

Major Determinants of Economic Growth under Intermediate and Flexible Exchange Rate Regimes: Empirical Evidence from Turkey

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Abstract

The aim of this paper is to analyze empirically the major determinants of economic growth under intermediate and flexible exchange rate regimes in Turkey. The cointegration analysis show that there is a long-run relationship between all the variables. The determinants of the growth of real GDP show differences depending on the exchange rate regimes. While the ratios of investment and government expenditures to GDP have positively significant effects on the growth rate of real GDP in the intermediate exchange rate regime, they have negatively significant effects on the growth rate of real GDP in the flexible exchange rate regime. While the openness of the economy has positive effects on economic growth in the intermediate exchange rate regime, it has negative effects on the economic growth in the flexible exchange rate regime. While employment rate has positive effects on economic growth in the intermediate exchange rate regime, it has negative or insignificant effects on economic growth in the flexible exchange rate regime. While the central bank policy rate has negative effects, the inflation rate has positive effects on economic growth in both of the exchange rate regimes.

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Keywords: Economic growth, flexible exchange rate regime, intermediate exchange rate regime, cointegration, error correction model.

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1 Introduction

The relationship between exchange rate regimes and economic growth is an highly discussed and unanswered topic in the economics literature. After the collapse of Bretton Woods fixed exchange rate regime in 1973, many of the developed and emerging market economies started to adopt flexible exchange rate regime. In the flexible exchange rate regime, exchange rates are determined freely by demand and supply in the foreign exchange market. The main advantages of the floating exchange rate regime are to pursue an independent monetary policy, their invulnerability to currency crisis and their ability to absorb adverse shocks. On the other hand, in the fixed exchange rate regime, the monetary authority fixes exchange rate to another country's currency, a basket of currencies or the price of gold. The main advantages of fixed exchange rate regimes are to foster investment and international trade by reducing uncertainties about exchange rates and interest rates, to decrease real interest rates by reducing inflation and maintaining price stability.

What could be relationship between exchange rate regimes and economic growth? This linkage comes from investment, international trade and productivity. It is expected that under the fixed exchange rate regime due to lower uncertainty, investment and international trade will be higher as compared to those of the flexible exchange rate regime. However, under the fixed exchange regime, the elimination of adjustment mechanism distort price signals and prevent the efficient allocation of resources across sectors. Ghosh, Gulde, Ostry and Holger (1996) showed that while investment is higher in fixed exchange rate regime, productivity is lower as compared to that of flexible exchange rate regime. So, output growth is slightly lower in fixed exchange rate regime. Since, the economic growth shows differences depending on the type of exchange rate regime implemented, the macroeconomic determinants of economic growth may also show differences depending on the type of exchange rate regimes.

Bailliu and Perrault (2003) states that the exchange rate regime affects the economic growth indirectly through its influence on determinants of economic growth such as investment, openness of the economy, capital flows and financial market development. The effects of the exchange rate regimes on economic growth that occur through these indirect channels can be captured by the coefficient of these explanatory variables in the regressions, but, not by the coefficient of the exchange rate regime variable. In this study, the major macroeconomic variables that affect economic growth under intermediate and flexible exchange rate regimes in Turkey are analyzed. Since, the type of exchange rate regime has important implications on economic growth, it is expected that the macroeconomic variables that affect the economic growth may change depending on the type of exchange rate regime. Regarding intermediate and flexible exchange rate regimes periods in Turkey, some macroeconomic indicators are given in Table 1. As can be seen from Table 1, even though average

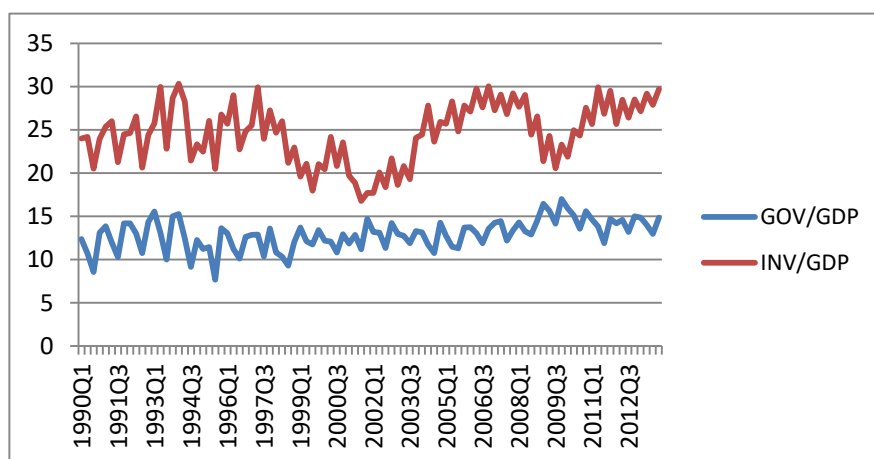
investment/GDP and average government/GDP ratio is around 1 percent higher in flexible exchange rate regime period, average growth rates of nominal and real GDP are higher in the intermediate exchange rate regime period. Ghosh, Guide, Ostry and Wolf (1996) states that while investment is higher under fixed exchange rate regimes for industrial and upper middle income countries, there is no difference about investment between exchange rate regimes for lower-income countries.

Table 1: Macroeconomic Indicators for Intermediate and Flexible Regimes

Variable name	Intermediate exchange rate regime	Flexible exchange rate regime
Average growth rate of real GDP	0.042	0.01
Average growth rate of nominal GDP	0.19	0.05
Average INV/GDP	24.08	25.09
Average GOV/GDP	12.08	13.60
X+M/GDP	0.40	0.48

Note: The variables are calculated using the IMF data.

The share of investment and government expenditures to GDP during intermediate and flexible exchange rate regimes are given in Figure 1. As can be seen from Figure 1, the amount of investment expenditures are almost two times more than government expenditures in both intermediate and flexible exchange rate regimes.



Note: The variables are calculated using the IFS of the IMF data.

Figure 1: Investment and Government Expenditures Share of GDP

In this paper, the major macroeconomic determinants of economic growth under intermediate and flexible exchange rate regimes are analyzed in Turkey. Since

intermediate exchange rate regime has lower uncertainty, it is expected that investment and openness of the economy (or international trade) have positive effects on economic growth. The structure of this study is organized as follows: The second part gives a brief literature review. In the third part, the evolution of foreign exchange rate regimes in Turkey is summarised. In the fourth part, theoretical framework of the study is explained. In the fifth part, methodology of research, data description and data sources are explained. In the sixth part, empirical results of the research are presented and discussed. The last part concludes the study.

2 Literature Review

Why some countries have higher economic growth rates while others have not? Barro and Sala-i-Martin (2004) give detailed information about growth theories and empirical analysis of countries growth experiences. In the literature, empirical studies about the relationship between exchange rate regimes and economic growth mostly use panel data consists of many countries. Some of these studies are as follows: Ashour and Yong (2018) examined the impact of exchange rate regimes on economic growth in 16 developing countries between 1974 and 2006 using pooled data. The empirical results show that as compared to flexible exchange rate regime, economic growth rate was higher by 1.2 percent in fixed exchange rate regime and 0.64 percent higher in intermediate exchange rate regime. It is also concluded that the lack of developed financial markets in the developing countries is the main reason for depriving of the benefits of flexible exchange rate regime.

Bayraktutan and Özkaya (2009) examined the relationship between exchange rate regimes and economic growth for 97 countries over the period from 1975 to 2004. Bayraktutan ve Özkaya (2009) found that as compared to flexible exchange rate regime, fixed and intermediate exchange rate regimes have better performance on economic growth, but, their effects are minimal. Bleaney and Francisco (2007) examined the relationship between exchange rate regimes and per capita GDP growth for 91 developing countries over the period from 1984 to 2001. Bleaney and Francisco (2007) finds that in the developing countries hard pegs are associated with significantly slower growth rates than flexible and soft pegs exchange rate regimes. Levy-Yeyati and Sturzenegger (2003) studied the relationship between exchange rate regimes and economic growth for 183 countries over the period from 1974 to 2000. Levy-Yeyati and Sturzenegger (2003) finds that exchange rate regimes have significant effects on economic growth of developing countries and have weaker effects on economic growth of industrialised countries Levy-Yeyati and Sturzenegger (2003) also found that less flexible exchange rate regimes are associated with slower growth in developing countries.

On the other hand, Chirwa and Odhiambo (2016) gives a review of international literature on macroeconomic determinants of economic growth. Chirwa and Adhiambo (2016) finds that the determinants of economic growth are show differences depending on whether the country is developed or developing country. Chirwa and Odhiambo (2016) study reveals that for developing countries the key macroeconomic determinants of economic growth based on the order of their importance include exogenous factors (foreign aid, foreign direct investment), fiscal policy, trade, physical capital, human capital, demographics, monetary policy, natural resources and geographic, regional, political and financial factors. For developed countries, the key macroeconomic determinants are associated significantly with economic growth are physical capital, fiscal policy, human capital, trade, demographics, monetary policy as well as financial and technological factors.

The empirical studies that examine the relationship between the exchange rate regimes and economic growth in a specific country are few. Tarawelle (2010) examines the relationship between the real exchange rate and GDP growth in Sierra Leone using cointegration, error correction models and causality tests. Tarawelle (2010) shows that in the long-run, real exchange rate, monetary policy and fiscal policy have positive effects on economic growth and depreciation of real exchange rate leads to higher economic growth. In the short-run, money supply has positive and inflation and civil unrest have negative effects on economic growth. Granger causality test shows that there is causality from real exchange rate to economic growth. Kocherlakota and Yi (1996) examines the effects of temporary changes in government policy variables on per capita GNP levels in exogenous and endogenous growth models in the United States. Kocherlakota and Yi (1996) found that of the seven U.S. policy variables, i.e., marginal income tax rate, ratio of total duties collected to total value of imports, real government nonmilitary equipment, real government non-military structural capital, real government military capital, real government military structural capital, only non-military equipment capital and non-military structural capital have statistically and economically significant effects on long-run GNP levels of the US. Kocherlakota and Yi (1996) also showed that temporary changes in public sector accumulation lead to highly persistent changes in the level of GNP.

Regarding Turkey, Bayraktar (2006) examined the correlation between economic growth and selected macroeconomic indicators between 1968 and 1998. Bayraktar (2006) finds a robust correlation between high-school enrollment rate and economic growth as well as housing investment and economic growth. But, Bayraktar (2006) did not found any correlation between fiscal (share of expenditures and deficits in GDP) and trade (real exchange rate, share of imports in GDP, share of exports in GDP) variables and economic growth as well as investment share of GDP.

To conclude, previous empirical studies mostly used panel data with many countries that may mask the effects of macroeconomic variables on economic

growth at the country level. On the other hand, country-specific empirical studies do not take into account the implemented exchange rate regimes. As compared to previous empirical studies, the time period covered: the variables, the econometric model and the data sources used are different in this study. To the best of our knowledge, there is no empirical study about Turkey that examines the effects of macroeconomic variables on economic growth under different type of exchange rate regimes.

3 Foreign Exchange Rate Regimes in Turkey

The exchange rate regimes implemented in Turkey from 1990 to 2001 can be described as intermediate exchange rate regimes (Reinhart and Rogoff, 2002; Bubula and Ötoker-Robe, 2002; Pinar and Erdal, 2016). Beginning from the 1990s, *de jure* flexible exchange rate regime was implemented, the Central Bank of Turkey often intervened the exchange rate volatility. For that reason, the exchange rate regime was called “managed floating”. At the beginning of 1995, the value of the Turkish lira was pegged to the currency basket consists of 1 US dollar and 1.5 Deutsche mark. It was also decided that the monthly value of the currency basket would be increased with respect to expected monthly inflation rates. The Central Bank of Turkey intervened in the foreign exchange market to maintain foreseen increase in the currency basket.

Between 1996 and 1999, the Central Bank of Turkey regulated the foreign exchange rate policy with respect to the monetary policy. In this period, since the primary objective of monetary policy was to maintain financial markets’ stability, using the exchange rate policy the exchange rate volatility tried to be minimized. The Central Bank of Turkey intervened in the exchange markets in order to minimize exchange rate volatility. The devaluations were made with respect to expected inflation rates. So, the exchange rate regime implemented this period can be described as “managed floating with no predetermined path for the exchange rate”.

In December 1999, a stand-by arrangement was signed with the International Monetary Fund (IMF) and within the framework of the disinflation program “forward looking crawling pegs” started to be implemented. The exchange rate increases were determined in accordance with the targeted inflation rate. The value of the exchange rate basket consisted of 1 US dollar and 0.77 euro was announced for one year. But, after the financial crisis on 21 February 2001, this regime was abandoned and flexible exchange rate regime was adopted. Currently, the Central Bank of Turkey intervenes in the foreign exchange market to minimize excessive exchange rate volatility, and in the case of excess foreign exchange supply in the market buy them to increase its foreign exchange reserves.

4 Theoretical Model

In the theoretical part of the study, a modified Solow model is used to estimate the effects of additional growth enhancing shift variables (Bhaskara, 2006). The production function can be written as follows:

$$Y_t = A_0 e^{(g_1 + g_2 Z)t} K_t^\beta L_t^{1-\beta} \tag{1}$$

where “ Y_t ” is output, “ A_0 ” is the initial stock of knowledge, “ K_t ” is physical capital, “ L_t ” is labour, “ g ” is assumed a function of growth promoting shift variable “ Z ” and is also some unknown trended variables proxied with time. So, the “ Z ” variable could be openness, foreign aid etc., or a vector of some growth improving variables. Let’s take logarithm of both sides of equation. So, the suggestions of this modification are as follows:

$$\ln Y_t = \ln A_0 + (g_1 + g_2 Z)t + \beta \ln K_t + (1 - \beta) \ln L_t \tag{2}$$

$$\Delta \ln Y_t = [g_1 + g_2 (\Delta Z_t t + Z_t)] + \beta \Delta \ln K_t + (1 - \beta) \Delta \ln L_t \tag{3}$$

$$\Delta \ln y_t = [g_1 + g_2 (\Delta Z_t t + Z)] + \beta \Delta \ln k_t \tag{4}$$

$$\Delta \ln y^* = g_1 + g_2 Z \quad \text{as } \Delta \ln k_t \text{ and } \Delta Z \gg 0 \tag{5}$$

If Z is trade openness, economic growth rate will be higher in more open economies in the long-run equilibrium. Let’s now consider non-linear form of this equation:

$$Y_t = A_0 e^{(\beta_1 \frac{\beta_2}{Z})t} K_t^\beta L_t^{1-\beta} \tag{6}$$

In equation (6), if Z is research and development expenditures, the economic growth rate will not perpetually increase with ever increasing research and development expenditures. So, it would be useful to use non-linear specification in this study to see the effects of macroeconomic variables on economic growth rate.

Bhaskara (2006) states that in the country-specific time series growth models proper model specification and estimation techniques are important. The economic growth can be measured by the growth rate of real GDP and there are four major determinants of economic growth: 1-Capital formation (capital employed), 2- Human resources (increase of active population or human capital investment), 3-Natural resources (land and underground resources) and 4-Technology (technological advancement). However, what determines the increase of each determinant is different. For instance, investment, public expenditure, employment rate, exchange rate, inflation etc. could have different effects on economic growth, and these determinants could have different implications depending on whether the country is developed or not (Boldeanu and Constantinescu, 2015). In this study, the following equation is constructed to determine the effects of macroeconomic variables on economic growth:

$$\text{GROWTHREALGDP}_t = B_0 + B_1 \text{REAL EXCHRATE}_t + B_2 \text{INV/GDP}_t + B_3 \text{GOV/GDP}_t + B_4 \text{OPENNESS}_t + B_5 \text{CBRATE}_t + B_6 \text{INFLATION}_t + B_7 \text{EMPLOYMENT}_t + u_t$$

where dependent variable is the growth rate of real GDP. Independent variables can be described as follows:

$REALEXCHRATE_t$ is nominal exchange rate deflated by inflation at time t . The sign of the coefficient is expected to be positive. An increase in exchange rate shows depreciation of domestic currency and export volume should increase, import volume should decrease and net exports should increase. An increase in net exports leads to increase of growth rate of real GDP. However, in this study, Real Effective Exchange Rates Based on Manufacturing Unit Labor Cost for Turkey is used. So, an increase in real exchange rate shows appreciation of Turkish lira, then exports should decrease, imports should increase and net exports should decrease. This outcome may lead to decrease of growth rate of real GDP. So, the sign of the coefficient is expected to be negative.

INV/GDP_t is the ratio of investment expenditures to GDP at time t . The increase of investment expenditures leads to higher economic growth rates. So, the sign of the coefficient is expected to be positive.

GOV/GDP_t is the ratio of government expenditures to GDP at time t . The sign of the coefficient is expected to be negative. However, if government expenditures are directed to production, this may increase future economic growth. These government purchases can be productive or non-productive, but their effect on output is at most temporary. So, the sign of the coefficient is an empirical issue.

$OPENNESS_t$ is the openness of economy to international markets at time t . It is expected that countries that are more open to international trade will tend to grow more rapidly, because they can take advantage of larger markets and they can absorb technological developments (Barro and Sala-i-Martin, 2004). As the openness of economy to international markets increases, productivity also increases with the specialization (Erdal, 2017). So, the sign of the coefficient is expected to be positive.

$CBRATE_t$ is the Central Bank policy interest rate at time t . The central bank policy rate is used by the central bank as a monetary policy tool. The level of central bank policy rate has direct effects on the level of both deposits and credit interest rates. As the central bank policy rate increases, both demand and deposit interest rates increase. Since, an increase of interest rates leads to decrease of investment, economic growth decreases. So, the sign of the coefficient is expected to be negative.

$INFLATION_t$ is the inflation rate at time t . Inflation rate is the rate of change in general price level. High inflation rates increase uncertainty about future price levels. This uncertainty may deter investment decisions of the firms. So, the sign of the coefficient is expected to be negative. On the other hand, it is also argued that moderate inflation may increase investment, and thereby economic growth. A small increase in output prices stimulates producers to increase their production or production capacity. This increase in inflation rate may lead to higher economic growth. So, the sign of the coefficient is an empirical issue.

EMPLOYMENT_t is the employment rate at time t. The increase of employment rate leads to higher labor force, and therefore higher economic growth rates. So, the sign of the coefficient is expected to be positive.

5 Research Method

In the empirical part of the study, the major macroeconomic determinants of the growth rate of real GDP are analyzed under intermediate and flexible exchange rate regimes in Turkey. The intermediate exchange rate regime was implemented between January 1990 and February 2001 and after February 2001 to date flexible exchange rate regime is implemented. The Johansen cointegration analysis is used to determine the long-run relationship between the variables. Then, the error correction models (ECMs) are estimated to see if there is short-term adjustment to return to long-term values, and if it is, to see the speed of adjustment of variables to return to long-run values. In this framework, the following equation is estimated:

$$\text{GROWTHREALGDP}_t = B_0 + B_1 \text{REALEXCHRATE}_t + B_2 \text{INV/GDP}_t + B_3 \text{GOV/GDP}_t + B_4 \text{OPENNESS}_t + B_5 \text{CBRATE}_t + B_6 \text{INFLATION}_t + B_7 \text{EMPLOYMENT}_t + u_t$$

In this equation, real exchange rate, inflation rate, central bank policy rate and employment rate are in logarithmic forms, other variables are in their levels. The dependent variable is the growth rate of real GDP. Source: International Financial Statistics (IFS) of the International Monetary Fund (IMF). The description of independent variables and their data sources are as follows:

REAL EXCHANGE RATE_t: Real effective exchange rate based on manufacturing unit labor cost for Turkey (Index 2010=1), not seasonally adjusted. Source: Federal Reserve Bank of St. Louis Economic Data (FREDII).

INV/GDP_t: The ratio of gross fixed capital formation to the GDP. Gross fixed capital formation is calculated as total value of a producer's acquisitions, less disposals of fixed assets during the accounting plus certain additions to the value of nonproduced assets (such as subsoil assets or major improvements in the quantity, quality or productivity of land). Gross fixed capital formation has three major components: 1- Construction: Housing, other buildings and other construction, 2- Machinery and equipment: Transportation systems, information and communication technology, weapon systems, etc. 3- Other assets: Software development, data sets, research & development expenditures and other investment oriented assets. Source: IFS of the IMF.

GOV/GDP_t: The ratio of government consumption expenditures to the GDP. The government consumption expenditures consist of expenditure incurred by general government on individual consumption goods and services plus collective consumption services. Source: IFS of the IMF.

$OPENNESS_t$: The ratio of total foreign trade to GDP (export+import/GDP). Source: IFS of the IMF.

$CBRATE_t$: The overnight borrowing rate was used as monetary policy rate by the central bank. However, since 20.05.2010, the one week lending repo rate has been using as the central bank policy rate. Source: IFS of the IMF.

$INFLATION_t$: Inflation rate is the annual percentage change of Consumer Price Index (CPI) (2003 = 100). Source: Turkish Statistical Institute.

$EMPLOYMENT_t$: The employment rate is the ratio of employed person to non-institutional population 15 years and over. Source: Turkish Statistical Institute.

6 Procedure of the Study and Empirical Results

In the empirical part of the study, Johansen cointegration test is done if there is a long-term relationship between the variables and ECM is done to see the short-term adjustments. To do the cointegration analysis, the variables should be integrated in the same order. So, firstly variables are tested whether they have a unit root.

6.1 Unit Root Test

Firstly, each of the variable is tested using Augmented Dickey Fuller (ADF) test whether the variable has a unit root. The ADF test consists of regressing each series on its lagged value and lagged difference terms. The ADF test results are shown in Table 2. The ADF test results show that the variables are not integrated of order (0), except $lncentralbankrate$ in intermediate and openness of the economy ($X+M/GDP$) in flexible exchange rate regime. The variables are integrated of order (1) in total period, intermediate exchange rate regime and flexible exchange rate regime.

Table 2: ADF Unit Root Test Results

	Total	Period	(1990Q1-2013Q4)
Variable Name	Level	Level	First Difference
GrowthrateofrealGDP	-1.35		-28.32*
Lnrealexchangerate	-1.85		-8.10*
INV/GDP	-2.29		-3.20**
GOV/GDP	-1.59		-4.41*
X+M/GDP	-2.37		-4.52*
Lninflation	-0.30		-3.39**
Lncentralbankrate	-0.65		-12.59*
Lnemployment	-1.47		-5.29*
	Intermediate	Exchange Rate	Regime
Variable Name	Level	Level	First Difference
GrowthrateofrealGDP	-0.32		-19.91*
Lnrealexchangerate	-1.41		-5.98*
INV/GDP	-2.74		-4.61*
GOV/GDP	-2.14		-2.70***

X+M/GDP	-1.85	-2.62***
Lninflation	-0.39	-4.09*
lncentralbankrate	-6.46*	-
Lnemployment	-2.52	-7.09*
	Flexible	Exchange Rate Regime
Variable Name	Level	First Difference
GrowthrateofrealGDP	-2.81	-2.94**
Lnrealexchangerate	-2.10	-6.65*
INV/GDP	-1.37	-4.37*
GOV/GDP	-1.91	-3.90*
X+M/GDP	-4.81	-
Lninflation	-1.50	-2.93**
lncentralbankrate	-1.43	-5.95
Lnemployment	-1.77	-1.43

Note: “*” shows that the variable is stationary at 1 %, “**” shows that the variable is stationary at 5 %, “***” shows that the variable is stationary at 10%.

McKinnon critical values: For total period: -3.5 for 1%, -2.89 for 5%, -2.58 for 10%.

For intermediate exchange rate regime: -3.58 for 1%, -2.92 for 5%, -2.60 for 10%.

For flexible exchange rate regime: -3.56 for 1%, -2.91 for 5%, -2.59 for 10%.

6.2 Cointegration Analysis

The Johansen test statistics (trace and maximum eigenvalue) are used for the cointegration analysis. The cointegration test results for growth of real GDP, real exchange rate, Investment/GDP, Government/GDP, openness of the economy (X+M/GDP), inflation rate, central bank policy rate and employment rate are presented in Appendix A. The cointegration test results show that cointegration exists between variables in total period as well as in intermediate and flexible exchange rate regimes. The existence of cointegration between variables means that there is a long-run relationship among growth rate of real GDP, real exchange rate, Investment/GDP, Government/GDP, openness of the economy, inflation rate, central bank policy rate and employment rate. The estimation of cointegrating relationship for growth rate of real GDP and macroeconomic variables for intermediate and flexible exchange rate regimes and for different scenarios are given in Table 3, and the summary of long-term effects are given in Table 4 respectively.

Table 3: Estimation of cointegrating relationship

	Total period	Intermediate	Flexible
ALL VARIABLES INCLUDED			
Lnrealexchangerate	-0.75** (4.60)	-0.10 (0.22)	-0.29** (2.62)
INV/GDP	0.93** (4.20)	1.59** (2.06)	0.04 (0.22)
GOV/GDP	3.75** (7.34)	7.15** (5.82)	-0.77** (2.18)
X+M/GDP	-0.05 (0.55)	0.27 (1.51)	-0.88** (6.34)
Lninflation	-0.11** (2.47)	0.19 (0.68)	0.07** (3.68)
lnCBrate	0.12** (4.04)	-0.22** (1.78)	-0.09** (1.78)
Lnemployment	1.38**	3.87**	-0.47**

	(4.35)	(3.81)	(3.11)
REAL EXCHANGE RATE	EXCLUDED		
INV/GDP	0.95** (2.98)	1.35** (1.86)	-0.24** (1.80)
GOV/GDP	4.90** (6.68)	7.90** (6.16)	-1.11** (3.7)
X+M/GDP	0.33** (2.33)	0.41** (0.19)	-0.73** (6.48)
Lninflation	-0.12** (2.06)	0.37** (1.97)	0.05** (2.65)
lnCBrate	0.22** (5.10)	-0.35** (2.91)	-0.07** (5.55)
Lnemployment	3.02** (5.96)	4.22** (5.24)	-0.22 (1.34)
INFLATION RATE	EXCLUDED		
Lnrealexchangerate	-0.74** (2.98)	-0.25** (3.45)	-0.50** (5.05)
INV/GDP	1.09** (8.11)	1.99** (11.4)	-0.11 (0.75)
GOV/GDP	2.41** (6.22)	-0.31 (0.83)	-0.27 (0.83)
X+M/GDP	-0.17** (2.58)	-0.06 (1.46)	-0.069 (0.61)
lnCBrate	0.03** (2.69)	-0.08** (2.65)	-0.04** (-4.56)
Lnemployment	0.69** (3.20)	2.48** (11.6)	-0.87** (6.69)
REAL EXCHANGE RATE	&INFLATION RATE	EXCLUDED	
INV/GDP	1.12** (4.02)	1.55** (2.56)	-0.40** (3.79)
GOV/GDP	4.55** (6.69)	5.032** (4.66)	-0.84** (2.86)
X+M/GDP	0.206 (1.62)	0.45** (2.92)	-0.45** (0.09)
lnCBrate	0.14** (8.39)	-0.24** (2.33)	-0.03** (3.79)
Lnemployment	2.05** (6.47)	4.07** (5.67)	-0.02 (0.19)

Note:“***” shows that the variable is significant at 5 % level. The values in the paranthesis are t-statistics. Number of observations for total period are 96, for intermediate regime are 45 and for flexible regime.

As can be seen in Table 3 and Table 4, the signs of the explanatory variables are as expected as a whole for total period and intermediate exchange rate regime. But, for the flexible exchange rate regime, some of the variables have unexpected signs. The coefficient of the real exchange rate has a negative sign and statistically significant for total period as well as intermediate and flexible exchange rate regimes. Since, real effective exchange rate is used in the estimations, an increase of real exchange rate shows an appreciation of domestic currency, so imports increase and exports decrease. The decrease of net exports may lead to decrease of the growth rate of real GDP.

The coefficient of the ratio of investment to GDP has a positive sign and statistically significant in total period and intermediate exchange rate regime as expected, but negatively significant or statistically insignificant in the flexible exchange rate regime. Bayraktar (2006) also found a robust correlation between housing investment and economic growth in Turkey. The coefficient of the ratio

of government expenditures to GDP has a positive sign and statistically significant in total period and intermediate exchange rate regime. Kocherlakota and Yi (1996) also showed that temporary changes in public sector accumulation lead to highly persistent changes in the level of GNP. On the other hand, the coefficient of the ratio of government expenditures to GDP is negatively significant or statistically insignificant in the regressions for the flexible exchange rate regime.

Table 4: Summary of the Long-Run Effects*

	Total period	Intermediate	Flexible
ALL VARIABLES INCLUDED			
Lnrealexchangerate	-	0	-
INV/GDP	+	+	0
GOV/GDP	+	+	-
X+M/GDP	0	0	-
lninflation	-	0	+
lnCBrate	+	-	-
lnemployment	+	+	-
REAL EXCHANGE RATE EXCLUDED			
INV/GDP	+	+	-
GOV/GDP	+	+	-
X+M/GDP	+	+	-
lninflation	-	+	+
lnCBrate	+	-	-
lnemployment	+	+	0
INFLATION RATE EXCLUDED			
Lnrealexchangerate	-	-	-
INV/GDP	+	+	0
GOV/GDP	+	0	0
X+M/GDP	-	0	0
lnCBrate	+	-	-
lnemployment	+	+	-
REAL EXCHANGE RATE & INFLATION RATE EXCLUDED			
INV/GDP	+	+	-
GOV/GDP	+	+	-
X+M/GDP	0	+	-
lnCBrate	+	-	-
lnemployment	+	+	0

(*) “+” shows positive and statistically significant effect, “-” shows negative and statistically significant effect and “0” shows statistically insignificant effect.

The coefficient of the openness of the economy shows variations among exchange rate regimes and among different scenarios. While the coefficient of the openness of the economy is positively significant or statistically insignificant in the intermediate exchange rate regime, it is negatively significant (except Scenario 3) in the flexible exchange rate regime. As can be seen in Figure 2, starting from the second quarter of 2001, the difference between the amounts of imports and amounts of exports was started to widen. So, the widening difference between

imports and exports (Imports values – Exports values) may affect economic growth rate negatively.

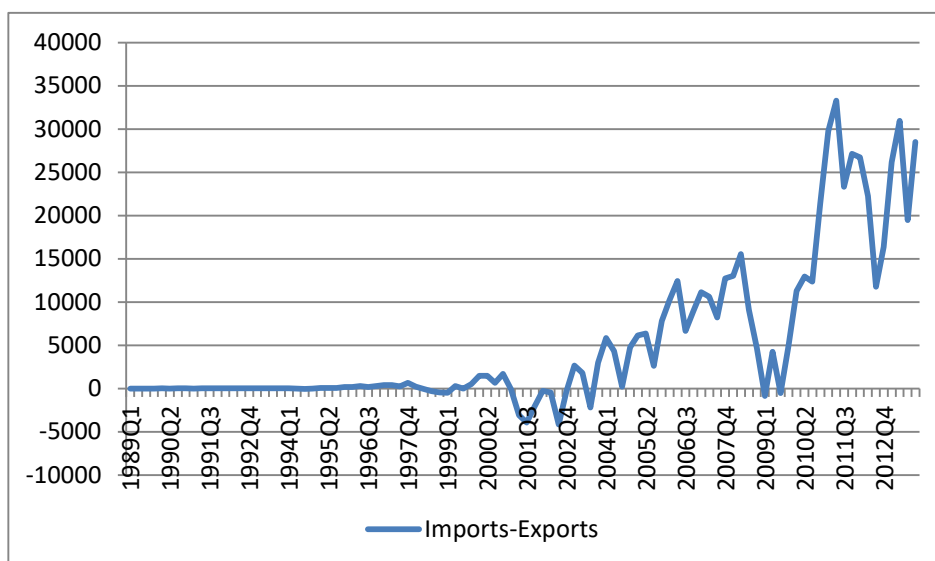


Figure 2: The difference between imports and exports

The coefficient of inflation rate is negative and statistically significant for total period as expected. But it is positive and statistically significant for intermediate and flexible exchange rate regimes. This result could be interpreted as moderate inflation may increase investment, and thereby economic growth. A small increase of output prices stimulates producers to increase their production capacity. The coefficient of the central bank policy rate is negative and statistically significant for intermediate and flexible exchange rate regimes as expected. The central bank policy rate has direct effect on the level of interest rates for products such as savings, loans, and mortgages. On the other hand, the coefficient of the central bank policy rate is positively significant in the regressions of total period. The coefficient of employment rate has a positive sign and statistically significant for total period and intermediate exchange rate regime as expected. On the other hand, the coefficient of employment rate is negatively significant or statistically insignificant for flexible exchange rate regime contrary to expected.

6.3 Error Correction Model (ECM)

As a third step, the ECMs are estimated. The cointegration will be supported if the coefficient of the lag of the error correction model (ECM_{t-1}) is negative and statistically significant. Besides, the coefficient of ECM_{t-1} represents the proportion of the disequilibrium in growth rate of real GDP in one period corrected in the next period. To do the ECM estimation, five period lags of the independent variables are included in the regressions and they are estimated. The statistically insignificant variables are dropped from the regressions and the

statistically significant ones are kept in the regressions and they are re-estimated. The residual of each estimated equation is saved as ECM. Then, the regressions using first difference of both dependent and independent variables and the lag of the ECM (i.e., ECM_{t-1}) are re-estimated. The estimation results of these regressions in other words, ECMs are given in Table 5. As can be seen in Table 5, the coefficient of ECM_{t-1} is negative and statistically significant in all of the equations, which confirms that all the variables are cointegrated. The value of the ECM_{t-1} coefficient shows variations between the equations. But, on average, the value of the ECM_{t-1} coefficient is around 0.60, which implies that about 60 percent of the deviations from the long-run values of the growth rate of real GDP are corrected in the following period.

Table 5: Error Correction Models Estimation Results

	Total period	Intermediate	Flexible
Dependent variable: Δ Growth rate of real GDP			
ALL VARIABLES INCLUDED			
$\Delta \ln \text{realexchangerate}$	0.05 (0.17)	-0.21 (-0.33)	0.47** (1.81)
$\Delta \text{INV/GDP}$	-1.94** (-6.11)	-1.81** (-2.93)	-0.97** (-3.30)
$\Delta \text{GOV/GDP}$	-1.55** (-2.62)	-1.62 (-1.37)	-1.90** (-3.69)
$\Delta \text{X+M/GDP}$	-0.29 (-1.42)	-0.49 (-1.18)	0.90** (4.06)
$\Delta \ln \text{inflation}$	-0.08 (-0.78)	-0.25 (-0.87)	0.04 (0.52)
$\Delta \ln \text{CBrate}$	0.12** (2.36)	0.13** (1.69)	-0.004 (-0.07)
$\Delta \ln \text{employment}$	0.56** (1.36)	0.20 (0.17)	-0.08** (-2.45)
ECM t-1	-0.72** (-5.86)	-0.76** (-3.31)	-0.57** (-2.45)
R ²	0.72	0.79	0.67
DW statistic	1.81	2.04	2.08
REAL EXCHANGE RATE EXCLUDED			
$\Delta \text{INV/GDP}$	-1.82** (-5.76)	-2.48** (-3.91)	-0.95** (-3.08)
$\Delta \text{GOV/GDP}$	-1.58** (-2.78)	-1.28** (-1.07)	-1.77** (-3.34)
$\Delta \text{X+M/GDP}$	-0.33** (-1.73)	-0.52 (-1.29)	0.80** (3.44)
$\Delta \ln \text{inflation}$	-0.12 (-1.22)	-0.24** (-0.76)	0.05 (0.66)
$\Delta \ln \text{CBrate}$	0.12** (2.59)	0.14** (1.71)	-0.006 (-0.09)
$\Delta \ln \text{employment}$	0.28 (0.70)	0.55 (0.44)	-0.15 (-0.49)
ECM t-1	-0.67** (-6.00)	-0.39** (-0.71)	-0.56** (-2.38)
R ²	0.72	0.74	0.63
DW statistic	1.75	2.12	2.00
INFLATION RATE EXCLUDED			
$\Delta \ln \text{realexchangerate}$	0.15 (0.54)	-0.07 (-0.10)	0.53** (2.29)
$\Delta \text{INV/GDP}$	-2.03** (-6.42)	-2.67** (-4.24)	-0.79** (-2.95)
$\Delta \text{GOV/GDP}$	-1.41**	-0.51	-2.55**

	(-2.39)	(-0.39)	(-5.31)
$\Delta X+M/GDP$	-0.26 (-1.31)	-0.54 (-1.24)	0.92** (4.29)
$\Delta \ln CBrate$	0.10** (1.98)	0.18** (2.29)	0.004 (0.08)
$\Delta \ln employment$	0.51 (1.27)	0.29 (0.23)	-0.05 (-0.19)
ECM t-1	-0.75** (-6.06)	-0.61** (-2.61)	-0.76** (-4.05)
R ²	0.71	0.76	0.72
DW statistic	1.83	1.98	1.96
REAL EXCHANGE RATE &	INFLATION	EXCLUDED	
	RATE		
$\Delta INV/GDP$	-1.76** (-5.38)	-2.43** (-3.87)	-1.004** (-3.34)
$\Delta GOV/GDP$	-1.66** (-2.85)	-1.07 (-0.93)	-1.70** (-3.25)
$\Delta X+M/GDP$	-0.30 (-1.56)	-0.59 (-1.49)	0.78** (3.37)
$\Delta \ln CBrate$	0.13** (2.61)	0.15** (1.88)	0.01 (0.30)
$\Delta \ln employment$	0.71** (1.67)	0.61 (0.49)	-0.17 (-0.56)
ECM t-1	-0.63** (-5.49)	-0.42** (-1.89)	-0.60** (-2.62)
R ²	0.70	0.74	0.64
DW statistic	1.87	2.12	1.97

Note: “***” shows that the variable is significant at 5 % level. The values in the paranthesis are t-statistics. Number of observations for total period are 96, for intermediate regime are 45 and for flexible regime are 51.

7 Conclusion

This paper analyzed empirically the major determinants of the growth rate of real GDP under intermediate and flexible exchange rate regimes in Turkey. To do that, cointegration analysis and error correction models are used. The empirical results indicate the existence of cointegration between variables. This means that there is a long-run relationship among growth of real GDP, real exchange rate, Investment/GDP, Government/GDP, openness of the economy ($X+M/GDP$), inflation rate, central bank policy rate and employment rate.

The estimation results of long-run relationship are as expected in the study. The determinants of growth of real GDP show differences depending on the implemented exchange rate regimes. While the ratios of investment and government expenditures to GDP have positively significant effects on growth rate of real GDP in the intermediate exchange rate regime, they have negatively significant effects on the growth rate of real GDP in the flexible exchange rate regime. While the openness of the economy has positively significant or insignificant effects on economic growth in the intermediate exchange rate regime, it has negative effects on the economic growth in the flexible exchange rate regime. While Bayraktar (2006) did not find any correlation between the ratio of fiscal expenditures to GDP, the ratio of exports and imports to GDP and economic growth, this study finds correlation between the ratio of fiscal

expenditures to GDP and economic growth as well as the ratio of exports and imports to GDP and economic growth. The inflation rate has positive effects on real GDP growth in both intermediate and flexible exchange rate regimes. The central bank policy interest rate has negative effects on economic growth in both intermediate and flexible exchange rate regimes. Since the level of central bank policy rate has direct effects on the level of deposit and credit interest rates of banks, the policy makers should take into account this empirical result when taking interest rate decision. While employment rate has positive effects on economic growth in the intermediate exchange rate regime, but, it has negative or insignificant effects on economic growth in the flexible exchange rate regime. The ECMs estimation results show that the short-run dynamic converges to its long-run cointegrating relationship with a high speed of adjustment.

Consequently, it could be said that the implemented exchange rate regime is important for the type of macroeconomic variables affecting the economic growth in Turkey. As compared to flexible exchange rate regime, investment and openness of the economy have more effective on real GDP growth in intermediate exchange rate regime. Further research may be done by disaggregating investment expenditures and government expenditures to see the effects of different type of investment and government expenditures on the economic growth.

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Appendix A

Cointegration Test Results

	TOTAL	PERIOD		
Variables Eigenvalue		Trace statistics	0.05 critical value	Probability*****
<u>All variables****</u>				
None*	0.68	242.19	159.52	0.00
At most 1	0.37	131.42	125.61	0.02
At most 2	0.28	86.14	95.75	0.19
At most 3	0.19	53.48	69.81	0.48
At most 4	0.11	32.60	47.85	0.57
At most 5	0.10	20.63	29.79	0.38
At most 6	0.06	9.53	15.49	0.31
At most 7	0.03	3.08	3.84	0.07
<u>Except real exchange rate and inflation***</u>				
None*	0.62	156.10	95.75	0.00
At most 1	0.26	61.83	69.81	0.18
At most 2	0.14	31.73	47.85	0.62
At most 3	0.10	16.39	29.79	0.64
At most 4	0.05	1.04	15.49	0.64
At most 5	0.01	6.96	3.84	0.30
<u>Except real exchange rate****</u>				
None*	0.63	196.82	125.61	0.00
At most 1	0.30	99.69	95.75	0.02
At most 2	0.27	64.16	69.81	0.13
At most 3	0.12	32.78	47.85	0.56
At most 4	0.09	20.22	29.79	0.40
At most 5	0.07	10.33	15.49	0.25
At most 6	0.02	2.79	3.84	0.09
<u>Except inflation****</u>				
None*	0.66	205.34	125.61	0.00
At most 1	0.35	99.06	95.75	0.02
At most 2	0.22	57.20	69.81	0.33
At most 3	0.13	33.22	47.81	0.54
At most 4	0.11	19.57	29.79	0.45
At most 5	0.05	7.96	3.84	0.46
At most 6	0.02	2.35	3.84	0.12
INTERMEDIATE				
Variables Eigenvalue		Trace statistics	0.05 critical value	Probability*****
<u>All variables****</u>				
None*	0.74	183.68	159.52	0.0012
At most 1	0.62	122.68	125.61	0.07
At most 2	0.44	78.79	95.75	0.40
At most 3	0.30	52.06	69.81	0.54
At most 4	0.29	35.65	47.85	0.41
At most 5	0.26	19.67	29.79	0.44
At most 6	0.12	5.91	15.49	0.70
At most 7	0.001	0.05	3.84	0.80
<u>Except real exchange rate and inflation****</u>				
None*	0.70	132.02	95.75	0.00
At most 1	0.54	76.61	69.81	0.01
At most 2	0.44	40.75	47.85	0.19
At most 3	0.21	14.31	29.79	0.82
At most 4	0.06	3.27	15.49	0.95
At most 5	0.008	0.38	3.84	0.53
<u>Except real exchange rate****</u>				

None*	0.73	155.44	125.61	0.0002
At most 1	0.56	96.42	95.75	0.04
At most 2	0.42	58.63	69.81	0.27
At most 3	0.31	33.34	47.85	0.53
At most 4	0.25	16.33	29.79	0.68
At most 5	0.06	3.09	15.49	0.96
At most 6	0.0002	0.01	3.84	0.90
<u>Except inflation***</u>				
None*	0.74	154.79	125.61	0.0003
At most 1	0.50	93.81	95.75	0.06
At most 2	0.46	61.91	69.81	0.18
At most 3	0.30	33.76	47.85	0.51
At most 4	0.25	17.37	29.79	0.61
At most 5	0.08	4.17	15.49	0.88
At most 6	0.004	0.19	3.84	0.65
FLEXIBLE				
Variables	Eigen ⁿ statistics	Trace	0.05 critical value	Probability*****
<u>All variable*****</u>				
None*	0.82	240.20	159.52	0.00
At most 1	0.69	151.76	125.61	0.0005
At most 2	0.54	91.64	95.75	0.09
At most 3	0.29	51.01	69.81	0.59
At most 4	0.28	33.18	47.85	0.54
At most 5	0.12	16.35	29.79	0.68
At most 6	0.11	9.73	15.49	0.30
At most 7	0.06	3.64	3.84	0.05
<u>Except real exchange rate and inflation*****</u>				
None*	0.76	171.95	95.75	0.00
At most 1	0.64	97.86	69.81	0.0001
At most 2	0.41	44.81	47.85	0.09
At most 3	0.18	17.45	29.79	0.60
At most 4	0.09	7.07	15.49	0.56
At most 5	0.03	1.87	3.84	0.17
<u>Except real exchange rate*****</u>				
None*	0.79	207.81	125.61	0.00
At most 1	0.66	125.89	95.75	0.0001
At most 2	0.50	70.84	69.81	0.04
At most 3	0.28	34.58	47.85	0.47
At most 4	0.17	17.71	29.79	0.58
At most 5	0.09	7.66	15.49	0.50
At most 6	0.05	2.76	3.84	0.09
<u>Except inflation**</u>				
None*	0.78	197.44	125.61	0.00
At most 1	0.67	119.20	95.75	0.0005
At most 2	0.43	61.49	69.81	0.19
At most 3	0.28	32.07	47.85	0.60
At most 4	0.13	15.10	29.79	0.77
At most 5	0.10	7.75	15.49	0.49
At most 6	0.03	2.02	3.84	0.15

(*) denotes rejection of null hypothesis at the 0.05 level.

(**) Trace test indicates no cointegrating equation at the 0.05 level.

(***) Trace test indicates 1 cointegrating equation at the 0.05 level.

(****) Trace test indicates 2 cointegrating equations at the 0.05 level.

(*****) MacKinnon-Haug-Michelis (1999) p-values.

(*****) Trace test indicates 3 cointegrating equations at the 0.05 level.