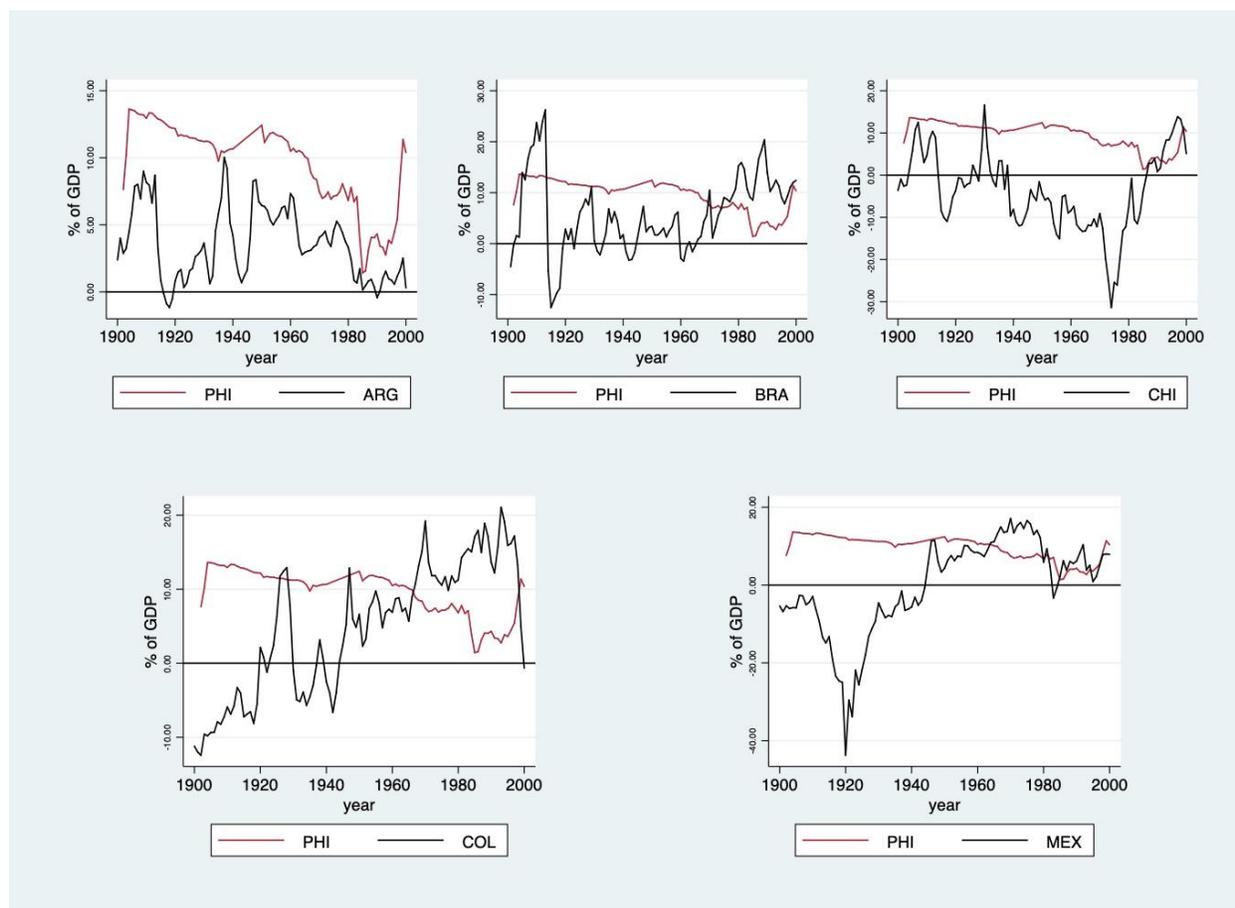


Figure 17. Comparison with Latin American countries, as percentage of GDP

Generally, Philippine genuine savings estimates are very stable as it did not change very much through time, compared to the data of the available Latin American economies. Figure 17 shows how Brazil, Colombia, and Mexico, do not share similar trends as the Philippines. Brazil and Colombia, after Brazil's drop in genuine savings in the 1910s, have both been slowly but steadily increasing throughout the century. Mexico's drop in genuine savings for the second decade of the century is attributed to the Mexican revolution which lasted until 1920. A steady increase in the Mexican data is seen until a drop in the 1970s which since then has been volatile.

In comparison to all presented Latin American countries, Philippine sustainability is much less volatile. Also in Figure 17, one can see that it is almost consistently higher than

<sup>3</sup> Blum et al. (2017) estimates used for consistency of data. See Rubio (2007) for historical estimates of Mexico and Venezuela.

Argentina and Chile apart from the 1990s when Chile has surpassed the Philippines with its consistent upward trend since the coup d'état against Salvador Allende, which despite the dictatorship of Pinochet, Chilean genuine savings improved through time. Argentinian genuine savings follows a similar trend as the Philippines with their similar years of political unrest.

In conclusion, the comparison of the Philippines with other Latin American countries is encouraging. This brief analysis suggests a new line of research for the effects of Spanish colonization on its previous colonies including the Philippines, long after a declaration of independence.

## 6. Limitations of the Study

Previous estimates for genuine savings have been made and common limitations of the previous estimates are often in the estimation of human capital formation and resource depletion since genuine savings highly depend on monetary values for these components and putting a price tag on human and natural capital are not simple tasks. While the study mainly addresses the extension of the genuine savings dataset for the Philippines and the incorporation of fishery rents and TFP-adjustments, other limitations to the estimation are still very relevant to the study.

The net national savings estimate has heavily relied on the World Bank estimates for adjusted net savings and may be improved by finding and using other possible sources of data on gross savings, fixed capital assets, and depreciation of fixed capital, especially for earlier years. Finding capital data would also be useful for the extension of TFP data, along with data on labour hours for the earlier half of the 20th century. Additionally, data from 1941 to 1949 has been linearly interpolated and is therefore an oversimplification of the data due to a lack of availability of easily accessible data on savings.

Public expenditure on education leaves out human capital investment from private education. Neither does it consistently include investments on higher education and other forms of investment in human capital, such as apprenticeships or informal training. More importantly, this proxy also loosely assumes that the value invested in public education gives a return of an equal amount back into the economy which is not necessarily the case, as seen in Europe (Clements, 2002) and in Latin America (Salazar, 2014). This is especially true in the case of the Philippines as the exponential growth of education expenditure in the last two decades did not reflect in the output of students educated in the public system. In fact, the OECD (2019) reports in the PISA results that the Philippines is the second to the lowest ranking for overall outputs in reading, comprehension, math, and science. This furthermore proves the inadequacy of public expenditure on education as a proxy of human capital.

These issues leave space for further research in accounting for human capital which can be later on applied to improve the current genuine savings estimates. The application of the lifetime income approach to measure the stock of human capital (Liu, 2011) may be a promising measurement to include future estimations of genuine savings. Another approach is a measurement of the returns on the investment in children. Francesconi and Heckman (2016) summarize previous studies and points out the oversimplification of earlier methods but gives an overview of the recent studies being done which use better mathematical representations of dynamic multigenerational models. Both approaches require intensive work for its estimation and expansion to earlier years for long-run analysis especially since adapting microeconomic models to be applied for macroeconomic purposes is not an easy task.

For the extension of the resource rent data, similar to those used in this study, discovery of relevant data should be able to be improved in ordinary times when visiting archives and public libraries are available once again. Documents for the American colonization period of this study can mostly be found in university libraries in the United States such as Cornell University,

the University of Michigan, and the University of California to name a few. Forestry is one of the resources that are well documented in the Philippines even before the 20th century as there has been a separate governing body for mines and forests in Spanish colonies. The methodology of estimating forestry prices must also be improved. In this study, direct market costs of forests have been used but this does not take non-market environmental services into account such as the protection of biological diversity and watersheds, to name a few.

In addition to the limitations of the components already included in the estimation of genuine savings in this paper and in previous studies, the exclusion of other environmental indicators for sustainability remain to be an issue. This study includes fishery rents which World Bank estimates do not include but still lack important environmental indicators such as soil erosion, fossil water extraction, and trends in biodiversity. Forests, minerals, and energy production are natural resource degradation issues that have long been present and are more straightforward measurements compared to the other lacking and more newly measured components, which are of equal or of greater importance due to the progression of climate change and global warming as effects of the degradation of these natural resources. Unfortunately, the application of these indicators would require consistent and available data which is not always the case. Additionally, future researchers who would want to estimate genuine savings better must also identify the correct method of doing so.

Another possible limitation would be on sufficient information on how to correctly set the carbon pricing level. This study steers away from choosing a particular value for the social cost of carbon emissions and provides lower-bound and upper-bound values instead. Finding a particular value may be a good path for further research and will heavily depend on environmental economic research on carbon emissions.

The genuine savings indicator is based on monetary values of physical, human, and natural capital. It is subject to the valuation of the aforementioned capital forms and are only estimates to the true value of national capital. Depreciation of physical capital is more arbitrary than it is objective as a fully depreciated building may still have some value despite being worn out. Measuring human capital also remains to be a guesstimate as the value of each person cannot be fully measured when only considering certain aspects due to data availability. Furthermore, the use of the monetary value of natural resources may be more linked to valuation of the resource than the quantity or abundance of the resource itself. Nonetheless, the use of monetary values for these capital forms still remains to be the most consistent way to be able to create an indicator for sustainability, and is a closer estimate for national wealth than other indicators that do not take natural and human capital into account, such as GDP.

Finally, the limitation of a further extension of the data was not impossible but has been restrained due to pandemic restrictions. Other documents within the timeframe of this study may have been accessed by visiting national and university libraries in Michigan, New York, et cetera. Earlier documents may have also been retrieved from the *Archivo General de Indias* in Spain. The researcher is optimistic that the current dataset may be extended some thirty years back with access to these libraries and archives.

## 7. Discussion

Current estimations of genuine savings are impressive as it hurdles the challenges of putting a price on human and natural capital, although not perfectly. This section will be dedicated to a discussion of policy implications for sustainable development from the analysis of long-run Philippine genuine savings data, and future research topics that have risen from this study.

### 7.1. Policy Implications

#### 7.1.2. Beyond Economic Theory

A major theme in the analysis of genuine savings in the Philippines is the toll the economic situation of the 1980s took on the progress for sustainable development for the following years. Governments must take the time to read each situation and listen to its people instead of relying on economic theory. The Marcos government's decision to push through with costly public infrastructure projects despite the repercussions of large amounts of external debt and the obstinacy for delaying a much needed moratorium exacerbated the downfall of the economy. If government spending and debt had been managed better, the interest rate shock in the early 1980s would not have been as big of a blow as it was to the Philippine economy. Some leeway must be given for possible shocks when making progressive and risky policies.

It is understandable that each administration has its priorities that may not be similar to the priorities of the previous administration. The Philippine Council for Sustainable Development was established in the late 1990s but has then been long forgotten. A sharp decrease is clearly seen in the fishery rents after the enactment of the National Fisheries Code of 1998 but a change in administration soon after probably began the neglect for this law as fishery rents accelerated beyond its levels before the Code of 1998. Education efficiency has also been raised in the Educational Survey of the Philippines (Monroe, 1925) but has also been neglected, making it a concern up to the present day, almost 100 years after. A consistency of policies, especially for those dealing with the very foundations of the Philippine economy, must be maintained to make structural changes and long-lasting effects on the trend of economic growth and development.

#### 7.1.3. Improving Education Expenditure Efficiency

The inadequacy of the current proxy for human capital does not only lie in the limitation of its scope of education. As previously mentioned in the limitations of the study and the description of adjusted net savings in the World Bank database, a one-dollar investment in education does not necessarily return a one-dollar value of human capital. The inefficiency of public education systems is a main factor in this and is a major issue for the Philippine case.

The steady increases in education expenditure are impressive on its own but the output of these expenditures are plain disappointing. The latest publication of the OECD's (2019) Programme for International Student Assessment shows that the Philippines is lagging behind most other OECD and partner countries in mathematics, science, reading, and comprehension. The Educational Survey of the Philippines (Monroe, 1925) stated:

Before the system is further expanded attention should also be given to improving the quality of instruction. The present elementary-school curriculum is in many respects ill-adapted to the experiences and needs of Filipino Children. Before a single peso is spent on bringing this curriculum to more boys and girls, sufficient funds should be spent in its improvement to make certain the largest possible educational result. To continue the use of a poor instructional tool, when a much better one could be secured with a relatively small expenditure of funds, is wholly indefensible. [...] The direction of public funds to an improvement of the curriculum, the educative activities in which school children engage, may be expected to produce enduring benefits. (p. 80)

With the currently high amounts of education expenditures, it may be the case that there is still a lack of a sufficient allocation of expenditures to education or that the education expenditures are simply inefficiently used in an ill-fitting educational system. Perhaps an adjustment to education expenditures may be made, based on the output of student assessments such as the OECD's (2019) PISA. Attention to the efficiency of education is suggested to converge or surpass the value of the financial investment allocated for each Filipino, which may in turn boost the country's TFP and shall be reflected on its genuine savings for a more sustainable development.

#### 7.1.4. Improving Resource Rents

Impressive environmental laws already exist in the Philippines but are not implemented properly. Most of these laws such as the Philippine Fisheries Code and the Clean Air Act have been enacted in the late 1990s, or even further back in the 1970s. The most recent environmental laws are the Ecological Waste Management Act in 2000, the Clean Water Act of 2004, and some amendments have been made for the Clean Air Act but not much else has been done to intentionally progress with the mitigation of climate change issues in the last decade or so, despite the pressing concern to achieve international agreements on sustainability.

If natural resource rents were to be made efficient, amendment of older laws and enactment of new laws on environmental protection is advised. Furthermore, an improvement of institutional quality is recommended for proper implementation. According to a brief interview with Philippine environmental scientist Pilar Isabel Ronquillo, many of these existing laws pertaining to open air combustion and illegal fishing are not strictly monitored and those who do not abide by them are rarely punished. One practice already in place is the use of environmental compliance certificates which are necessary for infrastructure projects. The certificate is only given after environmental, socio-economic, and socio-cultural assessments have been done. Due

to poor public institutional frameworks that are prone to corruption, some major projects are still able to receive a certificate despite its destructive nature.

Another aspect of improving resource rents is its measurement. The World Bank's methodology is also raised with the use of present discounted values of forest especially when negative rents from reforestry are set to zero. When reforestation exceeds deforestation, zero rents would mean that the reforested areas are not given a value although it is an increase in capital. Boos (2015, p.) discusses that "forest growth for economic reasons does not increase the natural capital stock," and is not critical to estimating genuine savings. Even the methodology of this study may be raised, since the use of direct market costs is insufficient to evaluate forests as it cannot take shadow prices into account (Kengen, 1997). A collaboration with environmental economists and scientists would be needed to tackle these shortcomings as it is usually beyond the expertise of economic historians to do so. Indirect market costs may include the related goods approach, hedonic pricing, or replacement cost technique (Lette & de Boo, 2002). Moreover, sources of forest depletion are inconsistent since land classification within the Philippines is simply the residual of other classified land (Uitamo, 1996). The Philippine Statistics Authority must collaborate with the Department of Environment and Natural Resources to improve national statistical reporting of natural resources.

It is also important to recall that the measurement of resource rents include labor costs for workers in the sector. Using the current methodology for computing genuine savings and including resource rents, the objective of achieving higher genuine savings, which translates into better national sustainability, should not necessarily be attained by having the lowest possible resource rents especially if, like the fishing sector, it provides jobs for over a million Filipino people each year. Underemployment in agriculture, fishing, forestry, and other jobs that involve natural resource extraction is also something that must be avoided and protected for the well-being of workers in the sector.

## 7.2. Future Research

### 7.2.1. Migration

Apart from the many criticisms and limitations in measuring human capital through public expenditure on education, education itself may be just one aspect of national human capital. Emigration is a form of human capital flight which is particularly relevant in the Philippines. Haque and Kim (1995) show that investment in education may lead to an increase in economic growth while the emigration of a people can lead to a reduction of national income and growth. While public expenditure on education is the government's investment on each Filipino person, each Filipino person who leaves the country to work or live abroad takes that invested capital elsewhere.

The Philippines has quite a long history of migration, dating back to the Spanish colonial period when students were sent and subsidized to study in Europe to bring back the knowledge they acquired to their home country. Upon the arrival of the Americans, emigration for

scholarships still existed but the rise of demand for agricultural labor in the west coast of the United States and Hawaii (Liu, 2011). Filipinos who contributed to the American economy through agricultural labor or through participation in their armies were given an opportunity to be naturalized in the United States. Later on, the Middle Eastern countries with the rise of oil supply had great demand for their industrialization in the 1970s and Filipinos were keen to take this opportunity as well (Asis, 2006). Many highly-skilled Filipinos leave the country for better job opportunities, pay, and living standards such that as of 2019, the number of registered Filipino migrants summed up to 2.2 million. So much so that the Philippines is one of the top 10 sending countries that supply the highest number of migrants (Pison, 2019). This has even

Although the remittances of Filipino migrants positively contribute to Philippine economic growth (Ang, 2007), Ang, Sugiyarto, and Jha (2009) find that remittances to the Philippines do not show a significant effect on investment spending, similar to the case of Mexico where remittances are not generally used for productive activity as well (Mendoza Cota & Diaz Gonzalez, 2008). In other words, remittances from Filipino migrants are not reinvested productively into the economy as it is mainly used for consumption and will hypothetically decrease savings which would contribute to unsustainable development. In this sense, migration may not be sustainable in the long run and something would have to be done about the emigration of the Filipino people.

### 7.2.2. Predictive power

This study has raised several possibilities for future research. First of which, is the testing of Philippine genuine savings' predictive power or its ability to become an indicator of future well-being as it is an indicator for sustainability. Recalling the previous studies, Hanley et al. (2015) summarizes relevant studies on the predictability of future well-being by the use of genuine savings. Mixed results have come out of this summary depending on the use of either time-series or panel data, and depending on tests over short or long horizons. It is suggested that panel data analysis without OECD countries give better support for the hypothesis of a 1-on-1 relationship with genuine savings and future consumption and the hypothesis implying a relationship closer to the previous one, with more types of capital included in the explanatory variable. Moreover, for time-series data, tests over long horizons of 50 to 100 years perform best with TFP adjustments.

The Philippines is a non-OECD country and with this study, it now has over 100 years worth of data. It would seem ideal to proceed with the testing of the predictive power of its current genuine savings data through a time-series analysis, or the inclusion of the Philippines for future tests using panel data, possibly with Latin American countries that also have long-run estimations already, or with the Philippines' neighboring countries once it is available.

### 7.2.3. Data extension into the 19th century

For further research in expanding the Philippine Genuine Savings dataset to the Spanish period, some information on the data collection is presented. The Ministerio de Ultramar or the

overseas ministry of the Spanish government had detailed information and data on the Philippines and its other colonies. The physical archives holding colonial documents were mainly in Madrid and Alcalá, with some moved to the Archivos General de Indias in Seville due to a lack of space. Unfortunately, the archives in Madrid and Alcalá have been burned down during the Spanish civil war in the late 1930s, leaving only the records of Puerto Rico, some of Cuba, and even less of the Philippines. The most relevant document would have been the State of Income and Expenditures of the Philippines for data which can be used in the construction of genuine savings values. Some other documents which may be useful, such as a semi-annual summary of Philippine mines, works carried out by the General Forest Inspection, provincial and municipal budgets, and the single document on the state of income and expenditures of the Philippines in 1877-1878. These documents are inaccessible online and would require a visit to the Sevillian archive.

#### 7.2.4. Filling in the war years

As mentioned in Chapter 4, the years through the 1940s have not been very useful in the analysis due to the interpolation of most of the components due to missing data from the war. Two statistical bulletins have been found, containing information on inflation, cost of living in Manila, labor and social statistics, business statistics, foreign trade statistics, and war damages. It may not directly report data on savings, investments, consumption, et cetera, but there might be some useful information that future researchers may infer something out of. One example would be a calculation of damages from pre-war capital to give an idea of how much was destroyed in the war years. A great deal of creativity may be needed for this sort of research.

#### 7.2.5. Other environmental indicators

As another recurring issue throughout the paper, the natural capital component of the current estimations of genuine savings is non-exhaustive. Roumasset et al. (2018) suggests the measurement of damages from natural disasters into green accounting. To the knowledge of the author, this is not often suggested to be included in the estimation of genuine savings but is an aspect that is very relevant to the Philippines as it is one of the countries most affected by climate change. The Asian Disaster Reduction Center (2021) notes that the Philippines has an average of five disastrous typhoons per year, one of which is the Super Typhoon Haiyan in 2013 which devastated the entire country but largely destroyed Leyte, an island in central Philippines. Typhoons are only one aspect of the natural disasters that the Philippines experiences on an annual basis in recent years. It is also prone to earthquakes and volcanic eruptions. With the likelihood of natural disasters taken into account, sustainable income is reduced as it records losses in physical and human capital (Roumasset et al., 2018)

This might actually only apply to the Philippines since not all countries suffer from frequent super typhoons. The researcher suggests that each country only include the natural resources that are relevant for each specific country due to different biomes they exist in, instead of standardizing the set of natural resources to be included in the estimation of genuine savings.

For example, the large increase in resource rents from including fishery rents in Philippine genuine savings will most probably not be the case for a country such as Laos due to its landlocked nature.

#### 7.2.6. Regional estimation

National estimates for genuine savings provide environmentalists, national and international policy-makers a common ground for discussion. Like most national estimations, economic and structural analyses may not exactly apply on a regional level. What is true for the capital or large cities, where a fast movement of goods and services are, may not be true for smaller cities or regions farther from the capital. An estimation of genuine savings at a regional level may be done as Biasi et al. (2019) and Pyzheva (2020) did for Italy and Russia, respectively.

## 8. Conclusion

The study has provided estimates for Philippine genuine savings from 1902 to 2018, extending the available data from the World Bank (2021a) by 75 years. This has opened the doors to future analyses of the sustainability of the Philippines' economic development using over a century's worth of data. It has also incorporated fishery, a major natural resource within Philippine territory, which has been neglected by the previous estimations of genuine savings. Furthermore, total factor productivity was also added to the estimates and reverberated the observation from Blum et al. (2017) and Weitzman (1997) that the application of TFP would make a "sizable adjustment" to genuine savings.

Philippine data on gross savings, consumption of fixed capital, resource rents (forestry, minerals, energy, and fishery), public investments on education, and TFP were collected from a wide range of sources from statistical yearbooks to international organization databases, academic papers, and government reports. The data collected has then been compiled to compute for genuine savings and plotted as time-series to be able to make a long-run analysis of sustainable development in the Philippines over the last century.

Throughout the 20th century, economic development in the Philippines has been generally sustainable given the current methodology for estimating genuine savings, and even when fishery rents are included. The high levels of savings and investment in and out of the country has kept Philippine genuine savings above zero. This, however, is given that only the current components are included in the calculation.

Results have shown that the exclusion of fishery rents takes more than half of the resource rents away from the estimation. Threats to soil erosion, groundwater depletion, and biodiversity are left to be taken into account while scholarly articles in the field of environmental sciences already mention the Philippines' lousy performance in protecting these resources. With further discussion, the researcher suggests to move away from standardization of accounting for natural resources and focus on the natural resources that are most important for each country lest risk the same issue of excluding environmental aspects that are more applicable to a particular country for the sake of standardizing estimation methods.

So far, only the period between 1980 and 2000 are at a major risk of becoming negative with the addition of other natural resource components. The major threat to reduce Philippine genuine savings is the carbon pricing level to be used, as it brings all estimates significantly downwards. Fortunately, the last two decades have still been showing promising levels of genuine savings regardless of an addition of either fishery rents or TFP. Only one note may be said as the rate of sustainability with regard to GDP has been slowly decreasing in the last two decades which suggests that economic growth is becoming slightly less sustainable and actions must be done to prevent a further decline in this trend.

A closer look and a better estimation of net national savings must be made to improve the genuine savings estimates in this study. Education expenditure as a proxy for human capital formation is severely overestimated in the Philippine data. Not only does public education in the

Philippines yield poor results, but it also leaves the brain drain effect of mass migration from the Philippines, especially in the 1970s to the 1980s.

The resource rents of the World Bank (2021a) are noticeably lower than that of the estimates of resource rents in this study, even when fishery rents are excluded. Since the Philippines is one of the major fish producing countries in the world (FAO, 2014), it is not surprising that the addition of fishery rents more than doubles the total resource rents applied to the genuine savings estimates and pulls the data downward. Carbon emissions steeply increased after World War II and have slowly been increasing up to the present day. Deforestation has been slowed down and has been slightly increasing in the last decade. Minerals and energy peaked in the 1970s to 2000 for coal and other minerals, while the main cause for its peak in the 2010s was the production of crude petroleum and natural gas. In recent years, the total minerals and energy production has shown signs of decrease. Many other types of resources are missing in the computation of genuine savings but the researcher recommends prioritizing the main natural resources of each country instead of standardizing a set of resources to be included for each country even when its production of the particular resource is negligible. Moreover, the inclusion of damage from natural disasters might make sense to include in future estimations of genuine savings as well.

The incorporation of TFP creates volatility in the genuine savings data from the mid-1970s but from its lowest point in the early 1980s has been showing signs of increase until the most recent data in 2018. The addition of TFP on Philippine genuine savings seems to make a positive impact on the progress of the Philippines for sustainable development, while political and financial crises seem to greatly affect the trend of TFP negatively.

Possible routes for future studies involve testing the inferences made on the effects of political and financial crises on TFP, and testing the predictive power of genuine savings on future well-being in the case of the Philippines. An extension of the data further into the 19th century also seems to be possible if mobility is once again an option. Additionally, the brief comparison of the Philippines with other Latin American countries opens the floor to more in depth comparative analyses as effects of colonization on political and socio-economic structures and institutions could be considered between the Philippines and Latin American region.

On a final note, governments must be wary about its decision to invest very largely, especially when crises hit. Large risks have great repercussions for the entire nation and may take decades to recover from them. A consistency of policies is very crucial for positive structural changes as well. Reports and efforts to promote an efficient education system before investing in larger amounts in 1925, and the establishment of a Philippine Council for Sustainable Development in 1992 are efforts way ahead of their time but have long been forgotten despite the ever-pressing concern of the purpose of its existence. Issues like these will never be solved if new priorities by new administrations are pushed forward, while priorities of older administrations are set aside.

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# Appendix

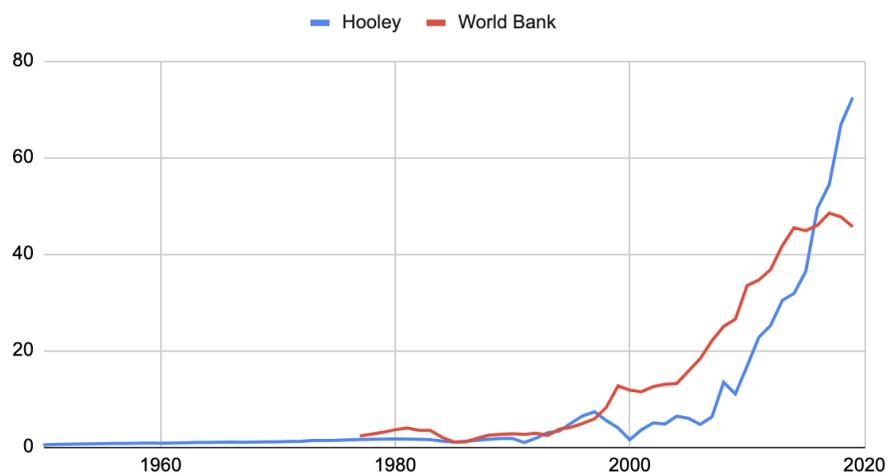


Figure A.1. Net National Savings Index Comparison of Hooley (2005) and World Bank (2021a)

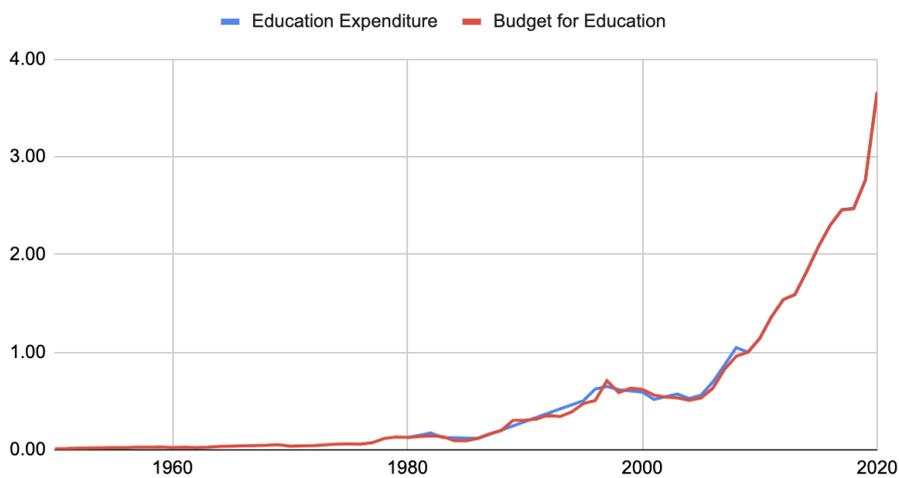


Figure A.2. Education Index Comparison for Expenditure and Budget data