SAVINGS RATES IN TURKEY: THE PROSPECTS FOR A SUSTAINABLE GROWTH

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ÖZET

SAVINGS RATES IN TURKEY: THE PROSPECTS FOR A SUSTAINABLE GROWTH

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Anadolu Üniversitesi Sosyal Bilimler Enstitüsü, Mayıs, 2017

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Bu çalışmanın amacı öncelikle Türkiye'de tasarruf oranlarının gelişim sürecinin açıklanması ve özellikle son yıllarda düşen yurt içi tasarruf oranlarının azalma nedenlerinin ortaya konulmasıdır. Çalışmanın ikinci amacı ise 1975-2014 arası dönemde yurt içi tasarruflarının sürdürülebilir ekonomik büyüme üzerindeki etkisinin zaman serisi analiziyle incelenmesidir. Araştırmanın sonuçlarına göre, Türkiye'de yurt içi tasarrufları dünya ortalamasının ve farklı gelir gruplarının oldukça altında seyretmektedir. Ayrıca, Vektör otoregresif (VAR) modeline dayalı Johansen eş bütünleşme analizi kullanılarak Türkiye'nin ekonomik büyümesi ile toplam yurtiçi tasarruflar, özel tasarruflar ve kamu tasarrufları arasında uzun dönemli bir ilişki olduğu bulunmuştur. Ayrıca, vektör hata düzeltme modeline (VECM'ye) dayalı olarak uzun dönemde ekonomik büyüme ile toplam yurtiçi tasarruflar, özel tasarruflar ve kamu tasarrufları arasında iki yönlü Granger nedensellik ilişkisi bulunmuştur. Kısa dönemde ise yine VECM modeline dayalı olarak ekonomik büyümeden toplam yurtiçi tasarruflara, özel tasarruflara ve kamu tasarruflarına doğru tek yönlü Granger nedensellik bulunmuştur. Ayrıca, etki-tepki ve varyans ayrıştırması analizlerinin de VECM'ye dayalı sonuçlarla uyumlu olduğu görülmüştür.

Anahtar Sözcükler: Sürdürülebilir Ekonomik Büyüme, Vektör Otoregresif Model, Johansen Eşbütünleşme Testi, Vektör Hata Düzeltme Modeli, Granger Nedensellik Testi.

ABSTRACT

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The objective of this study is firstly to explain the development process of savings rates and to reveal particularly the reasons for decline in domestic savings in recent years in Turkey. The second objective of the study is to investigate the effect of domestic savings on sustainable economic growth by employing time series analysis over the period 1975-2014. According to results of the study, domestic savings in Turkey remain considerably lower than world average and different income groups. Also, Turkey's economic growth is found to have long run relationship with total domestic savings, private savings and public savings by using vector autoregressive (VAR) approach of Johansen co-integration analysis. In addition, based on the vector error correction model (VECM), it is found that there is a bilateral Granger causality relationship between economic growth and total domestic savings, private savings and public savings in the long-run. In the short-run, main finding based on the VECM is that there is a unilateral Granger causality running from economic growth to total domestic savings, private savings and public savings. It is also seen that impulse response and variance decomposition analyses are consistent with the results based on VECM.

Key Words: Sustainable Economic Growth, Vector Autoregressive Model, Johansen Cointegration Test, Vector Error Correction Model, Granger Causality Test

ÖNSÖZ

Bu tez çalışmasında, Türkiye'de tasarruf oranlarının seyri, yurtiçi tasarruf oranlarındaki azalma nedenleri ve yurt içi tasarruflar ile sürdürülebilir bir ekonomik büyüme arasındaki ilişki araştırılmaya çalışılmıştır.

Çalışmanın konu belirlenmesinde, içerik oluşumunda ve yürütülmesinde desteğini asla esirgemeyen engin bilgi ve deneyimlerinden yararlandığım, akademik disiplin ve bilimsel temeller ışığında yönlendirmelerinden dolayı danışman hocam Prof. Dr. Nihal Yıldırım MIZRAK'a, çalışmamın uygulamalı kısmında bilgi ve deneyimlerinden yararlandığım Prof. Dr. Mustafa ÖZER'e ve manevi katkılarından dolayı annem Güldane DAŞTAN'a sonsuz teşekkürlerimi sunarım.

29/05/2017

ETİK İLKE VE KURALLARA UYGUNLUK BEYANNAMESİ

Bu tezin bana ait, özgün bir çalışma olduğunu; çalışmamın hazırlık, veri toplama, analiz ve bilgilerin sunumu olmak üzere tüm aşamalardan bilimsel etik ilke ve kurallara uygun davrandığımı; bu çalışma kapsamında elde edilemeyen tüm veri ve bilgiler için kaynak gösterdiğimi ve bu kaynaklara kaynakçada yer verdiğimi; bu çalışmanın Anadolu Üniversitesi tarafından kullanılan "bilimsel intihal tespit programı"yla tarandığını ve hiçbir şekilde "intihal içermediğini" beyan ederim. Herhangi bir zamanda, çalışmamla ilgili yaptığım bu beyana aykırı bir durumun saptanması durumunda, ortaya çıkacak tüm ahlaki ve hukuki sonuçlara razı olduğumu bildiririm.

Muhammet Daştan

CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

SYMBOLS AND ABBREVIATIONS

A : Total Factor Productivity

α : Alfa

β : Beta

g : Growth Rate

s : Marginal Propensity to Save

k : Capital output ratio

G : Geometric Rate of Growth and Government Expenditures

G_W : Warranted Rate of Growth

C : Value of the Capital Goods and Consumption Expenditures

σ : Average Social Investment Productivity

δ : Depreciation Rate of Physical Capital

n : Growth Rate of Population

k^* : Steady State Level of Capital per Worker

$\tilde{k}$: Effective Capital per Worker

$\tilde{k}^*$: Steady State Level of Effective Capital

y^* : Steady State Level of Output per Worker

$\tilde{y}$: Effective Output per Worker

$\tilde{y}^*$: Steady State Level of Effective Output

S_G : Public Savings

S_P : Private Savings

AGCC : Arab Gulf Cooperation Council

ARDL : Autoregressive Distribute Lag Model

ARG : Argentina

BGR : Bulgaria

BKM : Interbank Card Center of Turkey

BRA : Brazil

CHL : Chile

CHN : China

ECM : Error Correction Model

FEVD : Forecast Error Variance Decomposition

FMOLS : Fully Modified Ordinary Leas Squares

GDP : Gross Domestic Product

GFS : Government Finance Statistics

GRC : Greece

HIC : High Income Countries

IMF : International Monetary Fund

IND : Indonesia

IND* : India

KOR : Republic of Korea

LIC : Low Income Countries

LMC : Lower Middle Income Countries

LS : Least Squares

M : Import

MWALD : Modified Wald

MYS : Malaysia

OECD : Economic Co-operation and Development

OLS : Ordinary Least Squares

PAK : Pakistan

PPP : Production Possibility Frontier

RUS : Russia

TCMB : Central Bank of the Republic of Turkey

TUR : Turkey

TURKSTAT : Turkish Statistical Institute

TYDL : Toda-Yamamoto Approach to Granger Causality Test

UMC : Upper Middle Income Countries

URY : Uruguay

VAR : Vector Autoregression

VECM : Vector Error Correction Model

WLD : World

X : Export

ZAF : South Africa

K : Capital Stock

L : Labor

S : National Savings

T **:** Net Taxes

Y **:** Income

YD **:** Disposable Income

CHAPTER ONE

1. INTRODUCTION

The concept of savings can be defined simply as the portion of income not spent for consumption expenditures, and economic growth is mostly defined as real increases in the production capacity within one year. The basic role of savings is to finance investment expenditures. Since investments are the most important driving force of economic growth, it can be claimed that savings can feature in economic growth.

The subject of the relationship between savings and economic growth has been discussed for a long time. Classics have attached importance to savings with regard to explanation of economic growth. They argued that increase in profits would rise to capital accumulation and hence economic growth through increase in savings and investments. The theoretical studies known as Harrod-Domar and Solow growth models are related to this subject and they are obviously attracting importance to savings on economic growth. The Harrod-Domar growth theory indicates that economic growth is based on saving and capital output ratio. Likewise, the Solow model implies that increase in savings rates positively affects output per worker but the effect of savings on economic growth would be temporary. It is important to mention that many empirical studies in this context asserted that savings have a positive influence on economic growth whereas others suggested that there is no co-integration or causal relation between these variables.

Today, Turkish economy is more fluctuating and vulnerable to economic recessions or crises experienced in the world, even if the economy is growing more than most of the developed countries. One of the main reasons why Turkish economy is affected more than developed countries by recessions or shrinkages in the world can be considered as lack of adequate domestic savings in the country. The resultant saving-investment gap is usually tried to be offset by foreign savings because of lack of adequate level of domestic savings and therefore current account deficit is widening in Turkey. Also, foreign savings can easily leave the country in the course of economic fluctuations and this situation results with that the fluctuations can be more secular in Turkey. Taking into account all of these, it will be better understood how domestic savings can be effective on sustainable economic growth.

That is, as long as investments are financed mostly by domestic savings, there would be a presence of sustainable economic growth which is not only one that is

contributing to macroeconomic stability but also one that is a growth for everyone in an economy; therefore, it also promotes all aspects of human development.

Since the domestic savings have a great importance on sustainable economic growth which is the main argument that directs author to study on this context, it is necessary to research for the relationship between savings and economic growth, to learn which factors causing the decline in savings rates, and to try to think of ways how domestic savings can be increased in Turkey.

In this study, author aims at revealing the relationship between savings and economic growth, indicating the development process of savings in Turkey with making comparison of savings across countries, specifying the factors reasoning the decline in savings rates, and seeking solutions to increase domestic savings rates in Turkey and, therefore, trying to contribute to achievement of sustainable economic growth in Turkey.

This study consists of five chapters with introduction and conclusion parts. The first chapter of the study covers the problem statement and objectives, importance, scope, limitations and definitions. The second chapter covers the theoretical studies of Harrod-Domar and Solow and literature review on the relationship between savings and economic growth. The third chapter of the study covers the development process of savings, the course of the total, public and private savings, the relationship between saving-investment gap and current account deficit, comparison of Turkey's savings rates across World and different income countries, and the reasons for decline in private savings in Turkey. The fourth chapter covers time series analysis of economic growth and domestic savings relations in Turkey. Finally, the last chapter of the study covers conclusion, discussion and recommendation.

1.1. Problem Statement

A general assessment indicates that when domestic savings are inadequate to compensate the investments, the arising gap between these two factors has to be offset through using foreign savings. However, this situation results with current account deficits and hence economic fluctuations. Thereby, authorities aim at increasing domestic savings in order to reduce or abolish economic fragility and to ensure sustainable economic growth**.**

Since the importance of domestic savings on sustainable economic growth, Turkish authorities have intended to increase domestic savings from first five-year development plan to present day. However, domestic savings have still remained unsatisfactorily so as to cover investment expenditures in Turkey. Therefore, the unending saving-investment gap and hence current account deficit have become unavoidable problems in the country for a long time. That is, inadequate level of domestic saving causes to dependence on foreign savings and, therefore, it leads to increase in current account deficit and it makes the Turkish economy to be vulnerable to external shocks.

Unfortunately, domestic savings remarkably declined particularly from 1990s in Turkey and they still remain considerably low level at 14 percent on average within the period 2010-2015 because of some reasons which are increase in credit facilities and consumption expenditures, rapid rise in unemployment and urbanization rates, macroeconomic instability, low level of female labor force participation rate, and some demographic factors such as education level and young dependency ratio.

As it is shown in the figure 1.1, domestic savings as share of gross domestic product (% of GDP) decreased from 20 percent to 15 percent during the period from 1990 to 2015.

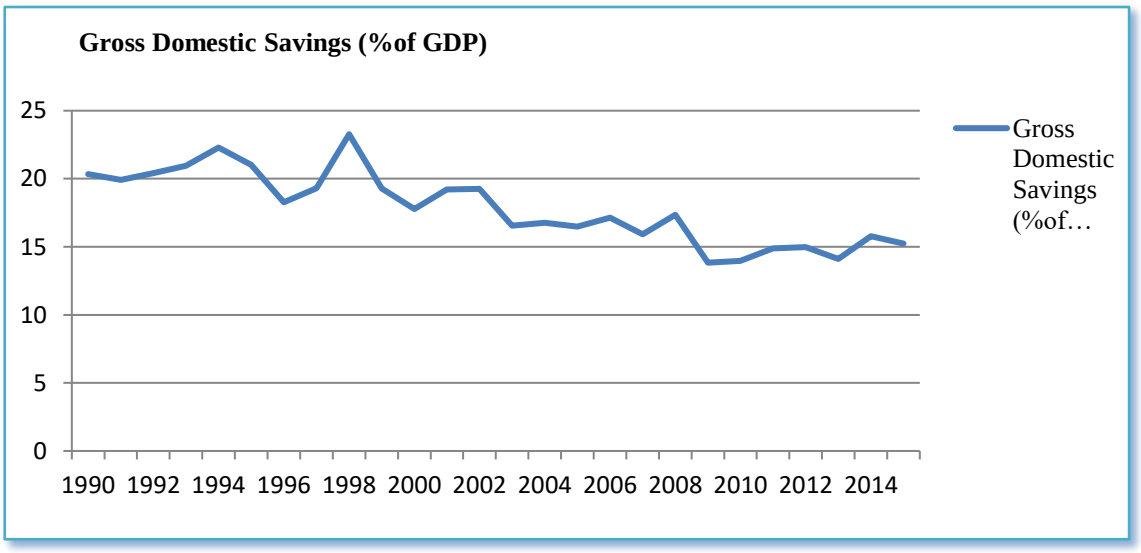

Figure: 1.1 *Gross Domestic Savings in Turkey (1990-2015)*

Source: *World Bank, http://data.worldbank.org/. (Date of access: 15.04.2017).*

Moreover, by comparing with world, Turkey's savings rates remain at low level. The same conclusion is valid for comparison of Turkey's domestic savings across different income countries.

The following table shows that the Turkey's savings rates have remained below remarkably with that of World average domestic savings for all of the selected periods. The same result is valid for comparison of Turkey's savings rates with lower middle countries (LMC), upper middle countries (UMC) and high income countries (HIC) groups. The inverse result is seen only in the comparison of Turkey's savings rates with low income countries (LIC).

Table: 1.1 *Comparisons of Turkey's Domestic Savings Rates with World and Different Income Countries.*

	1991-1995	**1996-2000**	**2001-2005**	**2006-2010**	**2011-2015**
	Gross Domestic savings (% of GDP)	**Gross Domestic savings (% of GDP)**	**Gross Domestic savings (% of GDP)**	**Gross Domestic savings (% of GDP)**	**Gross Domestic Savings (% of GDP)**
WLD	24,87	24,93	24,89	25,57	24,74
LIC	2,75	7,19	5,46	8,09	8,72
LMC	21,97	20,48	23,08	26,08	24,34
UMC	31,02	29,21	31,98	35,71	34,16
HIC	23,26	24,03	22,86	22,36	21,87
TUR	20,92	19,58	17,65	15,64	14,99

Source: *World Bank, http://data.worldbank.org/ (date of access: 15.04.2017). (Average rates of gross domestic savings are calculated by using World Bank data).*

1.2. Objectives of the Study

The main objective of this study is to reveal the development process of domestic savings rates in Turkey and to find out whether or not domestic savings promotes sustainable economic growth in the country through employing econometric estimation techniques. The specific objectives of this study are:

- To reveal a descriptive and econometric analyses about the relationship between domestic savings and GDP per capita growth by considering the development process of savings rates in Turkey and comparing Turkey's savings and GDP per capita growth rates across world and different income countries.

- To reveal a descriptive analysis about the relationship between saving-investment gap and current account deficit.
- To find out the reasons for decline in the domestic savings in Turkey.
- To seek a solution in order to increase domestic savings in Turkey.
- To initiate subsequent studies related with this context.
- To offer policy recommendations in order to achieve sustainable economic growth.

1.3. Importance of the Study

The rapid economic growth is the primary goal particularly for developing countries in every period of time. Therefore, studying out the factors causing to increase economic growth can be accepted as a most crucial issue in developing countries. It is also important to mention that economies experiencing macroeconomic instability attach importance to sustainable economic growth rather than rapid economic growth because the outcomes of sustainable economic growth not only lead to the economic development or welfare but also to the development of democracy in the countries.

Today, in developing countries as well as in Turkey, the lack of adequate savings can be considered as a main cause of economic instability because inadequate level of domestic savings cannot cover investments and the gap between these two factors is tried to be compensated through foreign capital inflows, however, this situation results with huge current account deficits and, therefore, it hinders the sustainable economic growth. Thereby, it is important to study out how domestic savings can affect the sustainable economic growth positively and which factors cause to decrease in savings rates in Turkey or why savings rates in Turkey remain considerably below the world average and different income groups.

1.4. Scope of the Study

This study firstly deals with GDP per capita incomes and total domestic savings, and covers the period from 1975 to 2014 by using World Bank data. Secondly, the study also deals with the public and private savings in Turkey over the period from 1975 to 2014 by using Republic of Turkey Ministry of Development data in order to research for the development process of savings, to reveal the factors causing the decline in

domestic savings and to find out the causal relationship among domestic savings and economic growth empirically.

1.5. Limitations of the Study

Time series data may be more useful when selected period of time is longer; therefore, the study can be affected by inadequate data. Data about private and public savings obtained from Republic of Turkey Ministry of Development covers only the period from 1975 to 2014 and hence the lack of adequate data for before 1975 and after 2014 can limit the scope of the study. Moreover, sustainable economic growth is used as a proxy for GDP per capita growth whereas the scope of sustainable growth not only covers income growth but also covers all human aspects. In addition, lack of adequate research about individual and corporate saving behaviors in turkey limit the study when revealing the reasons for decline in private savings.

1.6. Definitions

1.6.1. Definition of savings

In a broad sense, saving is the excess of income over consumption expenditures. That is, savings equals to income minus consumption expenditures.

The private saving is the excess of disposable income (YD) over consumption expenditure. Mishkin (2012, pp. 68-70) used a simple formulation in order to define the private saving more clearly as:

Private Saving (S_P) = Disposable Income (YD) - Consumption Expenditures (C). Here, disposable income (YD) equals to income (Y) minus net taxes (T) and net taxes equals to taxes minus government transfers:

$$YD = Y - T \tag{1.1}$$

Then, the private saving can be expressed as:

$$S_P = Y - T - C \tag{1.2}$$

The public savings indicate how much government is saving (S_G) and equals to net taxes (T, government income) minus government purchases (G):

$$S_G = T - G \tag{1.3}$$

Since the national saving is the sum of public and private savings, it can be shown as:

$$S = Y - C - G \quad (1.4)$$

Also, the total saving (S_T) is equal to the sum of national and foreign savings (S_F), total saving can be written as:

$$S_T = S + S_F \quad (1.5)$$

1.6.2. Definition of sustainable economic growth

In broad sense, the pure economic growth is defined as the real increases in total production of an economy within one year. Economic growth has significant outcomes in order to decrease unemployment rates, current account deficits, income inequality, and to increase the average incomes of individuals or to improve living standards of a nation.

Economic growth shifts production possibility frontier up and to the right. Here, the production possibility frontier indicates that all of the combinations of output produced when all of the scarce resources are used efficiently (Case, et al, 2009, p. 664). It is shown on the figure 1.2.

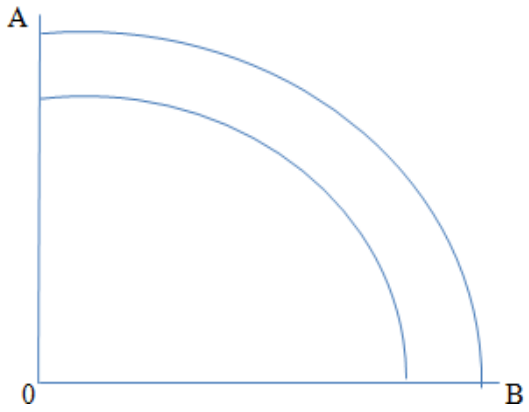

Figure: 1.2. *Production Possibility Frontier (PPP)*

In the figure 1.2 it is assumed that an economy produces two goods: A and B. When there is a presence of economic growth in an economy, the output would increase and then production possibility frontier would shift outwards.

However, sustainable economic growth actually does not hint a rapid growth. It actually refers that a continuous or balanced growth and its outcomes can be exploited by everyone in an economy. That is, returns of the economic growth encourage full employment and hence human development in an economy.

Landes (1998, pp. 217-218) indicated that the ideal growth and development society should have same requirements or features in order to achieve its economic goals, for example, encouraging saving and investment and hence realizing sustained economic growth. That is, the society would be as:

1. Knew how to operate, manage, and build the instruments of production and to create, adapt, and master new techniques on the technological frontier.

2. Was able to impart this knowledge and know-how to the young, whether by formal education or apprenticeship training.

3. Chose people for jobs by competence and relative merit; promoted and demoted on the basis of performance.

4. Afforded opportunity to individual or collective enterprise; encouraged initiative, competition, and emulation.

5. Allowed people to enjoy and employ the fruits of their labor and enterprise.

That reasons indicates why sustainable economic growth has different definition, requirements and outcomes than pure economic growth.

It can be concluded that if these requirements are satisfied, society can achieve higher level of savings and investment in order to realize sustainable economic growth. Also, it is important to mention that there can be a bilateral relationship between sustainable economic growth and required features for ideal growth and development.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

The phenomenon of economic growth is one of the most important social and economic issues for both developed and developing countries in every period of time. Therefore, factors or causes of economic growth as well as capital are undoubtedly one of the most controversial issues in economic literature. Moreover, the importance of capital on a nation's economic growth leads economists to ask the question of what causes to capital accumulation. The main answer for this question is that savings are the main sources of capital accumulation. Since the capital accumulation is a significant source of economic growth, the subject of savings has attracted the attention of economists for a long time. Consequently, economic literature has become the scene of many debates over the relationship between economic growth and savings.

Many studies in this context suggested that savings have a positive influence on economic growth while others argued against the suggestions. However, because of sustainable economic growth is relatively more recent macroeconomic event, less study has been done in this regard than pure economic growth. Thus, it would be more useful to clarify sustainable economic growth after revealing older ideas and arguments related to relations between economic growth and savings.

Sustainable economic growth can be explained as a good growth which mentioned through Yıldırım Mızrak. According to Yıldırım Mızrak (1997, pp. 29-30), the good growth has some outcomes for economies which are encouraging full employment, providing the formation of free will and information society, distributing the increasing welfare equitably, social collaboration and adaptation, and protecting the future of human development.

Therefore, sustainable economic growth does not imply a growth achieved only by physical capital, labor and technology without education or accumulation of knowledge or a growth its outcomes exploited mostly by specific groups in an economy. It actually refers that a long-lasting and useful for whole parts of the society by encouraging full employment, human development, and the nature at the same time.

In this section, primarily relations and sources of growth and savings will be addressed and then some of the basic growth models and empirical studies related with the context of the study will be introduced.

2.2. Savings and Economic Growth

By definition, saving is simply not spending some or all part of disposable income for consumption expenditures. Saving is substantially required for the process of investment which is closely related to economic growth Heilbroner (1972). Hence, it is important to mention that the most important source of financing for the investments that countries need to achieve long-term economic growth is domestic savings.

Today's savings increase the capacity of an entity to produce goods and services in the future; thereby savings lead the future generations to increase living standards (United States General Accounting Office, 2001, p.5). Therefore, saving is considered as a highly crucial issue for the process of investment and hence economic growth since it determines the nation's new capital building capacity.

Accordingly, it is important to refer that the domestic savings play an important role in economic growth especially for developing countries because these countries which have poor capital markets need domestic savings in order to fund their growth projects.

The relation between savings and economic growth has been discussed for a long time. From classical period to modern day, most of the research on the relationship between economic growth and savings has been claimed that savings have a significant influence on economic growth.

In industrial capitalism, the capital-owning class was believed to be the basic resource of production. The most important feature of this class was to save and to accumulate capital. According to Adam Smith, saving is another type of spending used to finance the investment and the share of workers and landowners from total production must fall while the share of capital owners from total production should be raised in order to ensure economic growth (Smith, 1776). The basic element behind his thinking that capital owners have a relatively higher tendency to save because rents are the basic motives in order for driving them to accumulate capital and to invest.

Classical economists have explained economic growth generally by placing importance on savings. To classics, effectively utilized capital can cause to reduce costs of production and increase profitability. As a consequence of increase in profitability, there would be a rise in capital accumulation and investment. The conversion of savings into investment expenditures which has become even clearer with the classical theory of

interest or Say's law (supply creates its own demand) will result in capital accumulation and hence economic growth (Bocutoğlu, 2012, pp. 55-104).

Although, there was a counter-view between classics such as Smith and Ricardo about the origin of value added, the common idea was that increasing profits can cause to increase in savings and to accumulate capital which leads to economic growth as a result.

The subject was also handled in theoretical framework through F.P. Ramsey (1928, pp. 543-559). His purpose of research is to find mathematically how much a nation should save and his suggestion is that today's saving can contribute to more future consumption under his assumptions.

After the Second World War, theoretical studies that began with Keynes continued with the contributions of Harrod (1939) and Domar (1946-1947). They aimed to relate Keynesian analysis with elements of economic growth. By assuming constant rate of saving and capital output ratio they generated an equation to illustrate economic growth. According to their simple formula, economic growth rate is based on the saving and capital output ratio (Bhattarai, 2004, p. 5). This is;

$$g = {}^{s}/_{k} \tag{2.1}$$

Where, g: growth rate, s: saving rate and k: capital output ratio.

One of the most crucial studies on growth analysis was made by Solow (1956) and Swan (1956) and the study mostly known as Solow Model emphasizes a closed economy which was built on neo-classic production function. This model reveals the effects of saving, population growth and technology on economic growth under some simplifying assumptions.

The interesting claim of the model is that the effect of the increasing saving rates on the increase in production per worker is temporary. Although, increase in savings will enhance to increase in the level of production per worker, the process does not last forever or it continues till economy reaches a new steady state (Dornbusch, et al, 2014, pp. 61-68). Therefore, it can be claimed that the Solow model implies that a higher saving rate does not have a positive effect on long-term economic growth. However, it must be taken into account that productivity growth may not be independent of capital accumulation when technical progress is came into existence on new capital equipment (Snowdon and Wane, 2005, pp. 611-612).

The endogenous growth theory that attracted attention after 1980 emphasized that the increase in savings rate would help to realize the economic growth through the capital accumulation and investment (Singh, 2010, p. 232). In the Solow model, saving rates can affect the economic growth in the short-term, whereas the Romer model which is an alternative view of long-run prospects for economic growth mentioned that saving rates can affect the economic growth in the long-term since the rates of return on capital and investment can increase with increases in the capital stock (Romer, 1986, pp. 1002-1037). Therefore, it can be mentioned that, in the Romer model, an increase in saving rates leads to the long-term economic growth.

In general, while exogenous growth theory implied that saving has a temporary effect on economic growth rate but it has a permanent effect on the level per capita income, the endogenous growth theory has claimed that the saving has permanent effect not only on the level of per capita income but also on the rate of economic growth (Buiter, 1991, pp. 1-2).

W. Arthur Lewis (1955) and Modigliani (1970) found considerable empirical evidences about the relationship between saving and economic growth for many countries. The main result of their studies is that higher savings rates lead to increase in investment opportunities by the help of increasing access to funds to finance investments and hence economic growth in the long run. Following the studies Lewis and Modigliani most of the authorities have implemented policies aimed at increasing their savings rates in order to achieve rapid economic growth in their countries.

Furthermore, a huge number of studies revealed for the same purpose of illustrating the relationship between these two variables in the economic literature. In the later empirical studies, these early findings have been widened and some studies suggested that savings have a positive influence on economic growth while others argue against the positive relationship between savings and economic growth.

2.3. The Sources of Savings

A nation's total savings consists of national savings (sum of the private and public savings) and foreign savings. Countries need foreign savings when domestic savings are inadequate so as to finance investments.

Private saving is mostly defined as the difference between disposable income (YD) and consumption expenditures (C). As Keynes states that since the amount of

saving and the amount of investment are the result of the common behaviors of individual consumers and entrepreneurs, these amounts are the exceeding part of the income from consumption and equal to each other (Keynes, 1936, p. 46).

In order to reveal the sources of saving and equality between saving and investment, it will be useful to introduce some identities related with the context.

$$S = YD - C \tag{2.2}$$

Where, S is private saving, YD is the disposable income which is the difference between income (Y) and Taxes (T) and C is consumption expenditures. Thus, the equation (2.2) can be written as:

$$S = Y - T - C \tag{2.3}$$

If we take into account the basic macroeconomic identity which requires that total income is the sum of consumption expenditures, investment expenditures, government purchases, and net exports, one can write the identity as:

$$Y = C + I + G + (X - M) \tag{2.4}$$

When these identities are reorganized, one can obtain a new equation as:

$$S = I + G + X - M - T \tag{2.5}$$

Then the equation can be written as:

$$I = S + (T - G) + (M - X) \tag{2.6}$$

According to the equation 2.6, investment expenditures are satisfied by the amount of private savings (S), public saving which is the difference between government's tax revenue and its purchases ($T - G$) and foreign savings or the amount of borrowings from abroad ($M - X$). In other words, in order to finance investments which is one of the most important sources of economic growth depends on the existence of private, public and foreign savings.

If there is a budget surplus which exists when government tax revenue is higher than its purchases, ($T > G$), it will make a significant contribution so as to finance the investment expenditures but it may be an undesirable thing for society. In addition, when the amount of exports is lower than the amount of imports, ($M > X$), the need for borrowing from abroad will arise for financing investment expenditures (Parkin, 2010, p. 164-165). As explained above, one can conclude that total savings consists of the sum of private, public and foreign savings can be used for financing the investments when there is a presence of lack of adequate domestic savings.

2.4. The Sources of Growth

The importance of growth is relatively higher than other economic issues because of its significant contributions to lowering unemployment, current account deficits, income inequalities, and increasing average incomes of individuals or improving living standards of a nation. Therefore, it is important to explain the sources of economic growth and how they affect economic growth. Mishkin (2012, pp. 145-146) used a simple illustration so as to reveal the sources of economic growth by using Cobb-Douglas Production Function as:

$$Y = F(K, L) = AK^{\alpha}L^{\beta} \quad (\alpha + \beta = 1) \tag{2.7}$$

Here K is capital stock, L is labor and A represents total factor productivity. Equation (2.7) tells us what happens to output (Y) if there is a change in any of the variables which are capital stock, labor and total factor productivity or technology level.

Before describing the effects of changes in these variables on the output, it is necessary to set out the properties of the production function. The first property of the production function is constant return to scale which refers that if the amount of any of the variables increases by one unit while other variables are hold constant, the output will increase the same unit. The second property of the production function is diminishing marginal product which means that an increase in the amount of one variable while other variables are hold constant will not increase output continuously, the increased output will decrease after a certain extent.

A growth equation from production function can be illustrated by using the rate of change or derivative as follows:

$$\Delta Y = \frac{\alpha Y}{\alpha A}\Delta A + \frac{\alpha Y}{\alpha K}\Delta K + \frac{\alpha Y}{\alpha L}\Delta \tag{2.8}$$

Where;

$\frac{\alpha Y}{\alpha A} = K^{\alpha}L^{\beta} = \frac{Y}{A}$

$\frac{\alpha Y}{\alpha K} = MPK$

$\frac{\alpha Y}{\alpha L} = MPL$

Then we can obtain an equation as follows:

$$\Delta Y = \frac{Y}{A}\Delta A + MPK\Delta K + MPL\Delta L \tag{2.9}$$

Through dividing both sides of the equation by Y, one can reach a new equation as follows:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + \beta \frac{\Delta L}{L} \quad (2.10)$$

Where;

$\frac{\Delta Y}{Y} = g_Y$ *(Rate of output growth)*

$\frac{\Delta A}{YA} = g_A$ *(Rate of technology growth)*

$\frac{\Delta K}{K} = g_K$ *(Rate of capital growth)*

$\frac{\Delta L}{L} = g_L$ *(Rate of labor growth)*

The equation 2.10 shows that the rate of output growth is determined by the rate of technology growth or the rate of total factor productivity and the rates of both capital and labor growth.

Neo-classical and post Keynesian growth theories placed more emphasis on the resources of economic growth have been centered so far. However, the resources of economic growth cannot automatically achieve economic growth on their own. It is necessary to be in existence of entrepreneurs, human capital, institutional structure, and government in order to enhance economic growth.

Entrepreneurs, who can bring these resources together with the best possible organization, manage the process of putting the sources into production really needed in revealing new product development, and find out new production methods and applications by forecasting risks of an entity (www.econlib.org, date of access: 01.02.2017).

Human capital, defined as qualified labor force that a society has, contributes to the production and hence economic growth by the help of factors such as education level and health. A higher level of human to capital stock can lead to higher growth by increasing physical capital or learning and exploiting the technologies from developed countries Barro (2001, p. 14).

The institutional structure that represents the network of culture, beliefs and traditions of a society leads to the presence of well-educated and talented human capital so as to increase labor productivity and to use resources efficiently. In addition, government, which constitutes the legal and political framework in a society, makes a significant contribution to economic growth through encouraging saving and investment

behaviors to society and provides effective working conditions to labors Wolla (2013, p 2). In sum, despite the fact that capital, labor and technology are three of the main sources of economic growth. Entrepreneurs, human capital, institutional structure and government are also required in order to be able to fulfill economic growth.

Also, according to study of Cooray (2009) based on selected 71 countries, government size measured through government expenditures, quality measured through governance, and human capital can enhance economic growth.

The following table indicates briefly the sources of economic growth and chief features of growth theories.

Table: 2.1. *Economic Growth Theories and Chief Features*

Growth Theories	**Sources of Economic Growth**	**Chief features**
Adam Simith (1776) David Ricardo (1817)	Division of Labor Productive reinvestment of surplus.	Non-continuous growth, Non-continuous Growth due to the decreasing returns in agriculture.
T.R. Malthus (1799)	Productive reinvestment of surplus.	Non-continuous growth due to the Law of Population.
Karl Marx (1867)	Capital Accumulation.	Non-Continuous growth due to the tendency of the profit rate to fall in the capitalist production process.
J.A. Schumpeter (1911-1939)	Bundles Innovations.	Un-stability of growth, unstable equilibrium.
Post Keynasian Growth Models: R.Harrod (1939); E.Domar (1946)	Growth rate is a function of investment and saving rates.	Unstable equilibrium.
Neo-Classic Growth Theories: R.Solow (1956)	Population and technological development ‘’ Exogenous’’.	Temporary growth due to an absence of technological development.
Models of Clup of Rome: Meadows (1972)	Natural resources.	Finite growth due to population explosion, pollution and energy consumption.
Regulation Theory: M.Aglietta (1976); R.Boyer(1986)	The relationship between productivity and demand.	Diversity of growth types due to space and time.
Endogenous Growth Theories: (New Growth Theories) P. Romer (1986); R. Lucas(1988); R. Barro (1990); J. Green wood and B. Jovanovic (1990)	Physical capital; human capital; technology; public capital, financial intermediaries.	Endogenous feature of growth, renewal of state; consideration of historical situation.
Industrial Districts Model: G. Becattini	Type of Industrial and community organization.	Explanation of the growth of regionals imbalances.

Source: *Yıldırım Mızrak, 1997, p. 25*

The emerging theories were also searched for different sources of economic growth under some of their assumptions. Neoclassical growth model failed to reveal the determinants of technological progress and to explain the sources of economic growth clearly while endogenous growth theory can be admitted more successful particularly on explanations of determinants of technological progress (Özer and Kılınç, 2014, p.75).

2.5. Theoretical Growth Studies

2.5.1. Harrod-Domar Growth Model

Keynes (1936) developed a static analysis in his General Theory that ignores the accumulation of capital and, consequently, economic growth altogether. However, he was criticized by Roy F. Harrod (1939) through investigating whether the market mechanism could automatically provide full employment in a growing economy by adding to the impact of investment on aggregate demand as well as on capital accumulation. Additionally, Evsey E. Domar (1946-1947) who is an American economist also developed an analysis which was so similar to Harrod model and this caused to these two models to be called Harrod-Domar growth model (Ünsal, 2016, pp. 83-84).

According to Bulutay, the Harrod-Domar model has two main purposes. The first purpose is that trying to overcome a great fear of nations for experiencing of huge economic crisis like great depression after the First World War. The second purpose of the model is that making a dynamic contribution to Keynes's static analysis (Bulutay, 2015, p. 3).

According to Ünsal, the Harrod-Domar model has three main assumptions. The first assumption is that a single commodity is produced in the economy by using only capital and labor inputs and the produced output is used for both consumption and investment. The second assumption is that the planned savings is the fixed rate of output. Finally, the last assumption is that the labor supply grows at a constant rate and the growth rate is exogenous (Ünsal, 2016, pp. 84-88).

The following equations can be established in the light of these assumptions and some definitions of variables expressed by Harrod (1939, pp. 14-33) as:

$G = \frac{x_1 - x_0}{x_0}$: Geometric rate of income growth.

G_w: Warranted rate of growth that everyone in an economy can be satisfied with.

However, there may be a difference between actual growth rate (G) and warranted growth rate (G_w) because of seasonal reasons.

s : Marginal propensity to save.

sx_0 : Total saving which is the fraction of income.

C: Value of the capital goods which is used for producing an additional unit of output.

C_P: Value of the increment of capital stock.

Since saving is the part of income that is not consumed by definition, total saving would be equal to addition to the capital stock. This condition is illustrated as:

$$sx_0 = C_P(x_1 - x_0) \tag{2.11}$$

If the equation (2.11) rearranged, one can reach a clearer equation as:

$$\frac{s}{C_p} = \frac{x_1 - x_0}{x_0} = G \tag{2.12}$$

If the value of the capital goods and the value of the increment of capital stock are equal, then the actual growth rate of output will be equal to the warranted growth rate of output as follows:

$$G_w = \frac{s}{C} \tag{2.13}$$

The meaning of the equality of warranted growth rate to the actual growth rate is that the planned growth rate which is determined at the beginning of the period is equal to the realized growth rate which is occurred at the end of the period. This situation is also referred as both planned saving and investment are realized and it is satisfactory to consumers and producers in the economy.

As it is stated before there may be an existence of difference between actual growth rate (G) and warranted growth rate (G_w). The difference between these two growth rates stems from actual growth rate can exceed warranted growth rate or vice versa. If the actual growth rate exceeds warranted growth rate, value of the increment of capital stock (C_P) will be higher than value of the capital goods (C). Then, there will be a shortage in production in the system.

However, the gap between these two growth rates will gradually diverge rather than converge due to the desire of the producers because they want to increase production in order to overcome the shortage in the system. This situation is called as inflationary process. Moreover, if the warranted growth rate exceeds the actual growth

rate it means that there will be excrescent amount of capital goods, producers will have to reduce their investment expenditures and then recession will be occurred in the system. This situation is called deflationary process (www.economicdiscussion.net, date of access: 03.02.2017).

Harrod (1939, p. 25) also mentioned natural growth rate as well as warranted and actual growth rates. According to him, the natural growth rate which is the maximum growth depends on the capital accumulation, population growth, technological improvement and labor. Under the assumption of full employment condition is satisfied, the natural growth rate would be achieved. For a growing economy the natural growth rate has to equal to actual growth rate due to ensure full employment growth which is called as golden age (Ünsal, 2016, p. 92).

According to Domar (1946, pp. 137-147), investment has two characteristics. These characteristics of investment can be expressed as investment can affect the productive capacity and income positively. He claimed that average and marginal propensity to save are equal ($^{I}/_{Y} = \alpha$) and productive capacity ratio is equal to the new investment project ($^{P}/_{K} = s$). In addition to that, he defined average social investment productivity as σ which is represented as $\sigma = \frac{\frac{dP}{dt}}{I}$. It means that an increase in productive capacity can be caused by investment and σ is equal to$1/C_P$ (inverse of value of the increment of capital stock which is defined by Harrod). Also, he defined α as marginal propensity to save and it is equal to s (marginal propensity to save which is also defined by Harrod) (Berber, 2015, p. 109). These similarities between two models have led to formation of two similar equations and hence these models are called Harrod-Domar growth model in general.

Under the assumption of excess labor in the model, there is only one factor determining production is capital. Therefore, one unit output can be produced by using one unit capital (σ or $1/C_P$), and hence $\frac{s}{C_p}$ amount capital can be accumulated. From this point of view, the growth rate of an economy, under the assumption of existence of excess labor, determined by saving and capital-output ratio (Ünsal, 2016, pp. 93-94). It can be concluded that if there is an increase in saving rates in an economy, there will be an increase in growth rate.

2.5.2. Solow Growth Model

One of the most important periods in the studies on growth analysis is neo-classical period after the Second World War. Many growth models have been asserted within the concept of neo-classical theory, but the most approved model in the literature revealed by Robert M. Solow in 1956 and the model is often called as neo-classical growth model because it is not only based on the assumptions of neo-classical growth theory but also carries the properties of it.

The Solow growth model aims at revealing how changes in the capital stock and the labor force, and improvements in technology affect each other in an economy as well as how they direct a nation's capacity of economic growth (Mankiw, 2009, p. 192).

Although the model derived from Solow's and Swan's independent studies, Solow (2007, pp. 3-4) explained three reasons why the model known as Solow model. The first reason is that Swan's work wholly depends on Cobb-Douglas production function and his explanations are not clear enough while Solow deals with different kind of production function and has clearer explanations. The second reason behind the claim of Solow is that when he intended to move away from the unrealistic ideas of Harrod and Domar and tried to find a more realistic concept for his study, Swan went into direction of Johan Robinson's objections about the capital and growth. The last reason is that Solow's study was published in the Quarterly Journal of Economic which is well known for economists.

On the contrary to Harrod-Domar model, Solow model is a supply-oriented model based on microeconomic analysis. In the Solow model, one of the main reasons for differences in output levels among countries is the different levels of capital accumulation rates and the model reveals that the convergence hypothesis is valid among countries (Özer and Kılınç, 2014, p.75).

Today, Solow model is used to explain the factors that determine the growth and income differences among national economies, so, even when different models are being studied, they can be better understood by comparison with the Solow model. The model is based on two basic functions when analyzing the growth process. The first one is Cobb-Douglas production function and the second one is the function of accumulation of physical capital stock.

2.5.2.1. Assumptions of Solow Model

The basic assumptions of the Solow model (Snowdon and Wane, 2005, p. 603) are written as:

- It is assumed that the economy has only one sector and economy produces a single commodity that can be used both for consumption and for investment.
- The economy is closed and the public sector is ignored.
- All saved production turns into investment. In other words, Keynesian problems were abolished because the planned savings in the Solow model were always equal to the planned investments.
- The assumption of full price elasticity and the neutrality of money are valid and potential level of production is always produced in the economy.
- The growth rate of technology, population and the depreciation of the capital stock are determined externally.

Barro and Sala-İ Martin (2004, pp. 23-28) formed equations that explain the structure of Solow model as follows:

- Four time dependent variables that the model takes them into account can be shown as:

$$Y(t) = F(K(t), A(t), L(t)) \tag{2.14}$$

Where Y is output, K is capital, A is knowledge or technology which affects the labor effectiveness and L is labor. Also, labor (L) and technology (A) grows exogenously.

$$\dot{L}(t) = nL(t) \tag{2.15}$$

$$\dot{A}(t) = gA(t) \tag{2.16}$$

- A closed economy where government purchase does not exist and output is homogeneous which can be consumed ($C(t)$) or invested ($I(t)$). Therefore, output is equal to the sum of consumption and investment expenditures as:

$$Y(t) = C(t) + I(t) \tag{2.17}$$

Since saving is the remaining part of the consumption from income$S(t) = Y(t) - C(t)$, it can be indicated as $S(t) = I(t)$.

- The marginal propensity to saving (s) is exogenous and it takes value between 0 and 1. The physical capital depreciates (δ) at a constant rate. In general,

depreciation rate is assumed to be 0.05. That is, 0.05 fraction of capital depreciates every year.

Since the change in capital stock per worker is equal to difference of new investment from depreciation, the following equation can be illustrated as:

$$\dot{K}(t) = I(t) - \delta \mathrm{K(t)} = \mathrm{sF}[K(t), L(t), T(t) - \delta \mathrm{K(t)}] \tag{2.18}$$

Where, the term $\dot{K}(t)$is the time dependent change in capital per worker which is shown as$\dot{K}(t) \equiv \partial K(t)/\partial t$.

- The labor input (L) changes during the time because of population growth. However, since the population growth is assumed to be constant ($\frac{\dot{L}}{L} = n \geq 0$), everyone in the economy has same skills and works the same amount of time.
- The production function has constant returns to scale that means when labor and capital multiplied with a constant (β) it will cause output to change as the same amount of labor and capital.

$$F(\beta K, \beta L) = \beta F(K, L) = 2Y \tag{2.19}$$

- There is a presence of diminishing marginal product of labor and capital, and both labor and capital are positive. This condition implies that the marginal product of labor diminishes while holding constant the quantity of capital or the marginal product of capital diminishes while holding constant the quantity of labor.

$$\frac{\partial F}{\partial K} > 0, \quad \frac{\partial^2 F}{\partial K^2} < 0$$

$$\frac{\partial F}{\partial L} > 0, \quad \frac{\partial^2 F}{\partial L^2} < 0 \tag{2.20}$$

- Inada conditions are valid. That is, while the amount of one factor labor or capital is higher, its marginal product will be small or vice versa. It means that while marginal product of labor or capital goes to infinity, labor and capital goes to zero or vice versa.

$$\lim_{K \to 0} \left(\frac{\partial F}{\partial K}\right) = \lim_{L \to 0} \left(\frac{\partial F}{\partial L}\right) = \infty$$

$$\lim_{K \to \infty} \left(\frac{\partial F}{\partial K}\right) = \lim_{L \to \infty} \left(\frac{\partial F}{\partial L}\right) = 0 \tag{2.21}$$

Now, the model can be developed through using Cobb-Douglas production function as:

$$Y = F(K, L) = K^{\alpha} L^{1-\alpha} \tag{2.22}$$

- Essentiality condition which refers that a positive amount of input is absolutely required to produce a positive amount of output is prevailed.

$$F(0, L) = F(K, 0) = 0 \tag{2.23}$$

When the production function is written with respect to output per capita and capital per capita by dividing both side of the function, the new form of the function can be illustrated as:

$$\frac{Y}{L} = F\left(\frac{K}{L}, \frac{L}{L}\right) = \left(\frac{K}{L}\right)^{\alpha} \tag{2.24}$$

Where:

$\frac{Y}{L} = y$: Output per capita

$\frac{K}{L} = k$: Capital per capita

Then one can reach a new equation which is called intensive form of production function can be expressed as:

$$y = f(k) \tag{2.25}$$

According to equation (2.25), the output per worker is independent of the amount of labor employed. This condition abolishes the scale effects which refers that output per capita increases as the number of workers increases. That is, Solow model does not depend on scale effects or the number of workers cannot increase or decrease the output per capita because of holding k as a constant.

Also, Solow growth model contains two different units which are individuals or consumers and firms or producers. Consumers that are both labor suppliers and capital owners receive wage (w) for labor and rent (k) for capital from firms. Therefore, the national income would be equal to labor income (wL) and return on capital (wK) (Ünsal, 2016, p. 112) as it is indicated below.

$$Y = wL + rK \tag{2.26}$$

If one differentiates both function (2.22 and 2.26) separately with respect to L and K;

$$\frac{\partial Y}{\partial L} = (1-\alpha)K^{\alpha}L^{-\alpha} = (1-\alpha)\left(\frac{K}{L}\right)^{\alpha} = (1-\alpha)k^{\alpha} = f'(k) = w \implies \frac{w}{f(k)} = 1-\alpha \tag{2.27}$$

$$\frac{\partial Y}{\partial K} = \alpha K^{\alpha-1}L^{1-\alpha} = \alpha\frac{K^{\alpha}}{K}\frac{L}{L^{\alpha}} = \alpha k^{\alpha-1} = r = f(k) - f'(k) \Longrightarrow rk/f(k) = \alpha$$

Where the labor share of income ($\frac{w}{f(k)}$) is equal to $1-\alpha$ and the capital share of income ($rk/f(k)$) is equal to α.

Then one can conclude that the marginal product of labor ($f'(k)$) is equal to wage and marginal product of capital ($f(k) - f'(k)$) is equal to rent.

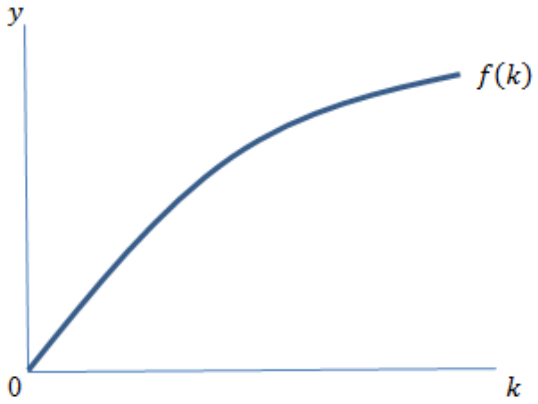

Figure: 2.1. *Output and Capital per Worker*

Figure 2.1 expresses that the relationship between output per worker and capital per worker. Output per worker is a function of capital per worker and the slope of the production function equals to marginal product of capital ($MP_K = \frac{\partial Y}{\partial K}$). As the capital per worker increases, the output per worker increases at a decreasing rate and the slope of the curve decreases because of diminishing returns.

2.5.2.2. The basic structure of Solow Model

In order to reveal the Solow's basic growth equation one can use the equation (2.18) which expresses that the change in capital stock over time is equal to the difference between investment and depreciation ($\dot{K}(t) = I(t) - \delta \mathrm{K(t)}$). Through dividing both sides of the equation by labor (L), the new equation can be written as;

$$\dot{K}/L = \frac{I}{L} - \delta\frac{K}{L} \qquad (2.28)$$

Where investment per worker ($\frac{I}{L}$) is equal to saving per worker ($s.f(k)$) and capital per worker ($\frac{K}{L}$) can be represented as''k''. One can rearrange the Solow's basic growth equation as follows.

$$\dot{K}/L = s.f(k) - \delta k \tag{2.29}$$

Here, if one takes the derivative of this function, then he can get;

$$\dot{k} = \frac{d(K/L)}{dt} = \dot{K}/L - nk \tag{2.30}$$

Where $n = \dot{L}/L$, it means that the labor participation rate is constant and the rate of population growth is equal to n.

After making necessary arrangement in the equation 2.30, Solow's basic growth equation can be illustrated as;

$$\dot{k} = sf(k) - (n + \delta)k \tag{2.31}$$

The equality (2.31) states that, in every period, the change in capital per worker is determined by three terms.

The first term ($sf(k)$) has resemblance to original capital accumulation equation and it represents the investment per worker. While depreciation per worker (δk) decreases capital per worker (k), investment per worker ($sf(k)$) increases it. The term nk states the decrease in capital per capita because of population growth.

The second term ($(n + \delta)k$) which is called as required investment represents the amount of investment necessary to keep the capital per person constant, since both deprecation in physical capital stock and population growth lead to decrease the investment per capita. If the required investment is greater than the gross investment or investment per worker, capital per worker is reduced. In other words, the gross investment does not cover the loss of capital per capita due to population growth and depreciation (Jones, 1998, p. 24).

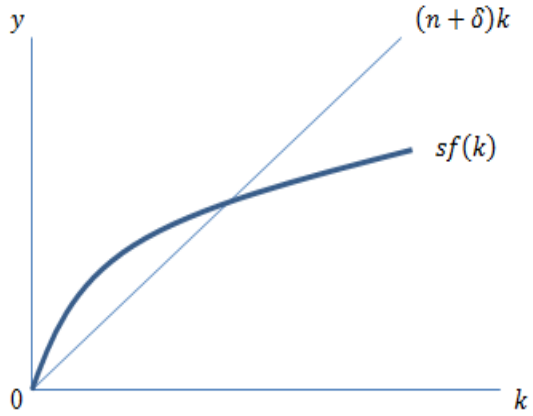

Figure: 2.2. *Basic Solow Diagram*

Figure 2.2 shows the relationship between capital per worker and output per worker. The line named $sf(k)$ is the investment per worker and the other line named $(n+\delta)k$ is the required investment. Difference between these two lines equals to change in the amount of capital per worker. When investment per worker is higher than the required investment ($sf(k) > (n+\delta)k$) capital per worker will increase and hence there will be existence of capital deepening. That is, capital per worker will increase over time.

Farther, when investment per worker is lower than the required investment ($(n+\delta)k > sf(k)$) capital per worker will decrease over time. Also, if investment per worker and required investment equals to each other, then capital per worker will remain constant and economy will reach to steady state.

As it is mentioned before that the steady state occurs when investment per worker equals to required investment. This condition will lead to create the steady state equation as follows.

$$\dot{k} = sf(k) - (n+\delta)k = 0 \Longrightarrow k^* = \left(\frac{s}{n+\delta}\right)^{1/(1-\alpha)} \tag{2.32}$$

Now the equation of steady state of output per worker can be written as:

$$y^* = \left(\frac{s}{n+\delta}\right)^{\alpha/(1-\alpha)} \tag{2.33}$$

This equation explains why some countries are richer than other countries. Countries which have higher level of savings tend to be richer because they can accumulate more capital per worker and hence the level output per worker is higher in such countries (Jones, 1998, pp. 28-29). The effect of saving on economic growth can be established by following figure as:

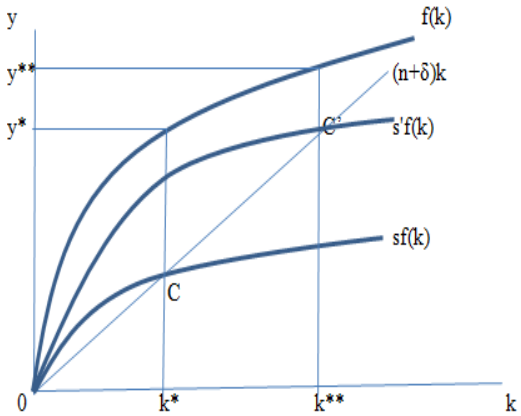

Figure: 2.3. *Production Function and Solow Diagram: An Increase in Saving Rate*

Figure 2.3 represents that the economy is initially balanced at the steady state level of capital per worker (k*) where the amount of output per worker is equal to y*. If there is an increase in saving because of any reason, investment per worker would be higher than the required investment and hence capital per worker (k*) will grow and reach to k** until these two sides of the basic Solow equation ($s'f(k)$ and $(n+\delta)k$) become equal to each other. That is, the saving line ($sf(k)$) will shift up to ($s'f(k)$) and then the economy will reach to new steady state (C') where the amount of output per worker is equal to k**.

Saving is the main determinant of the steady state capital stock in the Solow model. On one hand, when there is an increase in savings rates, higher level of capital stock will be formed in the economy. On the other hand, when there is a decrease in savings rates, lower level of capital stock and output will be formed in steady state in the economy (Mankiw, 2009, p. 201).

As a result, an increase in savings moves to economy from one steady state to new steady state where capital and output per worker is relatively higher than the old one. However, the effect of savings on increase in production per worker is temporary; therefore, the positive effect of savings on economic growth is not long run effect but short run effect.

2.5.2.3. Solow Model with technology

The fact that saving is not affecting the growth in the long-run leads us to answer the question of what is the source of long-run economic growth. According to (Snowdon and Wane, 2005, p. 611) the growth rate of output per capita in the long-run depends on only the rate of technological progress. Therefore, there is a need to add the technology on to Solow's basic growth model in order to find the answer to the question of what is the source of long-run economic growth.

The Solow model with technology can be created the model by adding the technology variable on to the production function as follows.

$$Y = F(K, AL) = K^{\alpha}(AL)^{1-\alpha} \tag{2.34}$$

Where technology variable (A), which is assumed exogenous and defined as labor augmenting, is growing at a fixed rate in the Solow model. Technology affects the

productivity of labor positively (Jones, 1998, pp. 32-33). If the equation 2.16 given earlier can be rewritten by assuming that A grows at a constant rate as:

$$\frac{\dot{A}(t)}{A(t)} = g \Longrightarrow A = A_0 e^{gt} \tag{2.35}$$

If the production function is written in terms of the output per capita and rearranged by using logarithm and derivation with respect to time, then the new format of the equation will be as:

$$y = k^{\alpha} A^{1-\alpha} \Longrightarrow logy = \alpha logk + (1-\alpha) logA \Longrightarrow \frac{\dot{y}}{y} = \alpha \frac{\dot{k}}{k} + (1-\alpha)\frac{\dot{A}}{A} \tag{2.36}$$

Where $\frac{\dot{A}}{A} = g, \frac{\dot{y}}{y} = g_y$ and $\frac{\dot{k}}{k} = k$

In the balanced growth process, output per worker and capital per worker both grow at the rate of exogenous technological growth. Therefore, if the model does not include technology, output and capital per worker will not grow in the long-run ($g_y = g_k = g = 0$). However, this result is contradictory to the actuality since economies experienced permanent growth in per capita income and capital. The main reason behind these experiments is exogenous technological development (Jones, 1998, p. 34).

In order to explain how Solow model with technology works, henceforth, the effective capital per worker will be mentioned instead of capital per worker. That is, the capital per worker ($k = K/L$), which is fixed in steady state level, is equal to effective capital per worker or per capita capital-output ratio ($\tilde{k} = K/L$) and effective capital per worker will be constant along the balanced growth path since output and capital per worker growth at the rate of technological growth rate ($g_y = g_k = g$).

Furthermore, effective per capita income can be named as per capita technology-output ratio ($\tilde{y} = \frac{Y}{AL}, (y = \frac{K}{A})$). Then the production function can be represented as $\tilde{y} = \left(\tilde{k}\right)^{\alpha}$.

When one rewrites the capital stock equation with respect to effective capital per worker the new equation can be written as:

$$\dot{\tilde{k}} = s\tilde{y} - n(d + g + \delta)\tilde{k} \tag{2.37}$$

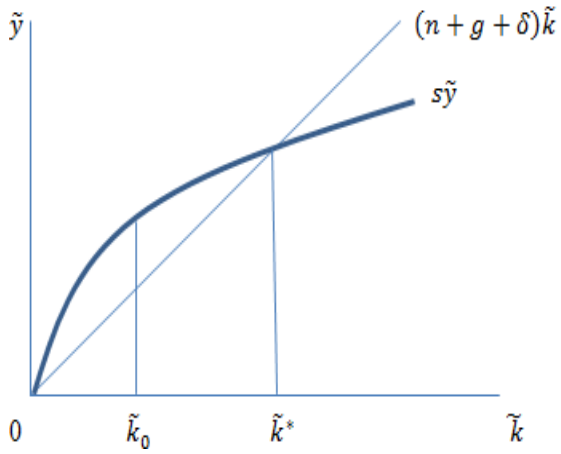

Figure: 2.4. *Solow Diagram with Technology*

Figure 2.4 represents that the economy is initially has lower level of effective capital per worker ($\tilde{k}_0$) than the steady state level effective capital per worker ($\tilde{k}^*$). Since the actual investment is greater than the required investment, the effective capital per worker will reach to steady state level effective capital per worker in progress of time where the amount of actual investment is equal to required investment.

Moreover, if the economy initially has higher level of effective capital per worker than the steady state level, the required investment would be higher than the actual investment and then effective per worker would reach to steady state level in time.

Steady state level technology-output ratio can be revealed by means of production function and the condition in which technology-capital ratio is equal to zero (Jones, 1998, p. 36). Therefore, steady state level of effective capital and output per worker can be represented as:

$$\tilde{k}^* = \left(\frac{s}{(n+g+\delta)}\right)^{1/(1-\alpha)} \tag{2.38}$$

If the equation is rewritten again with respect to effective output per worker and regulated in order to illustrate why population growth and investment rates have temporary effect on economic growth without technological development.

$$\tilde{y}^* = \left(\frac{s}{(n+g+\delta)}\right)^{\alpha/(1-\alpha)} \Rightarrow y^*(t) = A(t)\left(\frac{s}{(n+g+\delta)}\right)^{\alpha/(1-\alpha)} \tag{2.39}$$

According to equation (2.39), with the absence of technological development, changes in population growth and investment rates would not affect the long-run growth of per capita output ratio.

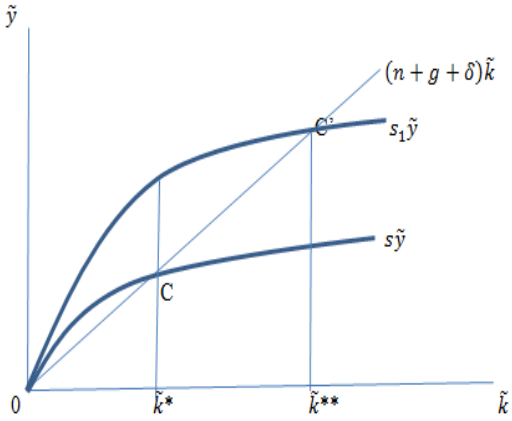

Figure: 2.5. *Solow Diagram with Technology: An Increase in Saving Rate*

As it is shown by the figure 2.5, if there is an increase in saving, there will be increase in capital per worker from initial point $\tilde{k}^*$ to $\tilde{k}^{**}$ since at the $\tilde{k}^*$ level of capitals per worker, the required investment is higher than actual investment. After the economy reaches the new steady state at the point $\tilde{k}^{**}$, the impact of the increase in savings on per capita income is over. That is, an increase in savings rates has positive impact on economic growth until the economy reaches the new steady state level; therefore, savings have a level or temporary (short-run) effect on economic growth rather than long-run or permanent effect.

2.5.2.4. Golden Rule of Capital

The concept of golden rule of capital accumulation was added to Solow model by Phelps (1961) implied a level of capital accumulation where consumption per worker is maximized.

What is to be emphasized by golden rule of capital accumulation is explained by Berber (2015, pp. 132-133) as a common point of intersection of public authority who aims at realize a steady state where capital per worker is higher and individuals who wishes higher level of per capita consumption rather than capital per worker. This situation which leads author to establish capital stock equilibrium where consumption is maximized can be illustrated by favor of per capita concepts as follows.

$\frac{K}{L} = k$: *Steady state level of capital per worker*

$\frac{Y}{L} = y$: *Output per worker*

$\frac{C}{L} = c$: *Consumption per worker*

Since the consumption is the difference between output and saving, the level of consumption per capita will equal to per capita output and per capita investment. Therefore, one can write the capital stock equation with respect to per capita consumption as:

$$c = f(k) - sf(k) \tag{2.40}$$

Since the actual and required investments are equal to each other in the steady state, the steady state level per capita consumption function can be written as:

$$c^* = f(k)^* - (n + \delta)k^* \tag{2.41}$$

When the difference between steady state level of output per worker and required investment is maximized, consumption per worker will be maximized automatically.

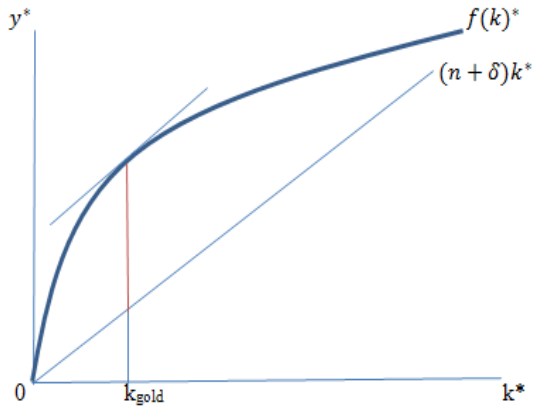

Figure: 2.6. *Golden Rule of Capital Accumulation*

Figure 2.6 presents that the consumption is maximized when the tangents drawn over the production function ($f(k)^*$) parallel to the required investment line ($(n + \delta)k^*$), that is, when the gap between required investments and output per worker gets its maximum, the consumption per worker would also be maximum at k_{gold} level of capital accumulation. If the capital stock remains under the golden level of capital accumulation, an increase in capital stock will cause to increase in production and hence consumption per worker. Moreover, if the capital stock remains over the golden level of capital accumulation, an increase in capital stock increases production level but results with decline in consumption per worker.

Therefore, it can be mentioned that the accumulation of capital would be more important for economies whose level of capital is lower than the golden level of capital stock.

Through assuming that output per worker is equal to square root of capital per worker ($y = \sqrt{k}$) and depreciation rate is equal to ten percent (δ=10%), golden level of savings rates calculated as 0.5 (Mankiw, 2009, pp. 207-208). It means that when the savings rates remain at fifty percent, the consumption reaches to its highest level, that is, the golden level of capital stock is realized.

As a result, by considering the savings rates in Turkey which is highly lower than the golden level of savings rates, it can be argued that an increase in savings rates in Turkey will lead to increase not only in consumption but also in production levels.

2.6. Empirical Studies on the Relationship between Savings and Economic Growth

Since economic growth is one of the most crucial issues for both developing and developed countries, many debates about the impact of factors as well as savings on economic growth are popular discussion topics particularly in developing countries. Moreover, the effects of the savings on economic growth that has been the subject of research from the classical period to today. Many studies in this context hold the idea that savings have a positive influence on economic growth while others claimed that there is no causal relation or co-integration among the variables. The results of the researches can be different because these studies applied to different countries and they are applied with different econometric techniques.

In this section, primarily we will try to mention the international literature and then refer to the relevant national literature related to the subject of the study.

2.6.1. The Empirics from international studies

One of the earlier international study asserted by Cardenas and Escobar (1998) who analyzed the determinants of savings and tested the correlations and causality among saving, investment and growth for Colombia for the period between 1925-1994 by using Error Correction Model (ECM) and Granger Causality testing procedures. The result of their study claims that the changes in saving and investment are perfectly correlated and there is an existence of granger causality running from saving to economic growth.

Andersson (1999) used Granger Causality testing for United Kingdom, Sweden and United States in order to reveal the causality between saving and economic growth.

By using time series data for real gross domestic product and saving for United Stated (1950-1997), for United Kingdom (1952-1996) and for Sweden (1950-1996), he found that the relationship between saving and economic growth differs across countries and the directions of causality can differ with respect to long-run and short-run process.

The results of Andersson's study implies that there is a bi-directional causality between gross domestic product and saving in the long-run for both United Kingdom and Sweden while there is no existence of causality between saving and growth for United States in the long-run. Farther, in the short-run, the causality between saving and economic growth is observed in both direction for United States and a unidirectional causality runs from saving to growth for United Kingdom while there is no causality observed among these variables for Sweden.

Krieckhaus (2002) conducted a study to express how public savings can contribute to sustainable economic growth. This study based on 32 countries formed by multiple regression analysis for the period between 1960 and 1980. By using the cross-national data from International Monetary Fund (IMF) and Government Finance Statistics (GFS), researcher compared the countries with respect to the level of their public savings and economic growths. The main conclusion of Krieckhaus' study is that the public savings have a positive effect on long-run economic growth.

Romm (2003) employed Johansen Vector Error Correction Model (VECM) in an attempt to analyze the direction of relation between savings and economic growth in South Africa for the period between 1946 and 1992. The first result of Romm's study mentioned that the private savings have a direct effect on private investments and indirect effect on economic growth. The second result of the study mentioned that economic growth has a positive influence on the private savings.

Alguacil et al (2004) analyzed the causality between savings and economic growth by using Granger Causality test procedure for Mexico for the period between 1970 and 2000. The multivariate causality test reveals that not only savings cause to economic growth but also foreign direct investments cause to economic growth. However, while there is an existence of a bi-directional causality between savings and economic growth, there is an existence of unidirectional causality running form savings to foreign direct investment. Indeed, Alguacil et al (2003) had conducted a similar study in order to reveal the causality between saving, foreign direct investment flows and economic growth for Spain for the period between 1970 and 1999 through using the

Granger Causality test procedure and their main finding was that the saving causes economic growth.

Irandoust and Ericson (2005) tested if foreign aid and domestic savings enhance economic growth or not for five African countries which are Niger, Nigeria, Rwanda, Senegal and Togo for the period between 1965 and 2000. Through using likelihood-based panel co-integration analysis in order to explain the long-run relationship between these variables, they came to conclusion implied that the foreign aid and domestic savings cause to economic growth for all countries.

Katircioglu and Naraliyeva (2006) aimed at investigating the long-run relationship and the directions of causalities between domestic savings, foreign direct investments and economic growth for Kazakhstan for the period between 1993 and 2002 by using co-integration and Granger Causality testing methods. The result of co-integration tests asserts that if there is one percentage increase in domestic savings and foreign direct investment, it would cause to relatively twenty eight and sixty two percentage increase in economic growth. Moreover, according to Granger Causality testing results, there are unidirectional causalities running from domestic savings and foreign direct investment to economic growth.

Sajid and Sarfraz (2008) addressed the causal relationship between savings and economic growth for Pakistan by using quarterly data for the period between 1973 and 2003. Through using (VECM) and Johansen co-integration testing methods they explored that there is a presence of bilateral relationship between savings and economic growth in the long-run. Moreover, the other main result of the study exhibited that there is an existence of unidirectional granger causality flowing from savings to economic growth. This result, therefore, explains the idea that the positive effect of savings on sustainable economic growth. Also, short-run testing result illustrated a presence of unidirectional causality flowing from gross national product and gross domestic product to savings and a presence of Granger Causality flowing from savings to gross domestic product.

Lean and Song (2009) revealed a study in an attempt to exhibit the relationship between the growth of domestic savings and economic growth in China for the period between 1955 and 2004. The applied Johansen and Juselius co-integration test results presented that there is a long-run relationship between domestic savings and economic growth. Furthermore, they also attempt so as to present whether there is an existence of

causality between variables through using Granger Causality testing method. As a result, bilateral causality is found between growth of domestic savings and economic growth in the sort-run while there is an existence of unidirectional causality running from growth of domestic savings to economic growth in the long-run. That is, growth of domestic savings can enhance the economic growth not only in the short run but also in the long run.

Chturvedi et al (2009) examined the relationships between savings, inflation, interest rates and economic growth by way of using two stage least squares (LS) testing methods and panel data for south and south-east Asia for the period between 1989 and 2003. According to test results of the study, there is a bilateral relationship among savings and economic growth. Furthermore, although inflation can positively affect the savings rates, it has significantly negative effect on economic growth. Another interesting finding of the study is that there is nonexistence of a relationship between savings and interest rates.

Tang and Chua (2009) applied nonparametric econometric techniques for ascertaining the relationship between savings and economic growth in Malesia over the period from 1991 to 2006. The result of the nonparametric co-integration tests revealed that there is a co-integration among savings and economic growth. Farther, the nonparametric causality testing results showed that the presence of bilateral causality among the variables. Therefore, the main finding is that not only savings cause to economic growth but also economic growth causes to savings in Malesia.

Agrawall and Sahoo (2009) attempted to constitute a study in order to investigate the sign of the causality between economic growth and saving, and determine the directions of relationship between economic growth and interest rates, bank density and dependency ratios, and savings in Bangladesh for the period between 1975 and 2004. By the help of using the time series techniques which are Autoregressive Distribute Lag (ARDL) model, Forecast Error Variance Decomposition (FEVD) procedure, and Granger causality testing procedure they firstly found that economic growth and interest rates, bank density and dependency ratios determine savings. The second finding of the study obtained by using ARDL method revealed that a presence of long-run fixed relationship between savings and its determinants. The last but most important finding of the study obtained from Granger causality testing procedure investigated that there is an existence of bilateral granger causality between savings and economic growth.

Oladipo (2010) formed a study on the purpose of illustrating the direction of causality between savings and economic growth in Nigeria for the period between 1970 and 2006. The first result of the study claimed that there is an existence of positive co-integration implied long-run fixed relationship between saving and economic growth and the second result of the study presented that the presence of unidirectional Granger causality flowing from savings to economic growth.

Jangili (2011) employed the Johansen co-integration and Granger Causality testing procedures on the purpose of investigating the relationships between savings, investments and economic growth in India for the period between 1950 and 2007. The result of the co-integration analysis revealed that the presence of a long-run relationship between the variables. Moreover, the result of the Granger Causality test suggests that there are separately two granger causalities flowing from savings to investments and investments to economic growth, therefore, the main result of the study exhibited that if there is an increase in savings rates, then there will be an increase in investments and hence economic growth.

Misztal (2011) intended to illustrate the relationship between savings and economic growth for advanced, emerging and developing countries for the period between 1980 and 2010. Through using co-integration and Granger Causality testing methods they analyzed the causal relationship among the variables. The result of the study indicated that there is a unidirectional causality running from savings to economic growth for advanced, emerging and developing countries. That is, while savings can cause to economic growth, economic growth cannot cause to savings or it has no significant effect on savings.

By employing the Toda-Yamamoto Approach to Granger Causality Test (TYDL), Tang and Chua (2012) exhibited another study three years after the previous study for the same purpose. The co-integration test result illustrated that an existence of co-integration between savings and its determinants which are income, foreign savings, interest rate and dependency ratio in the long run. As a result of TYDL Granger causality test, there is a bilateral causality between savings and economic growth as it is asserted in the Tang and Chua's previous study which is stated above.

Tang and Ch'ng (2012) published a study in an attempt to illustrate the relationship between saving and economic growth for the five ASEAN founding economies (Indonesia, Malesia, Singapore, Philippines and Thailand). The based

period of the study contains between 1970 and 2010 and applied econometric methods are both Johansen co-integration and Modified Wald (MWALD) causality testing techniques. The result of co-integration testing method presented that there is a presence of relationship between savings and its determinants in the long run which promotes the findings of the study developed by Tang and Chua (2012) for Malesia among the period between 1978 and 2008. More importantly, the result of the MWALD causality testing revealed that there is a presence of bilateral causality between saving and economic growth for all ASEAN founding economies.

Amusa and Busani (2012) tried to find whether there is a relationship between domestic savings and economic growth in Botswana over the period from 1980 to 2008. With the help of the ARDL bounds testing approach the result of the study suggested that there is an existence of co-integration between domestic savings and economic growth. It means that domestic savings has positive both short and long run influence on economic growth in Botswana.

Another study related to this concept conducted by Sekantsi and Kalebe (2015**)** in order to assert the relationships between savings, investmenst and economic growth in Lesotho for the period between 1970 and 2012. Through using ARDL and VECM techniques they found that there is an existence of causality flowing from growth to savings in the short-run while there is an evidence of causality flowing from savings to economic growth in the long run. Also, the result of the study reveals that the causality flowing from savings to investments and the causality flowing from investment to economic growth exist both long-run and short-run.

Khamsi (2016) studied on the subject of the causal relationship among savings and economic growth through VECM and unrestricted Vector Autoregression model (VAR) with the Granger Causality testing for Colombia, Mexico, Sweden and United Kingdom for the period between 1967 and 2014. His analysis resulted with there is a relationship between savings and growth for United Kingdom and Sweden in the long-run while there is a granger causality flowing from savings to growth for Colombia in the short-run. However, he did not find any causal relationship between saving and growth for Mexico.

Additionally, there is a number of opposing view studies in the literature. One of the earlier studies asserted by Carroll and Weil (1994) applied for 64 countries which are divided into two sample for the period between 1958 and 1987 and the result of

their study claimed that there is a unilateral granger causality flowing only from economic growth to savings.

Sinha and Sinha (1998) did an empirical study examining the relationship between private and public savings and economic growth for Mexico over the time between 1960 and 1996 found that the same result as Carroll and Weil (1994).

Also, Saltz (1999) employed the Granger Causality testing procedure so as to examine whether higher level of savings can cause to higher economic growth for seventeen Third World countries over the period between 1960 and 1991. The main finding of him revealed that there are only four cases in which savings causes to economic growth and ten cases asserted that there is bilateral causality between savings and economic growth while other cases suggested that the causality flowing only from economic growth to savings.

Likewise, Agrawal (2001) used Granger Causality analysis with VECM and VAR procedures for seven Asian countries over the period between 1960 and 1994 and asserted that the direction of causality between economic growth and savings mostly flowing from economic growth to savings.

Moreover, Mohan (2006) revealed a study related to countries with different income levels among the period from1960 to 2001 by means of Granger Causality testing. The result of the study represented that there is a Granger causality running from savings to economic growth for only two of twenty five countries while the opposite of this situation observed for most of the other countries and there is a presence of bilateral causality observed for only five countries.

Additionally, Verma (2007) employed ARDL approach so as to investigate the relationship between savings, investment and economic growth in India over the period between 1950 and 2003. The estimation results showed that while there is a positive relationship between savings and investment, there is no evidence on investment has an influence on economic growth.

In addition, Odhiambo (2009) suggested that there is a bilateral causality between savings and economic growth in the short run, however, the direction of the causality running from growth to savings in the long run for South Africa over the period from 1950 to 2005 through employing Granger Causality approach.

Abu (2010) tested also the direction of causality among savings and economic growth with using Granger Causality and Johansen co-integration testing techniques in

Nigeria for the period between 1970 and 2007. According to result of the study, savings and growth co-integrated in the long-run, however, the Granger causality flowing from economic growth to savings. For this reason, the main argument of this study explains that saving is not the engine of economic growth.

Another study revealed by Mphuka (2010) in an attempt to analyze whether saving affects the economic growth in Zambia during the period between 1960 and 2000 with the help of Granger Causality technique. The main result of the study presented that there is a granger causality running from economic growth to savings and savings have an indirect influence on economic growth.

Further, Alomar (2013) analyzed the relationship between domestic savings and economic growth through employing Co-integration and Granger Causality techniques for Arab Gulf Cooperation Council (AGCC) containing Bahrain, Kuwait, Oman, Qatar, Saud Arabia and United Arab Emirates for the period between 1980 and 2010. The main results of the study revealed that there is an existence of granger causality running from domestic savings to economic growth for only Oman and bilateral causality existed for Bahrain while the direction is opposite (presence of granger causality flowing from economic growth to domestic savings) for other countries and the level of signification of the integration between the variables observed for countries differ from each other.

In addition, Sothan (2014) interestingly presented that there is any direction of causality running from economic growth to domestic savings or vice versa through using the granger Causality test for Cambodia for the period between 1989 and 2012.

2.6.2. The Empirics from national studies

Many studies have been carried out in the relevant literature for Turkey and there is no complete agreement between them as well as international studies.

One of the interesting studies performed for Turkey for the period between 1964 and 1998 by Özcan et al (2003). Employing the Ordinary Least Squares (OLS) method they revealed that there is a significant effect of income level on the private savings. Farther, it is claimed that there is no evidence for supporting the positive effect of private savings on economic growth.

Ekinci and Gül (2007) tested whether there is a relationship between domestic savings and economic growth in Turkey for the period between 1960 and 2004 by favor

of Johansen co-integration techniques and Granger Causality approach. According to result of the co-integration test, there is a long-run relationship between these variables. Moreover, the result of the Granger causality approach argued that there is a unilateral direction of causality flowing from economic growth to domestic saving.

Çolak and Öztürkler (2012) viewed the decompositions of countries by taking into account the savings and current account deficit relationship with macroscale. Through using LS test technique taking into account 2010 as a base year they argued that propensity to saving is lower but savings can be increased by means of increase in income level in Turkey. The result implies that there is a positive effect of income on savings for turkey. Also, they argued that the savings which are required for financing investments should be supported by sustainable economic growth and fair income distribution.

Sancak and Demirci (2012) researched on the purpose of investigating the causes of the increase and decrease in national savings and revealing its effect on economic growth in Turkey over the period between 1998 and 2009 by means of cross-country analysis, related data of Turkey and literature survey. The main results of the study argued that the domestic saving in Turkey is lower accordingly international standards and investments cannot be compensated with domestic savings. The saving investment gap has to be, therefore, offset by foreign savings and this situation hinders the sustainable economic growth. A general outcome from their literature survey is that countries with high savings are able to invest more and generate more stable growth than countries with low savings.

Gülmez and Yardımcıoğlu (2013) aimed at investigating if there is a long-run relationship between national savings and economic growth for Brazil, Russia, India, China, South Africa (BRICS) and Turkey over the period between 1994 and 2011 by the help of VECM, Kao co-integration approach and Pedro Fully Modified Ordinary Leas Squares (FMOLS) method. According to Kao co-integration test result, there is a long-run co-integration between the variables and Pedro FMOLS testing results revealed that change in national savings have a significant effect on economic growth in the long-run. Furthermore, according to VECM testing result while there is a short-run bilateral causality flowing from national savings to economic growth, there is a long-run unilateral causality running from national savings to economic growth.

Genç et al (2014) employed bound testing for the purpose of analyzing the relationship between saving and economic growth in Turkey over the period between 1975 and 2012. According to test results, there is a co-integration between savings and economic growth. At the same time, have a positive impact on economic growth savings in the short and long term.

Çetinkaya and Türk (2014) performed a study in order to analyze the effects of domestic savings and fixed capital investments on economic growth in Turkey over the period between 1975 and 2012 by employing Johansen co-integration and VECM techniques. According to results of the study, there is a presence of relationship between the variables in the long run and there is an existence of causality running from domestic savings and fixed capital investment to economic growth in the short run.

Ganioğlu and Yalçın (2015) analyzed the reasons of divergence of growth rates among East Asian Countries with higher domestic saving rates and other emerging economies with low saving rates over the period between 1993 and 2010 by employing a cross-country panel data. Their study implied that domestic saving deficits may play an important role in the divergence of the growth rates of countries, even if there is no direct relationship between domestic savings rate and growth divergences. An increase in the share of domestic savings used in the financing investments has a positive influence on growth rates of the countries and this effect is more significant for medium or lower income countries.

Barış and Uzay (2015) tested the relationship between domestic saving and economic growth in Turkey among the period from 1960 to 2012 through employing Johansen co-integration and Granger and Toda Yamamoto Causality testing techniques. The results of the study claimed that the there is no relationship and causality between domestic savings and economic growth in the short-run. However, according to variance decomposition method, changing in the domestic saving can be explained by mostly changes itself and economic growth.

Kaya and Efe (2015) analyzed the direction of the relationship between domestic saving and economic growth for the twenty largest countries in the world for the period between 1980 and 2012 through employing Panel Data analyze technique. According to results of the study, countries with higher domestic savings rates such as China and India observed that they have faster and sustainable economic growth rather than other countries with low domestic savings such as Turkey, Brazil and Mexico. Consequently,

it is found that the domestic savings have a significant effect on economic growth especially for developing countries.

Sümer (2016) studied the direction of the relationship between domestic savings and economic growth in Turkey for the period between 1980 and 2013 by means of Toda-Yamamoto (1995) causality testing procedure. In the study, it was argued that there is a presence of unilateral causality running from economic growth to domestic saving and domestic investments to economic growth. Also, it is observed from the study that there is no evidence of relationship between domestic savings and investment.

Another study performed by Kaygısız et al (2016). The researchers used Toda-Yamamoto (1995) causality testing method in order to analyze the relationship between current account balance, savings, investments and economic growth in Turkey for the period between 1980 and 2014. According to test results of the study, there is no evidence of the relationship between economic growth, savings and investments or there is no presence of a significant relationship between savings and economic growth while there is an existence of a causality flowing from growth, savings and investments to current account balance.

When the conducted literature survey is generally evaluated, the relationship between savings and economic growth has a positive direction as it is implied by Solow (1956) and Harrod-Domar (1939, 1946-1947) growth theories. Furthermore, the long-lasting debate about the direction of causality between savings and economic growth could not be concluded with a common result. Namely, the causal relationship between savings and economic growth vary from study to study revealed mostly for different countries and with different econometric techniques or methodologies.

CHAPTER THREE

3. DEVELOPMENT PROCESS OF SAVINGS RATES IN TURKEY

3.1. Introduction

The level of social and economic prosperity reached by the changeovers achieved in the first period after the foundation of Turkish Republic could not be maintained for a long time, therefore, a number of development plans have been prepared to increase economic growth and social prosperity in Turkey. One of the main proposals that of these development plans was to provide sustainable economic growth and hence social prosperity (Republic of Turkey Ministry of Development, Development Plans, 2017).

The lack of adequate domestic savings has inevitably led Turkey to be dependent on foreign capital inflows in order to financing investments or to maintain economic growth.

In the great scheme of this issue in terms of Turkey from historical perspective, savings have remained on the agenda of Turkish politicians and economists from the proclamation of the Turkish republic to present time. In other words, since domestic savings have remained incapable to cover investment from past to present day, a large gap between savings and investments have opened up and hence a current account deficit which resulted with economic fluctuations in Turkey, thereby, it directed the authorities to attentive to increase domestic saving rates in order to reduce or abolish economic fragility and to ensure sustainable economic growth rather than attracting foreign savings into the country.

However, the planned domestic savings (% of GDP) have stayed mostly under the actual domestic savings rates in Turkey from the first five-year development policy. The stated reasons for low level of domestic savings by authorities in the second five-year development plan are low level of income and the saving creator entrepreneur groups have not reach the sufficient power and extensity. Kepenek objected these reasons by mentioning that the important issue is not lack of adequate sources but using these sources for more profitable non-production areas in the short run (Kepenek, 2012, p.148).

In this section, we will reveal saving rates in Turkey with international comparison and the reasons behind the decline in the domestic savings from a historical perspective.

3.2. Saving Rates in Turkey

3.2.1. Total domestic savings in Turkey

Inadequate domestic savings and unsteady economic growth problems addressed in all development plans but these problems have not yet been solved for a long time in Turkey. The country still has one of the lowest levels of domestic savings among the most of the developing and some of the developed countries.

Total domestic savings rates in Turkey increased to 12.8 percent of GDP from 8.4 percent in 1960-70 within the framework of first and second five-year development plans in which authorities aimed at increasing the domestic savings in order to enhance living standards in the long-run (Republic of Turkey Ministry of Development, first and second five-year Development Plans, 2017).

In the second half of the 1970s, the Turkish economy had strong difficulty due to external payment difficulties and high price increases. From 1975 to 1979 the domestic savings (% of GDP) stayed roughly comparable at 12 percent.

According to World Bank report, after a sharp increase between 1980 and 1988 due to high inflation and policy-making uncertainties, domestic savings dramatically declined from 1988 to 2015. Increasing the ratio of public deficit and hence decline in the public savings caused to decrease in the savings rates during the period between 1988 and 2001. Also, by contrast, over the period between 2001 and 2010 the decline in the private saving rates resulted with decrease in domestic savings rates (World Bank, 2011, pp. 1-57).

The domestic savings rates were too low in Turkey and the country grew about at 6 percent among the period from 2010 to 2013 by means of policies supportive of domestic consumption. However, this situation created a large current account deficit which was mostly financed by short-term capital flows (International Monetary Fund [IMF], 2014, p. 4).

Although, the Turkish economy attract considerable level of foreign capital in the post period due to its successful stabilization policies and attractive returns, however, it is clear that this growth strategy is unsustainable.

Domestic savings in Turkey remained considerably low level at 14 percent on average per year in the period 2010-2015; therefore, the gap between savings and investment is tired to be compensated with capital inflows.

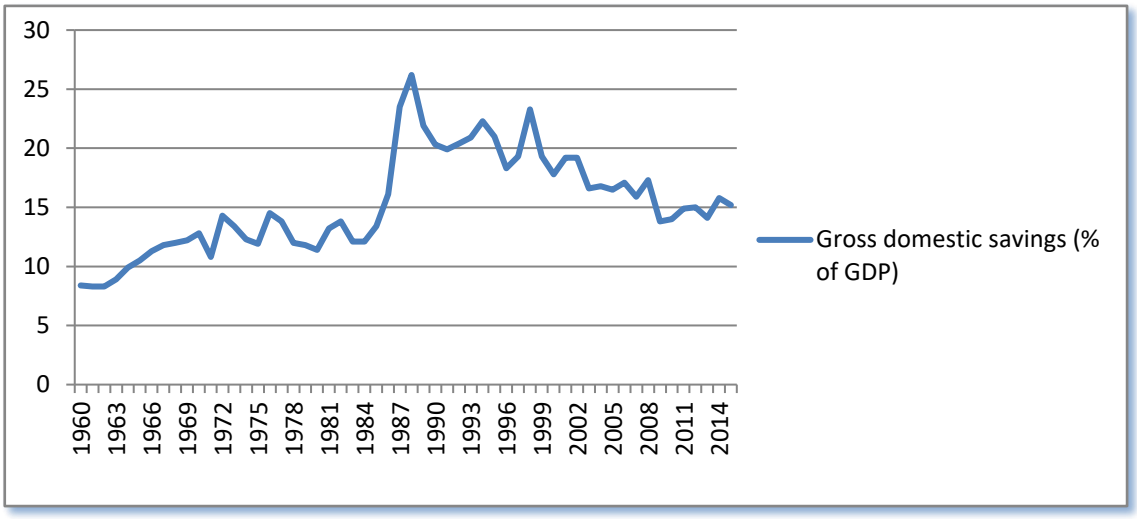

Figure: 3.1. *Turkey's Gross Domestic Savings (% of GDP)*

Source: *World Bank, http://data.worldbank.org/. (Date of access: 20.03.2017).*

As it is shown on the figure 3.1, which is covering the period from 1960 to 2015, Turkey's savings rates increased to 12.8 percent of GDP from 8.4 percent from 1960 to 1970. Between the period 1970 and 1984, saving rates remains 12 percent on average per year. While the savings rates sharply increased to 26.2 percent of GDP in 1988 from 12.1 percent in 1984, it dropped to 13.8 percent in 2009 and has stayed below 16 percent since 2008.

According to IMF country report (2016, pp. 3-4), after the 1999-2001 economic crises, Turkey continued a prospering policy of macroeconomic stabilization, thereby, public debt reduced to 33 percent of GDP in 2015 from 90 percent and inflation reduced to single digits from about 70 percent. Economy grew fast and the growth rate measured as nearly 7 percent on average during the period 2002 and 2007. Also, between 2001 and 2015, economy grew by 5 percent on average. However, the gross domestic savings decreased significantly from 1988 to 2015.

3.2.2. Public and private savings in Turkey

While the public sector savings rates averaged 4.5 percent over 1975-1991, it dropped to -2.2 percent over 1992-2004 and has stayed below 3 percent since 2005. Also, the private sector savings rates averaged 16.6 percent over 1975-1991, increased to 23.4 percent over 1992-2004, that is, the decrease in public sector savings

compensated with the increase in private sector savings and sharply decreased to 12.4 percent on average over 2004-2015.

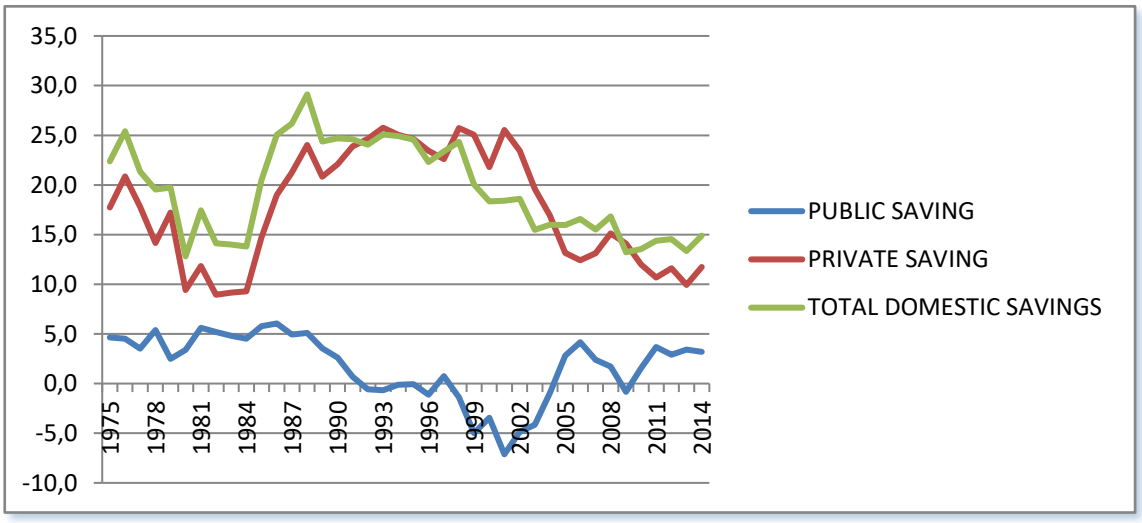

Figure: 3.2. *Total, Private and Public Savings in Turkey*

Source: *Republic of Turkey Ministry of Development, http://www.kalkinma.gov.tr/Pages/index.aspx. (Date of access: 23.03.2017).*

Figure 3.2 shows that the public sector savings have negative values in the aftermath of the 1992 and remain below 5 percent from 2005 to 2014.

In addition, Total domestic savings move on the same direction with private sector savings, therefore, it can be argued that total domestic savings have mostly been determined by private sector savings in Turkey for a long time. Thus, a sharp decrease in private savings leads to increase in current account deficit and causes to presence of unsustainable economic growth.

Moreover, domestic savings rates in Turkey are generally staying below the investments or no longer covered investment and the gap between savings and investments resulted with current account deficit.

Furthermore, since investments cannot be offset by domestic savings, the gap between savings and investments is tried to be compensated with using foreign savings.

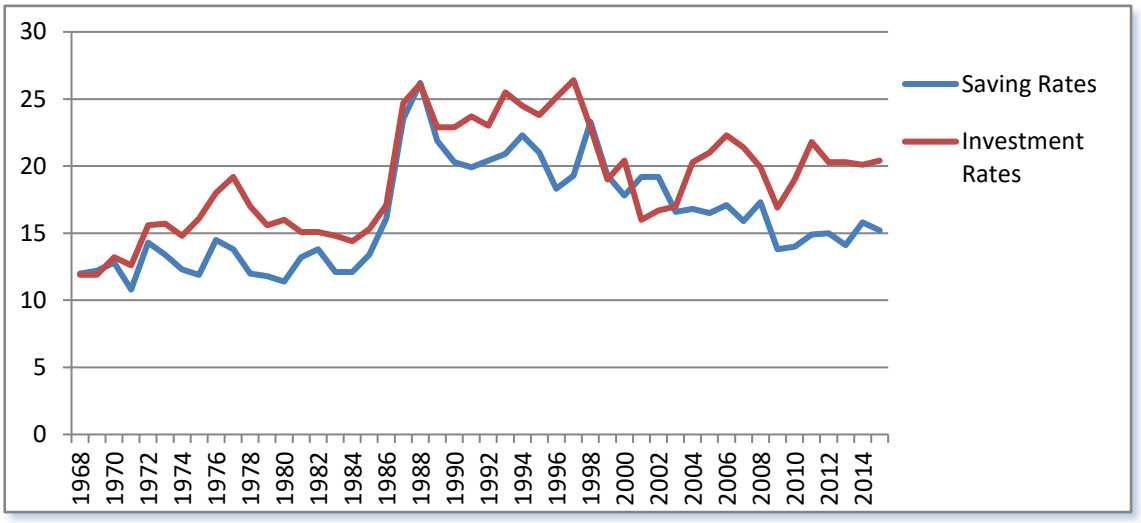

Figure: 3.3. *Savings and Investments (% of GDP)*

Source: *World Bank, http://data.worldbank.org/ (Date of access: 24.03.2017).*

Figure 3.3 covering the period between 1968 and 2015 indicates that the savings rates generally remain under the investment rates in Turkey.

Only between 2001 and 2003 savings rates remained above investment rates. Since savings are the main source of financing investments the saving and investment lines move on the same direction as it is shown in the figure 3.3. Since savings rates mostly remain below the investment rates, foreign savings have to be used as a substitution for domestic savings in order to meet the gap between savings and investments in Turkey.

In addition, this gap between savings and investments sorts out the formation of Turkey's never-ended current account deficit and how this deficit financed by foreign savings (İnal, 2013, p. 180). Furthermore, according to Karanfil, since the national savings remains incapable for providing sustainable economic growth, usage of foreign savings so as to accomplish the economic growth caused to current account deficit in Turkey for a long time (Karanfil, 2014, pp. 379-394).

Furthermore, according to Özlale and Karakurt, the basic source of increasing saving-investment gap in recent years in Turkey is the decline in private sector savings and the gap between saving and investment not resulted with higher level of investments but resulted with lower level of private savings during the recent years in Turkey (Özlale and Karakurt, 2012).

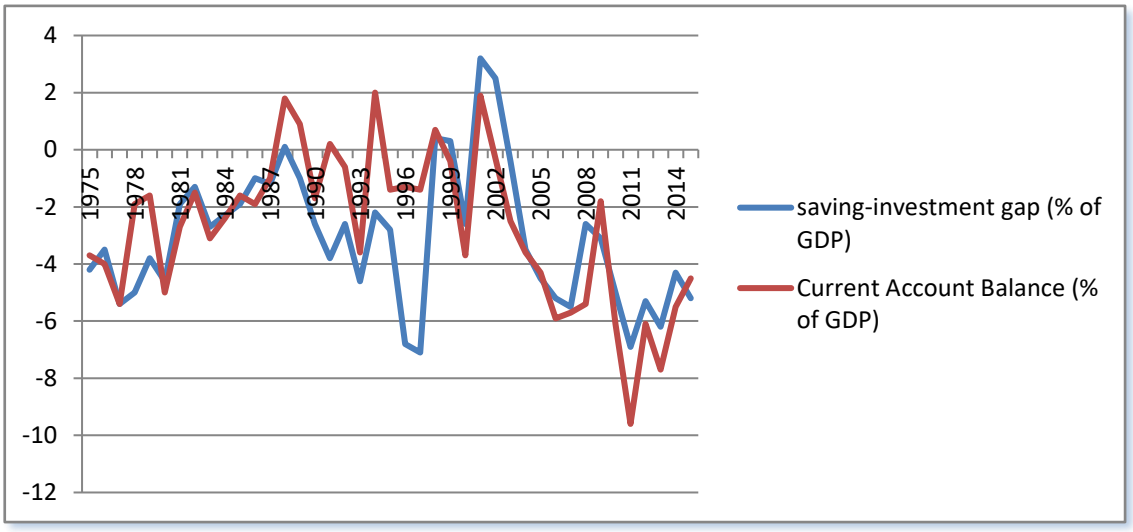

Figure: 3.4. *Saving-Investment Gap and Current Account Balance (% of GDP)*

Source: *World Bank, http://data.worldbank.org/ (Date of access: 26.03.2017). (Saving-investment gap is calculated by using data from World Bank).*

The relationship between saving-investment gap and current account balance (% of GDP) is indicated in the figure 3.4.

The current account deficit mostly remains high between 1975 and 2015. While the current account deficit decreased slightly from 1975 to 1989, this deficit sharply increased aftermath of the 1989. The current account balance took positive values only over the periods 1987-1989, 1994-1995, 1997-1999 and 2000-2002.

As it is shown in the figure, these two components are moves in a similar direction which means that there may an existence of positive relationship between these the saving-investment gap and current account deficit. That is, it can be claimed that the gap between savings and investments and therefore the current account deficit are widening because total domestic savings cannot cover investments in Turkey.

According to IMF country report (2016, p. 4);

> Ample capital inflows, intermediated by the financial sector, and financial deepening, eased credit constraints and led to rapid growth of private sector credit and consumption. Hedged external wholesale foreign currency borrowing by the banking sector has become a key feature sustaining loans growth, and corporates net foreign exchange liabilities have risen to US$176 billion at end October 2015.

3.3. International Comparisons of Savings Rates

Comparing the Turkey's savings rates internationally demonstrates that the Turkey's savings rates remarkably below the world wide average. The same result is valid for comparison of domestic savings in Turkey with different income groups.

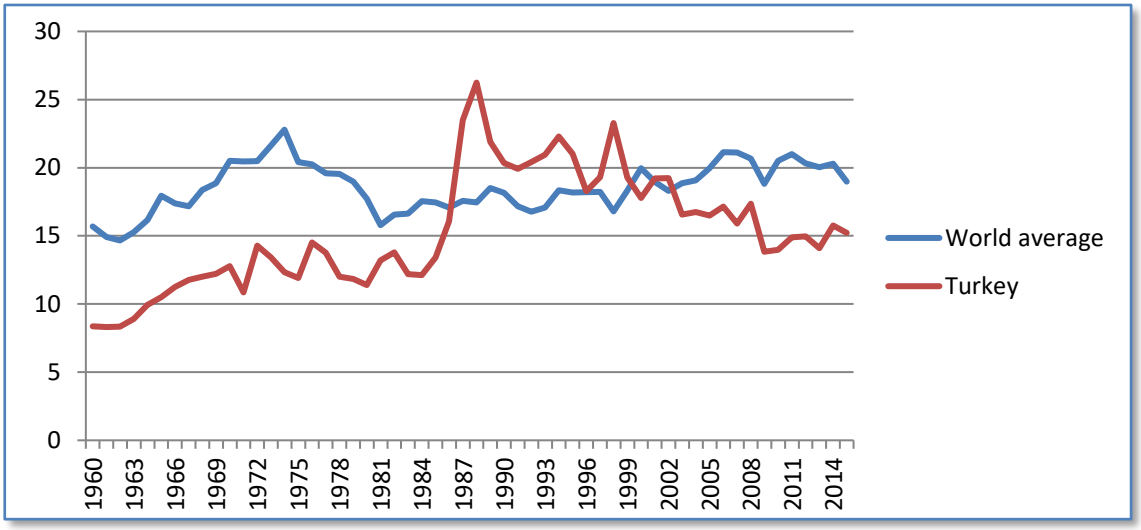

Figure: 3.5. *Gross domestic savings (% of GDP) in Turkey and World Average*

Source: *World Bank Data, http://data.worldbank.org/. (Date of access: 26.03.2017). (Average gross domestic savings (% of GDP) is calculated by using World Bank data).*

As it is shown in the figure 3.5, the average world savings rates have remained phenomenally constant at 20 percent of GDP between 1960 and 2015. However, gross domestic savings (% of GDP) in Turkey have remained below remarkably with that of World average domestic savings. The inverse of this condition was experienced over the period 1987-1999.

Table: 3.1. *Gross Domestic Savings Rates in the Selected Countries*

	1996-2000	2001-2015	2006-2010	2011-2015
	Gross Domestic Savings (% of gdp)	**Gross Domestic Savings (% of gdp)**	**Gross Domestic Savings (% of gdp)**	**Gross Domestic Savings (% of gdp)**
ARG	16,77	23,63	23,31	18,75
BRA	15,64	19,17	20,46	19,02
CHL	24,31	25,59	30,32	24,21
CHN	39,35	43,27	50,53	49,71
GRC	15,13	15,34	11,84	8,97
IDN	28,06	29,88	31,44	34,35
BGR	17,93	12,39	17,38	20,68
KOR	33,57	34,02	33,71	34,46
MYS	45,79	42,82	41,80	35,36
PAK	14,86	16,52	10,55	8,32
RUS	28,86	32,92	31,70	28,89
ZAF	19,26	19,12	20,28	19,29
TUR	19,58	17,65	15,64	14,99
URY	13,33	16,81	19,16	19,67
IND*	22,85	27,28	35,06	31,44

Source: *World Bank, http://data.worldbank.org/ (Date of access: 29.03.2017). (Average rates of gross domestic savings and GDP per capita growth are calculated by using World Bank data).*

Note: IND*: India

Table 1.1 indicates that during the period between 1996 and 2000, the average of gross domestic savings in Turkey remained at 19.58 percent of GDP and after that period the average savings rates decreased dramatically. During the period between 2001 and 2005, domestic saving rates in Turkey reduced about 2 points on average and remained at 17.65 percent of GDP. Also, during the periods between 2006-2010 and 2011-2015, the average of domestic savings in Turkey decreased modestly and respectively remained at 15.64 and 14.99 percent of GDP.

It is important to mention that during the period 1996-2000 Argentina (ARG), Brazil (BRA), Greece (GRC), Bulgaria (BGR), Pakistan (PAK), South Africa (ZAF) and Uruguay (URY) have lower level of domestic savings than Turkey's domestic savings, that is, this comparison indicates that Turkey's domestic savings were better off comparably with that of selected countries between 1996 and 2000. Also, the

comparison indicates that Turkey's savings rates remained below most of the countries apart from Uruguay, Greece, Bulgaria and Pakistan over the period from 2001 to 2005. In addition, during the period between 2006 and 2010, Turkey's savings rates declined about 2 points whereas savings rates in most of the countries, which were lower than that of Turkey' savings rates between 2001 and 2005, increased slightly. Moreover, the table 3.1 shows that domestic savings in most of the countries decreased over the period between 2011 and 2015. However, Turkey's savings rates have collapsed more and more over that time of period and still remain far below that of most of the selected countries.

Also, the comparison among Turkey and different income groups indicated in the figure 3.6 shows that Turkey's savings rates remained far below with that of upper middle income (UMC) countries and modestly below that of lower middle income countries (LMC) and high income countries (HIC). Whereas savings rates in lower middle income and upper middle income countries increased, Turkey's savings rates decreased over the period between 1991 and 2015. Even when comparing the Turkey's savings rates with low income countries (LIC), savings rates in low income countries remained far below with that of Turkey's savings rates but increased while Turkey's savings rates decreased over time.

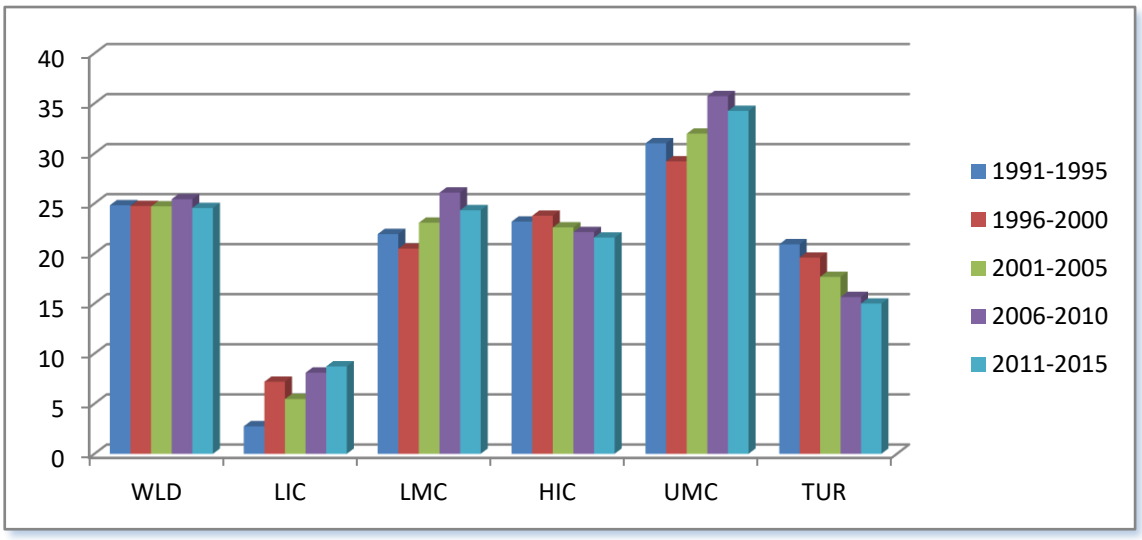

Figure: 3.6. *Comparison of Turkey's Savings Rates with Different Income Groups*

Source: *World Bank, http://data.worldbank.org/ (Date of access: 01.04.2017).*

(Averages are calculated by using the data from the World Bank).

Comparing Turkey to other income groups by GDP per capita growth shows a similar picture.

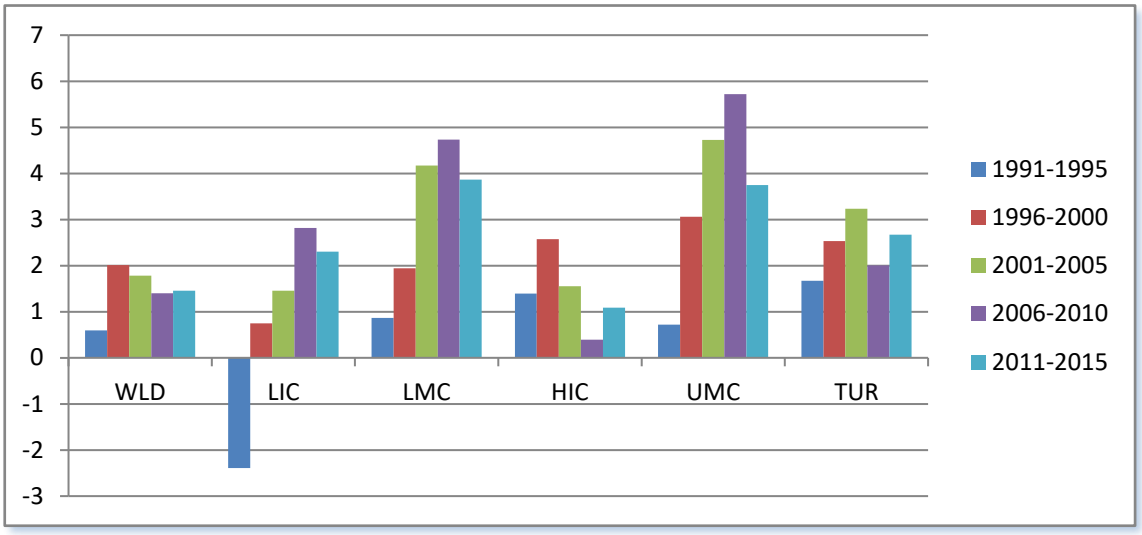

Figure: 3.7. *Comparison of Turkey's per Capita Income Growth with Different Income Groups.*

Source: *World Bank, http://data.worldbank.org/ (Date of access: 04.04.2017).*

(Averages are calculated by using the data from the World Bank).

Figure 3.7 indicating the comparison among Turkey and different income groups by GDP per capita growth shows that Turkey's per capita growth rates remain substantially higher than world and other income countries over the period between 1991 and 1995. Also, the comparison shows similar outcome for the period between 1996 and 2000 except for upper middle income countries.

However, aftermath the periods from 1996 to 2000, Turkey's per capita growth rates increased slightly whereas the growth rates in lower middle and upper middle income countries increased more and more. The comparison shows the same condition for the period between 2001 and 2006. Moreover, during the period between 2006 and 2010, per capita growth rates in Turkey decreased while per capita growth rates in other income groups increased except for lower income countries. In addition, per capita growth rate increased in Turkey over the period between 2011 and 2015 but it has remained still lower than lower middle and upper middle countries although their per capita growth rates decreased within this period.

3.4. Reasons for Decline in Domestic Savings in Turkey

Turkey's savings rates have decreased over time especially from 1990s and the comparison of Turkey's savings rates with different income countries shows that the Turkey's savings rates are lower than most of these income groups. However, the lack of adequate level of domestic saving causes to dependence on foreign savings and it leads to expand the external current account deficit and therefore effects sustainable economic growth negatively. Thus, it is important to reveal the reasons for decline in savings rates in Turkey in order to provide consistent suggestions to achieve sustainable economic growth.

As it was shown before in figure 3.2, Turkey's total domestic savings move on the same direction with private savings. This condition implies that the main determinant of total domestic savings is the private saving in Turkey and it can be argued that the reasons for decline domestic savings are mostly the reasons for decline in private savings such as rapid increase in private consumption expenditures in Turkey.

According to Organization for Economic Co-operation and Development (OECD) report, although Turkey has a strong growth pattern over the past 15 years, external deficits expanded more and more. This rapid growth helped capital flows to Turkey; however, it leads to increase private consumption expenditures and to decrease domestic savings (OECD, 2016, p. 6).

Moreover, the reasons behind the decline in private saving rates in Turkey are expressed by World Bank report (2011, pp. 1-60) as:

- The increase in income,
- The decline in real interest rates,
- The young age dependency ratio,
- The large decline in inflation rate,
- Strong precautionary motive for saving,
- The low level of female labor force.

In addition, Karagöl and Özcan (2014, pp. 14-21) mentioned some additional reasons for decline in private savings as follows:

- The increase in household consumption expenditures,
- Financial Sector
- Urbanization rate,

- Macroeconomic stability.

According to World Bank report (2011), the main reasons for the decline in private savings after 2001 are macroeconomic vulnerabilities. The report argued that even though the economy experienced a rapid growth, increase in credit facilities, decrease in interest rates and previously postponed consumption lead to fall in savings rates in Turkey.

3.4.1. The increase in income

The implication of the permanent income hypothesis is that there is an inverse relationship between savings and economic growth. According to that hypothesis, if permanent income which is the average level of expected future income of economic units (Case, et al, p. 642**)** higher than the current income, then economic agents will increase the consumption expenditures temporarily (Mankiw, 2009, pp. 514-516), that is, they will decrease their savings.

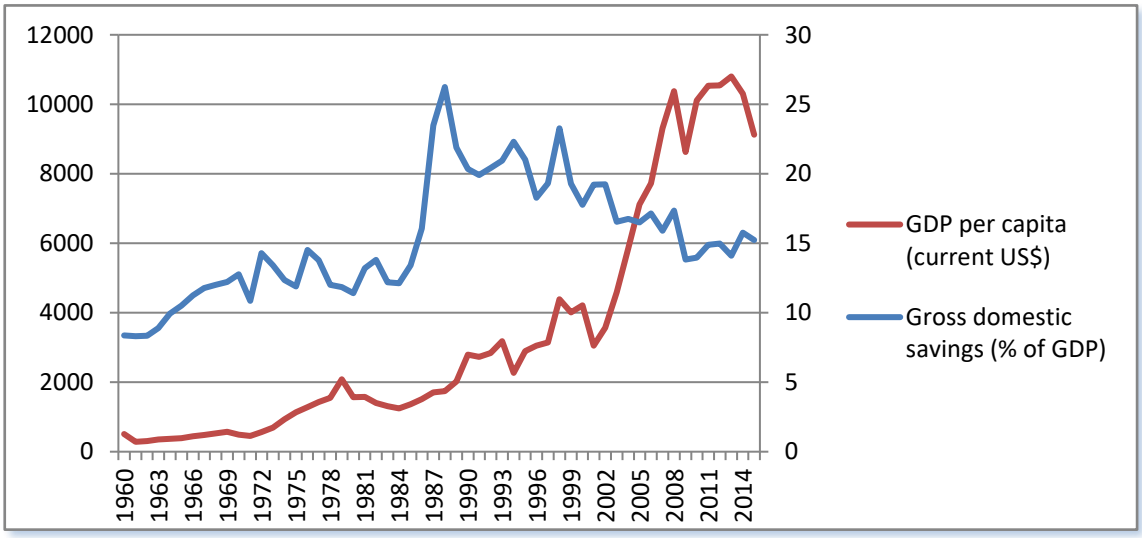

Figure: 3.8. *GDP per Capita and Gross Domestic Savings*

Source: *World Bank, http://data.worldbank.org/ (Date of access: 05.04.2017).*

As it is shown in the figure 3.8, aftermath of the 1987 gross domestic savings (% of GDP) have increased whereas per capita income has decreased over the time. Therefore, it can be argued that the permanent income hypothesis is valid in Turkey for the period between 1987 and 2015.

3.4.2. Household consumption expenditures

According to World Bank data, household final consumption expenditures remained at 66.5 percent of GDP in 1998 increased to 69.1 percent in 2015. Figure 3.9 confirming the suggestions of Karagöl and Özcan (2014) shows that Turkey has an ever-growing consumption expenditures and digressive domestic savings over the time.

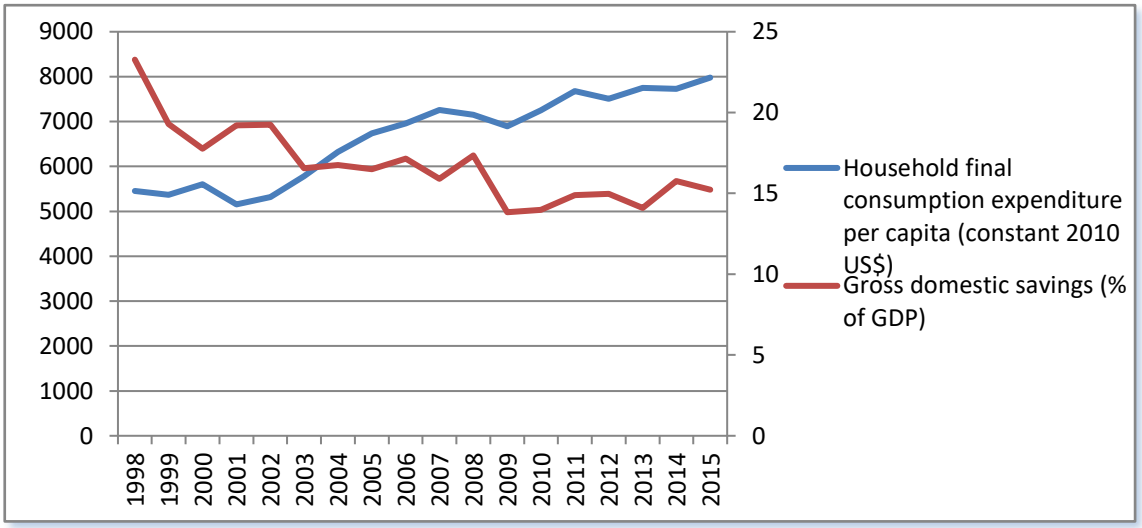

Figure: 3.9 *Household Final Consumption Expenditures and Gross Domestic Savings*

Source: *World Bank, http://data.worldbank.org/ (Date of access: 06.04.2017).*

One of the reasons of the sharp increase in consumption expenditure is the increase in credit card usage (Karagöl and Özcan, 2014, p. 15). According to Interbank Card Center data, domestic transactions with domestic and international cards increased over the time (Interbank Card Center [BKM], 2017).

Table: 3.2. *Domestic Transactions with Domestic and International Cards*

	Volume of Transaction (Million TL)		
	Purchase	**Cash**	**Total**
2012	23.765,08	2.386,12	26.151,19
2013	29.466,66	3.110,30	32.576,96
2014	34.572,83	3.596,79	38.169,62
2015	37.091,93	4.439,60	41.531,53
2016	40.536,65	5.053,12	45.589,77

Source: *Interbank Card Center (BKM), http://bkm.com.tr/en/secilen-aya-ait-istatistikler/?filter_year=2016&filter_month=1&List=List.(Date of Access:09.04.2017)*

Table 3.2 shows that the volume of transaction in the first months of five years between 2012 and 2016. The total volume of transaction is about 26 million TL in January, 2012 while it is about 45 million TL in January, 2016. That is, increase in credit card usages causes to sharp increase in consumption expenditure in Turkey.

3.4.3. Real interest rates

Real interest rates have an impact on private savings rates and the direction of that impact determined by income and substitution effects. The income effect implies that an increase in real interest rates leads to decrease in private savings since it result with decrease in present value of future income flows. In addition, the substitution effect implies that an increase in real interest rates provides higher return on savings and hence it leads to postpone the consumption expenditures. Therefore, the net effect of real interest rates on saving rates can be emerged by the relative strength of income and substitution effects (Matur et al, 2012, pp. 107-108).

In Turkey, the interest rates decreased considerably from double-digit rates to one-digit rates aftermath of 2001 because of macroeconomic stabilization. However, this situation caused to decrease in cost of consumer loans and led to increase in consumption expenditures and hence decrease in savings (Karagöl and Özcan, 2014, p. 16).

3.4.4. Financial markets

Financial markets where people transfer their excess of available funds to people who have a shortage (Mishkin, 2004, p. 3). That is, financial markets enhance the transfers from nonproductive mattress savings to productive usage or to fund investments and therefore it leads to sustainable economic growth through promoting economic efficiency.

However, growing credit facilities in financial markets leads to decrease in savings and increase in consumption expenditures in Turkey. Also, a high amount of mattress savings including gold, cash and foreign currency does not enter the banking system and has no positive effect on investments in Turkey.

3.4.5. Unemployment rates

The unemployment rate is still high in Turkey and reached to 13 percent in 2017. According to World Bank report (2011), the dependency ratio among the working age

population in Turkey is relatively higher than the OECD countries because of low female labor force participation rate and it leads to low level of private savings rates. A high level of female labor force participation rate creates additional income and hence it leads to increase in savings.

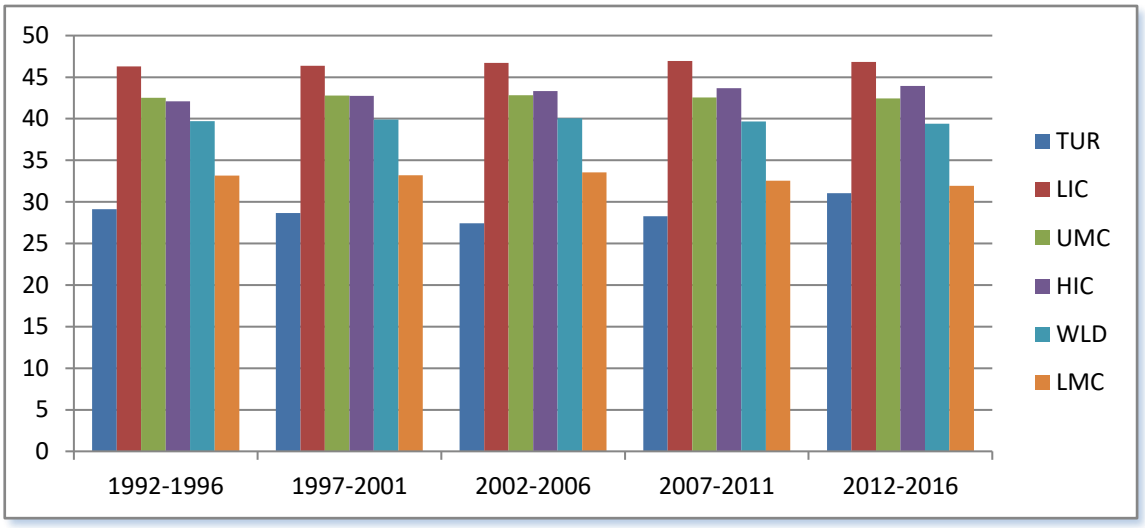

Figure: 3.10. *Female Labor Force Participations (% of total labor force)*

Source: *World Bank, http://data.worldbank.org/ (Date of access: 10.04.2017).*

(Averages are calculated by using the data from the World Bank)

3.4.6. Macroeconomic stability

Macroeconomic stability has a significant effect on savings rates since economic instability leads people to act cautiously and therefore it leads to increase in savings rather than consumption.

According to World Bank Report (2011), the decline in macroeconomic vulnerabilities is the main reason for the decline in private savings after 2001. However, increase in credit facilities, decline in real interest and inflation rates lead to increase in consumption and this condition restrains the positive effect of income growth on savings since people have a strong precautionary motive for savings in Turkey**.**

In the third quarter of 2016, macroeconomic uncertainty experienced in Turkey, and negative expectations about the labor market considerably increased saver rates in urban population. Also, in the fourth quarter of 2016, increase in unemployment and inflation rates and decrease in interest rates on deposits led to decrease in saver rates in urban population in Turkey (ING bank, 2016, p. 3).

3.4.7. Demographic factors

The demographic structure may be one of the significant determinants of domestic savings. In the literature, urbanization rates, education level and young dependency ratio have an influence on domestic savings. The age distribution in the country has an influence on the total saving rate because people tend to save more or less at their certain ages. Retirees' tendency to save is low and all expenditures of the population who are under the working age are covered by their families (Central Bank of the Republic of Turkey [TCMB], 2015, p. 3).

Ceritoğlu and Eren (2014) analyzed the impact of demographic change on household savings through using Turkish Statistical Institute (TURKSTAT) Household Budget Survey for the period between 2003 and 2010 and forecasted for the period from 2010 to 2050. Their main findings are that the urbanization rate has a negative influence on household savings whereas the ratio of college graduates has a positive effect on household savings. These findings coincide with outcomes of Hung's study on reasons for China's higher saving rates. The study claims that one of the most important reasons for China's higher savings rates is that lower urbanization. Also, education also creates a motivation to save more in China (Hung, 2010).

According to World Bank report (2011),

> Households with a high young dependency ratio have low saving rates. A high young dependency ratio (the ratio of the number of 0-14 year old children to the number of working members of the household) leads to decreased savings, as families with more children have a greater need for current consumption. At the same time households are either unable to plan their savings or do not fully realize the need to plan for future expenses.

ING Bank's survey on Turkey's saving trends mentions that saver rates in urban population is slightly increased after 2011 and realized at 14.5 percent in the fourth quarter of 2016. Also, the survey indicates that saving rates of families have no children decreased from 21 percent to 15 percent in the fourth quarter of 2016 which is shown as the main reason of decline in domestic savings in Turkey. However, in theory, families with have no children plans to save more than the families with have children. The main reason for incapacity for saving is seen as inadequate level of household income (ING Bank, 2016, p. 3).

CHAPTER FOUR

4. TIME SERIES ANALYSIS OF ECONOMIC GROWTH AND DOMESTIC SAVINGS RELATIONS IN TURKEY

To examine the relationships between economic growth and domestic savings in Turkey, we use VECM framework. To use VECM in empirical analysis, we first have to examine the time series properties of variables in question. To do this, we will carry out unit root test of ADF with a break point, co-integration test of Johansen and causality, impulse response and VCDs analysis within the VECM framework. Thus, we will start first explaining the techniques and then discuss the empirical results.

4.1. Introduction

This study particularly research for whether there is a positive effect of domestic savings on economic growth or not in Turkey by the help of time series analysis. The relationship between domestic savings and GDP per capita growth will be analyzed within the framework of econometric techniques and will be dealt with in four stages.

The first stage of this chapter covers the ADF unit root testing procedure with a break point in order to determine whether the variables are stationary or not.

In the second stage of this chapter, Johansen co-integration test will be performed in order to test if there is a presence of long run co-integration among the variables with the help of the VAR approach after determining the optimal lag lengths.

In the third stage of the study, Granger Causality testing procedure will be applied in the case of a presence of co-integration between the series. In case of co-integration, the causality tests carried out with the first differences of variables in the framework of the VAR model would be incorrect (Özer and Kırca, 2014, p. 694). For this reason, the existence of long-term causal relations can be investigated by adding error correction term to the VAR approach. That is, this stage also covers the VECM testing procedure and Wald test in order to test the long-term and short-term relationship between variables and dynamic relations between the series will be analyzed by using impulse responses and variance decomposition techniques.

The last stage of this chapter covers interpretations of the test results.

4.2. Data

Time series data obtained from Republic of Turkey Ministry of Development and World Bank for the period from 1975 to 2014 covers the gross domestic savings, private savings and public savings as percentage of GDP, and annual GDP per capita growth in Turkey. The dataset of each macroeconomic variables, descriptions and sources are illustrated in the table 4.1.

Table: 4.1. *Macroeconomic Variables*

Variables	Description	Source
TDS	Gross Domestic Savings (% of GDP)	World Bank
PRVS	Private Savings Rates	Ministry of Development
PUBS	Public Savings Rates	Ministry of Development
PCG	GDP per Capita Growth (Annual)	World Bank
D5	Dummy variable	Used for 2008 structural break

4.3. Unit Root Tests

Since the Granger causality test requires determination of the order of integration series, we first examined stochastic properties of two series by applying Augmented Dickey-Fuller (ADF) test (Ozer and Yeldan, 2016, p. 468). That is, since the time series can be affected by trend and the stochastic feature of variables, it should be tested whether variables are stationary or not.

The condition of stationary stochastic process defined by Gujarati and Porter (2009, p. 740) as:

> A stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods only on the distance or gap or lag between two time periods and not the actual time at which the covariance is computed.

These conditions can be shown as:

$E(Y_t) = \mu$ (Condition of constant mean)

$Var(Y_t) = E(Y_t - \mu) = \sigma^2$ (Condition of constant variance)

$Y_t = [(Y_t - \mu)(Y_{t+k} - \mu)]$ (Condition of dependence of covariance on two time periods).

Where k represents the lag level.

Whether these conditions are satisfied or not mostly tested by using Augmented Dickey Fuller (ADF) test. The ADF test can be illustrated by an equation as follows:

$$\Delta y_t = \alpha + \delta y_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta y_{t-i} + \varepsilon_t \quad (4.1)$$

Null and alternative hypothesis can be conducted as:

$H_0 : \delta = o$

$H_1 : \delta \prec o$

The null Hypothesis (H_0) indicates the presence of a unit root and the alternative hypothesis (H_1) indicates the stationary of the series. When the calculated ADF statistics for the variable do not exceed the critical value at the conventional significance level (5%), the null hypothesis is rejected.

4.4. Co-integration Test

When non-stationary time series have the same order of integration and linear combination of these time series exist and stationary, it is admitted that these time series are co-integrated (Engle and Granger, 1987).

The existence of co-integration between the variables can be tested by using VAR approach developed by Johansen and Juselius (1990). In this way, it can be determined how much long-term equilibrium relations between the variables with the same degree of integration. The relationship between the rank of a matrix and its characteristic roots or eigenvalues is determined by this method (Gilmore and McManus, 2002, p. 81). Supposing that x_t is a vector of variables which is integrated of order one of dimension px1. VAR order k can be represented by an equation as:

$$X_t = \mu + \Pi_1 X_{t-1} + ... + \Pi_k X_{t-k} + \varepsilon_t \quad (4.2)$$

Where;

$\Pi_1 ... \Pi_k$: represent (pxp) dimensional lag coefficients matrices,

ε_t : represents a (px1) dimensional error term with zero mean and non-singular variance-covariance matrix.

μ : represents a vector of constants.

The equation 4.2 can be rewritten with respect to error correction term since X_t has a unit root or it is non-stationary:

$$\Delta X_t = \mu + \Gamma_1 \Delta X_{t-1} + ... + \Gamma_k \Delta X_{t-k+1} + \Pi X_{t-k} + \varepsilon_t \quad (4.3)$$

Where;

$\Gamma_i = -1 + \Pi_1 + ... + \Pi_i$ (i=1,……, k-1)

$\Pi = -(1 - \Pi_1 - ... - \Pi_k)$.

It can be determined whether there is a long-term co-integration arises between X variables by examining the rank of Π matrix and information of the long-term relations among the variables in data is included in the coefficient matrix (Π) (Love and Chandra, 2005, p. 1162). Also, if a variable integrated order one I(1) and other variable integrated order zero I(0), the relationship between these variables is not possible.

There are three cases in order to determine if there is a presence of co-integration between X variables through the rank of Π matrix (r):

Rank of Π=p. In this case, all series are stationary in their level or they have not unit root. Thus, it is impossible to run the co-integration model.

Rank of Π= 0. In this case, unrestricted War model can be used to estimate the short-term relations since none of linear combinations of series are stationary.

Rank of Π=r and o<r<p. In this case, there will be presence of r co-integration vector and the rank matrix can be decomposed into matrices α and β; that is, $\Pi = \alpha\ \beta'$. Here α represents the speed of adjustment and β represents the co-integration vector matrix.

Moreover, while X_t is stationary in its first difference I(1), the combination $\beta' X_{t-1}$ is stationary in its level I(0).

In Johansen procedure, there are two likelihood (LR) tests, which are trace and maximum Eigen value tests, in order to detect whether there is a presence of co-integration vectors (Ozer and Yeldan, 2016, p. 469).

The LR statistics for trace test is the following equation:

$$\lambda_{trace} = -T \sum_{i=r+1}^{p} T \ln(1 - \hat{\lambda}_i) \tag{4.4}$$

$$\lambda_{\max} = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{4.5}$$

Here λ is the value of eigenvalues obtained from the estimated Π matrix, T represents the number of convenient observations after lag adjustments and r represents the number of co-integration vectors. Also, the Eigen maximum test is conducted for the null of r co-integrating vectors against the alternative of r+1 and the test statistics are

distributed asymptotically as χ^2 with p-r degrees of freedom (Ozer and Yeldan, 2016, p. 469).

4.5. Granger Causality Test

The Granger (1969) causality test is used to determine the direction of causal relationship among the current values of one variable and past value of another one (Ozer and Yeldan, 2016, p. 469)

In case of co-integration, the causality tests carried out with the first differences of variables in the framework of the VAR model would be incorrect (Özer and Kırca, 2014, p. 694). For this reason, the existence of long-term causal relations can be investigated by adding error correction term to the VAR approach. That is, if there is a co-integration between the variables, there should be at least unilateral causality between these variables. In the case of error correction term is added in the Granger causality test equation, VECM can be written as follows:

$$\Delta Y_t = \alpha_1 + \sum_{i=1}^{m} \beta_{1i}\, \Delta X_{t-i} + \sum_{i=1}^{n} \lambda_{1i}\, \Delta Y_{t-i} + \gamma_1 ECT_{t-1} + \varepsilon_{1t} \quad (4.6)$$

$$\Delta X_t = \alpha_2 + \sum_{i=1}^{m} \beta_{2i}\, \Delta X_{t-i} + \sum_{i=1}^{n} \lambda_{2i}\, \Delta Y_{t-i} + \gamma_2 ECT_{t-1} + \varepsilon_{2t} \quad (4.7)$$

Where ECT_{t-1} is the error correction term. The coefficient of error term is expected to take negative value and to be statistically significant indicating the response of variables to the deviations from equilibrium.

4.6. Impulse Response and Variance Decomposition Analyses

Although, the VECM Granger causality testing procedure can allow determining whether there is a presence of short and long run causalities between series, it is not useful for testing whether a shock on one variable respond to other variables or it is not useful for determining the sign of the causality. Thus, in order to determine the sign of the causality in the WAR system, it is necessary to research for the sign of impulse response. If there is a positive causality, the respond function will be positive in all periods. If there is not clear causality among the variables, then the sign of the respond function sometimes remains positive but sometimes remains negative. That is, the sign of the causality determined by the time horizon (Ozer and Yeldan, 2016, p. 470).

Moreover, the VECM Granger causality testing procedure is useful for testing causality among variables for the certain period (Akinlo, 2009, pp. 686-687). That is,

the VECM granger causality technique allow for testing the causality for selected period. Therefore, in order to test the causality for outside of the selected period, it will useful to apply variance decomposition analysis (Ozer and Yeldan, 2016, p. 470).

4.7. Empirical Findings

4.7.1. ADF Unit Root Test results

ADF unit root test results for each of the variables are shown in the following table.

Table: 4.2. *ADF Unit Root Test Results*

Variable	Level			First Difference		
	Intercept only	Test critical value (%5)	Prob.	Intercept only	Test critical value (%5)	Prob.
PCG	-3.959592	-4.193627	0.0820	-4.706509	-4.193627	0.0113
TDS	-1.648968	-4.193627	0.6846	-5.720501	-4.443649	0.01
PRVS	-3.542077	-4.193627	0.1751	-7.089122	-4.443649	0.01
PUBS	-2.440901	-4.193627	0.4925	-6.858.353	-4.443649	0.01

The first column of the table shows the variables, the second column shows the unit root test results for levels of variables and the third column shows the test results for first differences of variables. Table 4.2 indicating that each of the variables are I(1) with respect to 5% significance level because the test statistics are lower than the critical values only in their first differences.

Note: Since author used ADF test with structural break in 2008, a dummy variable was added in the system and the VAR and subsequent models will be applied in the face of the structural breaks.

4.7.2. Co-integration Test results

Before examining whether there is a presence of co-integration between the variables or not, it is necessary to determine optimal lag length for each of the variables in War approach by using Akaike Information Criterion (AIC), Schwartz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQ), and Final Prediction Error (FPE).

Table 4.3 indicates the result of determination of optimal lags for GDP per capita growth and total domestic savings.

Table: 4.3. *Optimal Lag Length for GDP per Capita Growth and Total Domestic Savings*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-202.0816	NA	7343.446	14.57726	14.67241	14.60635
1	-143.4698	104.6639	148.7570	10.67642	10.96189	10.76369
2	-140.9850	4.082250	166.7722	10.78464	11.26043	10.93010
3	-139.6941	1.936326	205.2128	10.97815	11.64425	11.18178
4	-136.1580	4.799038	217.6250	11.01128	11.86770	11.27310
5	-135.6937	0.563754	292.1742	11.26384	12.31057	11.58383
6	-133.3445	2.517009	350.6879	11.38175	12.61880	11.75993
7	-124.5708	8.146975	274.4211	11.04077	12.46814	11.47713
8	-120.6579	3.074414	317.4133	11.04700	12.66467	11.54154
9	-115.8933	3.062964	368.0383	10.99238	12.80037	11.54510
10	-112.2593	1.816991	510.0920	11.01852	13.01683	11.62943
11	-96.29126	5.702890	346.1833	10.16366	12.35228	10.83274
12	-39.05103	12.26576*	17.40860*	6.360788*	8.739724*	7.088052*

Note: * indicates lag order selected by the criterion.

According to table 4.3, all of the information criteria determined the optimal lag length as 12 but it is not significant in terms of the assumptions of VAR model. Therefore, the number of lag is decreased by 1unit and the optimal lag length is found as 7. The assumptions of VAR (7) are tested by the help of roots of characteristics of polynomial, Serial Correlation LM and Heteroscedasticity tests. The results of these tests are satisfied all assumptions of VAR (7).

Table 4.4 indicates the result of determination of optimal lags for GDP per capita growth and private savings.

Table: 4.4. *Optimal Lag Length for GDP per Capita Growth and Private Savings*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-157.1910	NA	343.2221	11.51364	11.70396	11.57183
1	-137.4445	33.85127*	111.8402	10.38889	10.76952	10.50525
2	-135.0870	3.704562	126.9704	10.50621	11.07716	10.68076
3	-133.3012	2.551171	151.6.132	10.66437	11.42563	10.89710
4	-128.8409	5.734703	151.6527	10.63149	11.58306	10.92240
5	-127.4348	1.606956	192.3490	10.81677	11.95866	11.16586
6	-123.0149	4.419845	201.9967	10.78678	12.11899	11.19405
7	-117.9123	4.373674	209.5830	10.70802	12.23054	11.17347
8	-114.4652	2.462241	257.8666	10.74751	12.46035	11.27114
9	-113.1303	0.762776	398.8166	10.93788	12.84103	11.51969
10	-110.2266	1.244443	625.2194	11.01619	13.10965	11.65618
11	-101.9421	2.366991	841.9550	10.71015	12.99393	11.40833
12	-41.04820	8.699135	46.89608*	6.646300*	9.120394*	7.402655*

Note: * indicates lag order selected by the criterion

According to table 4.4, all of the information criteria determined the optimal lag length as 12 but it is not significant in terms of the assumptions of VAR model. Therefore, the number of lag is decreased by 1unit and the optimal lag length is found as 7. The assumptions of VAR (7) are tested by the help of roots of characteristics of polynomial, Serial Correlation LM and Heteroscedasticity tests. The results of these tests are satisfied all assumptions of VAR (7).

Table 4.5 indicates the result of determination of optimal lags for GDP per capita growth and public savings.

Table: 4.5. *Optimal Lag Length for GDP per Capita Growth and Public Savings*

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-150.1887	NA	208.1405	11.01348	11.20379	11.07166
1	-125.6243	42.11051*	48.07542	9.544590	9.925220	9.660952
2	-121.7128	6.146513	48.84520	9.550917	10.12186	9.725460
3	-116.7123	7.143657	46.35877	9.479448	10.24071	9.712173
4	-109.6507	9.079234	38.50792	9.260761	10.21234	9.551667
5	-106.3430	3.780197	42.63836	9.310213	10.45210	9.659300
6	-103.2318	3.111141	49.16456	9.373703	10.70591	9.780971
7	-100.1088	2.676869	58.75887	9.436345	10.95886	9.901794
8	-98.43281	1.197155	82.04543	9.602343	11.31518	10.12597
9	-87.11474	6.467465	62.19324	9.079624	10.98277	9.661436
10	-80.76796	2.720048	76.24205	8.911997	11.00546	9.551990
11	-73.03768	2.208651	106.8175	8.645549	10.92933	9.343723
12	-21.51377	7.360559	11.61872*	5.250984*	7.725078*	6.007339*

Note: * indicates lag order selected by the criterion

According to table 4.5, all of the information criteria determined the optimal lag length as 12 but it is not significant in terms of the assumptions of VAR model. Therefore, the number of lag is decreased by 1unit and the optimal lag length is found as 3. The assumptions of VAR (3) are tested by the help of roots of characteristics of polynomial, Serial Correlation LM and Heteroscedasticity tests. The results of these tests are satisfied all assumptions of VAR (3).

Table 4.6 and 4.7 show the Johansen co-integration test results for GDP per capita growth and total domestic savings.

Table: 4.6. *Unrestricted Co-integration Rank Test (Trace) for GDP per Capita Growth and Total Domestic Savings*

Hypothesizes	**Eigenvalue**	**Trace**	**0.05**	**Prob.**
		Statistic	**Critical Value**	
None*(r=0)	0.350824	14.98247	15.49471	0.0596
At most 1(r≤1)	0.035505	1.156829	3.841466	0.2821

Note: * indicates no co-integration at the 0.05 level

Table: 4.7. *Unrestricted Co-integration Rank Test (Maximum Eigenvalue) for GDP per Capita Growth and Total Domestic Savings*

Hypothesizes	**Eigenvalue**	**Max-Eigen**	**0.05**	**Prob.**
		Statistic	**Critical Value**	
None*(r=0)	0.350824	13.82564	14.26460	0.0586
At most 1(r≤1)	0.035505	1.156829	3.841466	0.2821

Note: * indicates no co-integration at the 0.05 level

Even if the null hypotheses are not rejected for 5% significance level for trace and maximum Eigenvalue tests because both prob. Values (0.0596 and 0.0586) are higher than the 5% significance level, we can conclude that there is a long-term co-integration among GDP per capita growth and total domestic savings at the 10% significance level.

Table 4.8 and 4.9 show the Johansen co-integration test results for GDP per capita growth and private savings.

Table: 4.8. *Unrestricted Co-integration Rank Test (Trace) for GDP per Capita Growth and Private Savings*

Hypothesizes	**Eigenvalue**	**Trace**	**0.05**	**Prob.**
		Statistic	**Critical Value**	
None*(r=0)	0.433325	20.20293	15.49471	0.0090
At most 1(r≤1)	0.043277	1.459960	3.841466	0.2269

Note: * indicates no co-integration at the 0.05 level

Table: 4.9. *Unrestricted Co-integration Rank Test (Maximum Eigenvalue) for GDP per Capita Growth and Private Savings*

Hypothesizes	**Eigenvalue**	**Max-Eigen**	**0.05**	**Prob.**
		Statistic	**Critical Value**	
None*(r=0)	0.433325	18.74297	14.26460	0.0092
At most 1(r≤1)	0.043277	1.459960	3.841466	0.2269

Note: * indicates no co-integration at the 0.05 level

According to table 4.8 and 4.9, the trace and maximum Eigen value tests indicate that there is a long-run co-integration among GDP per capita growth and private savings at the 0.05 significance level because both prob. Values (0.0090 and 0.0092) are lower than the 5% significance level.

Table 4.10 and 4.11 show the Johansen co-integration test results for GDP per capita growth and public savings.

Table: 4.10. *Unrestricted Co-integration Rank Test (Trace) for GDP per Capita Growth and Public Savings*

Hypothesizes	**Eigenvalue**	**Trace**	**0.05**	**Prob.**
		Statistic	**Critical Value**	
None* (r=0)	0.369125	18.80327	15.49471	0.0153
At most 1(r≤1)	0.046436	1.759301	3.841466	0.1847

Note: * indicates no co-integration at the 0.05 level

Table: 4.11. *Unrestricted Co-integration Rank Test (Maximum Eigenvalue) for GDP per Capita Growth and Public Savings*

Hypothesizes	**Eigenvalue**	**Max-Eigen**	**0.05**	**Prob.**
		Statistic	**Critical Value**	
None*(r=0)	0.369125	17.04397	14.26460	0.0177
At most 1(r≤1)	0.046436	1.759301	3.841466	0.1847

Note: * indicates no co-integration at the 0.05 level

According to table 4.10 and 4.11, the trace and maximum eigenvalue tests indicate that there is a long-run co-integration among GDP per capita growth and public savings at the 0.05 level because both prob. Values (0.0153 and 0.0177) are lower than the 5% significance level.

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4.7.3. Granger Causality Test results

Table 4.12 indicates vector error correction estimates for long-run and VEC Granger causality/Wald test results for short run for GDP per capita growth and total domestic savings, private savings and public savings.

Table: 4.12. *Granger Causality Test Results*

Long-run		**Short-run**	
Null hypothesis	**Test statistics (t)**	**Null hypothesis**	**Test statistics (χ^2)**
D(PCG) Does not Granger cause D(TDS)	-2,40*	D(PCG) Does not Granger cause D(TDS)	15.28*
D(TDS) Does not Granger cause D(PCG)	-2,32*	D(TDS) Does not Granger cause D(PCG)	7.93
D(PCG) Does not Granger cause D(PRVS)	-2.17*	D(PCG) Does not Granger cause D(PRVS)	15.93*
D(PRVS) Does not Granger cause D(PCG)	-2.61*	D(PRVS) Does not Granger cause D(PCG)	3.85
D(PCG) Does not Granger cause D(PUBS)	-4.18*	D(PCG) Does not Granger cause D(PUBS)	11.76*
D(PUBS) Does not Granger cause D(PCG)	-3.26*	D(PUBS) Does not Granger cause D(PCG)	2.63

Note: * indicates the presence of causal relationships among variables at 5% significance level.

According to table 4.12, there is a bilateral causality between GDP per capita growth and total domestic savings, private savings and public savings the in the long run, since all of the t statistics are higher than the t-table values. In addition, the long-run results of the Granger causality test of the ect confirm that the ect coefficient of the GDP per capita growth takes negative value and statistically significant.

Moreover, since the chi-square test statistics for D(PCG) are lower than table chi-squared values, it can be concluded that there is a granger causality flowing from GDP per capita growth to total domestic savings, private savings and public savings in the short-run, but it the converse is not true.

4.7.4. Impulse Response functions

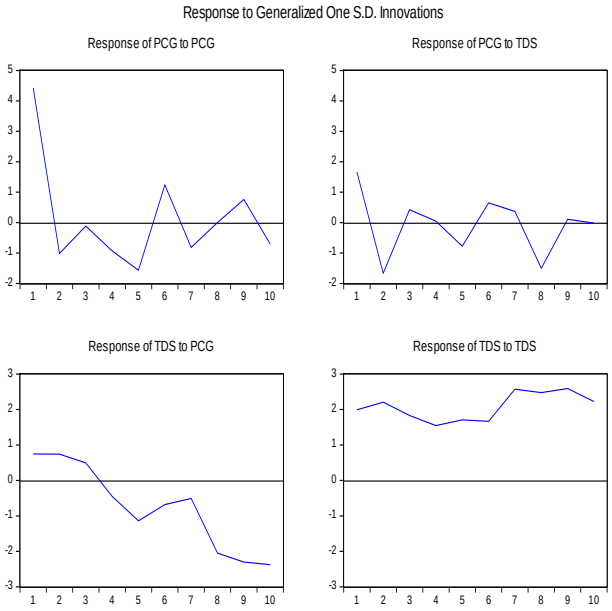

Figure: 4.1. *Impulse Response Results for GDP per Capita Growth and Total Domestic Savings*

According to impulse response graphs for GDP per capita growth and total domestic savings, shocks on total domestic savings affect positively GDP per capita growth in the first two periods, but the positive effect is not continues in all periods. Also, shocks on the GDP per capita growth affects total domestic savings positively in the first three periods, but this positive effect does not remain from the fourth period to last period.

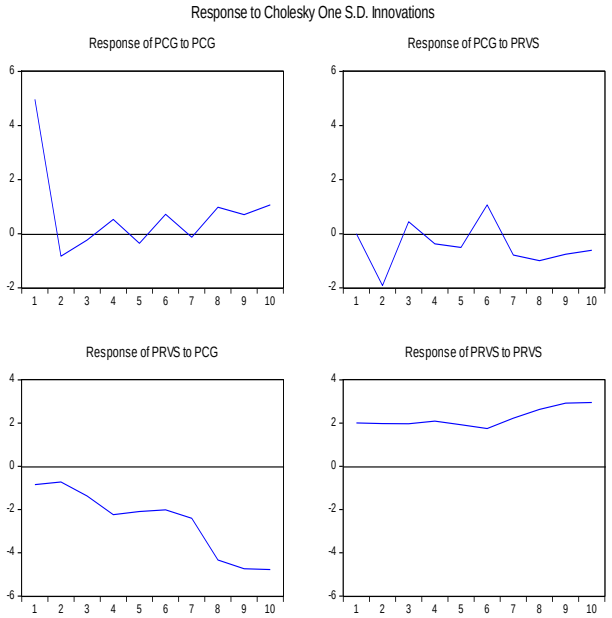

Figure: 4.2. *Impulse Response Results for GDP per Capita Growth and Private Savings*

According to impulse response graphs for GDP per capita growth and private savings, a shock on private savings affects positively GDP per capita growth in the third and 5-7 periods, but the positive effect is not continues in all periods. Also, shock on GDP per capita growth does not affect private savings from the first period to last period.

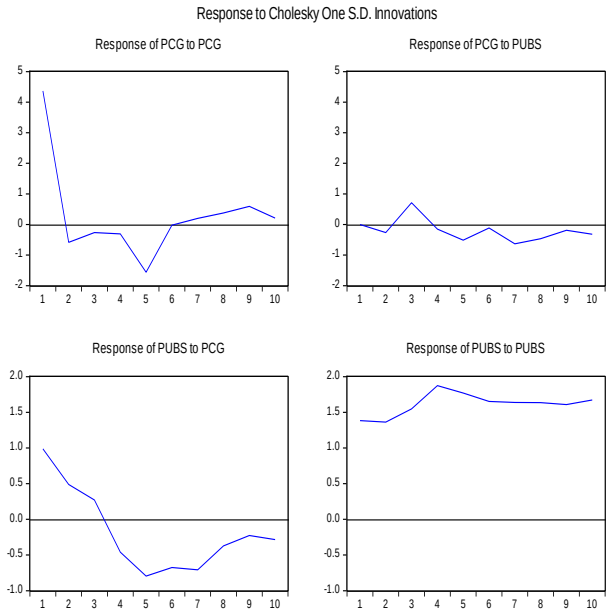

Figure: 4.3. *Impulse Response Results for GDP per Capita Growth and Public Savings*

According to impulse response graphs for GDP per capita growth and public savings, the shock on public savings affects positively GDP per capita growth from second period to fourth period, but the positive effect is not continues in all periods. Also, shock on GDP per capita growth affects public savings positively from the first period to fourth period.

4.7.5. Variance Decompositions of variables

Tables 4.13 and 4.14 indicate the variance decompositions for GDP per capita growth and total domestic savings.

Table: 4.13. *Variance Decomposition of GDP per Capita Growth Due to Changes in Total Domestic Savings*

Period	S.E.	PCG	TDS
1	4.424308	100.0000	0.000000
2	4.745929	91.48321	8.516794
3	4.774192	90.46260	9.537396
4	4.882693	90.12874	9.871260
5	5.131196	90.90532	9.094680
6	5.282750	91.27898	8.721016
7	5.394759	89.82154	10.17846
8	5.633090	82.38178	17.61822
9	5.686988	82.60762	17.39238
10	5.736674	82.68983	17.31017

According to table 4.13, fluctuation in GDP per capita growth stems from its own shock in the first period, but shocks on total domestic savings can cause to GDP per capita growth from the second period to tenth period. For example, shock on total domestic savings can cause to 9.53 percent fluctuation in GDP per capita growth in the third period while shock on total domestic savings can cause to 17.31 percent fluctuation in GDP per capita growth in the tenth period. That is, when the periods increase, shocks on the total domestic savings can cause more fluctuation in GDP per capita growth.

Table: 4.14. *Variance Decomposition of Total Domestic Savings Due to Changes in GDP per Capita Growth*

Period	S.E.	PCG	TDS
1	1.991479	14.02511	85.97489
2	2.973394	12.51556	87.48444
3	3.497334	11.05093	88.94907
4	3.980978	9.794131	90.20587
5	4.738700	12.71117	87.28883
6	5.216280	12.19582	87.80418
7	6.027674	9.843881	90.15612
8	7.265401	14.74377	85.25623
9	8.483464	18.18446	81.81554
10	9.428914	21.07810	78.92190

According to table 4.14, 14 percent fluctuation in total domestic savings stems from shock on GDP per capita growth in the first period and the effects of shocks on GDP per capita growth on fluctuation in total domestic savings varies during the first period to tenth period. For example, shock on GDP per capita growth can cause to 11.05 percent fluctuation in total domestic savings in the third period while shock on GDP per capita growth can cause to 21 percent fluctuation in total domestic savings in the tenth period.

Tables 4.15 and 4.16 indicate the variance decompositions for GDP per capita growth and private savings.

Table: 4.15. *Variance Decomposition of GDP per Capita Growth Due to Changes in Private Savings*

Period	S.E.	PCG	PRVS
1	4.963595	100.0000	0.000000
2	5.385975	87.31222	12.68778
3	5.409365	86.74658	13.25342
4	5.447887	86.45891	13.54109
5	5.483186	85.77944	14.22056
6	5.631630	82.93178	17.06822
7	5.688609	81.33159	18.66841
8	5.857116	79.50583	20.49417
9	5.947762	78.49888	21.50112
10	6.073301	78.36475	21.63525

According to table 4.15, fluctuation in GDP per capita growth stems from its own shock in the first period, but shocks on private savings can cause to GDP per capita growth from the second period to tenth period. For example, shock on private savings can cause to 13.25 percent fluctuation in GDP per capita growth in the third period while shock on private savings can cause to 21.63 percent fluctuation in GDP per capita growth in the tenth period. That is, when the periods increase, shocks on the total private savings can cause more fluctuation in GDP per capita growth.

Table: 4.16. *Variance Decomposition of Private Savings due to Changes in GDP per Capita Growth*

Period	S.E.	PCG	PRVS
1	2.179812	15.24853	84.75147
2	3.030567	13.56747	86.43253
3	3.866713	21.01623	78.98377
4	4.930889	33.46698	66.53302
5	5.690167	38.66114	61.33886
6	6.283932	41.96012	58.03988
7	7.085549	44.49236	55.50764
8	8.710977	54.17288	45.82712
9	10.33579	59.46376	40.53624
10	11.76213	62.41325	37.58675

According to table 4.16, 15.2 percent fluctuation in private savings stems from shock on GDP per capita growth in the first period and the effects of shocks on GDP per capita growth on private savings increases during the first period to tenth period. For example, shock on GDP per capita growth can cause to 21.01 percent fluctuation in private savings in the third period while shock on GDP per capita growth can cause to 62 percent fluctuation in private savings in the tenth period.

Tables 4.17 and 4.18 indicate the variance decompositions for GDP per capita growth and private savings.

Table: 4.17. *Variance Decomposition of GDP per Capita Growth Due to Changes on Public Savings*

Period	S.E.	PCG	PUBS
1	4.364433	100.0000	0.000000
2	4.411102	99.64598	0.354018
3	4.475633	97.14007	2.859932
4	4.488737	97.04521	2.954788
5	4.779983	96.24636	3.753638
6	4.781361	96.19308	3.806923
7	4.827282	94.54504	5.454956
8	4.864654	93.70829	6.291713
9	4.904277	93.65767	6.342329
10	4.919307	93.26991	6.730085

According to table 4.17, fluctuation in GDP per capita growth stems from its own shock in the first period, but shocks on public savings can cause to GDP per capita growth from the second period to tenth period. For example, shock on public savings can cause to 2.85 percent fluctuation in GDP per capita growth in the third period while shock on public savings can cause to 6.73 percent fluctuation in GDP per capita growth in the tenth period. It can be claimed that the effects of shocks on public savings on GDP per capita growth are relatively lower than the effects of shocks on total domestic and private savings on GDP per capita growth.

Table: 4.18. *Variance Decomposition of Public Savings Due to Changes in GDP per Capita Growth*

Period	S.E.	GROWTH	PUBS
1	1.700317	33.74075	66.25925
2	2.233321	24.33022	75.66978
3	2.730646	17.26596	82.73404
4	3.343062	13.40402	86.59598
5	3.865101	14.25988	85.74012
6	4.257156	14.26234	85.73766
7	4.615802	14.47533	85.52467
8	4.911097	13.36419	86.63581
9	5.172588	12.23866	87.76134
10	5.443893	11.32283	88.67717

According to table 4.18, 33.74 percent fluctuation in public savings stems from shock on GDP per capita growth in the first period and the effects of shocks on GDP per capita growth on public savings decreases during after the first period. For example, shock on GDP per capita growth can cause to 17.26 percent fluctuation in public savings in the third period while shock on GDP per capita growth can cause to 11.32 percent fluctuation in private savings in the tenth period.

CHAPTER FIVE

5. CONCLUSION, DISCUSSION AND RECOMMENDATION

5.1. Conclusion

Turkey's domestic savings have remarkably declined particularly from 1990s and still remained considerably low level at 14 percent on average within the period 2010-2015. The reasons behind this fact are claimed as increase in credit facilities and consumption expenditures, rapid rise in unemployment and urbanization rates, macroeconomic instability, low level of female labor force participation rate, and some demographic factors such as education level and young dependency ratio.

The comparison of Turkey's domestic savings rates among World shows that the Turkey's savings rates have remained below remarkably with that of World average domestic savings for all of the selected periods (1991-1995, 1996-2000, 2001-2005, 2006-2010 and 2011-2015) . Additionally, the comparison of Turkey's domestic savings rates among different income countries was indicated that Turkey's savings rates remained lower than (LMC), (UMC), and (HIC) groups. The inverse result is seen only in the comparison of Turkey's savings rates with low income countries (LIC).

One of the main reasons why Turkish economy is affected more than developed countries by recessions or shrinkages in the world can be considered as lack of adequate domestic savings in the country.

The resultant saving-investment gap is usually tried to be offset by foreign savings because of lack of adequate level of domestic savings and therefore current account deficit is widened in Turkey. Also, foreign savings can easily leave the country in the course of economic fluctuations and this situation results with that the fluctuations can be more secular in Turkey.

In this study, author particularly aimed at revealing the development process of domestic savings rates in Turkey and whether there is a positive effect of total domestic savings, private savings and public savings on sustainable economic growth or not in the country by the help of using time series analysis. The relationships are analyzed within the framework of econometric techniques.

Through employing ADF unit root testing procedure with structural break in 2008 in order to determine whether the variables are stationary or not, it is seen that each of the variables are stationary in their first differences. After a dummy variable was added

in to the system, the VAR and subsequent models were applied in the face of the structural break.

After determining the optimal lag lengths, author employed VAR approach in order to test if there is a presence of long run co-integration among the variables. The first result of co-integration test showed that there is a long-term co-integration among GDP per capita growth and total domestic savings. The second result revealed that there are long-term co-integrations among GDP per capita growth and private and public savings.

Moreover, the Granger causality test was used to determine the direction of causal relationship among variables. According to VECM estimation and Wald test results, the first finding is that there is a presence of bilateral Granger causality between GDP per capita growth and total domestic savings in the long run and there is a Granger causality flowing from GDP per capita growth to total domestic savings in the short run. The second result of the test showed that there is bilateral Granger causality between private savings and GDP per capita growth in the long run while there is a Granger causality flowing from GDP per capita growth to private savings in the short run. Finally, the third result of the test indicated that there is bilateral Granger causality among public savings and GDP per capita growth in the long run and there is a granger causality flowing from GDP per capita growth to public savings in the short run.

Additionally, dynamic relations between the series were analyzed by using Impulse-response analysis. According to impulse-response analysis for GDP per capita growth and total domestic savings, shocks on total domestic savings affect positively GDP per capita growth in the first two periods, but the positive effect is not continues in all periods and shocks on the GDP per capita growth affect total domestic savings positively in the first three periods, but this positive effect does not remain from the fourth period to last period. Also, according to impulse-response analysis for GDP per capita growth and private savings, a shock on private savings affects positively GDP per capita growth in the third and 5-7 periods, but the positive effect is not continues in all periods and shocks on GDP per capita growth do not affect private savings from the first period to last period. In addition, according to impulse response analysis for GDP per capita growth and public savings, shocks on public savings affect positively GDP per capita growth from the second period to fourth period, but the positive effect is not

continues in all periods and shocks on GDP per capita growth affect public savings positively from the first period to fourth period.

Furthermore, dynamic relations between the series were also analyzed by using variance decomposition analysis. It is seen that results of the variance decomposition analysis are consonant with the results of impulse-response analysis.

Main findings of the study can be indicated as follows:

- Long run relationship between total domestic savings and GDP per capita growth.
- Long run strong relationship between private savings and GDP per capita growth.
- Long run relationship between public savings and GDP per capita growth.
- Bilateral causality between total domestic savings and GDP per capita growth in the long run.
- Bilateral causality among public savings and GDP per capita growth in the long run.
- Bilateral causality between private savings and GDP per capita growth in the long run.
- Unilateral causality flowing from GDP per capita growth to total domestic savings in the short run.
- Unilateral causality flowing from GDP per capita growth to private savings in the short run
- Unilateral causality flowing from GDP per capita growth to public savings in the short run.

5.2. Discussion

The relationship among savings and economic growth has been discussed from classical period to modern day. While most of the research on the relationship between economic growth and savings has claimed that savings have a significant influence on economic growth, there are some studies founded that there is weak or nonexistence of such relation between these variables.

Moreover, theoretical studies on this subject such as Solow and Harrod-Domar model give researchers clue about the importance of savings on economic growth. The idea based on Solow model implied that an increase in savings rates can enhance economic growth in the short run. That is, the effect of savings on economic growth

suggested being temporary. Also, Solow model with technology implied that the basic source of long-run economic growth is technological progress and there is nothing attributed to savings on long-run economic growth. Moreover, Horrod-Domar model attaches importance to savings. According to this model, economic growth depends on savings and capital output ratio.

While not denying other studies related to this subject for the short run, this study found cointegration and Granger bilateral causality relationship between economic growth and total domestic savings, private savings and public savings in the long run in Turkey. This conclusion of the analysis promotes the research results of Alguacil et al (2004), Chturvedi et al (2009), Tang and Chua (2009), Agrawall and Sahoo (2009), Oladipo (2010), Tang and Chua (2012) and Tang and Ch'ng (2012).

5.3. Recommendation

Today, macroeconomic instability in Turkey depends on lack of adequate level of domestic savings. The reason behind this idea is that the consistent saving investment gap is tried to offset bay foreign savings and this situation lead to increase current account deficit. In order to find solution for this problem, it is necessary to find out why domestic savings decreases in Turkey because the reasons for decline in domestic savings can lead researchers come to solutions.

According to World Bank data, household final consumption expenditures remained at 66.5 percent of GDP in 1998 increased to 69.1 percent % of GDP in 2015. Particularly after 2002, it is seen that there is a sharp increase in household consumption expenditures whereas domestic savings have decreased dramatically. Also, the easy credit facilities lead people to consume more than adequate. The total volume of transaction is about 26 million TL in January, 2012 while it is about 45 million TL in January, 2016. Therefore, it is necessary to control banking system and to apply policy implementations that lead people to be aware benefit of savings are is than today's consumption in the long run.

Moreover**,** unemployment rate is still higher in Turkey and reached to 13 percent in 2017. According to World Bank report (2011), the dependency ratio among the working age population in Turkey is relatively higher than the OECD countries because of low female labor force participation rate and it leads to low level of private saving

rates. A higher level of employment rate and female labor force participation rate can enhance additional income to families and hence it leads to increase in savings.

Furthermore, education level can contribute to increase in domestic savings in Turkey because increase in financial literacy by education would lead to people to be aware of benefits of savings. Addition to this, a number of people keeping gold or money under the mattress but these mattress savings cannot useful for financing in investments and hence economic growth. Therefore, it is crucial to support financial literacy by education in order to increase in domestic savings rates in Turkey.

Finally, it is necessary to have effective channels to transfer domestic savings to productive investments or domestic savings should be reserved for sectors which create high added value and public assistance programs should be controlled properly so as to avoid unnecessary expenses for unproductive areas.

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