

The Shadow Economy and Economic Growth: A Case Study of Pakistan



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CERTIFICATE

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ABSTRACT

The present study is aimed to explore the relationship between shadow economy and economic growth in Pakistan. The study uses Autoregressive Distributed lag model (ARDL) on yearly data from 1973 to 2018. The core variables are the shadow economy and GDP per capital of Pakistan, while the investment and education variables are used as the control variable in the model. The result for present study can be summarized as in short run study has found significant impact of education and shadow economy. In long run both variables have sustained their impact, with different sign. In conclusion, the study has found negative impact of shadow economy on economic growth for Pakistan. On the comparison of different regimes, the trends in shadow economy indicate that the first military regime keep its size stable and lower than the democratic regime of 1990s. The second phase of military regime also bitterly perform to reduce the size of shadow economy compare to democratic regime after 2008. In recommendation the findings of the current study suggest that government should impose taxes on agriculture sector.

Key words: Economic growth, shadow economy, ARDL and GDP per capita.

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Abbreviations and Acronyms

GDP	Gross Domestic Product
ARDL	Auto Regressive Distributed Lag
ECM	Error Correction Model
SE	Shadow economy
ADF	Augmented Dickey Fuller
PP	Phillip and Peron
MIMIC	Multiple Indicators and Multiple Causes
WDI	World Development Indicator
SBP	State Bank of Pakistan
SNA	United Nation System of National Accounts

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Interest in drivers of economic growth has drawn attention of many economists and policy makers around the world with several studies varying in data, scope and detail (Barro and Martin, 2003). However, the cause and effects of shadow economy have also gathered a fair bit of attention (Schneider and Enste, 2000), due to underlying measurement issues, the empirical research in this regard is recent. The shadow economy is a broad concept. It has different names in the economic literature; underground, hidden, black, informal, unofficial, unreported, or unrecorded economy. It relates to the economic activities that are not included in the formal measurement of GDP. Increasing attention has been paid by many developed and developing countries in recent years to the shadow economy and its consequences. A recent study by Schnider et al. (2010), for 162 developed and developing countries overall the world between 1999 and 2006/2007, found that the shadow economy has reached remarkable proportions, with an average value of 34.5% of official GDP of those countries. Almost all studies of the shadow economy phenomena find that the main cause of this phenomenon is a high tax and social security burden. The existence of the shadow economy creates a distortion in the market competition as a result of the unequal production situations between the producers in the formal economy compared to the producers in the shadow economy. This leads to significant distortions in official economic and social indicators. Most economists agree that there is a strong bidirectional causal relationship between the tax system and the size of shadow economy. The shadow economy reduces government revenues due to tax evasion, which, in turn, reduces the

quality and quantity of public goods and services provided by governments. In order to cover its overall need for tax revenue, the government may raise tax rates. The result is often an increase in the size of the shadow economy and more tax evasion. This can increase the distortions in the two economies even more and can have serious distributional consequences. Furthermore, the shadow economy may be associated with underestimates of the true economic growth rate and the national income and may overestimate the true unemployment rate. Policy makers will tend to base their decisions on inaccurate information, reducing the efficiency of public policy. For example, effective monetary and fiscal policy require a level of precision in the estimates of key statistics (such as: income, consumption, unemployment, etc.), and the existence of the shadow economy can distort these measures (Albu, 1995). Therefore, efforts should be made to estimate the size of the shadow economy. The purpose of this study is to do so in the context of Jordan, in order to supplement official national accounts statistics and provide more accurate information for policy makers for the purpose of understanding and reducing the size of the shadow economy.

1.2 Definition of the shadow economy

There is no unique definition for the shadow economy. According to Feige (1989), it “consists of those economic activities and the income derived from them that circumvent or otherwise elude government regulation, taxation, or observation”. Smith (1994, p.15) presents four alternative definitions of the shadow economy ranging from a narrow definition; “marketbased production of legal goods and services that escapes detection in the official estimates of GDP”, to a broad definition; “market-and non-market-based production of goods and services, whether legal or illegal, that escapes detection in or is intentionally excluded from the official estimates of GDP”. According to the United Nations System of National Accounts (SNA 1993, Para 6.34), the

shadow economy (called the underground economy) “consists of activities which may be both productive in an economic sense and also quite legal (provided certain standards or regulations are complied with) but which are deliberately concealed from public authorities (e.g. to avoid the payment of taxes and/or social security contributions or to avoid meeting certain standards or administrative requirements)”. While Schneider (1986, p. 646) defines it as “all economic activities that contribute to value added and should be included in national income in terms of national accounting conventions but are presently not registered by national measurement agencies”. Schneider and Enste (2002, p.79), concentrate in their definition on the “legal value-added creating activities which are not taxed or registered and where the largest part can be classified as “black”

1.3 Theoretical reasoning of interaction in official vs unofficial economies

There are many interactions between the two economies (official and unofficial) in a country. Therefore, separation of these two is not possible. Hence, there is a continuous interaction between the two economies. Moreover, Schneider (2005, 2010) stressed that official part could never work efficiently if it were totally separated from the unofficial part. The study carried by OECD acmes this concern further, that the shadow economy permanently competes with the official economy; on the other hand, Lubell (1991) and Schneider (2005) state that both economies complement each other. Other studies (Besozzi (2001) and Schneider (2005)) show that a certain influence of the shadow economy on the efficient functioning and development of the official economy cannot be denied. In principle, these interactions stem from three main topics that are influenced by the shadow economy, namely taxation, general locations and biased effects of economic policies.

In earlier literature, it was not clear that whether shadow economy promotes or harm economic growth. On the other hand, direct and indirect government expenditures were decreased due to lower tax collections through the leakages to the informal or underground sector. It adversely affects the incentive of tax paying firms. This led to decline in economic growth with an expansion in the informal sector. On the other hand, informal sector provides the greater competition and efficiency to the formal sector. This will result the greater economic growth. Shadow economy existence, for example, enable formal sector firms to outsource service cheaply or evade harsh regulation. Not only are these theoretically opposite effects ambiguous, the resulting empirical evidence regarding the effects of the informal sector on economic growth is also ambiguous (see Schneider and Enste (2000)).

To study the impacts of shadow economy on official one. Then the shadow economy has been integrated into macroeconomic models. This ends in an extended macro model of business cycle, as well as tax and monetary policy linkage with the shadow economy. As a result, it becomes quite clear that these effects should be taken into consideration for tax and regulatory policies. The presence of shadow economy tends to overestimate the inflationary effects of a fiscal or monetary stimulus and tends to understate the respective effects of unemployment.

When the growth of the shadow economy and the official economy are positively related (which is likely to be the case when entry costs into the shadow economy are low due to the probability of enforcement), an expenditure fiscal policy has a positive stimulus for both the formal and the informal economies. The underground economy is a beneficiary in so far as it responds to the economic environmental demands for urban services and small skill manufacturing. These sectors provide the economy with dynamic and entrepreneurial spirit and can strengthen competition, increase efficiency, and put effective limits on government activities. These sectors

contribute to the creation of markets, increase financial resources and transform the legal, social and economic institutions necessary for accumulation. Moreover, a substantial part (up to 70% of the earnings gained in the shadow economy) is quickly spent in the official sector and thus boosts the demand in the official economy. These expenditures tend to raise consumer expenditures as well as (mostly indirect) tax revenues. Theoretically the effect of the shadow economy on the official one and vice versa is open.

1.4 Statement of the Problem

Pakistan has been facing various political and economic turmoil's since its establishment which create difficulties for the smooth stabilization path for the economy. The tax collection issue is one of the major problem in the economy, the authorities always face the lacks to collect the sufficient amount to stable the path of growth and increase the public revenue. These problem of an economy render the county's government to take financial assistance from the national & and international institution and other financially stable countries to afford the expenditure. Therefore, this research area is very important to estimate the size and effect of shadow economy on the economic growth of Pakistan.

1.5 Research Question

Does greater prevalence of the shadow economy slowdown Pakistan economic growth?

1.6 Objective of the Study

- To examine the relation between shadow economy and economic growth for the economy of Pakistan.
- To examine the effect of shadow economy in different regimes democratic vs dictatorship for Pakistan.

1.7 Research Gap

Several studies were conducted to examine the size and impacts of shadow economy for Pakistan. However, there are plenty of studies exist who examine the relationship between economic growth and other macroeconomic variables. It has been observed in existing literature that most of studies have just estimate the size of shadow economy and the impact of different variables on economic growth. None of the studies were conducted in the domain of relationship between shadow economy and economic growth except one which belongs internationally. Therefore, this study is going to contribute in existing literature by examine the relationship between informal economy and economic growth for Pakistan. Moreover, this study also highlights the trend of shadow economy for democratic and dictatorship regime.

1.8 Organization of the study

The current chapter include a brief discussion of introduction to the study, which is followed by widespread review of related literature concerning to the questions being considered and investigated. Chapter 3 presents the theoretical and econometric framework for explaining the relationship between shadow economy and economic growth. Chapter 4 discusses the data description and variables construction in detail. Chapter 5 deal with estimation and results. Lastly, the conclusion of the study is followed by policy recommendations accordingly.

CHAPTER 2

LITERATURE REVIEW

To reflect the importance of shadow economy, in functioning economies, many empirical and theoretical researches have been done. But, making estimation of shadow economic activities by using direct methods is challenging, due to the enigmatic nature, in result researchers have focused on developing indirect methodologies. This chapter focuses upon the literature on estimating shadow economy analyzing its determinants, consequences, and implications.

The leading study on the shadow economy was conducted by Guttman (1977), which estimate the size of the US economy. This study adopt the method of circulation in currency and argue that currency in circulation has been growing rapidly in the United States which is more than the demand deposit with reference to growth. That can be seen as a more suitable method for unrecorded or untaxed transaction. However, this disparity, reflects growth in shadow the extra-legal money. He took the ratio of currency to demand deposits from the period of 1937 to 1940. In which he took it as a benchmark period. In that according to his assumption no informal transactions were seen. He assumed that the amount of currency used in legal transactions in 1976. It was the reflection of demand deposits as in 1937 to 1941. This excess ratio of 1976 ca be attributed to the amount of currency needed for informal transactions. In this he took the ratio of money in circulation to the size of GNP. From that he had estimated the size of shadow in that year.

Lippert and Walker (1997) did eighteen studies on number of countries mainly on Canada, for the evidences and implications of the shadow economy. Studies reflected wide range of estimations for the size of shadow economy in different countries, mainly due to the differences

in the definitions, which are used to measure the shadow economy. The major argument given by most of the studies is that primarily regulations, high tax rates and unfair distribution of tax account for the shadow economy. Studies concluded that, increment in proper tax enforcement, or increasing the effective tax to higher rates makes the economic agents to escape from paying taxes, and it increases the size of shadow economy.

Schneide and Enste (2000) estimated the size of the shadow economy in OECD, developing and transition countries. The study used several methods and different time periods for individual countries and for a group of countries. It was found that especially in OECD countries, the main cause for the increase of shadow economy, are high tax rates and social security along with growing state regulations. They estimated that in most of the 76 countries the shadow economy had been growing overtime and reached a large size.

Sevgin (2009) tested the effect of high tax rates, weak legal environment, corruption, regulatory burden, and income inequality on the size of shadow economy. Applying the Ordinary Least Square Regression to test hypothesis, where the dependent variable was the ratio of the shadow economy to gross domestic product, and independent variables are the above ones. Data for this study was taken from the work of Schneider (2004), which has estimates of 145 countries, and the data on independent variables were collected by the author himself. This study covered 133 countries for different years, ranging mostly from 2003 to 2005. He found negative relationship between the shadow economy and rule of law. Furthermore, underground economy has positive association with income inequality, regulatory burden and corruption. On the other hand, majority of studies contrast to his study. He also found a moderate negative correlation between shadow economy and tax burden that is contradicting with his expectations. He stated the reason as better institutions and enforcement of taxation in countries despite of high tax rates.

2.1 Literature on the currency approach

For shadow money demand is calculated as an indicator in this approach. However, the main causes are taxes, which make contribution in shadow economy. According to the approach. People who are the part of shadow economy. Used their cash in 32 transactions. To eschew away from paying taxes. On their shadow economic activities. The equation of demand for money in circulation can be estimated, where taxes are a part. Afterwards, the predicted equation can be used to determine excess demand. In results of tax rates. The informal can be calculated by multiplying the excess currency by the velocity of money in circulation

2.2 literature related to MIMIC approach

Frey and Weck-Hennemann (1984), were first to estimate the shadow by using multiple indicator and multiple causes approach. This was considered as a tool to measure the shadow. He has estimated the shadow economy for seventeen OECD nations FROM 1960 TO 1978. In this they incorporate more than one cause because of its ingenious nature.

In estimated equation he puts the coefficient for both cause and indicator variables. The purpose was to construct the index for latent variables. He makes interpretation as a percentage of GNP. In which he has explored the higher growth rates in shadow economy in these all countries.

Helberger and Knepel (1988) bring criticism of above results. In which they defined, that structural equations are the best way for constructing the index of latent variables. Moreover, they alleged that the problem in the results of previous study was due to incorporation of variable reflection cause and effect relation for shadow. Furthermore, they stressed that the idea of initial study was outspreaded by Schneider et al (2002) with econometrics modification. Their purpose was to add time series properties of data and permit for lag adjustment in dynamic MIMIC model. In this robust study of shadow for US three studies have gotten substantial attention.

First was of Giles (1999) conducted for the economy of NWZ. Secondly, Anno and Schneider (2003) for Italy and last were of Bajada and Schneider (2005) for Australia. The three of studies have used structural equation modelling to gauge the shadow economy. First, have changed the MIMIC model approach while considering the properties of time series data. They have used unit root and co-integration for estimation of informal economy. Moreover, the second were used to speak the advantageous and disadvantages of SEM technique. The main advantageous are listed below. i) Showing relation between latent and manifest variable ii) consideration of nonlinear properties of data. iii) Provides the detail for symmetric and asymmetric information about the data. iv) It takes into account the time series properties which makes SEM approach best stoical technique for research in area of economics. As for as the disadvantages are concerned the main disadvantage. It unable to provide the proper meaning of unobservable variables. However, MIMIC was based on confirmatory analysis rather than exploratory. Last were focusing on the detail of estimation of shadow economy.

T.Breusch (2005) presents the criticism of above on the basis of twenty one divergences in studies. He discovered that there is a problem in interpretation of latent variables. The problem also lies in the calibration. He illustrates that results are penetrating towards the transformation of the data. On the ground of these three he says that MIMIC is not a suitable model for undocumented economy. In his opposite Anno and Schneider (2006) says still it served the purpose at its best.

Dell'Anno (2003) He had estimated the unrecorded economy for Italy. In which he has used MIMIC model to carve out econometric analysis. While, estimating that he found different determinants. From Portugal unrecorded economy. Moreover, he discovered that government consumption to gdp ratio, index of efficient justice and index of illegality are the main

determinants of informal economy. However, the indicators namely real GSP and currency are outside the bank. While estimating the SE for Portugal. He used variable such as social benefits given by government, labor force employment by government and subsidies as causes. Moreover, the indefinite matrix or non-positive definite matrix is the problems. One can found in model approach. This problem can be handled via using the monte Carlo simulation. Instead of weakness in Model this study declares it a best to use for estimation of shadow.

Dell'Anno (2007) He was indulged to find out the statistical relation between macroeconomic variables and undocumented economy. He used time series data for getting the sense of his objectives. MIMIC approach was used by him to reach on consensus. In end he concludes that the underlying causes are contributing in SE. I) Government employment in labor force depicting economic freedom and over burden index for public sector. II) Tax burden is one of the most significant for shadow economy. It can be hypothesized that. Higher the tax burden will mean higher the incentives of shadow economy. III) Subsidies are the payments made by government to protect the domestic industry. IV) Social benefits paid by government in these variable current transfers are embodied. These are received by the households for certain events and circumstances. Including unemployment, retirement and sickness.

Social benefits also have contradicted relation with informal economy. Such as, subsidies, self-employment considered as a viable cause for shadow economy. The last one is unemployment rate. For this study he takes two indicators I) Real GDP index II) labor force participation rate. His results conclude that the magnitude is ranging to 17.6 per cent of official GDP.

2.3 Shadow Economy in Pakistan

In the recent empirical research of shadow economy in Pakistan's case, the researcher utilized monetary approach, MIMIC approach and electric consumption for analysis (Arby et al. 2010).

The time span taken for the period of 1966 to 2008, on the basis they calculate the shadow economy magnitude. This study unveil the important phenomenon of Pakistan being a pioneering attempt to estimate the underground economy on the basis of said approaches. In the monetary approach, the researchers discuss the stationarity and utilized the ARDL cointegration technique. Basically, the three main causes discusses by MIMC model which includes tax ratio GDP, M2 ratio to GDP and the durability of regime, and also the indicators of underground economy which is the circulated currency and growth in the electric consumption. The paper conclude that 30 percent share hold by underground economy in the total economy which is significantly decrease to twenty percent in the starting decade of 21st century. The conclusion further approve and support the suggestions and results of previous literature on Pakistan's shadow economy. Furthermore, the study of Kemal (2007) attempt to measure the informal economy with K and Q approach (basically it is the discrepancy approach), and calculate the private sector's total consumption. Moreover, they account the survey of household for the population which is further adjusted with the net trade and estimate the true GDP. The paper further compare it with GDP of the Accounts of Nation Income. Basically the shadow economy is the difference between these two types of GDP. Furthermore, the study unveil the magnitude of informal economy which is rising till the last decade of 20th century. So, the decreasing trend in the magnitude of underground economy showed by the study of Ahmad and Hussain (2006).

The estimation of shadow economy through currency approach is calculated by Ahmad et al. (1995) over the time span of 1960 to 1990. This study unveil that there is fluctuations trend in the underground economy and in many years tax evasion has been increased, but the registration of informal economy has been declined. Additionally, the further argue that the presence of informal economy cause the revenue inversely. They estimated figure of informal economy in

this study is about from 40 billion PKR to 45 billion PKR. In the different sectors, informal economy and the evasion of taxed are estimated by Iqbal et al. (1999) for the period of 1973 to 1996. This research study found the size of informal economy in Pakistan is significantly rise it magnitude from 15 billion PKR to 115 billion PKR in 1996. In 1973, the tax evasion recorded as 1.5 billion PKR by this study which is on peak at 1996 with the amount of 152 million PKR. Moreover, the several sectors of black economy unveiled that revenue from the informal economy in the external sector is more than the non-tax payer sector and domestic sector. Additionally, the study concluded that the tax revenue losses and public services expenditure losses are the main factor of deficit in the budget and cost of uncertainty in doing business. The method of Tanzi and Fiege used by Kemal (2003) estimated the tax evasion and the size of informal economy in Pakistan which is held on the base of indirect and direct approaches. The paper further observed the size of economy as 25.76 in 1974 which is reached to 35.2 in the year of 1990. The size of informal economy in 1998 is reached to 70 percent which is lower in 2002 to 25 percent. The evasion in taxes are calculated as 2.74 percent of GDP in the year of 1973 and in 1990 it is 4.73 percent, and in 1998 it is 9.40 percent. Further, the paper discuss that the size of informal economy is changed due to changes in the variable or the benchmark and the period of time due to the changes in the parameter and magnitude. Furthermore, they argued that the good governance in the country might help in the reduction of the size and magnitude of informal economy in Pakistan.

2.4 The literature related to shadow economy and economic growth

The earlier work was done by Schneider and Enste (2000), and we borrow some from their work (Schneider (2012)). In another take, it is argued that tax revenues go up as the shadow sector declines. These enhanced revenues in turn improve the quantity and quality of public goods,

which would fuel economic growth. Alternately, in the presence of congestible public goods, both the formal and informal sectors compete for public services, with the informal sector free riding on such services. This results in inefficient allocation and/or use of public goods, leading to lower growth. This negative relation between the shadow economy and economic growth is noted by Loayza (1996) for Latin America.

On the other hand, the shadow economy and economic growth can have a positive relation when informal markets improve overall competitiveness and provide avenues for shadow entrepreneurs to escape stringent government regulations in the informal sector (Williams (2006)). This self-selection by entrepreneurs can ultimately increase economic growth. Furthermore, the shadow economy absorbs the excess demand and supply of the formal economy. For instance, over the short run during economic downturns the shadow economy employs unemployed workers and provides cheaper products and services. Over the long run, the shadow economy could alter institutions that are necessary for factor accumulation (Asea (1996)). Thus, the overall effect of the shadow economy on economic growth is ambiguous (see Schneider and Enste (2000)) and the present work will shed light on this for the United States over a considerable period.

2.5 Economic growth and its determinants

Barro (1996) seems to document that high inflation in a country reduces the rate of economic growth. Many studies find no strong positive association between openness and growth of the economy. Grilli and Milesi-Ferretti (1995) do not support the hypothesis that inflow of foreign capital promotes growth. Rodrik (1998) shows no significant correlation between financial liberalization and growth in small open economies. Similarly, Edison (2003) does not find strong evidence of a relationship between trade liberalization and growth. He also concludes that

financial integration does not promote the growth per se, without controlling for some economic, financial, institutional and policy characteristics.

Edwin and Shajehan (2001) support that apart from growth in the labour force, investment in skill and technology, as well as low inflation rate and open trade policies, are important for economic growth. Moreover, the ability to adopt beneficial technological shocks in order to increase efficiency is also necessary. Since many developing countries have a large agricultural sector, adverse supply shocks in this sector are likely to originate an adverse impact on economic growth. Growth in agriculture has a positive impact on industrial and service sector's growth, social infrastructure is an important determinant of the investment decisions [Krishna (2004)]. The author however stresses that there is a need for exploring other approaches to explain economic growth from all perspectives.

Easterly and Levine (2003), find no effect of geography on growth after controlling for institutions. Edwin and Shajehan (2001) empirically suggest that apart from growth in the labor force, investment in both physical and human capital, as well as low inflation and trade liberalization policies are essential for economic growth. They also suggest the ability to adopt technological changes in order to increase efficiency is also important. Klein and Olivei (2003) utilizes quadratic interaction between income per capita and capital inflow or financial liberalization and established a positive and significant effect of capital account openness along with stock market liberalization on economic growth for middle-income countries but not for poor and rich countries. In small, open economies, absorption capacity for capital is limited because the financial markets are impulsive. The excessive capital inflows towards small open economies might cause "Dutch" disease phenomena and asymmetric information might be inefficient use of capital Carlos, et al. (2001).

Stark and Lucas (1988) establish the positive relationship between remittances and economic growth. Empirical evidence of previous studies of the impact of worker's remittances on economic growth as well as poverty reduction is mixed Juthathip (2007). The results suggests that, remittances have a significant impact on poverty reduction in developing economies through increasing income tends to relax the consumption constraints of the poor, they have a nominal impact on growth working through enhance in both domestic investment and human capital development.

Goel et al.,(2017) have examine the relationship between economic growth and shadow economy for US economy. They took data from 1870 to 2014 by using the ARDL model they found that before world War II shadow economy have a negative impact on economic growth . While after World War II they found it beneficial for economic growth.

2.6 Economic growth and its determinants in Pakistan

Studies on determinants of economic growth in Pakistan are very large; for example, Iqbal main thrust of Iqbal (1994) is to analyses the impact of structural adjustment lending on real output growth in Pakistan. The regression results showed that real output growth declined with the availability of adjustment lending and there was a deterioration in the terms of trade while, alternatively, favorable weather and real domestic savings growth produced positive effects on real GDP growth. Iqbal (1995), in another study, uses a three-gap model to examine macroeconomic constraints to Pakistan's economic growth, and shows that real devaluation, growth in foreign demand, and capacity utilization allowed an accelerated growth rate of real GDP in Pakistan.

Khilji and Mahmood (1997) find the defense burden to be negatively related to GDP growth. Shabir Mahmood (1992) conclude that net foreign private investment has significant positive

effects on the rate of growth of real GNP, while three other explanatory variables—namely, disbursements of external grants and loans, domestic savings, and exports—have a positive but statistically insignificant impact on real GNP growth.

Abbas (2004) finds that there was a significant positive growth payoff to debt, even at the very high levels, 93 percent of GDP. Analysis presented quite a complex picture of the relationship between debt and growth, and domestic debt and growth. On one hand, the results seemed to affirm conventional wisdom that the decision to switch the source of budgetary finance from external to domestic debt would be fraught with difficulties. On the other, the study obtained quite robust results on the growth payoff of domestic debt issuance in more developed financial systems. However the overall relationship remained negative.

Abbas (2007) has extended its previous work; and finds the evidence that above a ratio of 35 percent of bank deposits domestic debt undermines economic growth. Anwar (2002) concluded that if exports remain stagnant, then devaluation has directly increased foreign debt in rupee and results in dramatic increase in debt service burden, lower economic growth and higher poverty level. Study argues that it is crucial to address basic reasons that caused debt build-up and subsequent adverse effects on economic growth and poverty levels while designing a debt reduction strategy. Policy of tax reforms, expanding the production and export base and creating diversification in exports can be handy in tackling debt problem. In another study, Waheed (2006) concluded that there is primary deficit so it has to be filled out by domestic debt. The only way to stop the process of debt accumulation is to reduce the primary deficit by continued fiscal adjustment. This adjustment should not be achieved on the cost of cut in development expenditure rather there is need for serious efforts to increase domestic tax revenue.

Chaudhary, et al. (2002) investigates the role of trade instability on investment and economic growth. The results show that export instability does not affect economic growth and investment in Pakistan. However export instability could affect foreign exchange earnings and as a result it could have negative impact on imports and economic growth. Chaudhary, et al. (2007) examines the impact of trade policy on economic growth in Bangladesh. Results strongly support a long-run positive and significant relationship among exports, imports and economic output for Bangladesh. Furthermore, empirical evidence shows relationships between exports and output growth and also between imports and output growth in the short-run. A strong feedback effect between import growth and export growth has also been established.

Shahbaz (2009) examines the relationship between some macroeconomic variables and economic growth in case of Pakistan. The study uses credit to private sector as a proxy for financial development. The results of the study show that financial development enhances economic growth in Pakistan over the long-run. The study concludes that investments and exports have positive whereas imports and inflation have negative impact on economic growth in Pakistan.

2.7 Literature summary and contribution

For the estimation of shadow economy, several studies has been cited in the references which estimate the size, trend and the effect of shadow economy on the growth of a country. Previous studies adopt several methods and approaches to estimate the said scenario and its effects. However, two approaches are very common and important in the past literature, which is demand deposit approach and MIMIC approach. A few studies has been account which specifically estimate the shadow economy and its effect on the economic growth. Therefore, the importance of this topic is much more if the analysis will conduct for the specific case of Pakistan in order to

retrieve some meaningful findings and suggestions. This aim of this study is to contribute in the literature regarding Pakistan. Specifically, the objective of this study is to estimate the effect of shadow economy on economic growth of Pakistan with ARDL bound testing technique over the period of 1973 to 2018. This specific time span covers approximately four decades which consist of two military and two democratic regimes consecutively.

CHAPTER 3

METHODOLOGY

This chapter includes of three sections. Section one focus on the calculation of shadow economy. Section two contains theoretical background of the study. Lastly, it gives a glimpse of data and its sources.

3.1 Calculation of shadow economy

$$\text{Log} \left(\frac{c}{M2} \right) = \beta_0 + \beta_1 \log(T) + \beta_2 \log \left(\frac{WS}{NI} \right) + \beta_3 \log(R) + \beta_4 \log(Y) + e \dots \dots \dots (x)$$

$\left(\frac{c}{M2} \right)$ =Ratio of currency to holding money

T = Tax rate

$\left(\frac{WS}{NI} \right)$ = Ratio of wages and salaries in national income

Y = Per capita income

e = error term

To receive the estimates of shadow economy we use the following method: For each year the predicted level of the currency ratio C/M2 can be calculated using the regression equation X. The predicted level of currency holding – \hat{C} – can be calculated given the actual figure for M2 following the method used by Tanzi (1980).

Let the dependent variable in the preceding econometric equation be represented by V . Therefore

$$V = \ln\left(\frac{C}{M2}\right) = \ln C - \ln M2$$

If we rewrite this equation in terms of $\ln C$ we get

$$\ln C = V + \ln M2$$

Where the circumflex above the C represents the predicted value from the econometric equation, solving this equation results in:

$$\hat{C} = \exp(v + \ln M2)$$

This represents the value of currency at time t predicted by the econometric equations. The next step is to set the tax variable equal to its lowest value, keeping all the other coefficients unchanged to obtain \acute{C} , the predicted level of currency in circulation without taxes. This is done by following the same procedure outlined above. The difference between the two variables \hat{C} and \acute{C} gives us the amount of extra currency in the economy.

Using the Ahumada et al (2007) approach of circumventing the issue of differing velocities of money between the legal and illegal economy

$$\frac{Y_{informal}}{Y_{formal}} = \left(\frac{C_{informal}}{C_{formal}}\right)^{1/\alpha} = \left(\frac{Y_{informal}}{Y_{formal}}\right)^{1/\alpha}$$

3.2 Theoretical framework

3.2.1 The relationship between shadow economy and economic growth

The impact of shadow economy on economic growth can be either positive or negative Goel *et al.*, (2017). Shadow activities might shoot or impede on economic growth depending on their interaction with formal sector. And impacts on provision of public goods.

3.2.2 The relationship between investment and economic growth

The relationship among investment and economic growth is positive levien and Renelt (1992). The relationship between two is followed by classical growth model of Solow. In which he defines that in increase of investment will leads to enhance your productivity in turn increase GDP. Hence the relationship between is positive

3.2.3 The relationship between education and economic growth

The relationship between economic growth and education or human capital is positive levien and Renelt (1992). Solow model has defined that education improve the quality of labor which in turn increase the efficiency of labor. Hence the relationship between is positive

3.3 Econometric Model for shadow economy and economic growth

The general form of model is given below.

$$GDPpercapita_t = f(Shadow_t, INV_t, EDU_t, Shocks_t)$$

Where

GDP per capita= used as proxy for economic growth

Shadow = per valiance of the shadow economy

INV=Investment

Edu= labor quality

$$GDPPC_t = \beta_0 + B_1INV_t + \beta_2EDU_t + \beta_3shadow_t + \beta_4shocks_t + \varepsilon_t \dots \dots \dots (3.1)$$

To estimate a level relationship, we rely on methodology from Pesaran and Shin (1998) and Pesaran et al. (2001) based on an autoregressive distributed lag (ARDL) approach. Unlike traditional cointegration tests, such as Engle-Granger (1987) and Johansen and Juselius (1990) which require that the variables be integrated of the same order, the Bounds testing approach is able to test for the existence of a levels relationship among I(0) and I(1) variables. This is

$$\Delta GDPPC_t = \alpha_0 + \sum_{i=1}^{q=1} \theta_i \Delta GDPPC_{t-i} + \sum_{i=0}^{q=2} \gamma_i \Delta INV_{t-i} + \sum_{i=0}^{q=3} \phi_i \Delta EDU_{t-i} + \sum_{i=0}^{q=4} \delta_i shadow_{t-i} + \phi_1 ECT_{t-1} + shocks_t^j + \varepsilon_t \dots \dots \dots (3.3)$$

Where ECT_{t-1} is the error correction term which measures deviations from the long-run equilibrium and ϕ_1 captures the speed of adjustment to long-run equilibrium. The first differenced variables and their corresponding coefficients give the short-run dynamic responses. Therefore, the error correction model includes the short-run dynamics and the adjustment to the long-run equilibrium.

This study is going to use time series data. Thus, for reaching meaningful results, we need to take in to account the precautionary tests to check for the stationarity of data. To see for autocorrelation. Literature has various tests, but this study is restricting itself to the most famous test to address above properties. Dickey and Fuller is used to check for stationarity. However, to suspect the problem of autocorrelation this will going to use ADF test. The current study is going with both to achieve desired outcome.

Dickey and Fuller test will just check for the unit root of variables, that whether variables have a unit root or not. In this null hypothesis specified for having unit root, while alternative holds for no unit root in variables.

3.4 Dickey & Fuller

$$\Delta y_t = \alpha + \beta y_{t-1} + \mu_t \dots \dots \dots (3.8)$$

Where $\Delta y_t = first\ difference\ of\ timeseries$ and the unit root coefficient $\beta = \delta - 1$. so the null hypothesis is $H_0: \beta = 0$ or $\delta = 1$ and the alternative hypothesis would be $H_a: \beta < 0$.

Here is assumed to be a white noise but it is not a white noise in many cases. Therefore, dickey and fuller have suggested another equation to regulate the effect of autocorrelation. This augmented term is just known as the lag of dependent variable.

3.5 Augmented Dickey & Fuller

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \mu_t \dots \dots \dots (3.9)$$

$$\Delta y_t = \alpha + \gamma y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \mu_t \dots \dots \dots (3.10)$$

$$\Delta y_t = \alpha + \gamma y_{t-1} + \alpha_2 t + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \mu_t \dots \dots \dots (3.11)$$

These three butts are different from one another with reference to their deterministic element. The apt model choice will be based upon plotting the graph for series and acquiring the right model for study.

3.6 Phillip Peron Test

The Phillips and Peron test propose an alternate method to deal with serial correlation in the testing of unit root. Essentially, they use the ADF or DF test, but bring modification in the t ratio that serial correlation does not disturb the asymptotic distribution of test statistic. PP test is non-parametric test, if a series is found to be not normally distributed then we use this test to check the order of integration of that series. Similarly, the PP test is good for large sample but not so good for small samples.

$$y_t = c + \delta t + \alpha y_{t-1} + e(t) \dots \dots (6)$$

The null hypothesis of PP test is $\alpha = 1$, it means that series have unit-root against the alternate hypothesis of no unit root. This test uses modified DF statistic to account for serial correlation in the innovations process $e(t)$.

3.7 Variables definition and source of data

The brief description of variables with respect to its definition and measurement are given in table 3.1. The said table also account the sources of data which is collected for the analysis of the present study.

Table 3.1: Data Sources and Variables Description

Variable	Definition	Source
<i>GDPper capita</i>	The change in the log of real GDP per capita is taken as a proxy for economic growth	WDI
<i>INV</i>	Investment-to-output ratio.	WDI
<i>EDU</i>	Fraction of population with a high school degree.	WDI
<i>Shadow</i>	The size of the shadow economy (% of GDP).	Geidigh et al. (2016)

Source of Construction: Author

CHAPTER 4

RESULTS AND DISCUSSION

In this chapter we present the results for above mentioned Objectives. This section makes up of three sections. Section one holds results for ADF test. Section two dealt with the results of shadow economy. Last section has results for ARDL Model.

4.1 Descriptive Statistics

In table 4.1 in the Appendix, the descriptive state are given for all variables in this study. As we discussed earlier, we have GDP per capita as dependent variable, and the remaining all are explanatory variables i.e. Shadow economy, Investment and Education. The Sample of data were taken for one single economy that is Pakistan over the period of 1973 to 2018. The Descriptive statistics includes minimum and maximum, mean, and standard deviation of data. The second column shows the means value for all variables, the mean value is of GDP per capita in log form is 0.39826 and then followed by shadow economy 0.53368, investment 0.15984, and education 0.65771. The third column shows the standard deviation, the standard deviation of GDP per capita is 0.096627, shadow economy 0.079489, investment 0.047372, and education 0.083325. The forth column shows the Minimum values. The Min values of GDP per capita is .0640198, shadow economy 0.37954, investment 0.00667, and education 0.06536. The fifth column shows the Mix values, the Mix values of share capital for overall companies. The Mix values of GDP per capita is 0.98786, shadow economy 0.73878, investment 0.69787, and education 0.86579.

4.2 Unit root tests results

Table 4.2: Results of Augmented Dickey Fuller Test at Level and First Difference

Variable	Level			First Difference		Conclusion
	Lag	ADF	ADF_T	Lag	ADF	
Ln (GDP)	0	0.74	0.38	9	0.000	I(1)***
INV	0	0.02	0.13	--	----	I(0)**
Ln (SE)	0	0.44	0.36	0	0.000	I(1)***
Ln (Edu)	1	0.37	0.04	-	----	I(0)**

*ADF test for time series. *, **, *** represents a significance level of 10%, 5% and 1% respectively.
Source: Author's calculation based on Eviews V.10*

Table 4.3: Results of Phillip and Peron test of unit root at level and first difference.

Variable	Level			First Difference		Conclusion
	Lag	PP	PP_T	Lag	ADF	
Ln (GDP)	4	0.75	0.38	4	0.000	I(1)***
INV	2	0.15	0.03	-	-	I(0)**
Ln (SE)	3	0.37	0.53	3	0.000	I(1)***
Ln (Edu)	4	0.37	0.83	2	0.002	I(1)***

*PP test for time series. *, **, *** represents significance level of 10%, 5% and 1% respectively.
Source: Author's calculation based on Eviews V.10*

Table 4.1 and 4.2 contains results for ADF and Philip Peron test to check for the stationarity of the series. It can be seen that in 4.1 shadow economy and GDP per capita are stationary at level. However, the other two variables are found to be stationary at first difference. Moreover, the results of Philip Peron test shows that all variables are stationary at first difference except investment. Hence it can be concluded from the above results that this study has mixture I(1) and

I(0) variables. Therefore, ARDL can be used to estimate the short run and long run coefficients for this study.

4.3 Shadow Economy of Pakistan

Figure given in appendix as 4.1 is the graphical representation of the Pakistan shadow economy. The shadow economy of Pakistan is calculated by using formula mentioned in 3rd chapter with detail. Since, we know that Pakistan was experiencing political instability throughout its birth, which have the series of dictatorship and democratic regime. The estimates in the given tables are based on the yearly data which unveil the yearly changes in the size of shadow economy in different regimes. The name of the head of the state also mentioned with specific regime in figure. The distribution of shadow economy in different political regime showed in figure give expressive and comprehensive understanding to the result of current study.

The general rise in the size of shadow economy occurs since 1973 in Pakistan, though the growth is faster in the Regime of starting year of dictatorship, when Zia ul Haq taken control as the head of the state. This increase can be seen in the figure might be attached to the two main reason, the one is the separation of East Pakistan which is the leading part of the economy and the other is the encroachment of dictators to politically control the power of state of Pakistan. However, the country has witnessed the rapid increase in shadow economy when the political power converted from the democratic regime of Zulfikar Ali Butto to Military regime. The third reason for the rapid increase in the shadow economy after 1977 might be the liberal policies of military regime after the nationalization era of Pakistan people party. Conversely, the size of shadow economy decreased in the starting year of the next military regime powered by Gen. Parvez Musharraf. This regime is again the dictatorship but the scenario of decreasing the shadow economy might because of the reformation in the said regime. The measure taken by that regime the

establishment of independent organization and controlling the flow of corruption in the government institutions. The National Accountability Bureau also founded by the Musharraf government to control the corruption, as well as the advent of tax reforms which is introduces after a decade of unstable political situation in Pakistan. The rise in the shadow economy again occurred after the resign of Musharraf government with the democratic regime. The rising trend in the shadow economy in the new political regime could by contributed by the policies designs of Zardari and Nawaz Sharif government.

The overall trend in the graph shows that rise in the shadow economy firstly occurred in the starting of first military regime after 1973. But this increase in much lower and stable than the political regimes of two parties between the two dictators regime. However, the second military regime is much better in lowering the size of shadow economy because of their well appreciated economic and political policies regarding reforms and institutions. On the other hand, the second democratic political regime after 1973 or after the government of Musharraf also responsible for its inefficiency with reference to the growing size of shadow economy. The overall figure shows that controlling the shadow economy or lowering its size, the military government perform better than democratic regimes.

4.4 Results from ARDL bound testing approach

The ARDL bound tests confirm the existence of long run relationship between dependent and independent variables, which is the initial of applying ARDL model. The bound test approach consist of two bounds i.e. the upper and lower bound. The upper bound assumes the assumption of upper bound is that all variables are $I(1)$ while the lower bound assumes $I(0)$ nature of all variables.

The bound test approach is grounded on F-statistic to test the null hypothesis of no Cointegration relationship or no long run relationship i.e. $H_0 \pi_1 = \pi_2 = \pi_3 = \pi_4 = 0$) Contrast to the alternative ($H_a \pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq 0$) where $i = 1,2,3 \dots$. For the Cointegration relation or long run relationship, the calculated value of F-state must be above than upper bound. If the calculated value is below than lower bound, it will be considering no long run relationship. On the other hand, the range between upper and lower bound will be count inconclusive. The Result of ARDL Cointegration F-statistic and it critical values are given in the following table briefly. The Significance level of concerns is set to 10%, 5% and 1%.

Table 4.4: F-Bound test statistic of main ARDL Models and its tabulated critical values

F-Bound Test Statistic	F-Bound Test Critical Values		
	10 %	5 %	1%
4.577**	[3.03 , 4.06]	[3.47 , 4.57]	[4.4 , 5.72]

The values in [-] shows the F-Bound test statistic critical values of lower bound and upper bound.

, **, * indicate 10%, 5% and 1%significance level.*

Source: Authors' Calculations and Pesaran et al (2001).

The result of the above table concludes that the existence of long run relationship in the model among chosen variables. In the above results model strongly reject the null hypothesis of no Cointegration relationship. The F calculated value of the model is greater than upper bound, even at 1 percent of significance level.

4.5 Model Stability Tests

The stability and quality of the models are analyzed through CUSUM and CUSUMSQ. These methods are proposed by Brown et al. (1975) which is based on the recursive residual. These test are the graphical representation of recursive residuals with a critical bound line of 5 %. In the CUSUM test, the sum line cross the critical bound then it is consider the structural

break on that particular point. Similar is the case of CUSUMSQ which plot the cumulative sum of square of residual.

The plot shown in the figure (1-2) of CUSUM and CUSUMSQ tests approve the structural stability of estimated model of this study, because the sum and cumulative sum don't break the critical bound of 5 % at any point. Hence, we conclude that short run and long run coefficients are stable. In simple word we can say that there is no parameter instability in the mean and the variance. The figures of stability test related to estimated model can be seen below.

Figure 4.2: CUSUM test of stability

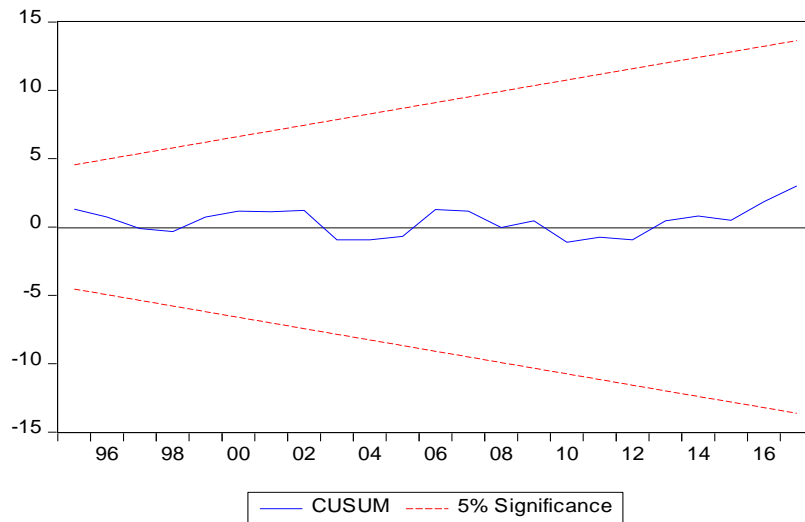
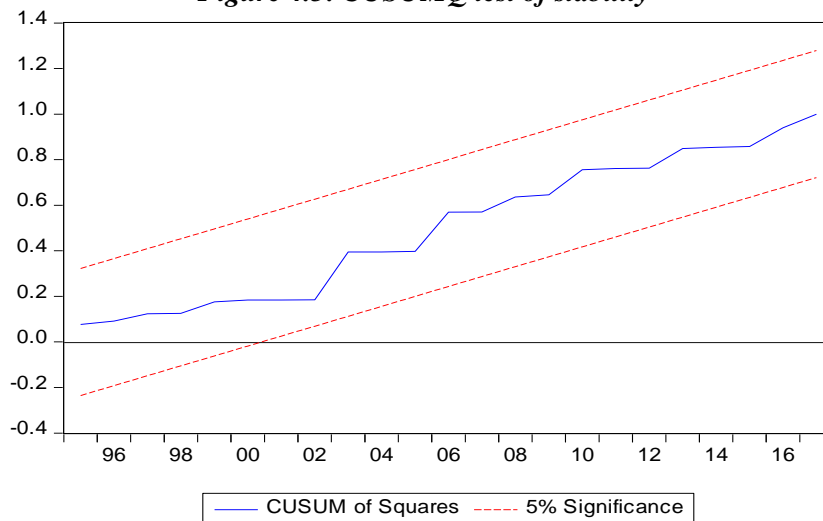


Figure 4.3: CUSUMQ test of stability



4.6 Lag Length Selection

The optimal lag selection is an important step because it determines the results of the model. Several methods to determine the optimal lag p are existing in econometrics. The common methods are to minimize the value a criteria using the AIC and SIC defined by the following equation (1') and (2').

$$AIC = -2\ln(mL) + 2k \dots \dots (1')$$

$$SIC = -2\ln(mL) + k\ln(n) \dots (2')$$

Where \ln represent the natural logarithm, k is the number of parameter in the regression to be estimated partially described by the lag p , n is the number of observation and mL is the maximum likelihood of model. Keep in mind the critical importance of the determination of relationship among variables, the lags are selected carefully. To fulfill the need of lag length selection, different criteria are available in the literature, i.e. the Akaike Information Criteria which allows the model to select the maximum relevant lag length and Schwarz Bayesian Criteria which specify the model with smallest relevant lag length because it is a parsimonious model. According to econometricians no criteria is superior to other. Still the AIC is preferred for our choice model ARDL, so to be reliable we pick to apply the AIC. The frequency of the data also matters in the selection of optimal lag length. According to researchers, yearly data may have lag length of 2, quarterly 4 and monthly 12. Still we use the AIC while the frequency criteria is only used to indicate the upper limit (maximum) of lag length for the specific model. As explored by Pesaran et al. (2001) that serial correlation, Heteroscedasticity, non-normality and misspecification should not be present in the estimated model, so the length of lag have to be adjusted for possible biases. Consequently, in order to rational model the AIC will be utilized to govern the optimal lag for both the ARDL model as well as for unit root tests.

This study has used the time series data and time series data has a property that it's very sensitive to the lag choice. Therefore, it is necessary to confirm the optimal lags to be used. Here are five different criteria to determine the number of lags. In this we go with two most used in literature AIC and SC. Here, it can be noted that AIC suggests number of lags to be included are two and SC suggests one, for better results the study goes with AIC.

Table 4.5 Optimum Lag Length

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-203.5105	NA	0.011207	9.698161	9.902952	9.773682
1	-32.62840	294.0761	1.28e-05	2.912949	4.141693*	3.366072*
2	-1.284753	46.65101*	1.00e-05*	2.617895*	4.870593	3.448621
3	15.87490	21.54933	1.64e-05	2.982563	6.259214	4.190890

* indicates lag order selected by the criterion

Source: Authors' Calculations

4.7 Results and Discussions of ARDL Model

Table 4.6: Short run coefficients of ARDL model.

Dependent Variable is GDP	
Independent Variable	Statistic
INV_t	1.06*** (0.00)
INV_{t-1}	0.23*** (0.005)
$Ln SE_t$	0.085*** (0.00)
$Ln SE_{t-1}$	0.69** (0.07)
$Ln Edu_t$	0.28 (0.46)
$Ln Edu_{t-1}$	0.80** (0.039)
D	0.03 (0.83)
D_{t-1}	-0.49** (0.02)
ECT_{t-1}	-0.65*** (0.000)
R^2	0.72
$R Bar^2$	0.53

F	3.89 (0.001)
DW	1.98

*P values are presented in parenthesis. Highly insignificant variables are exclude from results.
*, **, *** indicated 10 %, 5 % and 1 % significance level respectively.
Source: Author's' Calculations*

Table 4.7: Long run estimates coefficient of ARDL Model

Dependent Variable is GDP	
Independent Variable	Statistic
INV	0.238 (0.35)
Ln SE	-1.784 (0.045)
Ln Edu	1.230 (0.06)
D	0.797 (0.030)
Serial Correlation	0.910
Heteroscedasticity	0.468
Normality	0.261

*Ln is the natural logarithm. P values in parentheses.
*, **, *** indicate 10%, 5% and 1% significance level respectively.
Source: Authors' Calculations*

Table 4.7 holds short run effects of the model, where all variable has significant coefficients with different lags. Implying that these variables have a short run impacts on economic growth of Pakistan economy. Furthermore, R square shows that 72 percent variation is explained by explanatory variables to the dependent variables.

In table 4.6 we have results for long run relationship among the dependent and independent variables. Except investment all other variables have a significant coefficient with different signs. Shadow economy has a negative coefficient which shows that informal sector affects negatively to economic growth. Rising informal sector by one percent will shrink the economic

growth of Pakistan by 1.78 percent. While, education has a positive coefficient this mean increase in education will lead to increase in economic growth. These long run effects would be valid only when co-integration amongst the variables exists. In table 4.3 results for bound tests are presented which shows there is co-integration amongst the variables, ECM term is also negative and significant which supports co-integration.

The diagnostic tests are conducted to identify that ARDL tries to estimate the best linear unbiased estimator. For confirmation of valid results and statistical robustness we need to apply the tests such as serial correlation (LM), Heteroscedasticity (ARCH), Normality (JB), Misspecification (RESET) and tests for stability in the residuals. If the results of the model in this study contain none of these biases then it will be considered satisfactory and valid result which can be for the analysis. Furthermore the cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ) tests proposed by Pesaran and Pesaran (1997) are used in case of ARDL estimators for the stability checking. Moreover, this model will pass other diagnosis test. It is free from the problem of autocorrelation, and heteroscedasticity.

CHAPTER 5

CONCLUSION AND POLICY RECOMMENDATION

This study is aimed to examine the impact of shadow economy on the economic growth for Pakistan from the period of 1973 to 2018. In literature, many studies were conducted to examine the determinants of economic growth for Pakistan. Owing to these the impact of shadow economy on economic growth is remain unrequited so far. Informal sector has grown over the time in case of Pakistan but its prevalence has varied. In connection with growth shadow economy has carried either positive or negative impacts or it would retard economic growth. The argument is when country has a low tax collection due to informal sector then it will reduce the externalities. In contrast to this, shadow will spur the economic growth. However, the synergies with the formal sector improve productivity and growth.

In order to retrieve both short run and long run coefficients for economic growth and its determinants the present study has used ARDL bound test technique given by Pesaran *et al.*, (2001). Following this method study has found that investment has a positive impact on economic growth. However, the statistical impact of shadow economy on economic growth is remained negative in case of Pakistan. Moreover, the effect of education on economic growth remains positive. In connection with this the study has found increasing trend in shadow economy over the period of time in both democratic vs military regimes.

This study also suggests that some policy recommendation for policy maker to reduce the size of informal economy from Pakistan. First, the government should implement taxes on the agriculture sector, as approximately 70% Pakistan population belong to the agriculture sector. But Pakistan agriculture sector has not involved in any big direct tax. Second , the FBR takes

serious action against illegal transportation system and put them under document system with a serial number as per provincial and federal level. This action will give a proper income in shape of revenue tax through a proper channel. Finally, provisional and federal government join hands to eradicate non-documented housing schemes. These housing schemes are working at a small, medium and large level such as rent the house, small businesses inside the house and big housing schemes, which are neither reported nor documented in complete form. Moreover, the ministry of land and cooperative society will make sure that all resident, industrial and agriculture sector land to escape form land lords and fake owners of land. This activity gives allot of revenue in the sense of taxes.

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APPENDIX

Trend in shadow economy over the period of time in Pakistan

Year	Shadow Economy Rs in million	Shadow Economy as % of GDP
1973	22354	28.89
1974	23188	29.16
1975	29909	28.8
1976	34838	29.1
1977	41043	30.18
1978	52953	33.13
1979	67371	37.88
1980	78471	37.32
1981	99599	40.19
1982	119336	40.85
1983	138947	42.31
1984	163768	43.75
1985	166473	39.16
1986	160980	34.52
1987	195770	37.98
1988	205026	34.11
1989	221482	32.42
1990	269371	35.45
1991	391358	43.08
1992	521325	38.36
1993	682580	56.86
1994	943507	66.78
1995	953509	51.10
1996	1378554	65.02
1997	2483178	102.26
1998	2340199	87.4
1999	1583370	53.89
2000	1857396	48.55
2001	1833138	43.54

2002	2088384	46.9
2003	2029850	41.93
2004	2223698	39.42
2005	2418636	37.21
2006	3118761	40.91
2007	1829218	21.09
2008	2783824	27.18
2009	3855252	30.30
2010	3964512	26.72
2011	7575512	35.42
2012	8062174	35.81
2013	9139659	39.90
2014	47078455	41.65
2015	53343882	41.97
2016	60437746	43.28
2017	68469584	43.58
2018	77563419	43.89

Source of Data: for calculation of shadow data was taken from various economic surveys and annual reports of the SBP.

Table 4.1, Descriptive Analysis

Variable	Mean	SD	Min	Mix
GDP	0.39826	0.096627	.0640198	.987865
Shadow	0.53368	0.079489	0.37954	0.73878
Investment	0.15984	0.047372	0.00667	0.69787
Education	0.65771	0.083325	0.06536	0.86579

Source: Author Computation's

Figure 4.1: Graph of shadow economy as a percentage of GDP.

