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Comparative Analysis: The Impact of Financial Sector Development on Economic Growth in the Non-Oil Sector in Saudi Arabia

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By

Mohammed Alghfais

Financial Sector Development Department

Saudi Arabian Monetary Agency

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ABSTRACT

The aim of this paper is to examine the relationship between financial sector development and economic growth in the non-oil sector in Saudi Arabia. Six measures of financial sector development are used in this study, The data used in this study are from Saudi Arabia and consisted of time series data for the period of 1985 to 2015. The data are analyzed using the Autoregressive Distributed Lag (ARDL) model. The main conclusion is that there is a positive and significant impact of financial sector development on the total economic growth of the non-oil sector[1] and the economic growth of the non-oil public and private sector.

Keywords: Financial development, Economic growth, Non-oil, Saudi Arabia, Autoregressive Distributed Lag (ARDL).

JEL classification codes: O11, O16, O47

[1] Growth of total non-oil sector consist of non-oil private sector and non-oil public sector

* Contact Details: Mohammed Alghfais, Email: malghfais@sama.gov.sa

1. Introduction

Over the last few decades, the standard of living in oil-exporter countries has reached a remarkable level, which reflects these countries' total significant economic growth. Standard factors of production of goods and services can affect economic growth, including capital, labor, knowledge or effectiveness of labor, and land and other natural resources. By the same token, financial development plays a major role in affecting economic growth in both developing and developed countries. Saudi Arabia**,** an oil-based economy, has recently devoted more attention to financial sector development. The financial sector in Saudi Arabia has grown rapidly in the last several years, particularly in the banking, stock market, and insurance sectors.

The relationship between economic growth and financial development has been widely discussed in the literature. Economic researchers have used several different indicators to measure financial development. In this paper, a wide range of these measurements within financial sector development and their impact on the Saudi Arabian economy in the non-oil sector is discussed.

One of the most influential studies relevant to the present research is found in Schumpeter (1911). Schumpeter (1911) studied the relationship between financial development and economic growth and highlighted that finance plays a major role in enhancing economic growth. In addition, Shandre and Jiunn (2004) analyzed the impact of financial development on economic growth. Their study covers the period from 1960 to 1999 in Australia, and it examined how financial development affects economic growth using three indicators to assess financial sector development. They found no evidence suggesting that economic growth has an effect on financial sector development;

however, greater attention could have been paid to several levels of measurement, particularly since the study examined six models with two explanatory variables for each model. Models with more than two explanatory variables for each model should have been examined to obtain a more accurate, credible, and reliable results. Lewis (1955), who expanded on the work of Schumpeter (1911), analyzed the relationship between economic growth and financial sector development using different measures, while Samargandi, Fidrmuc, and Ghosh (2013) devoted on this relationship in oil-exporter countries. Both of these papers included similar measures of financial development.

The aim of this paper is to examine the relationship between financial development and economic growth in Saudi Arabia using an Autoregressive Distributed Lag (ARDL) model. This study builds on the work of the papers mentioned previously. The model used for this research has similar characteristics to those previous studies. The analysis is carried out using annual time series data from Saudi Arabia from 1985 to 2015. Specifically, this study sought to determine whether these indicators, in conjunction or independently, affect Saudi Arabian economic growth of non-oil sector and, if so, in what way and to what extent. In addition, the aim is to compare the magnitude of such effects on Saudi Arabian economic growth of non-oil as a whole, non-oil of the private sector, and non-oil of the public sector based on how they have been affected by financial development. This paper will add to the current literature by providing updated data along with a wide array of explanatory variables that have yet to be analyzed collectively.

In December of 2015, The Custodian of the two Holy Mosques, King Salman bin Abdulaziz, announced economic reforms to diversify sources of

income and to reduce the high dependence on oil in Saudi Arabia. Thus, conducting a comparative analysis of economic growth in the non-oil sector that has been impacted by financial sector development is crucial to enhance the kingdom's economic growth, making this study extremely relevant and significant. It is vital for policymakers to identify what type of economic growth (total non-oil sector, non-oil private sector, and non-oil public sector) has been the most directly impacted by financial sector development to determine what policy changes can be made to enhance future economic growth in Saudi Arabia.

The paper is structured as follows. Section 2 discusses the most important previous papers on financial development and economic growth. Section 3 describes the model under the assumption that the data perfectly match the ideal theoretical and empirical characteristics for the model. Section 4 discusses how closely the data obtained matches the theoretical "ideal" for the variables and the identified time period, sample, and type of data. Section 5 discusses and interprets the results. Section 6 outlines the conclusion and policy implications.

2. Literature Review

The subject of financial sector development and how it contributes to economic growth is an ongoing debate. Over the past several decades, a plethora of studies have estimated how financial sector development affects economic growth, including banking sector indicators and stock market indicators. Nonetheless, there has not been a study that combines the majority of these indicators in one cohesive model. This paper will build from previous research that has examined financial sector development to determine what type of

economic growth (total non-oil sector, non-oil private sector, and non-oil public sector) has been impacted by financial sector development. Several theoretical models have been proposed to examine the relationship between financial sector development and economic growth. Schumpeter (1911) asserted that financial intermediation is a significant action to enhance the economy. In fact, financial intermediations affect the allocation of savings, therefore enhancing productivity along with the rate of economic growth.

Several empirical studies have been conducted to test the relationship between financial development and economic growth. Samargandi, Fidrmuc, and Ghosh (2013) examined the impact of financial development on economic growth in Saudi Arabia using a sample of 252 observations and five variables during the period from 1968 to 2010. Their research used five variables and three models in total. The autoregressive distributed lag (ARDL) is used to analyze the factors or indicators it examined. Their study also contained three levels of measurements, including broad money, liquid liabilities, and credit to the private sector. A principal component analysis is used as a single composite indicator of financial development. Furthermore, based on their study, it is found that financial sector development has a positive significant impact on the economic growth of the total non-oil sector; however, the effect of financial sector development on the economic growth of the oil sector as well as on the economy as a whole is insignificant. They used an interesting modeling technique in examining the relationship between financial sector development and economic growth; however, the scope of the study is undoubtedly too narrow. The study devoted solely on the predictive power of three explanatory variables (broad money, liquid liabilities, and credit to the private sector) in determining economic growth. The inclusion of additional potentially

significant indicators should improve the model's predictive ability at all levels of economic growth.

Similarly, Ibrahim (2013) examined the relationship between economic growth and financial development using three indicators of financial development, including the real general stock market, credits to the private sector, and the real industrial production index. Ibrahim's (2013) study used annual data from 1989 to 2008 and implemented fully-modified ordinary least squares (FMOLS) to analyze the indicators of financial sector development that affect economic growth in Saudi Arabia.Ibrahim (2013) found that the domestic bank credit to the private sector ratio has a significant and positive impact on economic growth in the long-term but an insignificant and negative impact on economic growth in the short-term. In the long-term, the stock market and economic growth are positively related but not significant. In the short-term, the stock market has a negative but insignificant impact on economic growth; however, the real industrial production index[2] has a positive and significant impact on economic growth in both the short and long-terms. In addition, Inanga and Emenuga (1997) and Adjasi & Biekpe (2006) claimed that the performance of the stock market is a significant indicator of financial development affecting economic growth because it measures changes in economic activity and how financial sector development behaves. For example, if the stock market is active, it positively impacts economic growth; however, Ibrahim (2013) should have looked beyond the typical financial development indicators linked to economic growth to consider the influence of the entire spectrum of financial development indicators on economic growth.

[2] This index is used as a measure of financial depth

Furthermore, numerous studies have examined the relationship between financial development and economic growth in Asia. For instance, Jalil and Ma (2008) compared two countries in terms of the effect of financial development on economic growth and found conflicting results. They studied both China and Pakistan using an ARDL model and used the deposits liability ratio and the credit to the private sector ratio to assess financial development. Their findings are contradicted in their study. They found that financial development has a positive and significant effect on economic growth in the case of Pakistan, whereas in the case of China, the results are positive but not significant for the deposits liability and significant for the credit to the private sector. Although Jalil and Ma (2008) have implemented an interesting modeling technique for both countries, they should have looked beyond these two levels of measurement to assess the financial development because it is possible that there are other indicators that affect economic growth that are not considered, which are therefore captured in the error term in their model. It would be interesting to include other variables in the model and to use different measures for financial development to test whether or not the relationship found by these studies still holds. The results in the case of Pakistan are similar to Samargandi, Fidrmuc, and Ghosh's (2013) study in which they used similar levels of measurement of financial development.

Similarly, numerous papers have devoted on the effect of financial sector development on economic growth using different measurements of financial sector development in different regions in Europe. For example, Caporale, Rault, Christophe, Sova, and Sova (2009) studied the relationship between financial sector development and economic growth in ten new European Union members' economies. They estimated a dynamic Generalized Method of

Moments (GMM) method using panel data during the period from 1994-2007. Their main findings are that financial development has a positive effect on economic growth but not vice versa. Although they utilized an extensive list of explanatory variables throughout their analysis, they failed to consider other important financial development indicators, such as the insurance sector. Caporale (2009), Rault (2009), and Sova's (2009) studies has similar results to Shandre and Jiunn (2004): financial development has a positive effect on economic growth but not vice versa. Patrick (1966), Greenwood and Jovanovic (1990), Greenwood and Bruce (1997), and Demetriades and Hussein (1996) asserted the existence of a two-way relationship between financial sector development and economic growth.

Finally, other studies found that financial development has a negative effect on economic growth. For instance, De Gregorio and Guidotti (1995) examined the impact of financial development on economic growth using credit to the private sector as an indicator of financial development. They used panel data of 12 Latin American countries, which included 95 observations from 1950 to 1985. They found that credit to the private sector has a negative impact on economic growth. They justified their result by the existence of poor regulations in Latin American countries, which are the reasons for the negative impact on economic growth. Similarly, Al-Malkawi, Marashdeh, and Abdullah (2012) examined the impact of financial development on economic growth in United Arab Emirates (UAE). They indicated that financial development has a negative effect on economic growth in the UAE and they justified their results by the fact that the financial system in UAE is still in the transition phase.

This study contributes to the current body of knowledge on the relationship between economic growth and financial sector development

through the examination of the effects of economic growth of total non-oil, non-oil of the private sector, and non-oil of the public sector. The results determine whether or not financial development has an effect on the economic growth levels of the non-oil sector. This paper's dissemination of the above findings will undoubtedly aid in providing a stronger theoretical framework. As a whole, the previous research strongly bolsters the hypothesis that economic growth is associated with financial sector development. The focused of the present study is Saudi Arabia.

3. Theoretical and Empirical Model

This paper examines the relationship between economic growth and financial sector development. The main hypothesis is that financial development has a positive effect on the economic growth of total non-oil, non-oil of the private sector, and non-oil public sector. The more a country is financially developed, the more the country will experience economic growth. Thus, expanding financial development is important for increasing economic growth. It is important to know whether there is a relationship between the economic growth of the non-oil sector and financial development. Determining the size and the direction of the effect, if any, could help in making policy decisions.

Samargandi, Fidrmuc, and Ghosh (2013) constructed three models with different economic growth measures as the dependent variables to establish the relationships between the economic growth of the oil sector, the non-oil sector, the economy as a whole, and financial development. Likewise, three models with similar explanatory variables are used in this study but with different

dependent variables: gross domestic product of the total non-oil sector per capita (GDPN), GDPN per capita of the non-oil private sector (GDPNP), and GDPN per capita of the non-oil public sector (GDPNG). The model is as follows:

$$Y_t = \beta_1 + \beta_2 INF_t + \beta_3 OIL_t + \beta_4 GOV_t + \beta_5 INV_t + \beta_6 T_t + \beta_7 FD_t + \varepsilon_t \quad (1)$$

The dependent variables in this study are measurements of the value of all final goods and services produced by the non-oil private sector, the non-oil public sector, and the total non-oil sector from 1985 to 2015 in Saudi Arabia. In this study, the relationship between these three economic growth indicators of non-oil sector measures and financial development are tested to determine whether the relationship is the same or whether financial development will have a positive relationship with the economic growth of the non-oil measures. Since Saudi Arabia has an oil-based economy, it is important to tailor these models to apply them to Saudi Arabia and to know whether an improvement in financial markets actually has an effect on the value of economic activity within Saudi Arabia. If valuable data are obtained, the results could be used to inform policy decisions.

The inflation rate (INF), oil prices (OIL), government expenditure (GOV), investment (INV), and trade openness (T) are believed to be omitted variables as previous literature review suggested. Financial sector development index (FD) is the variable of interest in this study. Specifically, FD is a set of banking indicators and a set of stock market indicators used to assess financial development in Saudi Arabia. The insurance sector is not included due to the lack of data. Banking indicators include the ratio of M2 to nominal GDP

(MGDP2)[3], the ratio of broad money (M3)[4] to nominal GDP (MGDP3), and the ratio of credit to the private sector nominal GDP (CPT).

The MGDP2 indicator is used to assess the effect of financial development on economic growth. Financial sector development indicators at World Bank (2006) indicated that MGDP2 is a typical measure of the financial sector, and the number of bank accounts or deposits per person is a proxy for the use of banking services. Thus, the relationship between MGDP2 and the economic growth of the non-oil sector is expected to be positive.

The MGDP3 indicator is used to assess the effect of financial development on economic growth. Beck et al. (1999) asserted that MGDP3 measures the size of financial intermediaries; therefore, it captures the overall size of the financial sector. Theoretically, the relationship between MGDP3 and the economic growth of the non-oil sector is expected to be positive.

CTP could be a vital banking indicator of financial development that is associated with economic growth. Levine (1993) found that CTP is an essential indicator of financial development and that it has a positive association with economic growth because it allows for faster financial sector growth. Thus, the relationship between CPT and the economic growth of the non-oil sector is expected to be positive.

On the other hand, stock market indicators, such as the ratio of stock market capitalization to GDP (SMC), value traded ratio (VT), and turnover ratio (TR), are also considered important indicators of financial development. Diamond (1984), Greenwood and Jovanovic (1990), and Williamson (1986) suggested that these three indicators could encourage long-term growth because stock

[3] M2 includes currency outside banks, demand deposits and time and saving deposits.
[4] M3 includes Other Quasi- Money Deposits(Comprise residents' foreign currency deposits, marginal deposits for LCs, outstanding remittances), and M2

markets promote specialization, increase the acquisition and spreading of information, and decrease the cost of mobilizing savings; each of these effects promotes investment. Thus, the expected effect of these indicators on economic growth are expected to be positive.

3.1Unit Root

First step we conduct a unit root test, or more specifically, the augmented Dickey–Fuller (ADF) test, to determine whether the series is stationary or not stationary. If the series is stationary, then it is I (0), and we do not have to use the difference. Nonetheless, if the series has a unit root, then it is I (1), and the first difference of the series must be taken.

3.2 Autoregressive Distributed Lag (ARDL) Approach

An Autoregressive Distributed Lag (ARDL) model is implemented for the chosen time period of 1985 to 2015. Mahran and Khalid (2014) pointed out that this model is simple, flexible, easy to evaluate, efficient, and reliable for a small sample. It is also typically appropriate for macroeconomic variables. Additionally, Hakkio and Rush (1991) indicated that monthly or quarterly data are not sensitive to a co-integration analysis; however, the duration of the sample is significant and is sensitive to a co-integration analysis. The ARDL framework of equations 1 is as follows:

$$\Delta Y_t = \forall_0 + \sum_{i=1}^{p} \lambda_i \, \Delta Y_{t-i} + \sum_{i=1}^{p} \epsilon_i \, \Delta INF_{t-i} + \sum_{i=1}^{p} \zeta_i \, \Delta OIL_{t-i} + \sum_{i=1}^{p} \eta_i \, \Delta GOV_{t-i} + \sum_{i=1}^{p} \theta_i \, \Delta INV_{t-i} + \sum_{i=1}^{p} \iota_i \, \Delta T_{t-i} + \sum_{i=1}^{p} \kappa_i \, \Delta FD_{t-i} + \mu_1 \, Y_{t-1} + \mu_2 \, INF_{t-1} + \mu_3 \, LOGOIL_{t-1} + \mu_4 \, GOV + \mu_5 \, INV_{t-1} + \mu_6 \, T_{t-1} + \mu_7 \, FD_{t-1} + \upsilon_t \qquad (2)$$

Where $\forall_0$ is the drift terms (intercepts), and υ_t is the vector of white noise residuals. In addition, the terms with summation signs represent the error correction dynamics. In equation 2, the μ represents the long-term relationship. First step we estimate a bound test on equation 2 to test the long-term relationship using the ordinary least square (OLS) procedure. Perform an F-test to test the existing long-term relationship among the variables in equation 2. The null hypotheses for equation 2 is $H_0 : \mu_1 = \mu_2 \ldots = \mu_8 = 0$, assuming that there is no co-integration (no long-term relationship) among the variables. In contrast, for the alternative hypotheses H_1: $\mu_1 \neq \mu_2 \ldots \neq \mu_8 \neq 0$, there is co-integration (a long-term relationship) among the variables. After performing this test, we compared the calculated F-statistic with critical values given by Narayan[5] (2005).

Pesaran and Pesaran (1997) indicated that if the calculated F-statistic is above the upper bound of the critical values variables, whether they are I (1) or I (0) or a combination of both, then we must reject the null hypothesis, accept the alternative hypothesis, and conclude that there is co-integration (a long-term relationship) among the variables. Pesaran and Pesaran (1997) showed that if the calculated F-statistic is below the lower bound of the critical values variables, whether they are I (1) or I (0) or a combination of both, then we must

[5] Narayan's (2005) critical values are more reliable than Pesaran critical values (2001) when it comes to small sample

accept the null hypothesis, reject the alternative hypothesis, and conclude that there is no co-integration (no long-term relationship) among the variables. In addition, Pesaran and Pesaran (1997) indicated that if the calculated F-statistic lies between the lower and upper bounds of the critical values, then the bound test is inconclusive and cannot be determined. When a long-term relationship exists among the variables, then we need to examine whether there is also a short-term relationship that exists among the variables using an error correction model (ECM) framework, as shown in equation 2.

$$\Delta Y_t = \forall_0 + \sum_{i=1}^{p} \lambda_i \, \Delta Y_{t-i} + \sum_{i=1}^{p} \epsilon_i \, \Delta INF_{t-i} + \sum_{i=1}^{p} \zeta_i \, \Delta OIL_{t-i} + \sum_{i=1}^{p} \eta_i \, \Delta GOV_{t-i} + \sum_{i=1}^{p} \theta_i \, \Delta INV_{t-i} + \sum_{i=1}^{p} \iota_i \, \Delta T_{t-i} + \sum_{i=1}^{p} \kappa_i \, \Delta FD_{t-i} + ¥ECM_{t-1} + \upsilon_t \quad (3)$$

Pesaran and Pesaran (1997) advocated implementing a residual stability test after using the error correction model. This test is known as a cumulative sum of recursive residuals (CUSUM) and a cumulative sum of squares of recursive residual (CUSUMSQ). If the CUSUM and CUSUMSQ statistics lie between the lower and upper critical bounds at the five percent significance level, then the null hypotheses of all coefficients in the given regression are stable.

Finally, this proposed theoretical model contributes to the economic growth literature by incorporating several vital significant independent variables into a comprehensive, economic model. In addition, this study avoids several weaknesses common in the research literature, including a heavy reliance on estimated or an unofficial source of data. Moreover, reliance on narrow and/or a few financial indicators, which can lead researchers to draw inaccurate conclusions and lead to biased results.

4. Data Analysis

This study used an ARDL model for the time period from 1985 to 2015. The data sources for the variables are from the Saudi Arabia Monetary Agency (SAMA). The original data set contained 420 observations for Saudi Arabia.

The following list provides a brief definition as well as the data source for each variable**:**

1. GDPNP: Real gross domestic product per capita of the non-oil private sector in Saudi Arabian Riyal. (in billions of 2010 Riyals). *Source:* SAMA
2. GDPN: Real gross domestic product per capita of the non-oil sector in Saudi Arabian Riyal. (in billions of 2010 Riyals). *Source:* SAMA
3. GDPNG: Real gross domestic product per capita of the non-oil public sector in Saudi Arabian Riyal (in billions of 2010 Riyals). *Source:* SAMA
4. INF: The share of inflation as percentage of GDP. *Source:* SAMA.
5. OIL: Oil prices of Arab light in US dollar. *Source:* SAMA.
6. GOV: The share of government expenditure as percentage of nominal GDP. *Source:* SAMA.
7. INV: The share of investment as percentage of nominal GDP. *Source:* SAMA.
8. T: Trade openness ((Export + Import)/ nominal GDP). *Source:* SAMA.
9. MGDP3: Banking indicator that has been measured as the ratio of borad money to nominal GDP. *Source:* SAMA.
10. MGDP2: Banking indicator that has been measured as the ratio of M2 to nominal GDP. *Source:* SAMA.

11. CPT: Banking indicator that has been measured as the ratio of credit to the private sector (Including agriculture, fishing, manufacturing, processing, mining, quarrying, electricity, water, gas, building, construction, commerce, transport, communications, finance, services and miscellaneous excluding government and quasi government) to nominal GDP. *Source:* SAMA.

12. SMC**:** Stock market indicator that has been measured as the ratio of stock market capitalization to nominal GDP. *Source:* SAMA.

13. VT**:** Stock market indicator that has been measured as the ratio of value traded to nominal GDP. *Source:* SAMA.

14. TR**:** Stock market indicator (turnover ratio) that has been measured as the ratio of stock market capitalization to value traded. *Source:* SAMA.

The descriptive statistics in Table 1 appear to be reasonable statistics for the variables. The standard deviations of INF, SMC, TR, and VT are fairly large, as reported in Table 1. These indicated substantial variations in INF, SMC, TR, and VT observations in their means. In particular, INF has the largest variation among the variables. The variations of these variables are considered large because their standard deviations are higher than their means. On the other hand, the standard deviations of OIL, CTP, GOV, INV, GDPN, T, MGDP2, GDPNP, MGDP3, and GDPNG are small, as reported in Table 1. In particular, GDPNG has the lowest variation among the variables. The variations of these variables are considered small because their standard deviations are less than their means. Possible corrective actions may be taken for some variables. This may include transforming variables into logarithmic forms or accounting for significant outliers within the series.

4.1 Chart Analysis

This section provides an overview of how financial sectors have developed in Saudi Arabia, especially for the last 10 years after the oil price boom, which led Saudi Arabia to make massive investments and thereby boost the financial sectors. Figures 1, 2, and 3 represent the banking sector from 1985 to 2015. Figure 1 shows an upward trend of the credit to the private sector and an increase of 200 percent. This means that it is two times higher than 1985. Figure 2 shows an upward trend of MGDP2 and an increase of 70 percent. Figure 3 shows an upward trend of MGDP3 and an increase of 50 percent. Figures 4, 5, and 6 represent the stock market sector. The stock market sector started to rise beginning in 2002. Figure 4 shows an upward trend of TR and an increase of 900 percent. This means that it is nine times higher than 1985. Figure 5 shows an upward trend of VT and an increase of 1150 percent. This means that it is eleven and half times higher than 1985. Figure 6 shows an upward trend of SMC and an increase of 305 percent. This means that it is roughly over three times higher than 1985. It appears that the stock market sector grew much faster than the banking sector from 2002 to 2015. Figure A represents the economic growth of non-oil sector. Figure A indicates that Non-oil private sector contributes more than non-oil public sector to total non-oil economic growth.

4.2 Principal component analysis (PCA)

It is important and helpful to employ PCA in this study to reduce the number of the variables due to a small sample and to avoid the problem of collinearity

among the variables, especially the variables that are associated with financial sector development.

Table 2 presents the outcomes of PCA of the six measures of financial sector development. The eigenvalue of FD associated with the PCA1 is 4.6; thus, it is significantly larger than one. PCA1 explains roughly 77 percent of the standardized variance; PCA2 explains another 20.4 percent, and PCA 3 accounts for only 1.3 percent. PCA 4 explains 0.75 percent, PCA 5 explains 0.35 percent, and PCA 6 explains 0.18 percent of the variation. Noticeably, PCA1 explains the variations of the economic growth better than any of the other linear combinations of explanatory variables; thus, it is the most accurate measure of financial development in this study.

5. Empirical Results

Three models are estimated using an Autoregressive Distributed Lag (ARDL) model to assess the relationship between financial development and the economic growth of the non-oil sector. The economic growth of the non-oil sector is the dependent variable in the three models. Specifically, The first model measured the total economic growth of the non-oil sector (both the public and private sector), the second model used the economic growth of the non-oil private sector, and the third model used the economic growth of the non-oil sector of the public sector. The primary variable of interest is financial development. The data used in the estimation of the models are annual time series data from Saudi Arabia from 1985 to 2015. All variables have been transformed into logarithmic forms to normalize the data.

All models have been estimated after determining the appropriate number of lags using Akaike information criterion (AIC). Nonetheless, when including all of the variables in the regression, some are not significant. Thus, insignificant variables have been dropped one by one from the model beginning with the most insignificant variable. INF, INV, and GOV are insignificant. INV is insignificant because INV is highly correlated with FD; thereby, it was dropped from the model. Oil prices, trade openness, and financial sector development are the only significant variables on the total non-oil GDP, non-oil GDP of the private sector. These results are consistent with Samargandi's (2013) results.

5.1 Unit root test

The ARDL model does not require all variables to be nonstationary or stationary; however, it is important to conduct a unit root test to ensure that none of the variables are stationary at a second difference (I(2)) or beyond. An Augmented Dickey–Fuller test (ADF) is employed to determine whether there is a unit root for each variable or not, as shown in Table 3. GDPN, INV, and FD are stationary at levels I(0) with the intercept and trend, while INF is stationary at a level with the intercept only. GDPNP, OIL, T and GOV are stationary at the first different I (1) with the intercept only, while GDPNG is stationary at the first different with the intercept and trend. Since that they are stationary at different levels, employing the ARDL model is appropriate for this study.

5.2 Cointergration Test, Long-term Impact, and Short-term Impact for total Non-oil GDP

For the total non-oil GDP, two models[6] are estimated to determine which model best predicted the total non-oil GDP. Bound tests are conducted on models 5 and 6, and they are 34.29 and 51.73, respectively, which both are higher than the upper bound critical value of Narayan (2005) table at 1 percent significance level. Thus, they indicate that there is enough evidence that there is a long-term relationship among the variables for both models; however, Model 5 is the appropriate model because model 6 indicates there is an error with the functional form. ARDL (1, 4, 4) selected on the basis of AIC for model

The regression outcomes demonstrate that the trade openness and financial development coefficients have a positive relationship, as expected under the alternate hypothesis, and that it is significant at the 1 percent significance level using the appropriate one-tailed or two-tailed hypothesis tests. Ceteris paribus, a 10 percent increase in trade openness, a total non-oil GDP increase on average by 7.3 percent on the long-term, while a 10 percent increase in financial development, the total non-oil GDP increase on average by 1.2 percent in the long-term. The magnitude of the effect of financial sector development is very small; this is plausible because financial development grows slower in an oil-based economy than in a non-oil based economy[7]. This conclusion bolsters previous research that financial development grows slower in an oil-based

6 Trade openness and financial development are regressed against the total non-oil GDP on the model 5, for model 6, oil prices and financial development are regressed against the total non-oil GDP.

7 The higher the country depends on oil, the slower financial sector development grow.

economy than in a non-oil based economy. In particular, this is consistent with findings by Nili and Rastad (2007) and Samargandi (2013).

5.3 Cointergration Test, Long-term Impact and Short-term Impact for the Non-oil GDP of the Private Sector

Bound tests are conducted on models[8] 5 and 6, and they are 34.29 and 51.73, respectively, which both are higher than the upper bound critical value of Narayan (2005) table at 1 percent significance level. Thus, that indicate there is evidence that there are long-term relationships among the variables for both models. Model 5 indicated that there is an heteroscedasticity issue at 10 percent significance level. However Fosu and Magnus (2006) argue that it is reasonable to spot heteroscedasticity because they are co-integrated at different order(I(0) and I(1)). Model 5 is the most appropriate model because model 6 indicated that there is an error with the functional form. ARDL (1, 0, 2) selected on the basis of AIC for model 5.

The regression results show that the trade openness and financial development coefficients have a positive relationship and it is significant at the 1 percent significance level using the one-tailed hypothesis tests. Ceteris paribus, a 10 percent increase in trade openness, a non-oil GDP of the private sector increase on average by 8.7 percent in the long-term, while a 10 percent increase in financial development, a non-oil GDP of the private sector increase on average by 1.7 percent on the long-term. The magnitude of the effect of financial sector development is very small but larger than the total non-oil GDP;

[8] Trade openness and financial development are regressed against the non-oil GDP of the private sector for the model 5, while for model 6, oil prices and financial development are regressed against the non-oil GDP of the private sector.

this might indicate that financial sector development performs better under the non-oil GDP of the private sector.

5.4 Cointergration Test, Long-term Impact and Short-term Impact for the Non-oil GDP of the Public Sector

Two models[9] are estimated to determine which model best predicted the non-oil GDP of the public sector, as shown Table 8. Bound tests are conducted on models 5 and 6, and they are 5.2 and 10, respectively, which are higher than the upper bound critical value of Narayan (2005) table at 1 percent significance level. Thus, they indicated that there is a long-term relationship among the variables for both models. Model 5 is the most appropriate model and ARDL (3, 4, 4) selected on the basis of AIC for model 5.

The regression results indicated that financial development has an expected positive sign under the alternate hypothesis, and is significant at the 1 percent significance level using the appropriate one-tailed or two-tailed hypothesis tests. Ceteris paribus, a 10 percent increase in trade openness, a non-oil GDP of the private sector increase on average by 4.3 percent in the long-term, while a 10 percent increase in financial development, a non-oil GDP of the private sector increase on average by 0.97 percent on the long-term. Financial development has the least impact on the non-oil public sector among all other types of the economic growth of non-oil sector in this study. The reason might be due to the fact that the economic growth of non-oil public sector is less efficient than the economic growth of non-oil private sector.

[9] Trade openness and financial development are regressed against the non-oil GDP of the public sector for model 5, while for model 6, oil prices and financial development are regressed against the non-oil GDP of public sector.

5.5 Error Correction Model (ECM), Short-term Impact for the Total Non-oil GDP, Non-oil GDP Private Sector and Non-oil GDP Public Sector

Short-term relationships exist among the variables. The coefficients of ECM_{t-1} have a negative sign, as expected under the alternate hypothesis, and are significant at the 1 percent significance level for the total non-oil GDP, non-oil GDP private sector and non-oil GDP public sector, as shown in Table 5, 7 and 9 respectively. This confirms the long-term relationship among the total non-oil GDP, non-oil GDP private sector and non-oil GDP public sector. The coefficients of ECM_{t-1} are -0.13, -0.114 and -0.097, which indicate that the speed of the adjustment process is 13 percent, 11.4 percent and 9.7 percent of the disequilibria in the total non-oil GDP, non-oil GDP private sector and non-oil GDP public sector growth of the previous year's shock adjust back to the long-term equilibrium in the present year respectively. In particularly, the system corrects its previous period disequilibrium at a speed of 13 percent, 11.4 percent and 9.7 percent annually to reach at the steady state.

5.6 Diagnostic test

No evidence is found of a serial correlation, error functional form, or heteroscedasticity at 5 percent significance level. A cumulative sum (CUSUM) test and cumulative sum square (CUSUMSQ) test are conducted to ensure the stability of the models, as shown in Figures 7, 8, 9, 10, 11 and 12. All tests remained within the critical boundaries of 5 percent and indicated that the model is stable.

6. Conclusion & Policy Implications

Existing research has found that there are three major contributors to the economic growth of the non-oil sector. Previous research has not combined these contributors in one cohesive model to determine how financial sector development impacts the total non-oil GDP and non-oil GDP of the private sector. This study has included a number of financial development indicators in an effort to better predict the economic growth of the non-oil sector in Saudi Arabia. An appropriate regression analysis with time series data is used to identify significant predictors of the economic growth of the non-oil sector. The study used PCA to construct an index for financial development using six measurements of financial development, which is a constructed index that has not been used in the previous studies and is an incredibly strong predictor of the economic growth of the total non-oil sector and the non-oil private sector. One conclusion is that financial development does not have a statistically significant impact on non-oil GDP of the public sector. Another conclusion is that financial development and trade openness are significant predictors of the total non-oil GDP and non-oil GDP of the private sector.

The effect of financial development on non-oil GDP of the private sector is larger than the effect on the total non-oil GDP, that might indicate that the non-oil public sector contributes less than the non-oil GDP of the private sector. Thus, privatizing some of the public sectors is crucial because this should lead to greater productivity and more transparency and should reduce the overall cost. In addition, financial development can be greatly improved by easing credit constraints on the Small and Medium-sized Enterprises (SMEs) and can improve the allocation of capital, thereby accelerating economic growth.

This study supports the Saudi vision 2030, which has been proposed by deputy crown price and defense minister Mohammad Bin Salman. The findings of this study are vital because they can inform policy decisions on financial development in Saudi Arabia, which can develop specific models to boost the growth of the non-oil sector.

Future research can devote on examining financial development by dividing it into two sectors. In fact, it can be examined by constructing two indexes: one for the banking sector and one for the stock market sector. In addition, future research should use panel data on oil export countries because a panel approach estimation would provide more precise estimates of variable coefficients than is possible with the currently implemented ARDL approach.

Appendix

Table 1: Summary Statistics

Variables	Mean	Median	Maximum	Minimum	Std. Dev.
GDPN	31983.97	28830.79	45107.81	26026.5	6160.996
GDPNG	11742.1	11196.52	14095.24	10692.09	1009.483
GDPNP	20241.88	17273.64	31514.63	15203.48	5441.349
GOV	0.357631	0.333423	0.576195	0.266806	0.103042
OIL	41.38065	24.32	110.22	12.2	32.83118
INV	0.208357	0.196933	0.317152	0.137665	0.058532
INF	1.554982	0.907563	9.868752	-3.203331	2.854822
CTP	0.297033	0.274262	0.540016	0.152361	0.095919
MGDP2	0.405744	0.399061	0.645035	0.321311	0.071269
MGDP3	0.500721	0.503671	0.724247	0.399236	0.067735
SMC	0.562963	0.09985	3.727868	0.002019	0.926619
TR	0.695997	0.304005	4.291885	0.011343	0.89175
VT	9.602899	0.780819	48.54107	0.01046	14.02885
T	0.604486	0.5698	0.824545	0.451704	0.103622

Table 2: PCA of FD

Component	Eigenvalue	Difference	Proportion	Cumulative Value	Cumulative Proportion
PCA 1	4.625350	3.402992	0.7709	4.625350	0.7709
PCA 2	1.222358	1.147278	0.2037	5.847709	0.9746
PCA 3	0.075080	0.029892	0.0125	5.922789	0.9871
PCA 4	0.045188	0.023951	0.0075	5.967977	0.9947
PCA 5	0.021237	0.010451	0.0035	5.989214	0.9982
PCA 6	0.010786	---	0.0018	6.000000	1.0000

Table 3: Unit Root Test

Variables	ADF Test		ADF Test	
	Level I(0)		First difference I(1)	
	Intercept	Intercept and trend	Intercept	Intercept and trend
GDPN	0.234	-5.546***	-3.789***	-3.661**
GDPNG	-1.135	-3.086	-2.582	-3.535*
GDPNP	0.466	-2.167	-4.287***	-4.208**
OIL	-0.970	-2.989	-5.843***	-5.497***
INF	-2.629*	-2.8336	-6.895***	-6.864***
INV	-1.299	-3.594**	-5.083***	-4.988***
T	-1.729	-1.747	-4.747***	-4.821***
GOV	-2.276	-2.313	-7.218***	-7.251***
FD	-1.199	-3.489*	-5.234***	-5.101***

*** indicates 1% significance level, **indicates 5% significance level,*indicates 10% significance level

Table 4: ARDL Estimate Long Term

Dependent Variable: GDPN						
Variables	Model 1	Model 2	Model 3	Model 4	Model 5^	Model 6
OIL	0.177*	0.188**	0.261***	0.236***		0.25***
	(0.102)	(0.086)	(0.053)	(0.033)		(0.028)
INF	0.009	0.0052				
	(0.01)	(0.006)				
INV	-0.087					
	(0.219)					
T	0.423	0.38	-0.056	0.058	0.730***	
	(0.392)	(0.317)	(0.181)	(0.114)	(0.289)	
GOV	-0.135	-0.107	0.0216			
	(0.157)	(0.125)	(0.062)			
FD	0.0413	0.034**	0.025**	0.036***	0.119***	0.036***
	(0.026)	(0.014)	(0.01)	(0.005)	(0.027)	(0.006)
Const	9.71***	9.8 ***	9.45***	9.59***	10.8***	9.5***
	(0.444)	(0.44)	(0.27)	(0.152)	(0.150)	(0.09)
Diagnostic Test Statistics						
Serial correlation $\chi^2(1)$	2.52**	2.20**	1.3	1.3	0.793	0.31
Functional form $\chi^2(1)$	0.002	0.035	4.35**	4.38*	2.40	6.84**
Normality $\chi^2(1)$	0.247	0.952	1.47	1.46	1.403	0.784
Heteroscedasticity $\chi^2(1)$	1.055	0.715	1.303	1.40	0.903	0.854
Bounds $\chi^2(1)$	17.02***	25.3***	32.4***	40.7***	34.29***	51.73***

*** indicates 1% significance level, **indicates 5% significance level,*indicates 10% significance level
^ ARDL (1, 4, 4) selected on basis of Akaike information criterion (AIC).
Standard error in parentheses

Table 5: ARDL Model ECM Results

Dependent Variable: ΔGDPN		**Diagnostic Test Statistics**	
ΔT	0.053**	R-squared	0.98
	(0.029)		
ΔFD	-0.001	Adjusted R-squared	0.97
	(0.002)		
ECM(-1)	-0.126***	Durbin-Watson stat	2.18
	(0.01)		

*** indicates 1% significance level, **indicates 5% significance level,*indicates 10% significance level
Standard error in parentheses

Table 6: ARDL Estimate Long Term

Dependent Variable: GDPNP						
Variables	Model 1	Model 2	Model 3	Model 4	Model 5^	Model 6
OIL	-0.149	0.30***	0.30***	0.298***		0.265***
	(0.350)	(0.062)	(0.061)	(0.061)		(0.036)
INF	-0.051	-0.00051				
	(0.043)	(0.005)				
INV	0.084					
	(0.106)					
T	0.047	0.0407	0.033	0.0509	0.866***	
	(0.232)	(0.228)	(0.196)	(0.188)	(0.258)	
GOV	0.047	0.0311	0.0313			
	(0.067)	(0.065)	(0.064)			
FD	0.116	0.036***	0.036***	0.035***	0.170***	0.082***
	(0.070)	(0.012)	(0.012)	(0.012)	(0.0242)	(0.017)
Const	11.36***	8.91 ***	8.91***	8.90***	10.47***	9.024***
	(0.316)	(0.323)	(0.301)	(0.30)	(0.12)	(0.130)
Diagnostic Test Statistics						
Serial correlation $\chi^2(1)$	2.30	2.80*	0.45	0.532	1.81	0.35
Functional form $\chi^2(1)$	1.87	0.725	2.3	2.35	0.979	3.77*
Normality $\chi^2(1)$	0.714	0.157	0.51	1.68	1.057	0.11
Heteroscedasticity $\chi^2(1)$	2.36*	1.88	2.01*	2.88	2.4*	1.227
Bounds $\chi^2(1)$	7.72***	9.92***	31.07***	33.75***	43.58***	46.10***

*** indicates 1% significance level, **indicates 5% significance level,*indicates 10% significance level
^ ARDL (1, 0, 2) selected on basis of Akaike information criterion (AIC).
Standard error in parentheses

Table 7: ARDL Model ECM Results

Dependent Variable: ΔGDPNP		**Diagnostic Test Statistics**	
ΔT	0.079**	R-squared	0.97
	(0.036)		
ΔFD	0.00164	Adjusted R-squared	0.96
	(0.0041)		
ECM(-1)	-0.114***	Durbin-Watson stat	2.6
	(0.0076)		

*** indicates 1% significance level, **indicates 5% significance level,*indicates 10% significance level
Standard error in parentheses

Table 8: ARDL Estimate Long Term

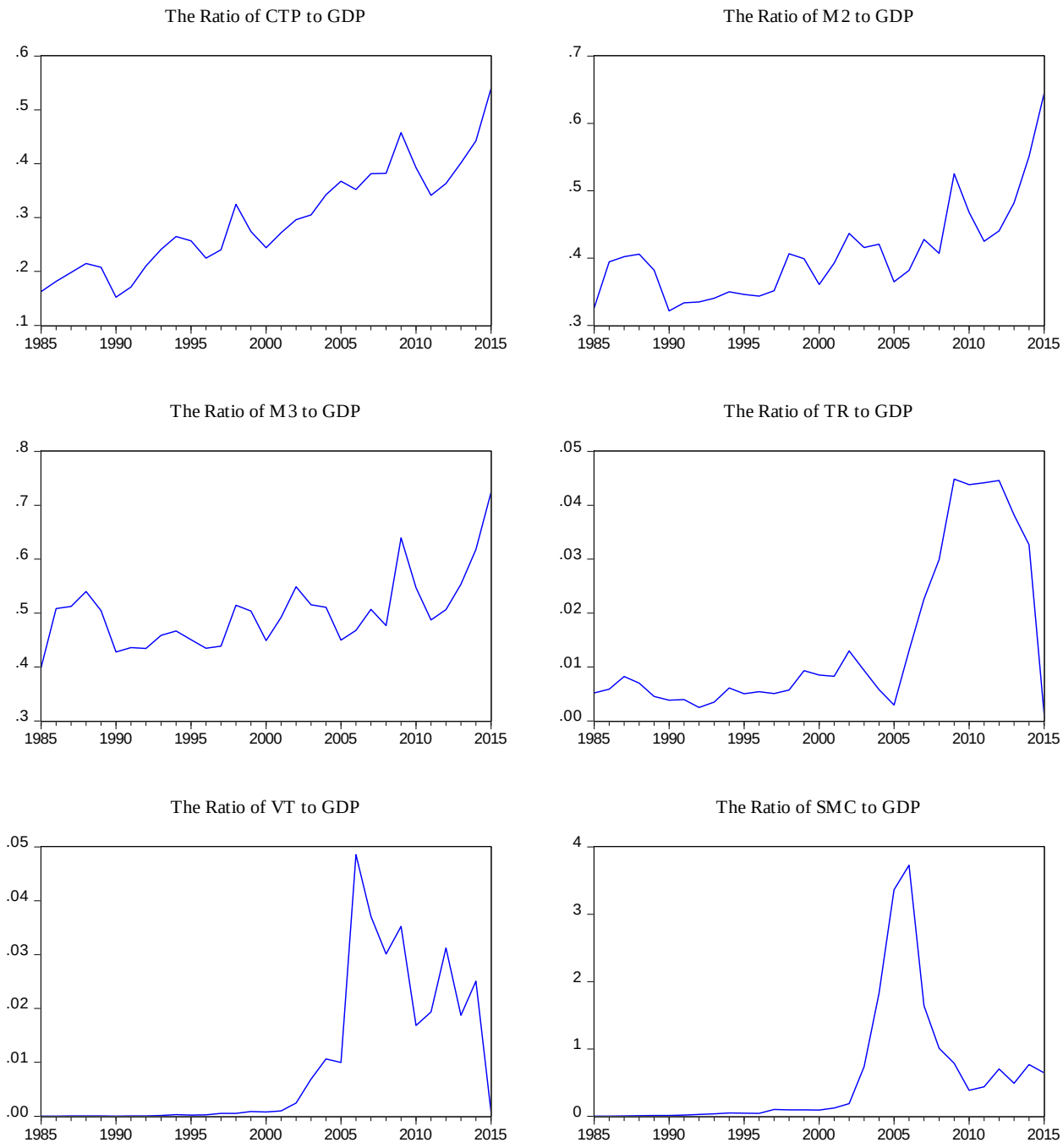
Dependent Variable: GDPNG						
Variables	Model 1	Model 2	Model 3	Model 4	Model 5^	Model 6
OIL	0.192	0.287	0.472	0.438*		0.125**
	(0.171)	(0.239)	(0.285)	(0.241)		(0.043)
INF	-0.009	0.051				
	(0.153)	(0.041)				
INV	0.717					
	(0.44)					
T	-1.052	-1.841	-1.563	-1.45*	0.429	
	(0.714)	(1.129)	(0.869)	(0.804)	(0.476)	
GOV	0.248	0.967	0.148			
	(0.28)	(0.992)	(0.356)			
FD	-0.062	001	-0.085	-0.082	0.097*	0.012
	(0.05)	(0.05)	(0.065)	(0.054)	(0.064)	(0.022)
Const	16.62***	15.51 ***	14.25***	14.23***	9.678***	8.975***
	(1.24)	(1.26)	(1.35)	(1.204)	(0.255)	(0.162)
Diagnostic Test Statistics						
Serial correlation $\chi^2(1)$	0.101	0.37	0.556	2.18**	1.51	3.330**
Functional form $\chi^2(1)$	48.2***	51.6***	53.01***	49.5***	0.905	0.717
Normality $\chi^2(1)$	1.525	0.687	0.726	0.856	1.95	2.938
Heteroscedasticity $\chi^2(1)$	0.942	3.07**	2.73**	2.38*	0.575	0.439
Bounds $\chi^2(1)$	2.29	2.42	2.73	2.30	5.208***	9.96***

*** indicates 1% significance level, **indicates 5% significance level,*indicates 10% significance level
^ ARDL (3, 4, 4) selected on basis of Akaike information criterion (AIC).
Standard error in parentheses

Table 9: ARDL Model ECM Results

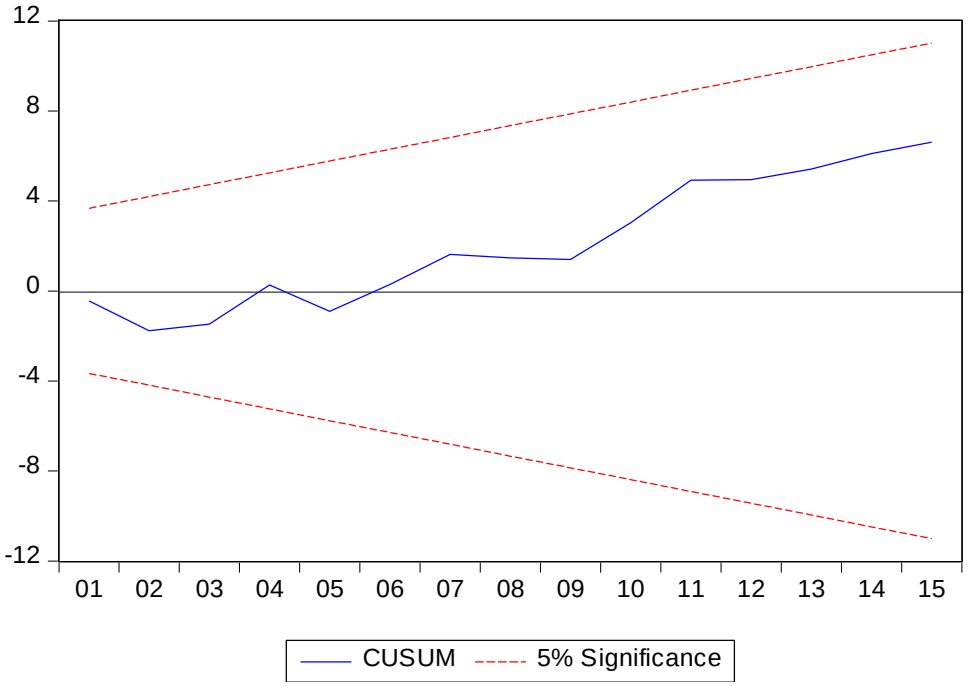
Dependent Variable: ΔGDPNP		**Diagnostic Test Statistics**	
ΔT	0.0515	R-squared	0.98
	(0.036)		
ΔFD	0.009	Adjusted R-squared	0.96
	(0.052)		
ECM(-1)	-0.097***	Durbin-Watson stat	2.53
	(0.0076)		

*** indicates 1% significance level, **indicates 5% significance level,*indicates 10% significance level
Standard error in parentheses



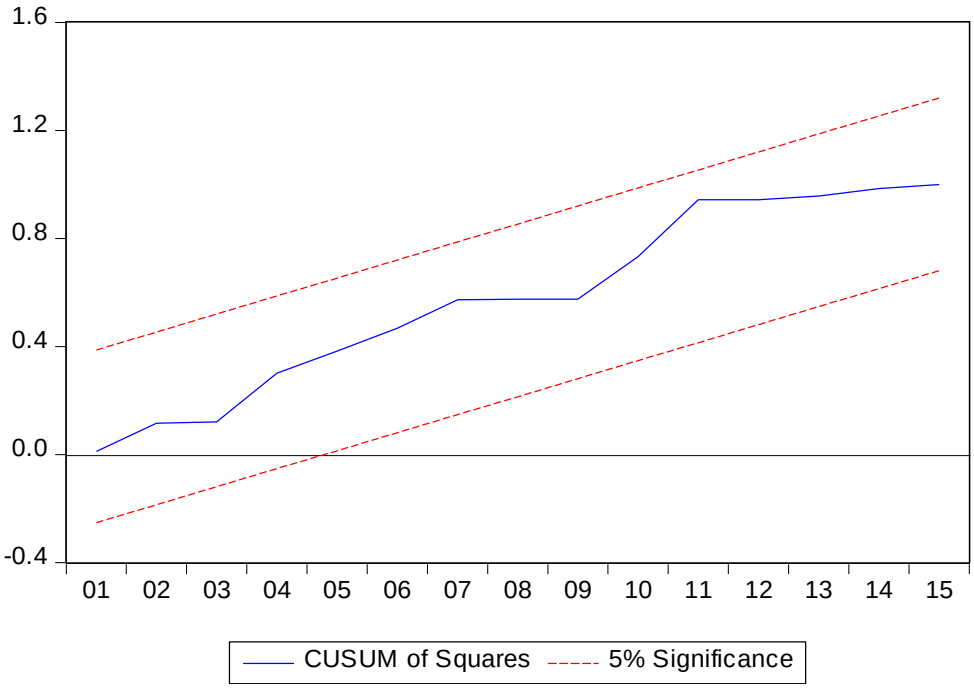
Source: Author's Calculation

Figure 7: Cumulative Sum of GDPN



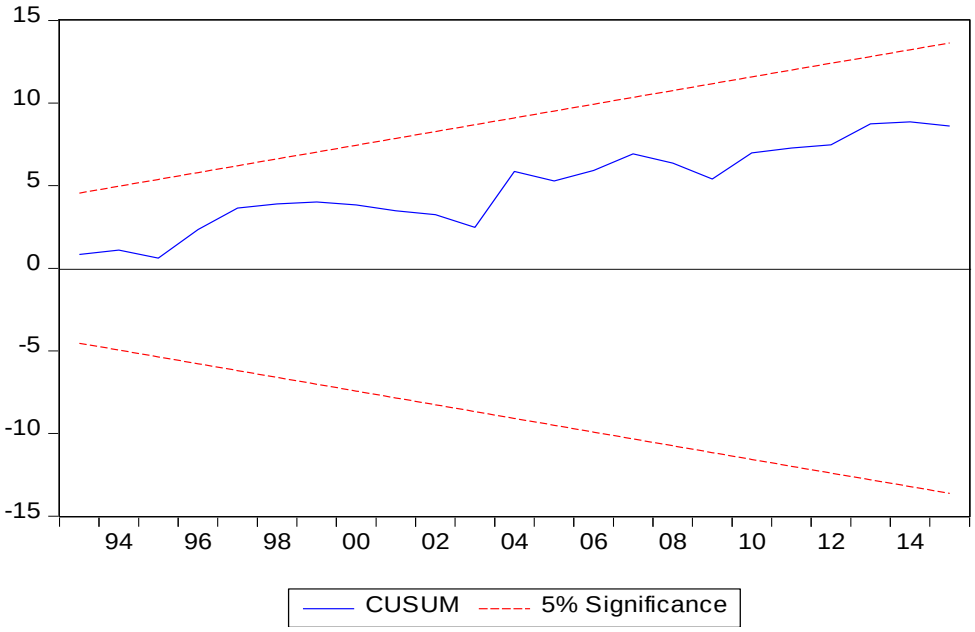
Source: Author's Calculation

Figure 8: Cumulative Sum Squared of GDPN



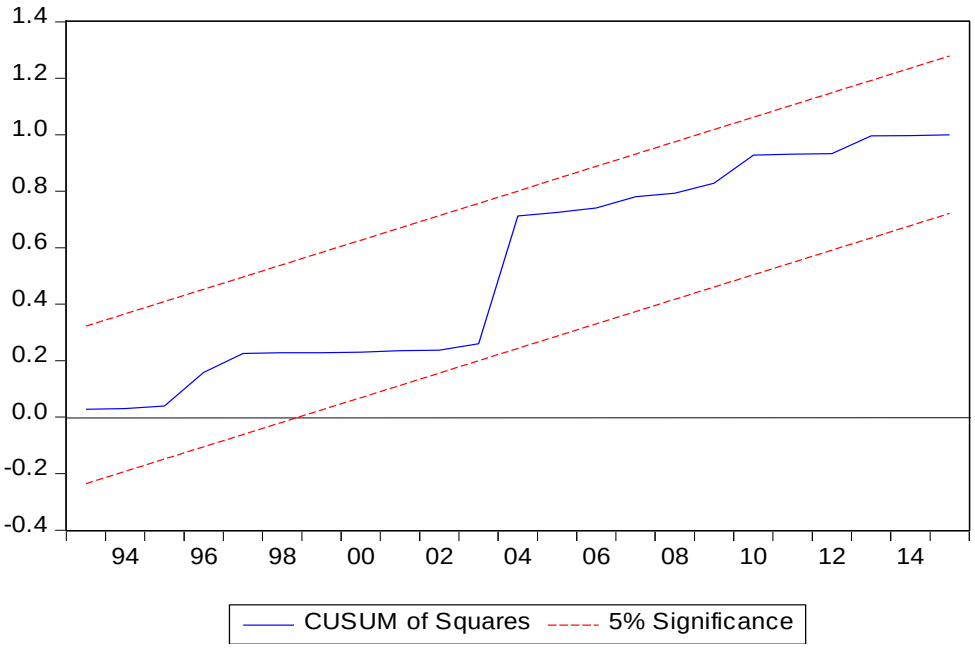
Source: Author's Calculation

Figure 9: Cumulative Sum of GDPNP



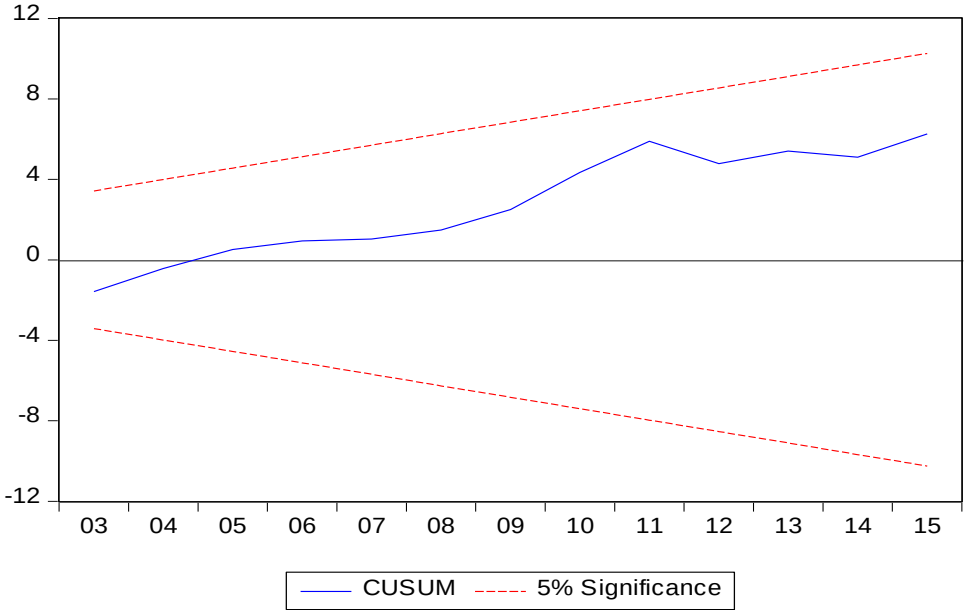
Source: Author's Calculation

Figure 10: Cumulative Sum Squared of GDPNP



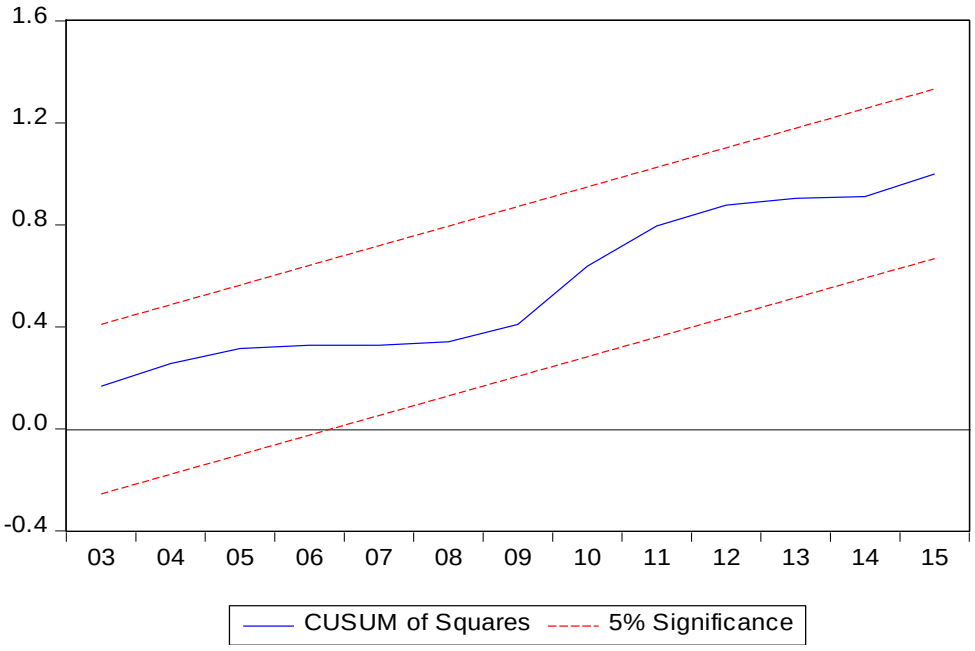
Source: Author's Calculation

Figure 11: Cumulative Sum of GDPNG



Source: Author's Calculation

Figure 12: Cumulative Sum Squared of GDPNP



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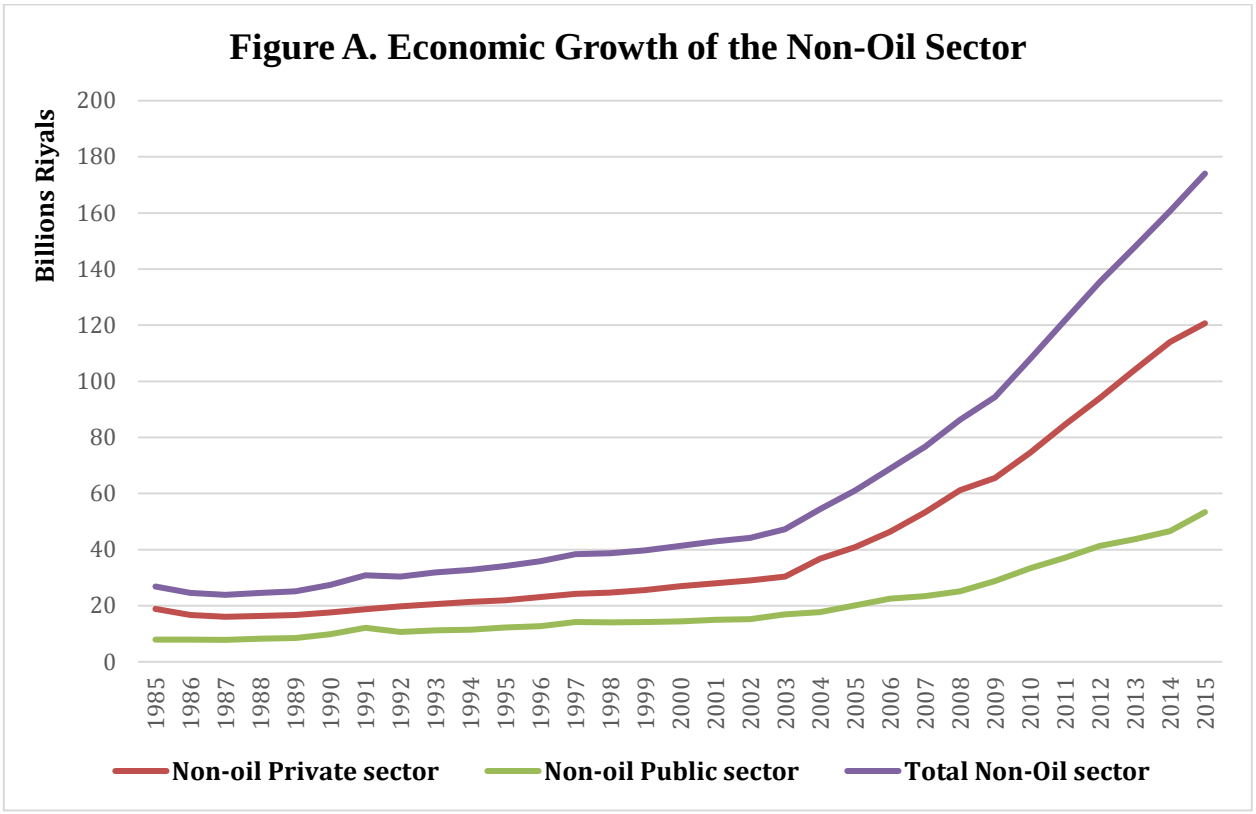

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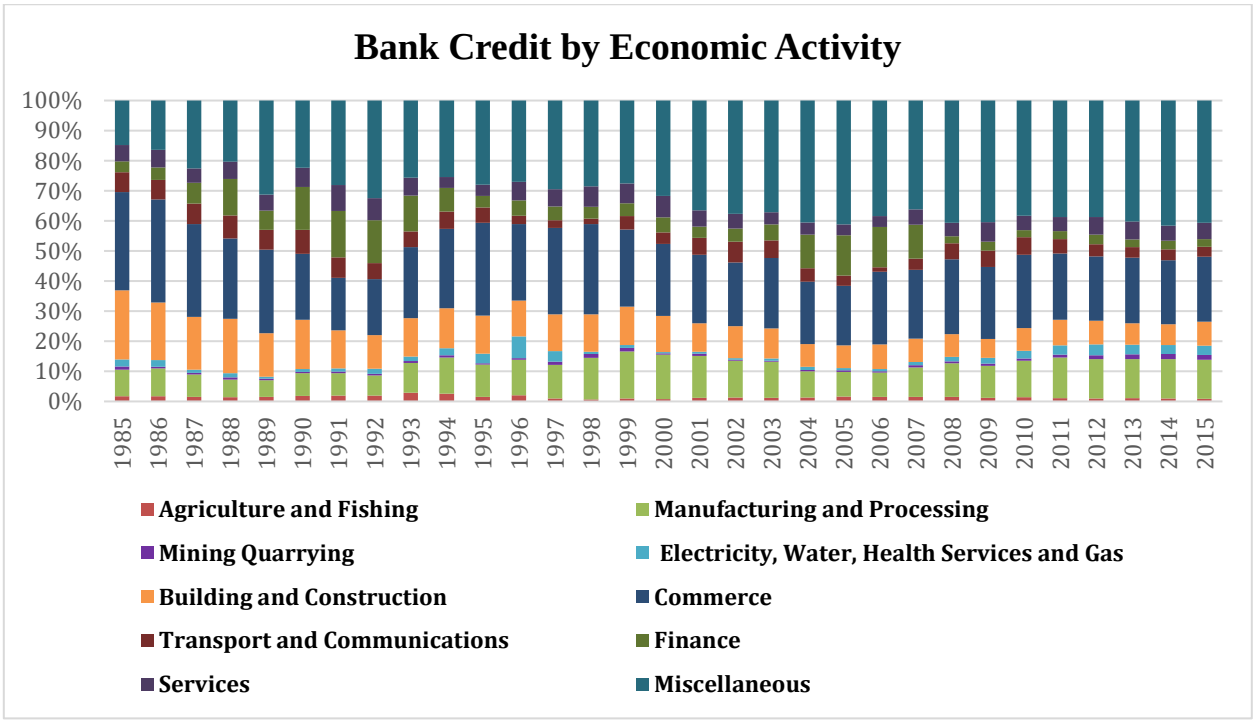

Source: SAMA

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