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Shadow Economy in Pakistan: Its Size and Interaction with Official Economy

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Abstract

Shadow economy encompasses wide array of activities that influence the official economy and government policies, either directly or indirectly. In this paper we estimate the shadow economy of Pakistan using currency demand approach with two econometric approaches, i.e. one using Auto Regressive Distributed Lag (ARDL) model and two with Engel Granger two step approach. Additionally, we use a variant of currency demand approach where along with tax variable we include unemployment rate and intensity of government control as indicator variables of shadow economy, for the first time in case of Pakistan. The average shadow economy of Pakistan estimated from 1973-2015 as percentage of GDP is 26.41, 25.29, and 26.11 from Models 1, 2, and 3 respectively. Furthermore, we analyzed interaction between the official and shadow sector using ARDL model. Our results show a significantly increasing shadow economy in Pakistan with positive impact on the official sector in long run while negative impact in the short run. This again is a novelty in our paper where we observe short and long run impacts separately along with dynamic simulations to show Pakistan's GDP per Capita in the absence of shadow economy.

Keywords: Shadow Economy, Pakistan, Impact of the official Sector, Currency Demand Approach

JEL-Codes: E26, H26, K42, O17

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1. Introduction

The focus of any economy is implementation of viable policies for its social development and economic prosperity and National Accounts provide a set of statistical data for the purpose of economic analysis, decisions and policy making. It is widely used as an indicator of economic activity and measures performance of the economy using important parameters such as GDP/GNP, Investment, Savings, and Inflation etc. Therefore, national accounts calculations are essential for formulation of economic policies. The quality of national accounts data can be judged by the level up to which it covers all the economic activities. They are treated to be the true picture of an economy. But the shadow economic activities, whose prime objective is to work without detection, hinder this objective. Economists, policy makers, businessmen and foreign investors base their policies on the available economic indicators, however, in case of presence of the shadow economy; the indicators do not depict the real scenario, resulting in ineffective policies in some cases.

Pakistan is a developing country faced with many challenges. As per the estimates of UNDP the multi-dimensional poverty index shows 38.8 % people in Pakistan can be classified as poor during 2004-15³ while 4 out of 10 Pakistanis live in multidimensional poverty⁴. In order to improve their economic conditions and ensure rapid development; effective policies are required which can only be ensured if the macroeconomic indicators are unbiased and accurate. However, this is only possible if the shadow economy is measured and incorporated in their policy framework. There have been multiple estimates of Pakistan's shadow economy which tend to point towards its growing size. Although there are multiple methodologies for estimating the shadow economy (to be discussed in methodology section), yet currency demand approach has been most widely used in case of Pakistan. This approach uses causes for existence of shadow economy and incorporates indicators to capture additional demand for currency. The most commonly used cause is increase in taxes, which increases shadow economy as per the theoretical and empirical literature. Most of the estimates of Pakistan assume tax as the only indicator variable with slight changes in definition of dependent or independent variables. Only Arby, Malik and Hanif (2010) considered unemployment rate prevailing in the economy as one of the indicator variables in their currency demand equation. There has been discussion in theoretical and empirical literature about intensity of government regulations and control in the economy which postulates that this leads to increased shadow economic activities [Johnson, Kaufmann and Shleifer (1997), Schneider and Dreher (2006), Loayza (1996)]. Yet this aspect has been ignored in Pakistan's estimates owing to difficulty in quantification.

Most of the developing countries are marred with complex processes and bureaucratic formalities that are required for all essential services. This drives the economic agents to look for alternatives which can also be in the form of tax evasion, bribes and kickbacks. Pakistan is also not different where the size of its public sector employment is reflective of extensive government control on the economy. The process of automation and use of MIS to improve processes is a recent emerging trend in public offices. Still the regulations, their intensity and overlapping procedural formalities make Pakistan a difficult country to run business in. In 2017 Pakistan slipped down three places on world's "Ease of Doing Business" index to 147th rank among 190 countries⁵. This points towards extensive codal formalities in various processes in Pakistan. Another important aspect that has been ignored in Pakistan's estimates is the effect of shadow economy on the official sector. Although shadow economy is widely accepted to be a nuisance because of the previously discussed policy issues as well as the fact that illegal activities have deep roots in the hidden sector. Yet it might be giving survival opportunities to the officially unemployed, and is considered to be very dynamic

³ http://www.pk.undp.org/content/pakistan/en/home/library/hiv_aids/Multidimensional-Poverty-in-Pakistan.html

⁴ UNDP Press Release June 20, 2016: "Pakistan's new poverty index reveals that 4 out of 10 Pakistanis live in multidimensional poverty"

⁵ Shahbaz, R. (2017, November 1). Pakistan now ranked 147th in World Bank's Ease of Doing Business Index. The Express Tribune. Retrieved from URL: <https://tribune.com.pk/story/1546434/2-pakistan-now-ranked-147th-world-banks-ease-business-index/>

and can change with economic conditions as against formal sector which is marred with bureaucratic formalities.

This paper is an attempt to estimate shadow economy of Pakistan, but the novelty comes from use of ARDL with three indicator variables. Most of the authors used OLS for shadow economy estimates of Pakistan via currency demand approach (except Arby et al (2010) and Kiani et al (2015) who also used ARDL). OLS estimates might not be consistent since it is estimated on time series variables and there is a chance of unit root. Just like preceding authors we use a tax variable but we also include unemployment rate and a proxy for “intensity of regulation and control” by the government in an economy which is known to be one of the causes of shadow economy. Hence we expect increased taxes, increased unemployment, and increased intensity of regulations and control in Pakistan to have statistically and economically significant impact in increasing shadow economy. Detailed discussion of indicator variables will follow in section 3.2. We build three models for estimations where two have been estimated using Engel Granger two step approach while one has been estimated by employing ARDL bounds testing approach. We provide latest estimates from 1975 to 2015 with these indicator variables which is not available in literature. Also for the first time in case of Pakistan we link our estimates with the political regime at the time and find that the results are very consistent with the actual events in a specific regime.

Another novel aspect of this paper is the use of dynamic simulations to show what the actual GDP per Capita of Pakistan would be if shadow economy is not present. For this we estimate an ARDL model for the short and long run effects of the shadow economy on official sector which as per the authors’ knowledge is not available in literature in case of Pakistan. Then we show the distortion in GDP per Capita first by only considering the long run effect of shadow economy and then including short run effect as well.

The remainder of the paper is structured as follows: Section 2 discusses the existing literature published on Pakistan’s estimates of Shadow Economy. In Section 3 we discuss definition of a shadow economy and present the main causes for the existence of a shadow economy. In section 4 we show the estimation methodology and the used dependent and independent variables. Section 5 presents the econometric results and section 6 provides the size and development of the shadow economy for Pakistan over 1973 to 2015. Section 7 consists of interaction between official and unofficial sectors and finally section 8 presents a summary and draws some conclusions.

2. Literature Review

Empirical studies on Pakistan have shown the growth in shadow economy and tax evasion. Table 1 presents a summary of all the estimates on shadow economy of Pakistan (up to the authors knowledge). Kemal (2007) used three currency demand equations all having the ratio of currency in circulation and

Table 1 Summary of Literature on Shadow Economy Estimates of Pakistan

Sr. No.	Authors	Estimation Period	Theoretical Approach	Empirical Estimation Methodology	Main Results ⁶
1.	Ahmed and Ahmed (1995),	1960-1990	Modified Tanzi's Monetary Approach including bearer bonds	OLS	Avg Shadow Economy: 41.79%. Overall Increase in Tax Evasion and SE, but decline in SE as percentage of GDP.
2.	Shabsigh (1995),	1975-1991	Modified Tanzi's Monetary Approach used to estimate shadow economy as percentage of domestic, exports and imports sectors	OLS	Avg Shadow Economy: 22.70% Overall Increase in in SE as percentage of GDP. Showed Short run and Long run relationship between SE and Govt Budget Deficit
3.	Aslam (1998),	1960-1998	Modified Tanzi's Monetary Approach including dummy for Resident Foreign Currency Accounts	OLS	Avg Shadow Economy: 39.33%. High level of Shadow Economy susceptible to/fluctuating with changes in policies and political scenario
4.	Iqbal, Qureshi, and Mahmood (1998),	1973-1996	Modified Tanzi's Monetary Approach including domestic and foreign tax variables	OLS	Avg Shadow Economy: 34.30%. Increasing Shadow Economy and Tax Evasion
5.	Kemal (2003),	1974-2002	Modified Tanzi's Approach	OLS	Avg Shadow Economy: 31.82%. Increasing Shadow Economy
6.	Yasmin and Rauf (2003),	1974-2002	Tanzi's Approach	OLS	Avg Shadow Economy: 23.62%. Increasing Shadow Economy. Shadow Economy and Tax Evasion has negative impact on Formal economy
8.	Kemal (2007),	1974-2005	Modified Tanzi's Approach	OLS and VAR Model	Avg Shadow Economy from 3 equations: 25.77, 49.54, and 36.37 %. Increasing Shadow Economy. Using Cointegration found significant positive long run association between Official and Unofficial Economies. While using VAR results showed positive effect of SE on GDP in Short run but no effect of Formal economy on SE.
9.	Ahmed and Hussain (2008)	1960-2003	Modified Tanzi's Approach	OLS	Avg Shadow Economy: 25.22, and 30.51%. Using dummy for Tax Reforms of 1997, showed that tax reforms reduced unofficial demand for money.

⁶ Results also include Average Shadow Economy (SE) as percentage of GDP over the estimation period; based on estimates presented in Kemal and Qasim 2012)

10.	Arby, Malik and Hanif (2010)	1966-2008	Modified Tanzi's Approach	ARDL	Avg Shadow Economy: 29.68%. First an increasing trend with largest increase in 1990s and then decline.
		1973-2008	MIMIC Approach	Structural Equation Models	Avg Shadow Economy: 29.43 %. First a sharp increasing trend then consistent between 20-30% from 1980s to 2000s
		1975-2008	Electricity Consumption	-	Avg Shadow Economy: 21.60 %.
11.	Gulzar Junaid and Haider (2010)	1982-2010	Tanzi's Approach	OLS	Avg Shadow Economy: 34.11 %. Concluded that SE between 32-38 % of GDP
		1973-2010	Modified Tanzi's Approach	DOLS	Avg Shadow Economy: 23.84 %. Concluded that SE between 20-22 % of GDP
		1973-2010	MIMIC	Structural Equation Models	Avg Shadow Economy: 29.93 %. Concluded that SE around 28 % of GDP
		1974-2010	Electricity Consumption Approach	-	Avg Shadow Economy: 50.25 %. Concluded that SE between 20-22 % of GDP
		2002-2010	Labor Market Approach	-	Avg Shadow Economy: 26.74%. Negative relationship between growth rate of real GDP and avg. yearly income in informal sector.
12.	Kemal and Qasim 2012	2007-08	Kemal & Qasim Approach (Discrepancy Approach based on import & export mis-invoicing)	-	Estimated SE as 91.44 % of GDP for 2007-08. The author expects that estimates are still an underestimate owing to non-adjustment of investment data.
13.	Kiani, Ahmed, & Zaman (2015)	1975-2010	Modified Tanzi's Approach	ARDL	They average shadow economy of their estimates is 26.72%.

foreign currency accounts to Money supply as dependent variable, for the period 1974 to 2005. His estimates showed that in 2005 the shadow economy ranged from 54.6 to 62.8 as percentage of GDP.

The tax revenue lost by Pakistan is of utmost importance for its economy and Ahmed and Ahmed (1995) estimated a revenue loss between Rs 40 to Rs 45 billion in 1989-90 alone due to black economy. The estimates of Pakistan by Ahmed and Ahmed (1995), Shabsigh (1995), Aslam (1998), Iqbal, Qureshi, and Mahmood (1998), Kemal (2003), Yasmin and Rauf (2003), Kemal (2007), Ahmed and Haider (2008), used Tanzi's currency demand equation and considered taxation as a major cause for increase of the shadow economy and used it as explanatory variable in one form or another. However, three recent studies are Arby, Malik and Hanif (2010), Gulzar, Junaid and Haider (2010), Kemal and Qasim (2012) and Kiani et al (2015). Arby et al. (2010) employed Autoregressive Distributed Lag Model and provided estimates uptill 2008 using Tax and Unemployment as indicators of shadow economy. They also estimated using electricity consumption approach and MIMIC model.

On the other hand, Gulzar et al. (2010) used monetary, Labor Market, MIMIC, and Electricity Consumption approaches. Kemal and Qasim (2012) developed a new discrepancy approach (KQ Approach); where they calculated total private consumption from the household survey for the total population and included mis-invoicing of imports and exports to calculate the true estimates of GDP for 2007-2008. The difference between this and published GDP was termed as shadow economy. Comparative graphs of the monetary approach based estimates, already highlighted in Table 1 above, are presented in Figures 1 & 2 below.

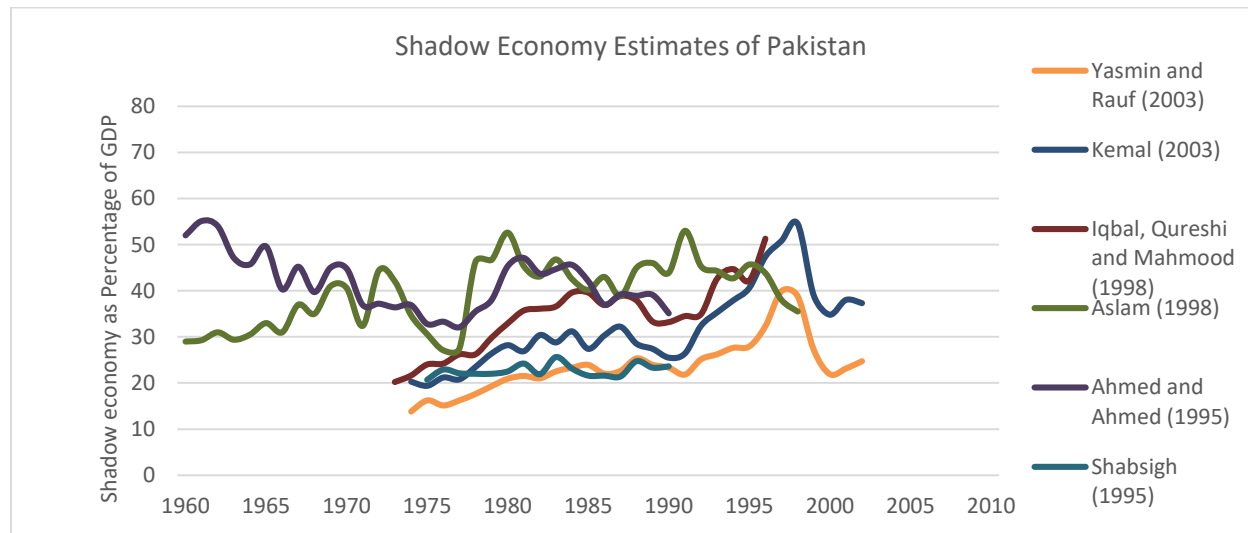


Figure 1 *Shadow Economy Estimates of Pakistan up till 2003*

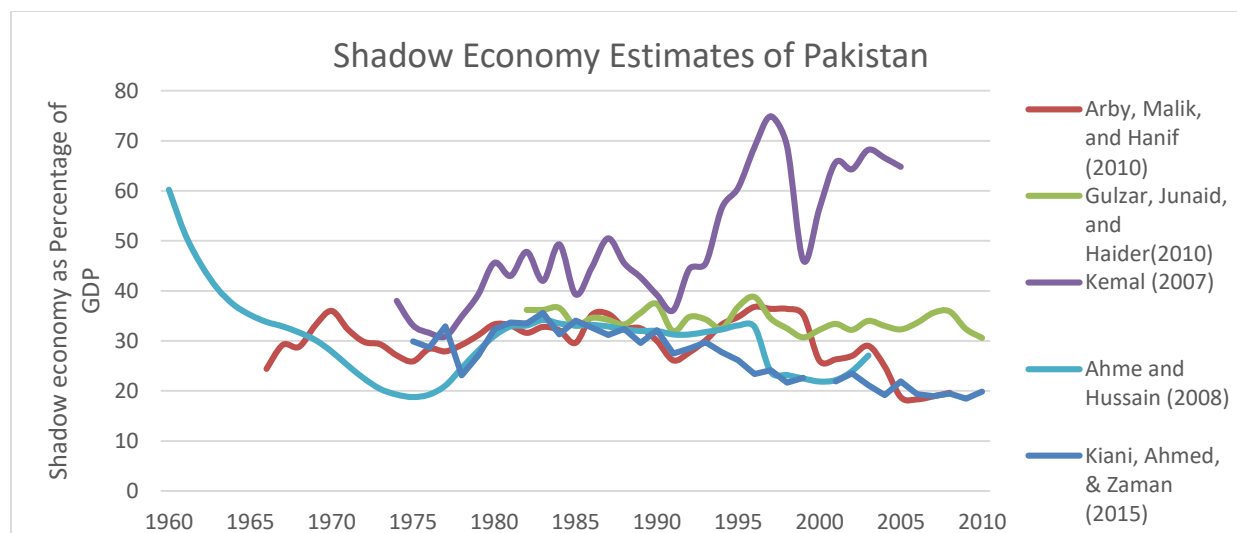


Figure 2 Shadow Economy Estimates of Pakistan from 2003 to 2010

Most of the studies showed shadow economy between 20 to 60 percent of the GDP over their respective estimation periods, except for Kemal (2007) whose estimates are on much higher side between the years 1995 to 2000s. As is evident from table 1, most of the authors while using currency demand approach utilized OLS to estimate the regression model, which might face the issue of cointegration and unit root, except for the cases of Arby et al. (2010) and Kian et al. (2015) who used ARDL, and Gulzar et al. (2010) who used DOLS using maximum likelihood approach. The prime variable of interest or the indicator variable has been tax variable in all the studies, while Arby et al. (2010) also added unemployment as an indicator. This is where our study brings novelty in the existing estimates of Pakistan, first by using ARDL and then having a proxy for government regulation and control exercised in the economy in addition to the unemployment and tax variable. The intensity of government control in the economy (to be discussed in detail in section 3.2.2) is expected to play a significant role in increasing shadow economic activities in the economy. Additionally, this study also contains another ARDL to capture the short and long run effects of shadow economy on the official sector along with dynamic simulations to present the magnitude of this interaction.

3. Theoretical Considerations

3.1 Defining Shadow Economy

There is yet to be a consensus among economists on the definition of the shadow economy hence it has acquired many names like Informal Economy, Underground Economy, Hidden or Black Economy, Unofficial Economy, Parallel Economy, Clandestine Economy, however there is a general agreement that the shadow economy comprises of hidden economic activities which result in distorted National Accounts. Tanzi (1999) emphasized “*there cannot be any question that the underground economy is a real phenomenon with important implications that deserve attention and study*”.⁷

To some extent the definitions are based on what exactly the researcher intends to measure and which part of the shadow economy is unveiled, i.e. whether the researcher intends to study just tax evasion, or informal labor markets, or informal household sector, or the research is carried out at a much macro level. A broader definition (OECD (2002)) is: “The shadow economy is defined as those activities that are productive and legal but are deliberately concealed from the public authorities to avoid payment of taxes and social security contributions or complying with regulations”.

⁷ See e.g. Vito Tanzi (1999), Feld and Schneider (2010), Schneider (2010), and Schneider, Buehn and Montenegro (2010).

For the purpose of research, we could not differentiate independently between legal and illegal activities since it is very difficult to get accurate data for smuggling, prostitution, and drug dealing etc. from Pakistan. And even if the data on such illegal activities is acquired somehow, the data reliability would be questionable. Therefore, since we are using currency demand approach, it is possible that the figures of shadow economy could include all unregistered economic activities, legal or illegal, that rely on cash based transactions and contribute to the officially published GNP.

3.2 Main Causes for the Existence of the Shadow Economy⁸

3.2.1 Increased Taxation

It is obvious that higher tax rates result in lower disposable income and reduce the incentives for workers to work in the official sector. Hence they might shift their activities towards unofficial sector where there is no taxation. Almost all the economists are of the same opinion that increased taxation and social security contributions play a vital role in increasing the shadow economy. Schneider (2006) mentions that

“The burden of taxation and social security contributions has a strong influence on individuals’ cost-benefit and/or labor-leisure choices because it heavily increases the opportunity cost for legal economic activities and finally reduces the profitability of legal (official) work. The greater the difference between total cost of labor in the official economy and after-tax earnings from work, the greater is the incentive to work in the shadow economy.”

Schneider and Halla (2005) argue that the idea of high tax morale is closely related to Motivation Crowding Theory. The motivation crowding theory is based on intrinsic and extrinsic motivation factors influencing an individual’s rational decision process. The intrinsic motivation of an individual is affected by the extrinsic factors, so the external factors like monetary benefits or increase in taxation can increase or decrease the tax morale of that individual. Spiro (1993) states “experience in other countries suggests that evasion of value-added taxes is a significant problem at the retail level. There is a likelihood that, at the margin, switching from the narrow-based federal manufacturers’ sales tax to the broad based goods and services tax (GST) may have increased the incentives and opportunities for tax evasion”. For Canada, Drummond et al. (1994) acknowledge the role of the increase in taxes including GST in the growth of shadow economy and also suggest that since the income tax was not increased either in 1991 or 1992, the increase in shadow economy may be due to the GST. In underdeveloped countries where a substantial number of people are living below the poverty line and yet many are striving to stay above it, taxes play a significant role in deciding whether they should work in the official or unofficial sector.

We summarize: Hypothesis 1: The higher the tax burden, the higher the shadow economy, *ceteris paribus*.

3.2.2 Intensity of Regulations

Restrictions by the government like permits and licenses increase prices of the goods and services by adding extra costs. It leaves a gap for underground workers and firms who can do the same at much lower costs. The relation between intrinsic and extrinsic motivation from the Motivation crowding theory can also be applied in the context of regulations. If the extrinsic factors like regulations, license fees, permits etc. cause an individual to feel overburdened and reduce his intrinsic motivation, it may result in pushing him towards shadow sector. The countries which have strong bureaucratic government structures also have various formalities even in simple procedures (red-tapism). Such formalities push certain agents either firms or individuals to look for and make use of shortcuts in the system or in some cases even bypass the system, which leads to hidden sector. Red-tapism often results in bribery etc. to speed up the process or to even get the job done in its due course of time. Such rules and regulations reduce the freedom of choice for individuals to work in the official sector and they are pushed towards the informal sector by the system itself.

⁸ For a comprehensive survey of all possible causes see Feld and Schneider (2010) and Schneider and Enste (2000)

Johnson, Kaufmann and Shleifer (1997) found empirical evidence that the countries with higher degree of regulations in their economies tend to have larger share of Shadow Economy in their GDP. They also conclude that implementing more regulations rather than enforcement of existing ones increases the shadow economy. Schneider and Enste (1998, 2000) suggest that Governments should put more emphasis on improving enforcement of the laws and regulations, rather than increasing their numbers. Loayza (1996) argues that as enforcement strength rises the relative size of the shadow economy decreases. Governments, however, prefer this policy option (more regulations and laws) when trying to reduce the shadow economy, mostly because this leads to an increased power of bureaucrats and a higher rate of employment in public sector. Schneider and Dreher (2006) also argue that more rigid regulations increases both corruption and shadow economy.

Again we summarize, hypothesis 2: The greater the intensity of regulation, the higher the shadow economy, *ceteris paribus*.

3.2.3 State of the “Official” economy

If the official economy is in a recession and/or if we observe low growth rates, unemployment increases providing people with more opportunities and necessities to work in shadow economy. Moreover, increased government restrictions on the labor market (minimum education level, minimum wage, maximum working hours) may cause extra burden on the firms for hiring as well as resulting in fewer job opportunities. Hence the job market is tightened with the effect of increasing unemployment. Unemployment together with increased taxation, high inflation, and minimal or no unemployment funds leads to the choice to become an unofficial economic agent, especially in case of developing countries where there is either minimal or nothing at all with respect to unemployment compensation.

Finally, we formulate hypothesis 3: The higher the unemployment rate, the higher is the shadow economy, *ceteris paribus*.

4. Estimation Methodology and Used Variables

There are multiple approaches to estimate shadow economy. The effectiveness of each approach mainly depends to two aspects, namely; which part of hidden economy a researcher intends to explore and the data availability which further depends on the country of origin. The approaches are broadly classified into direct and indirect approached, each of which have their own pros and cons. The direct approaches include survey questionnaires and tax auditing, however, the reliability of response in both of these approaches is questionable. The indirect approaches include national accounts discrepancy approach where the difference in income and expenditure side of national accounts can be treated as shadow economy. However, as pointed out by Schneider and Enste (2000); the national accounts statisticians will be anxious to minimize this difference and hence the published national accounts would not represent the true picture. Electricity demand approach is another indirect approach which is based on the assumption that GDP and Electricity has elasticity close to one, so the growth in total electricity consumption is an indicator of growth of total GDP, which includes the official as well as unofficial GDP. Therefore, overall growth in electricity can give a measure of shadow economy if official GDP is subtracted from the simulated GDP using electricity consumption. However, this approach will at best measure small scale household manufacturing in the shadow sector, since many shadow activities do not require use of electricity. Furthermore, with extensive electricity load shedding in Pakistan, many small scale businesses are dependent on diesel or gas generators, which further complicates the estimations. Another indirect approach is Multiple Indicators Multiple Causes (MIMIC) model which is latent or unobserved variables approach and in this case shadow economy is measured as a latent variable over time. Despite its advanced ability of catering for more than one cause and indicator variables this approach also has some shortcomings. As pointed out by Schneider (2006) that it shows volatility in the estimates with changes in sample size and specifications. The indirect approach

used in this paper is currency demand approach. This approach assumes that most of the transactions in shadow economy take place in the form of cash. Assuming Tax rate (used by Tanzi (1980, 1983)) as one of the reasons for increase in shadow economy, a currency demand equation is estimated while controlling for all the other factors influencing official demand for cash like per capita income, interest rate etc. Again assuming that at minimum tax rate there would be no shadow economy the equation is used to estimate the total shadow economy as percentage of GDP. This approach has been most widely used indirect approach for estimations in various countries and is known to produce acceptable results.⁹ Schneider and Hametner (2007) selected a variant of currency demand approach in which two tax variables (direct and indirect tax) were included to estimate the additional demand for cash induced due to shadow economic activities. A similar attempt, using a modified currency demand approach, has been made by Ardizzi, Petraglia, Piacenza, and Turati (2012), in which the authors have used “Ratio of the value of cash withdrawn from bank accounts to the value of total payments settled by instruments other than the bank” as a dependent variable. Considering the few basic assumptions of the shadow economic activities, the agents in unofficial sector do not prefer bank deposits or any other traceable financial asset, due to fear of prosecution in case of illegal activities and taxation in case of legal activities. Therefore, it can be assumed that such kind of dependent variable, which is based on bank account transaction, could only capture a small segment of the shadow sector, where the individuals do not fear to deposit their hidden cash in the banks. In order to capture a larger share of the shadow sector we use the currency deposit ratio as the dependent variable, where the currency demand consisted of currency outside deposit money banks.

In this paper, we have used yearly data from 1973 to 2015 to estimate currency demand equation for Pakistan and include shadow economy indicator variables in addition to traditional currency demand explanatory variables like GDP per capita, household consumption expenditure and rate of inflation. All the data was collected from State bank of Pakistan’s “Handbook of Pakistan Economy 2005” and yearly reports. The data for Inflation is from World Development Indicators. We establish a cointegrating relationship between the currency deposit ratio and other related variables and then use it to deduce the size of the informal sector in Pakistan’s economy. Instead of only using a Tax variable, we also use unemployment rate and government’s public admin and defense expenditure as a proxy of intensity of regulations and control over the economy. Larger public and defense expenditure represents more control over the economy by government in terms of more manpower as well as infrastructure.

Since we are using time series variables therefore, there is a possibility of unit roots and cointegration. We use two different techniques to estimate our model. First we employ Engel Granger Two Step Approach suggested by Engle and Granger (1987). In case there is unit root in variables, the EG model is first estimated at level and its residual is tested for unit root. If the residual is stationary, which is confirmation of cointegration, a second model is estimated at differences where lag of residual from first model appears as error correction term. Therefore, in this approach the coefficients with differenced variables express the short run relationship while the lagged residual from the level model establishes long run cointegration and shows error correction. We estimate the following two models¹⁰ using this approach:

⁹ Detailed discussion on various estimation procedures and critique to each of them has been extensively done by Schneider & Enste (2000) and Feld & Schneider (2010).

¹⁰ The only difference in above two models is how the proxy for government regulations and control enter into each model. We have used Government’s Public Admin and Defense Expenditure (PADE) in model 1 while Government’s Public Admin and Defense Expenditure per Capita (PADEPC) in model 2. This is only to ensure that our results are stable, since if the two variables are a true proxy of the same concept (excessive control), the size of coefficient should not change drastically with change in their calculation.

$$\begin{aligned} \Delta \text{LnC2DDP}_t = & \gamma_0 + \sum_{i=1}^n \gamma_{1i} \Delta \text{LnC2DDP}_{t-i} + \sum_{i=0}^n \gamma_{2i} \Delta \text{LnTAXGDP}_{t-i} + \sum_{i=0}^n \gamma_{3i} \Delta \text{LnUNEMP}_{t-i} \\ & + \sum_{i=0}^n \gamma_{4i} \Delta \text{LnLnPADE}_{t-i} + \sum_{i=0}^n \gamma_{5i} \Delta \text{LnLnGDPPC}_{t-i} + \sum_{i=0}^n \gamma_{6i} \Delta \text{LnHHCONPC}_{t-i} + \sum_{i=0}^n \gamma_{7i} \Delta \text{INFL}_{t-i} \\ & + \gamma_8 \text{SB}_t + \gamma_9 \mu_{t-1} + \varepsilon_t \dots \dots \dots (1) \end{aligned}$$

$$\begin{aligned} \Delta \text{LnC2DDP}_t = & \gamma_0 + \sum_{i=1}^n \gamma_{1i} \Delta \text{LnC2DDP}_{t-i} + \sum_{i=0}^n \gamma_{2i} \Delta \text{LnTAXGDP}_{t-i} + \sum_{i=0}^n \gamma_{3i} \Delta \text{LnUNEMP}_{t-i} \\ & + \sum_{i=0}^n \gamma_{4i} \Delta \text{LnLnPADEPC}_{t-i} + \sum_{i=0}^n \gamma_{5i} \Delta \text{LnLnGDPPC}_{t-i} + \sum_{i=0}^n \gamma_{6i} \Delta \text{LnHHCONPC}_{t-i} + \sum_{i=0}^n \gamma_{7i} \Delta \text{INFL}_{t-i} \\ & + \gamma_8 \text{SB}_t + \gamma_9 \mu_{t-1} + \varepsilon_t \dots \dots \dots (2) \end{aligned}$$

where,

C2DD is the Currency Deposit Ratio

TAXGDP is the Direct Tax Revenue as percentage of GDP

UNEMP is Rate of Unemployment

PADE is Government’s Public Admin and Defense Expenditure

PADEPC is Government’s Public Admin and Defense Expenditure per Capita

GDPPC is GDP per Capita

HHCONPC is Household Consumption Expenditure per Capita

INFL is the Rate of inflation

SB is the dummy variable for Structural Break¹¹ taking a value 1 from 2006 to 2015 and a value of 0 otherwise.

μ_{t-1} is lagged residual from the regression of same equation in levels

Secondly we also employ Autoregressive Distributed Lag (ARDL) model suggested by Pesaran and Shin (1999) and Pesaran et al (2001) which allows the use of both stationary and non-stationary variables in one model and can also produce long and short run relationships. Pesaran and Shin (1999) showed that ARDL-based estimators are super-consistent, and valid inferences on the long-run parameters can be drawn using the standard normal asymptotic theory. Before estimating ARDL bounds test, stationarity of all the variables has been examined by applying Dickey and Fuller (1979) unit root test to determine the order of integration. Although ARDL bounds test approach does not require all the variables to be integrated of same order but I(2) variables cannot be included, since computed F-statistic under bounds testing approach are based on the assumption that variables are either integrated of order zero or one i.e., I(0) or I(1). While using ARDL for estimation in addition to our three previously used shadow economy indicator variables we also include an interaction term between the dummy variable dictator and currency demand as another proxy for intensity of control and regulation in the economy. The dictator variable has a value of “1” during period of dictatorships while is equal to “0” during democracies. Hence it will be an attempt to see if the currency demand increases during dictatorships which are generally assumed to be periods of extensive control over the economy relative to democratic periods. Rest we include usual control variable for explain the currency demand in an economy. We estimated the following model with ARDL:

¹¹ As per BSD Circular No. 9 dated 18-7-2006, the amounts of Time Deposits with tenor of less than six months have been included to Demand Deposits from July 06.

ratio to increase by 0.22 percent. The proxy for intensity of government regulation has almost similar magnitude as TAXGDP ratio.

Table 2 Currency Demand Equation Using Engle Granger Two Step Procedure (Model 1 & 2)

Dependent Variable : Currency to Deposit ratio (D1.lnc2dd)		No. of Obs: 41			
Exogenous Variables		Model 1		Model 2	
Description	Variable Name	Coefficient	P>t	Coefficient	P>t
Lagged Currency to Deposit ratio	L1.D1.lnc2dd	0.078018 (0.092324)	0.405	0.087632 (0.091054)	0.343
Tax GDP Ratio	D1.lntaxgdp	0.464924* (0.247779)	0.07	0.439095* (0.240794)	0.078
Unemployment rate	D1.lnunemp	0.226589** (0.095879)	0.025	0.221129** (0.098406)	0.032
Public Admin & Defense Expenditure	D1.lnpade	0.465282** (0.214368)	0.038	-	-
Public Admin & Defense Expenditure per Capita	D1.lnpadepc	-	-	0.449066** (0.194371)	0.028
GDP per Capita	D1.lngdppc	-1.75186 (1.067717)	0.111	-1.73527 (1.070033)	0.115
Household Consumption per Capita	D1.lnhhconpc	0.14885*** (0.044151)	0.002	0.149669*** (0.043881)	0.002
Rate of Inflation	D1.infl_gdp	0.001185 (0.002403)	0.625	0.001165 (0.002387)	0.629
Structural Break	sb	-0.47198*** (0.129632)	0.001	-0.47938*** (0.127861)	0.001
EC Term	L1.resid	-0.42896*** (0.128568)	0.002	-0.43696*** (0.126732)	0.002
Intercept	_cons	-0.06487 (0.051018)	0.213	-0.05212 (0.048506)	0.291
R Squared		0.5870		0.5876	
Legend: * p<.1; ** p<.05; *** p<.01		(Robust Standard Error in Parentheses)			
Dicky Fuller Test for Unit root in Residual		-0.686		-0.689	
Legend: 1%: -3.634 5%: -2.952 10%: -2.610					

The table also contains unit root test for the residual of first step of Engle Granger Approach (estimation in levels) showing that residual is stationary, hence showing long run cointegration among the variables. When this residual is added as error correction term in these models it is negatively significant showing that the system reaches equilibrium. The disequilibrium is corrected by 42.8% annually in case of Model-1 while 43.6% annually in case of Model-2.

Table 3 below presents the autocorrelation and heteroscedasticity tests for the regressions in Table 2. The null of “no serial correlation” from Breusch-Godfrey LM test and “constant variance” of Breusch-Pagan/Cook-Weisberg heteroskedasticity test cannot be rejected.

Table 3 Diagnostic Tests for Model 1 & 2

Breusch-Godfrey LM test for autocorrelation <i>H0: no serial correlation</i>	chi2 = 0.134 Prob > chi2 = 0.7147	chi2 = 0.086 Prob > chi2 = 0.7695
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity, Ho: Constant variance	chi2 = 0.48 Prob > chi2 = 0.4897	chi2 = 0.54 Prob > chi2 = 0.4644
Cameron & Trivedi's decomposition of IM-test		
Heteroskedasticity	chi2 =41.00 Prob > chi2 = 0.4265	chi2 =41.00 Prob > chi2 = 0.4265
Skewness	chi2 =11.17 Prob > chi2 = 0.2642	chi2 =11.00 Prob > chi2 = 0.2760
Kurtosis	chi2 =0.22 Prob > chi2 = 0.6406	chi2 =0.37 Prob > chi2 = 0.5418
Total	chi2 =49.42 Prob > chi2 = 0.4965	chi2 =52.37 Prob > chi2 = 0.3822

5.2 Autoregressive Distributed Lag Model

Model-3 was estimated using ARDL bounds testing approach. Estimation results are placed at Table 4. All the variables were I(1) after being tested by Dicky Fuller Test suggested by Dickey and Fuller (1979) (Test results placed in Annex A table A.2). None of the variables is I(2) hence it was safe to run ARDL. One of the advantages of this technique is that we get long run as well as short run relationships among the variables. Results show that all the variables appear with expected signs except CD_DIC in short run, which is insignificant. Our indicator variables namely; TAX GDP, UNEMP and PADE_per also appear with expected signs showing that increased taxes, unemployment and increased intensity of government regulations and control in an economy leads to greater demand for cash and hence increased shadow economic activities, which again confirms our hypotheses. TAXGDP is significant at 1% while PADE_per and UNEMP are significant at 5% significant levels. The statistics for test of serial correlation by Breusch-Godfrey LM test and heteroscedasticity by Breusch-Pagan/Cook-Weisberg test are placed in Table 5 showing that there is no problem of serial correlation or heteroscedasticity in the model. Further CUSUM and CUSUM Sq showing stability of the results are placed at Annexure.

Table 4 Currency Demand Equation Using ARDL (Model 3)

Dependent Variable : Currency to Deposit ratio (D1.lnc2dd)			No. of Obs: 40	
Exogenous Variables			Model 3	
	Description	Variable Name	Coefficient	P>t
ADJ	Lagged Currency to Deposit ratio	L1.c2dd	-0.7132889*** (0.1140522)	0.000
LR	<i>Tax GDP Ratio</i>	<i>L1.taxgdp</i>	<i>0.107691***</i> <i>(0.0257733)</i>	<i>0.000</i>
	<i>Unemployment Rate</i>	<i>L1.unemp</i>	<i>.0613354**</i> <i>(.0243673)</i>	<i>0.018</i>
	<i>Public Admin & Defense Expenditure</i>	<i>L1.lnpade_per</i>	<i>.6007408**</i> <i>(.2305308)</i>	<i>0.014</i>
	GDP per Capita	L1.lngdppc	0.2126013 (0.1524451)	0.174
	Rate of Inflation	L1.infl	0.0160625*** (0.003971)	0.000
	Household Consumption per Capita	L1.lnhhconpc	0.0503329	0.281

			(0.0458633)	
	Currency Demand & Dictator (Dummy Interaction Var)	L1.Cd_dic	.0000142 (.0000141)	0.320
	Structural Break	L1.sb	-0.5402244*** (0.0797953)	0.000
SR	Tax GDP Ratio	D1.taxgdp	0.0768148*** (0.0184372)	0.000
	Unemployment Rate	D1.unemp	0.0437499** (0.0178016)	0.020
	Public Admin & Defense Expenditure	D1.lnpade_per	0.4285018** (0.1679437)	0.016
	GDP per Capita	D1.lngdppc	-1.778686** (0.7544943)	0.025
	Rate of Inflation	D1.infl	0.0114572*** (0.0028537)	0.000
	Household Consumption	D1.lnhhcons	0.0359019 (0.0315018)	0.264
	Currency Demand & Dictator (Dummy Interaction Var)	D1.Cd_dic	-0.385336 (0.0873575)	0.340
	Structural Break	D1.sb	0.0000101*** (0.0000104)	0.000
	Intercept	_cons	-3.231903*** (1.060926)	0.005
R-squared			0.66842976	
Legend: * p<.1; ** p<.05; *** p<.01			(Standard Errors in Parentheses)	

Table 5 Diagnostic Tests for Model 3

Breusch-Godfrey LM test for autocorrelation <i>H0: no serial correlation</i>	chi2 = 0.135	Prob > chi2 = 0.7129
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity <i>Ho: Constant variance</i>	chi2 = 2.16	Prob > chi2 = 0.1416
Cameron & Trivedi's decomposition of IM-test		
Heteroskedasticity	chi2 =40.00	Prob > chi2 = 0.4256
Skewness	chi2 =7.13	Prob > chi2 = 0.7134
Kurtosis	chi2 =2.29	Prob > chi2 = 0.1299
Total	chi2 =49.42	Prob > chi2 = 0.4965

The bounds test for long run cointegration is placed in Table 6. Since the calculated F statistic of 6.495 is above the upper bound, therefore, we can say that cointegration exists among the variables.

Table 6 Bounds Test for Cointegration

F-statistics calculated	Lower Bound Critical Value at 95%	Upper Bound Critical Value at 95%	Decision
6.495	2.22	3.39	Co-integration exists

The long run normalized equation from currency demand model above, which will be used for estimation of the shadow economy is as under:

$$C2DDP_t = -5.407 + 0.127TAXGDP + 0.081UNEMP + 1.014LnPADE_per + 0.318LnGDPPC + 0.032INFL + 0.058LnHHCONPC + 0.00003CD_DIC - 0.684SB$$

6. Size of the Shadow Economy of Pakistan

After the econometric estimations, simulations/calculations for the size of the shadow economy is carried out. The methodology adopted is such that the explanatory variables included to explain the extra demand for cash are to be held at their lowest level which provides the theoretical “official” demand for currency, which then are subtracted from the observed (total) demand for currency and finally provides the demand for currency generated due to shadow economic activities. These figures are multiplied by velocity of money in the official economy to get estimated size of the shadow economy. It needs to be highlighted that estimates of shadow economy from any technique, at best, give a trend in the shadow sector activities and in no case can be treated as exact, since estimates are subject to change with small changes in parameters. The main reason is hidden nature of agents in this sector and even direct estimates are as downward biased as the indirect estimates.

Figure 3 is graphical representations of the estimated size and development of shadow economy in percentage of GDP from all the three models. The table of results is placed in Annex A.2. Pakistan has had unstable political history which is evident from its periods of dictatorships and democracies spread across its existence. In order to elaborate on the yearly changes in estimates, each year in the figure has been coupled with the government regime of that year, where the head of state is mentioned if he/she was in power for six months or more in a given year. Interestingly the policies under two regimes might also differ specifically in terms of our new variable i.e. “intensity of regulations and control over the economy”. Displaying the estimates of shadow economy distributed across political regimes gives a meaningful understanding to our estimates.

The shadow economy in Pakistan has been increasing overall since 1973, however, the increase has been more rapid during the periods 1975-1980 which can be seen in all the three models. East Pakistan declared independence in Year 1971 and became Bangladesh. A sharp increase in the period 1975-1980 might be due to the effects of losing a part of the economy. Moreover, the democratic government of Zulfikar Ali Bhutto was replaced by the Dictatorship of General Zia-ul-Haq in 1977 which might be another reason for sharp increase in Shadow Economic activities. Model 1 & 2 show declining shadow economic activities in the latter periods of Zia’s regime which is not clear in Model 3. For rest of the years the three models follow a similar pattern. The reversal might be due to more liberal policies by Zia relative to Bhutto’s period which was covered in nationalization of many industries and strict control over the economy. From 1988-1990 and 1993-1996 Ms. Benazir Bhutto was elected the Prime Minister of Pakistan and was removed from the government in 1990 by the President Ghulam Ishaq Khan and in 1996 by President Farooq Ahmed Khan

Shadow Economy as Percentage of GDP

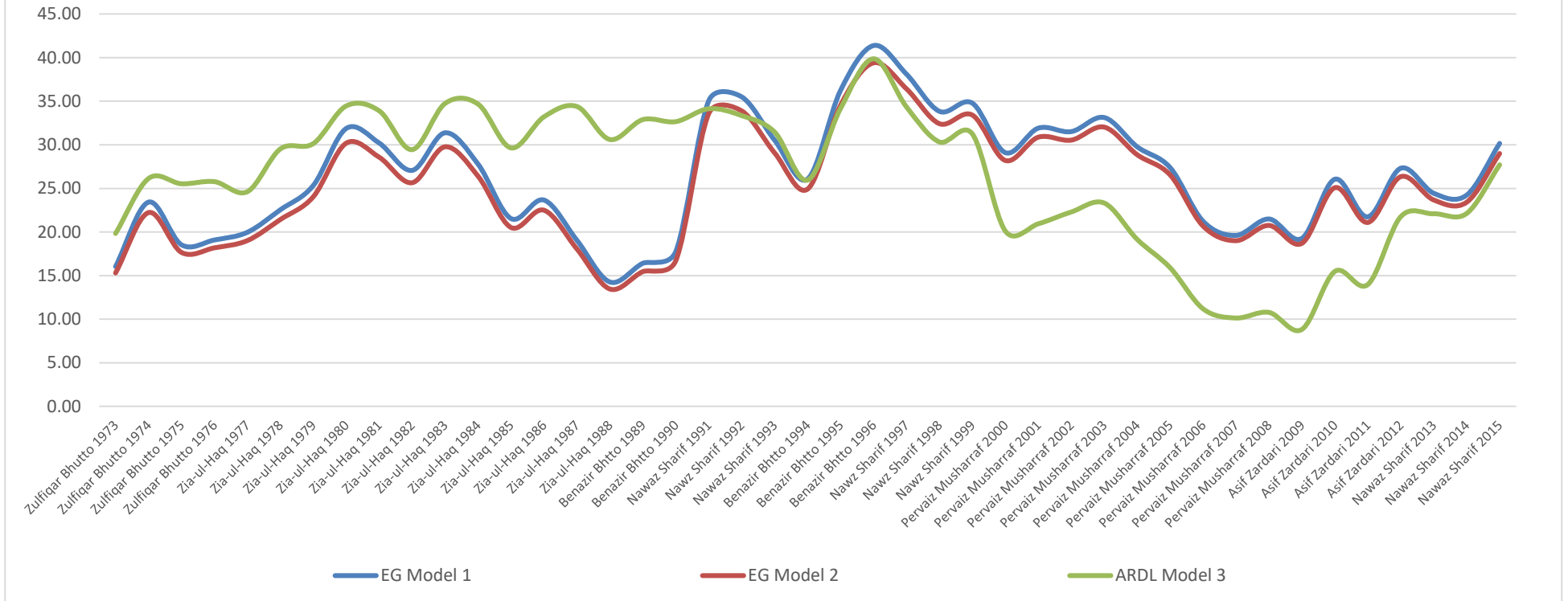


Figure 3 Estimates of Shadow Economy as Percentage of GDP using Models 1, 2 and 3

Laghari on the charges of corruption. The sharp decline in shadow economy from 1999 onwards represents the period of coupe by General Pervaiz Musharraf, which was again a dictatorship. Immediately after his coupe some extreme measures were taken to control corruption in the Government and an independent organization, National Accountability Bureau, was established to handle corruption cases along with introduction of new Tax Reforms resulting in sharp decline in corruption in the establishment. However, after 2008-2015 there is again an increasing trend which might be owing to resignation of President Musharraf.

7. Interaction between Official Sector and Shadow Economy

One of the main questions about existence of shadow economy is how it effects the official sector? The literature may have mixed views in this regard but the effect might differ across various economies owing to the economic structure both in informal and formal sectors. For example Loayza (1996) in his growth model concluded that in economies where the statutory tax burden is larger than the optimal tax burden and the implementation of obedience is too weak, the increase of the relative size of informal economy generates a reduction of economic growth. While on the other hand shadow economy stimulates the economic activity by giving jobs to the unemployed and providing services in the far-flung areas of an economy where the official sector has not yet reached. Schneider and Hametner (2007) for Columbia and Kemal (2007) for Pakistan and Dell' Anno (2008) for Latin American Countries found a positive relation between the GDP growth and shadow economy. Therefore, we summarize our hypothesis: *Increase in shadow economy may have a positive or negative effect on the growth of official economy.*

Although the informal sector may have a positive or negative impact, yet it would be interesting to differentiate between long and short run impact of informal sector on the official one. By using ARDL model we can have long and short run estimates of shadow economy on the economic growth. This is one of the novelties in our research paper for which the authors have found no evidence in past literature. The empirical analysis is carried out by using a log-log model with Log of GDP per capita as the dependent variable and log of shadow economy (as percentage of GDP) as exogenous variable along with other control variables for the yearly data from 1973-2015. All the variables have been tested for Unit roots by using Dicky Fuller tests to make sure that none of the variables are I(2), as already discussed; ARDL can only have I(0) and I(1) variables. The results are placed at Table A.3 in Annexure. Akaike Information Criteria has been used to check for the optimal number of lags to be employed in the model. The following model is estimated:

$$\begin{aligned} \Delta \text{LnGDPPC}_t = & \beta_0 + \beta_1 \text{LnGDPPC}_{t-1} + \beta_2 \text{LnTINVPC}_{t-1} + \beta_3 \text{LnDEVHEXP}_{t-1} + \beta_4 \text{LnTVIENROLL}_{t-1} + \beta_5 \text{LnUNIENROLL}_{t-1} \\ & + \beta_6 \text{LnINFL}_{t-1} + \beta_7 \text{LnSE}_{t-1} + \sum_{i=1}^n \gamma_{1i} \Delta \text{LnTINVPC}_{t-i} + \sum_{i=0}^n \gamma_{2i} \Delta \text{LnDEVHEXP}_{t-i} + \sum_{i=0}^n \gamma_{3i} \Delta \text{LnTVIENROLL}_{t-i} \\ & + \sum_{i=0}^n \gamma_{4i} \Delta \text{LnUNIENROLL}_{t-i} + \sum_{i=0}^n \gamma_{5i} \Delta \text{LnINFL}_{t-i} + \sum_{i=0}^n \gamma_{6i} \Delta \text{LnSE}_{t-i} + \mu_t \dots \dots \dots (4) \end{aligned}$$

where

- GDPPC is GDP per capita as the dependent variable
- TINVPC is Total Investment per Capita
- DEVHEXP is Development expenditure in health sector
- TVIENROLL is enrollment in Technical and Vocational Institutes
- UNIENROLL is enrollment in Universities
- INFL is Rate of INflation
- SE is the Shadow Economy as Percentage of GDP, own estimates.

All the variables appear in log form. The variables TINVPC, DEVHEXP, TVIENROLL, and UNIENROLL are expected to have a positive sign while INFL is expected to have negative effect on economic growth.

The error correction term (Adjustment Term) is expected to have a negative significant sign. As already discussed, due to varying effects of shadow economy on the official sector, we might expect a positive or negative sign with the variable.

The results are placed at Table 7. All the variables appear with expected signs in short and long run except UNIENROLL, which is not statistically significant. In long run Total Investment per capita, Technical & Vocational Institute Enrollment and Shadow economy as percentage of GDP have significant impacts. All these variables are significant at 1% level.

Table 7 Interaction between Official and Unofficial Sectors

Dependent Variable: 1st Difference of GDP Per Capita (D.lngdppc)			Number of Obs: 39			
	Variable	Description	Coefficient	Std Error	P>t	
ADJ	L1.lngdppc	GDP per Capita	-.4119078***	0.0665079	0.000	
LR	L1.Intinvpc	Total Inv per Capita	.4342535***	0.0695511	0.000	
	L1.Indevhexp	Development Health Expenditure	.0507818	.034773	0.160	
	L1.Intvienroll	Enrollment (TVI)	.1626005***	0.0450507	0.002	
	L1.Inunienroll	Enrollment (Uni)	-.0098421	0.0314684	0.758	
	L1.lninfl_gdp	Rate of Inflation	-.0196076	0.0117744	0.111	
	L1.Inse	SE as %age of GDP	.235977***	0.0418765	0.000	
SR	L1D.lngdppc	GDP per Capita	-.5374779***	0.1673397	0.004	
	L2D.		-.669267***	0.1501029	0.000	
	L3D		-.236711*	0.134136	0.093	
	D1.Intinvpc	Total Inv per Capita	.1788724***	0.0366556	0.000	
	D1.Indevhexp	Development Health Expenditure	.0209174	0.0147898	0.173	
	D1.Intvienroll	Enrollment (TVI)	.0669764***	0.0224458	0.007	
	D1.Inunienroll	Enrollment (Uni)	-.0221736	0.0179311	0.231	
	L1D.		-.0141002	0.0208296	0.506	
	L2D.		.0567216***	0.01978	0.010	
	L3D.		.0622178***	0.0192151	0.004	
	D1.lninfl_gdp	Rate of Inflation	-.0080765	0.0046839	0.100	
	D1.Inse	SE as %age of GDP	.0152208	0.0142467	0.298	
	L1D.		-.0502593***	0.0168271	0.007	
	L2D.		-.0364915**	0.0174465	0.049	
	L3D.		-.0300869**	0.0135103	0.038	
	_cons		Constant Term	1.82392***	0.3673542	0.000
	R-squared				0.80589672	
	Legend: * p<.1; ** p<.05; *** p<.01					

The short run results are also as expected. The most interesting part is that shadow economy has significant negative impact in the short run, which is different from long run effect. The shadow sector is a burden to the economy owing to tax evasion. This results into greater tax burden in the official sector hence a negative impact. The positive impact of shadow economy on economic growth in long run depicts the situation that it is a safe haven for poor population, which is highly likely in a developing country like Pakistan with

growing population. Many rural areas are deprived of basic facilities coupled with high unemployment rate, which as seen in the estimations section was causing an increased demand for currency. Hence it is evident that the officially unemployed have found means to earn income while staying hidden from the government documentation. Hence, tax evasion and sales tax skimming might be a major part of this positive impact. Additionally with excessive government control in the economy, the bureaucratic power itself might drive people towards alternate means to achieve a given legal right. The positive impact of shadow sector is further authenticated by the recent events in 2015-16, when owing to increase in Bank withholding tax rates on tax filers and non-filers¹², many businessmen went on strikes against the Government¹³. This clearly shows that tax evasion is from the productive sector of the society as well. Further if we consider the factor of intensity of regulations and control that increases bureaucratic power, it is a possibility that absence of such formalities may bring efficiency in business processes in the unofficial sector. Still it cannot be ignored that the hidden sector might also consist of illegal activities, and hence an increase in shadow economy might also contain a part of increase in illegal activities.

Table 8 gives the Bounds test statistic for Cointegration while Table 9 below presents diagnostic test statistics for the above results:

Table 8 Bounds Test for Cointegration

F-statistics calculated	Lower Bound Critical Value at 95%	Upper Bound Critical Value at 95%	Decision
7.584	2.45	3.61	Co-integration exists

Table 9 Diagnostic Tests for Interaction Model

Breusch-Godfrey LM test for autocorrelation <i>H0: no serial correlation</i>	chi2 = 0.121	Prob > chi2 = 0.7285
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity <i>Ho: Constant variance</i>	chi2 = 2.91	Prob > chi2 = 0.0879
Cameron & Trivedi's decomposition of IM-test		
Heteroskedasticity	chi2 =40.00	Prob > chi2 = 0.4256
Skewness	chi2 =7.13	Prob > chi2 = 0.7134
Kurtosis	chi2 =2.29	Prob > chi2 = 0.1299
Total	chi2 =49.42	Prob > chi2 = 0.4965

Since the F-statistic of 7.584 in Table 8 is above the upper bound critical value, there is long run cointegration among the variables. The Breusch-Godfrey LM test for autocorrelation and Breusch-Pagan/Cook-Weisberg test for heteroskedasticity clearly show that there is no problem of heteroskedasticity or serial correlation in the model, since we cannot reject the null hypothesis in each case. The CUSUM and CUSUM squared graphs also confirm stability of the model and are placed at Annex A. Based on the above model Log run normalized equation is:

¹² Withholding Tax on Non-filers is more than on filers, for every cash withdrawal

¹³ Iqbal, S. (2015, July 5). Tax on cash withdrawals stokes dollar demand. Dawn. Retrieved from: <https://www.dawn.com/news/1192489>

$$\ln GDPPC_t = 4.428 + 1.054 \ln TINVPC + 0.123 \ln DEVHEXP + 0.395 \ln TVIENROLL - 0.024 \ln UNIENROLL - 0.048 \ln INFL + 0.573 \ln SE$$

The above equation shows that a 1 percentage increase in SE would lead to 0.573 percentage increase in GDP per Capita. In order to empirically determine the relative and absolute influence of the shadow economy on official sector, for the study period, simulations are carried out. By using a dynamic simulation, the difference between official and theoretical real GDP per capita can be determined. Based on our estimates in table 7; shadow economy has positively and negatively contributed to GDP per capita in long and short runs respectively, hence by multiplying yearly variation in shadow economy with its estimated long run and short run coefficients and then subtracting long run result and adding short run result from the official recorded GDP per capita gives us the influence of Shadow Economy on the official economy of Pakistan, i.e. “What the official GDP per capita had been if the Shadow Economy had not been there?”. The simulation results are shown in Figure 4. The figure consists of three columns, the official GDP per capita, long run effect of Shadow Sector, and the last column is one where the short run effects are also accounted for by adding back the negative influence of shadow economy in the short run.

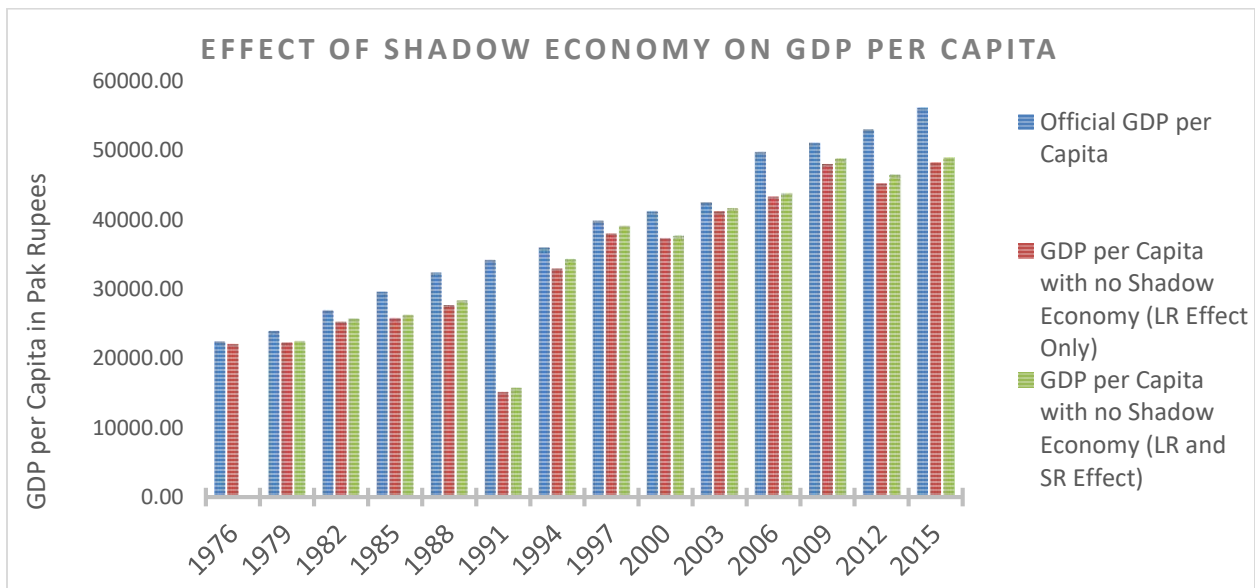


Figure 4 Influence of Shadow Economy on Official Sector of Pakistan

Figure above clearly shows that when the influence of Shadow Economy is removed using the estimated coefficient, the officially published figures are distorted, hence showing true picture of GDP per capita. Since the shadow economy has had positive effect on it in the Long run, therefore, if there had been no shadow economy the actual GDP per capita would have been lower. The same is presented in the table below for selected years, while the complete table is placed at Annex A.4.

year	Official GDP per Capita (Pak Rupees)	GDP per capita with no Shadow Economy (LR Effect Only)	GDP per capita with no Shadow Economy (LR and SR Effect)
1980	24917.80	21233.24	21540.01
1985	29562.80	25759.60	26193.74

1990	33320.60	31748.93	32501.56
1995	38512.40	29920.80	30414.39
2000	41114.90	37271.55	37594.46
2005	47803.90	45611.52	45961.90
2010	51251.30	40917.82	41481.42
2015	56061.20	48208.04	48879.25

Table 10 Influence of Shadow Economy on Official Sector

8. Summary and Conclusion

One of the prime reasons for considering the shadow economy as a nuisance is that it distorts the national accounts statistics resulting undesired effects of economic policies. The type of activities in a shadow economy that take place might be different from one culture to another and from one development stage of an economy to another. The non-payment of taxes and license fees by entities in the informal sector results in a similar effect as cross-subsidization. The economic agents working in the official sector, by paying taxes and license fees, are also bearing the burden of those who choose to avoid such formalities.

Pakistan’s public sector is dominated by bureaucratic dominance. Having a high share of population living below poverty line the local firms have to compete with the multinational firms from developed countries. Such firms have their basis in sound economic and political environment and are better able to compete with local firms who have to face political as well as economic turmoil on regular intervals. On one end it is necessary that education and research is promoted for the economic growth while on the other end providing people with a higher than minimum living standard is also of utmost importance. Like in many other developing parts of the world Pakistan also has the problem of corruption which when coupled with the shadow economy plays a role of catalyst as shown empirically by Schneider and Dreher (2006).

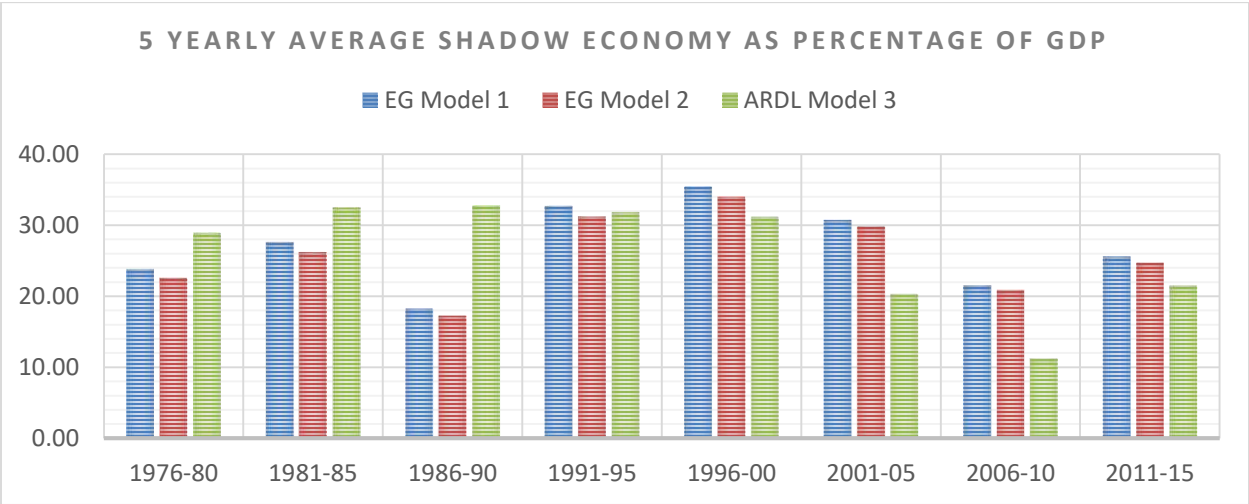


Figure 5 5 Yearly Average Shadow Economy (%age of GDP) of Pakistan

As already mentioned, being a developing country it needs to utilize its existing scarce resources up to its maximum potential, however due to such a large magnitude of unofficial sector it is losing a considerable amount of tax revenues. Moreover, the middle income class of population is bearing the huge burden of

those people who are mostly willingly avoiding the official sector. As the results show the increased taxation by the government is a major reason behind growth of shadow economy. The average Shadow Economy of Pakistan as percentage of GDP (26.41, 25.29, and 26.11 from Models 1, 2, and 3 respectively), and the plotted 5 yearly averages in Figure 5 above, clearly show that there is considerable leakage in revenue collection.

The most important conclusions that can be derived from this study are;

(1) The shadow economy is comprised of complex activities, therefore, the governments must consider the actual situation while making policies to curtail these activities since increased laws and regulations can either have a reducing effect or might play the role of a catalyst in further expanding such activities. New laws and regulations often feed the bureaucracy's hunger for power rather than making the system beneficial for its users. Therefore, governments must consider the cost of their own policies, before making a choice of a certain policy action.

(2) It is very important to consider that quite an extensive amount of revenue is being lost due to tax evasion, moreover increasing taxes further cause an increase in the shadow economic activities hence it is not a solution. Therefore, they should consider increasing the collection of existing tax revenues rather than increasing existing tax rates or implementing new taxes.

(3) The governments should consider such policies which attract people towards the official sector by providing incentives, like high quality public sector services may be ensured rather than pure bureaucratic formalities which hamper economic activities. A recent step¹⁴ (year 2014-15) in this direction has been linking tax filing with reduced cost of other documented facilities like reduced vehicle registration fee, reduced withholding tax at cash withdrawal from banks etc. However, the outcomes of these incentives will be visible in near future.

¹⁴ Income Tax Ordinance 2001 through Finance Bill (2014-15)

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Annexure

Table A.1 Unit Root Test for Variables in Model 1 & 2

Variable	At Level	Result	At 1st Difference	Result
Inc2dd	-0.232	I(1)	-5.568	I(0)
Intaxgdp	-1.691	I(1)	-8.907	I(0)
Inunemp	-1.617	I(1)	-6.260	I(0)
Inpade	-1.270	I(1)	-4.935	I(0)
Inpadepc	-0.889	I(1)	-5.000	I(0)
Ingdppc	-1.321	I(1)	-4.789	I(0)
Inhhconpc	-1.894	I(1)	-6.448	I(0)
infl	-2.917	I(1)	-4.146	I(0)
Critical Value Legend: 1%: -3.634 5%: -2.952 10%: -2.610				

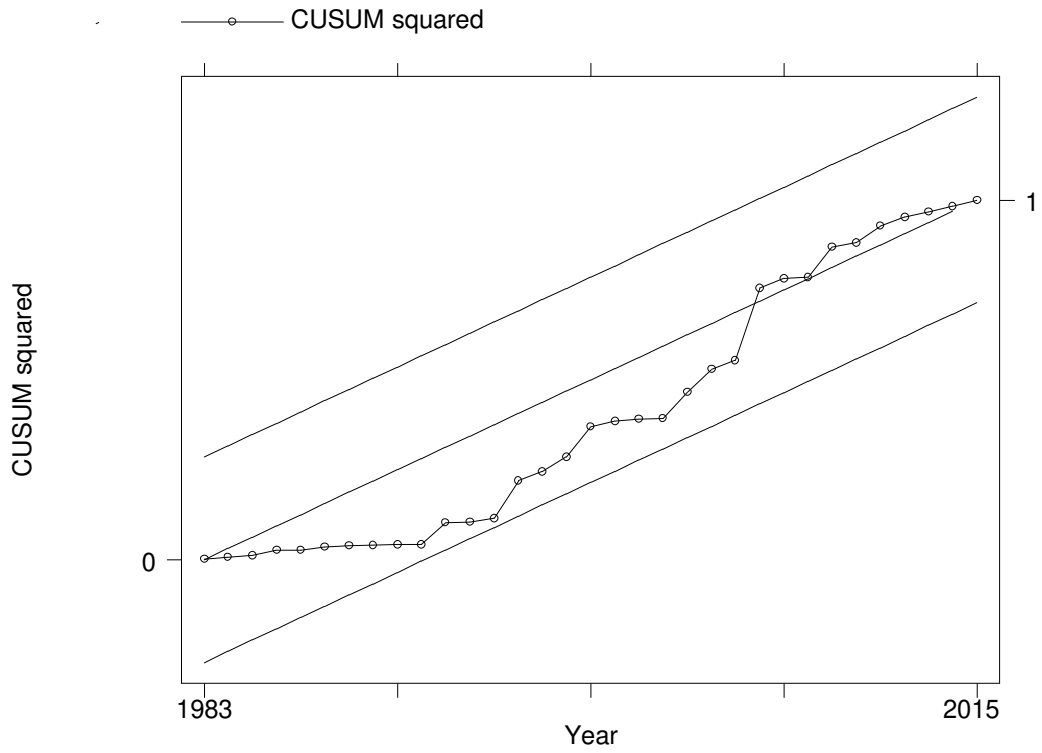
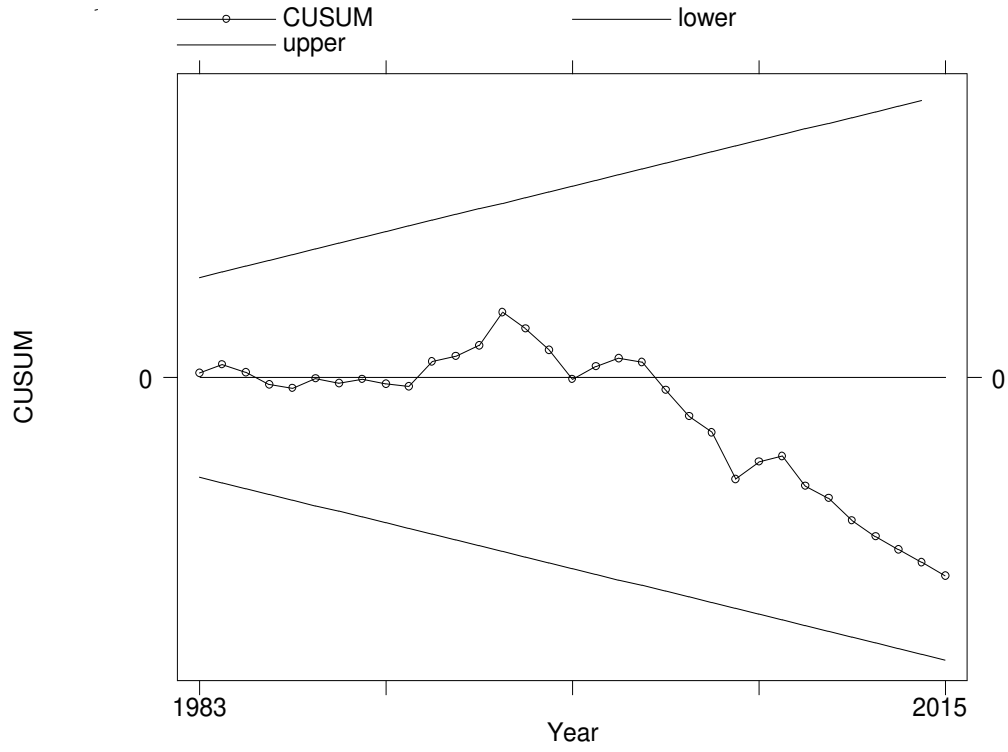
Table A.2 Unit Root Test for Variables in Model 3

Variable	At Level	Result	At 1st Difference	Result
C2dd	-0.680	I(1)	-6.493	I(0)
Taxgdp	-1.704	I(1)	-8.508	I(0)
Unemp	-1.515	I(1)	-6.005	I(0)
Lnpade_per	-1.260	I(1)	-5.393	I(0)
Lngdppc	-1.321	I(1)	-4.789	I(0)
Infl	-2.917	I(1)	-4.146	I(0)
Lnhhconpc	-1.047	I(1)	-8.977	I(0)
Cd_dic	-2.057	I(1)	-6.447	I(0)
Critical Value Legend: 1%: -3.634 5%: -2.952 10%: -2.610				

Table A.3 Unit Root Test for Variables in Interaction Model

Variable	At Level	Result	At 1st Difference	Result
L1.lngdppc	-1.135	I(1)	-4.693	I(0)
L1.intinvpc	-2.921	I(1)	-4.662	I(0)
L1.indevhexp	-1.045	I(1)	-5.864	I(0)
L1.intvienroll	0.115	I(1)	-5.911	I(0)
L1.inunienroll	1.084	I(1)	-5.545	I(0)
L1.ininfl	-2.772	I(1)	-3.394	I(0)
L1.inse	-2.969	I(1)	-7.095	I(0)
Critical Value Legend: 1%: -3.634 5%: -2.952 10%: -2.610				

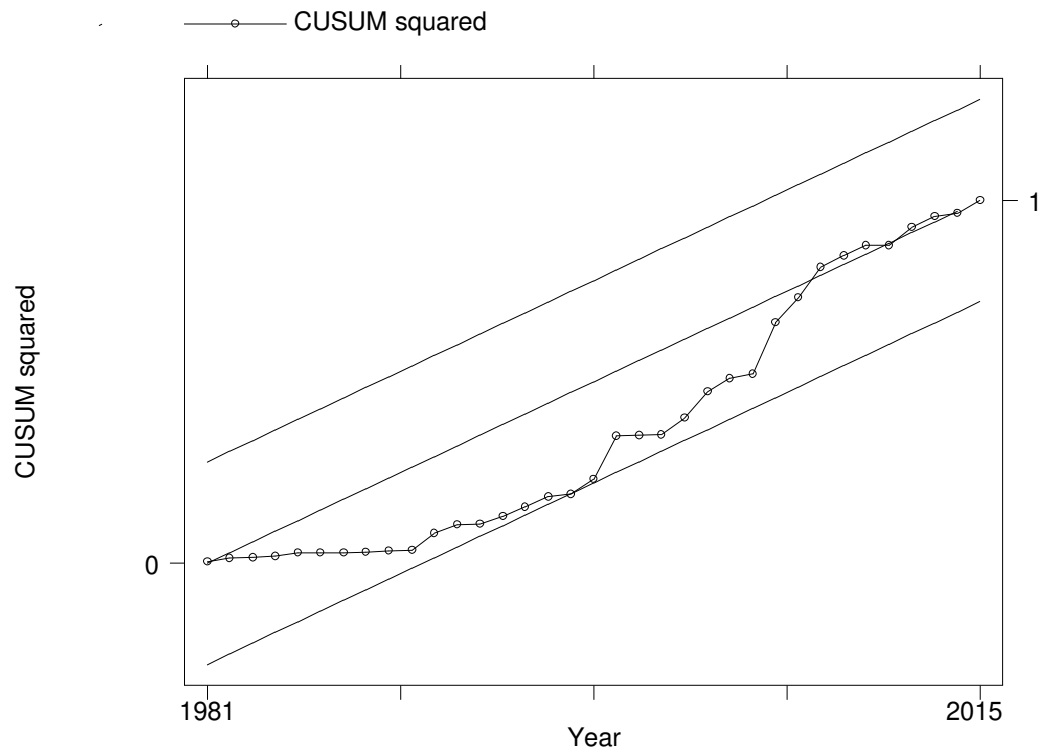
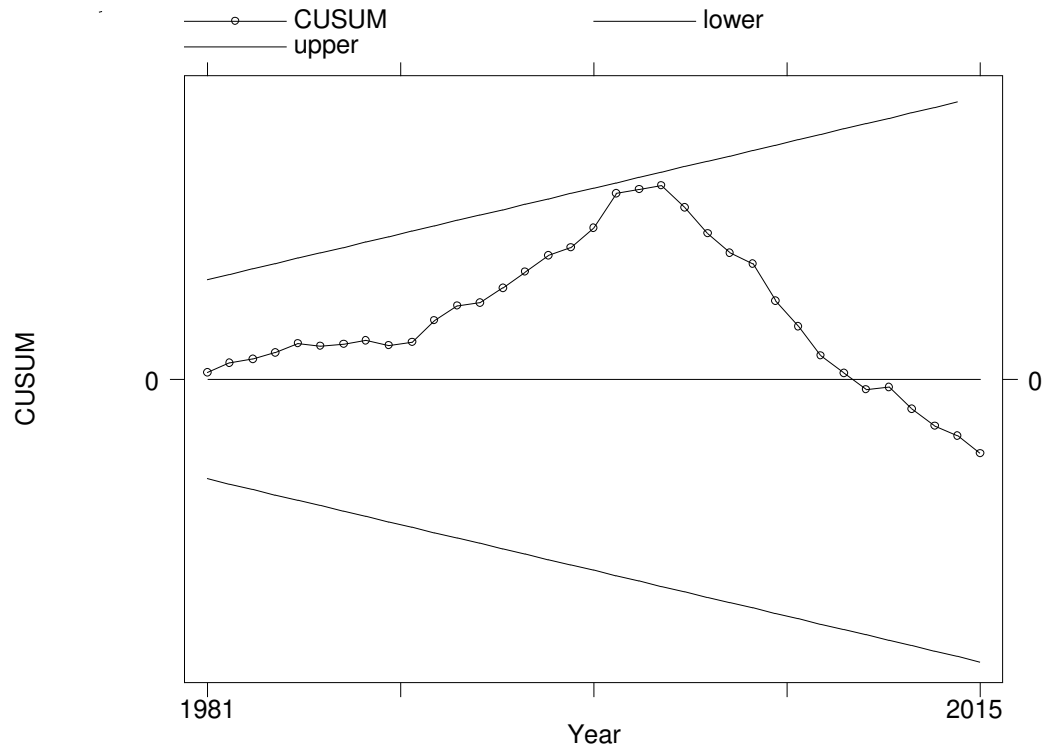
A.1 Stability of Model 3 Currency Demand Equation Results:



A.2 Estimates of Shadow Economy as Percentage of GDP

Regime/Year	EG Model 1	EG Model 2	ARDL Model 1
1973	16.04	15.30	19.82
1974	23.43	22.22	26.13
1975	18.54	17.65	25.53
1976	19.09	18.17	25.77
1977	19.97	19.01	24.62
1978	22.55	21.42	29.52
1979	25.33	24.04	30.14
1980	31.87	30.19	34.46
1981	30.20	28.57	33.90
1982	27.07	25.65	29.45
1983	31.38	29.77	34.75
1984	27.78	26.40	34.67
1985	21.54	20.51	29.64
1986	23.66	22.49	33.21
1987	19.05	18.04	34.40
1988	14.27	13.45	30.61
1989	16.42	15.45	32.89
1990	17.77	16.70	32.66
1991	35.04	33.58	34.14
1992	35.50	33.89	33.35
1993	30.52	29.07	31.46
1994	26.08	24.91	25.95
1995	36.24	34.54	34.17
1996	41.37	39.40	39.87
1997	38.10	36.42	34.35
1998	33.83	32.42	30.32
1999	34.77	33.41	31.24
2000	29.10	28.20	20.10
2001	31.91	30.87	20.93
2002	31.51	30.53	22.29
2003	33.12	32.03	23.32
2004	29.77	28.86	19.14
2005	27.39	26.54	15.89
2006	21.24	20.68	11.17
2007	19.61	19.00	10.12
2008	21.50	20.75	10.76
2009	19.27	18.69	8.81
2010	26.05	25.08	15.47
2011	21.74	21.09	13.96
2012	27.31	26.34	21.75
2013	24.44	23.67	22.09
2014	24.23	23.41	22.12
2015	30.16	29.00	27.70
Average	26.41	25.29	26.11

A.3 Stability of Interaction Results



A.4 Interaction between Official and Unofficial Sectors

year	Official GDP per Capita	GDP per capita with no Shadow Economy (LR Effect Only)	GDP per capita with no Shadow Economy (LR and SR Effect)
1974	22183.50	16325.90	-
1975	22359.00	19685.46	-
1976	22401.40	22019.95	-
1977	22353.20	21761.26	22274.79
1978	23367.70	21640.42	21866.75
1979	23928.40	22233.46	22450.35
1980	24917.80	21233.24	21540.01
1981	25728.70	24955.37	25504.99
1982	26841.80	25245.95	25669.32
1983	27802.00	25266.62	25680.68
1984	28038.20	26198.32	26573.00
1985	29562.80	25759.60	26193.74
1986	30497.40	28777.51	29395.13
1987	31301.70	27803.85	28322.99
1988	32311.90	27666.72	28317.74
1989	32846.80	30014.05	30759.25
1990	33320.60	31748.93	32501.56
1991	34118.30	15114.97	15701.06
1992	35644.60	35380.10	37389.99
1993	35392.20	32551.94	33918.05
1994	35923.10	32926.70	34247.15
1995	38512.40	29920.80	30414.39
1996	40062.90	36809.46	37975.02
1997	39772.10	37969.11	38991.65
1998	40189.50	37612.53	38450.95
1999	40913.90	40265.57	40788.25
2000	41114.90	37271.55	37594.46
2001	41078.50	38806.49	39323.06
2002	41525.40	41228.37	41711.58
2003	42427.00	41180.93	41565.24
2004	44717.90	42126.28	42391.72
2005	47803.90	45611.52	45961.90
2006	49660.70	43271.09	43730.74
2007	51482.40	49225.21	50113.25
2008	51920.00	49067.64	49817.77
2009	51016.70	47994.62	48727.56
2010	51251.30	40917.82	41481.42
2011	52024.10	47089.40	48355.77
2012	52933.10	45162.97	46447.70
2013	53778.60	50539.75	52126.38
2014	54844.30	54575.57	55651.15
2015	56061.20	48208.04	48879.25