

Chapter IV

Methodology, Estimation and Analysis

4.1- Data And Data Preparation Process

As datasets are prepared for different purposes therefore, they are often similar neither in spatial coverage nor in the time period covered. Also, there are some indices that are used by commercial agencies and they are not popularly available. Therefore, I have collected a set of available indices that cover a wide range of countries over a long period of time.

In this research the various types of uncertainty pertain to three different categories: *changes in policies and macroeconomic outcomes* (between 1971-2000), *the quality of public governance* (in 1996, 1998 and 2000) and *socio- political institutions and conflicts* (from 1970 to 1993).

- a) Under “*Changes in policies and macroeconomic outcomes*” we deal with unpredictability in the following factors: GDP growth, trade, inflation, domestic credit to private sector, real interest rate, distortion in exchange rates and terms of trade.
- b) Under “*Socio-political institutions and conflicts*” we measure uncertainty by the incidence of assassinations, strikes, purges, riots, revolutions, wars, civil wars, coups, variables that capture the extent of democracy, constitutional changes and inequality.
- c) Under “*quality of public governance*” we include government participation in the economy, control of corruption, regulatory burden,

property rights and rule of law. It is assumed that better quality of governance is associated with lower uncertainty.

The sources of the variables and their definitions have been explained as follows: *Private investment rate* is defined as the ratio of private investment to GDP. Data on *private investment rate* have been retrieved from Everhart & Sumlinski (2001). Private investment is defined as the difference between total gross domestic investment (from national accounts) and consolidated public investment (from different sources).

Government Participation in Economy is measured by The Heritage Foundation as an index of *government intervention*. This factor measures government's direct use of scarce resources for its own purposes and government's control over resources through ownership. The measure covers both government consumption and government production. The scale runs from 1 to 5. A score of 1 signifies an economic environment or set of policies that are most conducive to economic freedom (lowest government intervention), while a score of 5 signifies a set of policies that are least conducive to economic freedom (higher government intervention).

The index of *Property Rights* has been used by The Heritage Foundation and scored from 1 to 5 where 1 means the best condition and 5 the worst. Beach & Miles (2006) describe their methodology as the following:

This factor scores the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. It also assesses the likelihood that private property will be expropriated and analyzes the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and businesses to enforce

contracts. The less certain the legal protection of property, the higher a country's score; similarly, the greater the chances of government expropriation of property, the higher a country's score.

The next three variables are collected from Kaufmann et al. (2005), World Bank. This data source consists of surveys of firms and individuals as well as the assessment of commercial risk rating agencies, non-governmental organizations, and a number of multilateral aid agencies. These indices are normally distributed with a mean of zero and a standard deviation of one in each period. This implies that virtually all scores lie between -2.5 and 2.5 , with higher scores corresponding to better outcomes. I use the following variables from this collection:

Regulatory Burden measures the incidence of market-unfriendly policies. *Rule of Law* measures the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence. *Control of Corruption* measures the exercise of public power for private gain, including both petty and grand corruption and state capture.

Easterly (2001) has presented a unique collection of social, political and economic characteristics of countries: *Assassinations* is the number of politically motivated murders or attempted murders of a high central government official or politician. *Strikes* is the number of any strike of 1,000 or more by industrial or service workers (per ten million population). *Purges* is the number of systematic eliminations by jailing or execution of political opposition within the ranks of the regime or the opposition (per ten million population). *Riots* is defined as the number of violent demonstration or clashes of more than 100 citizens involving the use of physical force (per ten million population). *Revolutions* is the number of any illegal or forced change in the top governmental elite, any attempt at such a change, or any successful or

unsuccessful armed rebellion whose aim is independence from the central government. *Coups* is defined as the number of extra constitutional or forced changes in the top government elite and/or its effective control of the nation's power structure in a given year. Unsuccessful coups are not counted. *Constitutional Changes* is the number of basic alterations in a state's constitutional structure, the extreme case being the adoption of a new constitution that significantly alter the prerogatives of the various branches of government. Examples of the latter might be the sub-situation of presidential for parliamentary government or the replacement of monarchical by republican rule. Constitutional amendments, which do not have significant impact on the political system, are not counted.

Index of Democracy is another variable that I use. I collect it from Polity IV project by Marshall & Jaggers (2002). The Polity IV project continues the Polity research tradition of coding the authority characteristics of states in the world system for purposes of comparative, quantitative analysis. Their methodology considers democracy (DEMOC) as consisting of three essential, interdependent elements:

One is the presence of institutions and procedures through which citizens can express effective preferences about alternative policies and leaders. Second is the existence of institutionalized constraints on the exercise of power by the executive. Third is the guarantee of civil liberties to all citizens in their daily lives and in acts of political participation.

Other aspects of plural democracy (e.g. the rule of law, systems of checks and balances, freedom of the press, and so on) are means to, or specific manifestations of, these general principles. Authors also have calculated an index for autocracy (AUTOC). They at first define "Authoritarian regimes" as political systems whose common properties are a lack of regularized political competition and concern for

political freedoms. Then they use the more neutral term “Autocracy” and define it operationally in terms of the presence of a distinctive set of political characteristics. In mature form, autocracies sharply restrict or suppress competitive political participation. Their chief executives are chosen in a regularized process of selection within the political elite, and once in office they exercise power with few institutional constraints. The *POLITY* score is computed by subtracting AUTOC from DEMOC. The resulting unified polity scale ranges from +10 (strongly democratic) to –10 (strongly autocratic).

Wars and *Civil Wars* are two other indices, which I employ as the sources of uncertainty. I collect them from two sources: the first is Correlates of War (*COW*) project *1816 – 1997(V.3)* that was offered by Serkees (2000), and the second prepared by Gleditsch (2004), which is a revised version of *COW* covering the period 1816 - 2002. The author explains that the article displays a revised list of wars since 1816, with updates for 1997 to 2002 based on data compiled by the Department of Peace and Conflict Research at Uppsala University.

Inequality is another variable that I employ in this article. I have utilized Estimated Household Income Inequality Dataset (EHII). This dataset is offered by University of Texas – U.S. and as they state on their website, this is a global dataset, derived from the econometric relationship between UTIP-UNIDO¹, other conditioning variables, and the World Bank’s Deininger & Squire data set.

The following seven macroeconomic variables are gathered from World Bank Development Indicators 2005. It consists of terms of trade, inflation, GDP growth,

¹ -UTIP- UNIDO is a global data set that calculates the industrial pay-inequality measures for 156 countries from 1963-1999. This is a joint project by University of Texas Inequality Project (UTIP) and United Nations Industrial Development Organization (UNIDO).

real interest rate, trade, exchange rate distortion and domestic credit to private sector.

These variables are defined as follows:

Terms of Trade are the ratio of the export price index to the corresponding import price index measured relative to the base year 2000 (year 2000 = 100). *Real Interest Rate* is the lending interest rate adjusted for inflation as measured by the GDP deflator (percent). *Inflation* is measured by the annual growth rate of the GDP implicit deflator. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency (annual percent). *Growth of GDP* is the annual percentage growth rate of GDP at market prices expressed in constant local currency. *Trade* is the sum of exports and imports of goods and services measured as a share of gross domestic product (percent of GDP). *Domestic Credit to Investment* refers to financial resources provided to the private sector, such as loans, purchases of non-equity securities, and credits that establish a claim for repayment. For some countries these claims include credit to public enterprises (percent of GDP). The last variable is *Volatility of Distortion in Exchange Rate*. Dollar (1992) constructs this index to measure outward orientation in real exchange rate policies. As he urges, outward orientation generally means a combination of two factors: first the level of protection, specially for inputs into the production process, is relatively low, and second, there is relatively little variability in the real exchange rate, so that incentives are consistent over time. Brunetti & Weder (1997) have used this index as a proxy of policy uncertainty to analyze its effect on investment. The measure of the real exchange rate is distorted by the existence of non-tradables. Therefore, Dollar tries to correct this as following:

At first, he uses the International comparisons of price levels compiled by Summers and Heston (2002). They price the same basket of consumption goods in

domestic currency in different countries and then convert the measure into U.S. dollars, using the official exchange rate. Using the U.S. as the benchmark country, the index of country i 's relative price level (PRL) is

$$PRL_i = \left(\frac{P_i}{P_{u.s.}} \right) * 100$$

where P_i is the price of the consumption basket in country i in U.S. dollars. Then, Dollar regresses PRL_i on dummies for years and continents (the outliers detected by Hadi (1992, 1994) have been excluded from the estimation). This is done to correct for differences in factor endowment, which in turn serves as a proxy for differences in price of non-tradables. He uses the regression to calculate the predicted relative price level for each year and each country. The actual price level divided by this predicted price level (based on data from previous periods) is the index of real exchange rate distortion.

Unpredictability of these variables is considered as a source of uncertainty. I have calculated their unpredictability as variance of the residuals generated by the best fitted moving average (MA) process¹ conditional on information till the last period:

$$\sigma_{e_{x,t}}^2 = \frac{\sum_{t=0}^{\tau} e_{x,t-1}^2}{\tau - 1}$$

Where, $\sigma_{e_{x,t}}^2$ is the conditional variance of variable x for the first τ periods and $e_{x,t-1}$ is the residual of x in a MA process in period $t-1$. I used a MA process because it gives an estimation based on information and experiences of the previous

¹ - Mostly the best fit was available by MA(3) but in some cases I had to use the other orders like one, two or four.

periods. Therefore, conditional variance of its residuals is a measure of unpredictability in behavior of x . The list of these MA processes is provided in table-C1, appendix C. The lists of all the variables and their properties are presented in table-C2 and table-C3 respectively.

4.2- Methodology

I applied a panel method even though my study is about Iran. It is because of two reasons: first, shortage of data in some variables like rule of law, control of corruption and property rights, makes it impossible to utilize time series methods. Second, there are some factors, which hardly change over time - for example property rights or level of democracy. So, the analysis of these factors in a time series process is almost impossible. The methodology of panel data gives us the opportunity to take these factors into account in our analyses.

As Beck and Katz (1996) and Beck (2001) have mentioned, a panel data model yields generalizable results if the sample is collected through a random sampling scheme but yields sample specific results if a random sampling scheme is not used. I have collected data on 39 countries including Iran. The choice is dictated by availability of data and is not done through a random sampling. The list of countries is presented in table-C7 of appendix C. All inferences of the panel are valid only for the countries included in the panel. We can expand our inferences from this estimation to cover future periods for included countries but we cannot use them to generalize about other countries.

There are three incomplete panels as mentioned above: panel dealing changes in policies and macroeconomic outcomes for the period 1971 - 2000 with an average of 23 observations per country. b) Panel dealing with socio-political institutions and

conflicts for the period 1970 - 1993 with an average of 18 observations per country and c) finally a panel dealing with the quality of public governance and covering three years 1996, 1998 and 2000.

The fixed effects model is used if we think that there are intrinsic differences among units. The random effects model is used if the differences among units are not intrinsic to the units. Differences that are not accounted for by explanatory variables are random and restricted to the sample period alone. Hsiao (1986) and Beck (2004) argue that fixed effects are proper if one collected units without any sampling scheme, whereas the random effects model is suitable if one has a random sample from a larger population and wants to make inference about that larger population. Thus, the fixed effects are more suitable for my study than random effects, though, the *Hausman* specification test can be used as a diagnostic tool for distinction between fixed and random effects. I treated first and second panel as TSCS¹ data with its different cross sectional and times series issues², and third panel is thought as a fixed effect panel data because of the small number of observations per unit. I proceed as follow:

In the next section I will discuss the problems, challenges and results, which typically exist in TSCS data in the first panel. Then, the strategies and results about the second panel (socio- political institutions and conflicts) have been discussed. After that I will discuss the related issues in third panel, its specific problems and the results of the model.

¹ - Time series- cross section data is a panel data with relatively more observations- say more than 10- per unit.

² - Therefore some tests for detection of heteroskedasticity and contemporaneous correlation is needed.

4.3- Uncertainty About Macroeconomic Variables

4.3.1- Unit Root Test

I utilized the Maddala and Wu (1999) test to check for stationarity. The full details of test have expounded in table-C8, appendix C. There is evidence that supports rejection of the null hypothesis of nonstationarity. None of the variables in this panel has a unit root. Hence, we can proceed without any concern about spurious regression.

4.3.2- Poolability

The concept of poolability is concerned with the coefficients of variables for each country. It simply implies that the effect of a given explanatory variable is constant across the countries. The core question is that whether all countries have the same function for the data generation process or whether each country has its own function for the generation of data. If we assume that each variable is homogenous across countries then our model will be:

$$Y_{it} = X_{it}\beta + \varepsilon_{it} \quad (1)$$

where Y_{it} is the value of dependent variable for country i in the period t . X_{it} is the vector of independent variables, β vector of coefficients that are common among the countries and ε_{it} is error term for country i in the period t . However, if the coefficients of exogenous variables vary from one country to the other, then we can write:

$$Y_{it} = X_{it}\beta_i + \varepsilon_{it} \quad (2)$$

where β_i is the unit specific coefficient. We often like to pool the data to use its advantages: it increases the efficiency of the estimates (Stanig, 2005), this model

allows for the analysis of variables that vary only a little over periods or over units (Franzese and Hays, 2005). The number of observations as well as degrees of freedom increases (Plumper, Troeger and Manow, 2005). On the other hand, as Stanig (2005) shows if the functional relation among variables in the data generating process is not constant across units but the data is pooled, we will have specification error in our estimation.

There is a traditional F-test for the detection of heterogeneity in the data generation process. Referring to equation 1 and 2 the null hypothesis is

$$H_0 : \beta_i = \beta$$

F test compares the difference in sum of squares residuals from the two equations mentioned above, divided by the proper number of degrees of freedom and mean square error of equation 2:

$$F = \frac{\frac{(e'e - \sum e_i' e_i)}{(n-1)K}}{\frac{\sum e_i' e_i}{n(T-K)}} \sim F[(n-1)K, n(T-K)]$$

where $e_i' e_i$ is the sum of square of errors (SSE) of the OLS regression for group i . $e'e$ is the SSE of the pooled OLS regression. N is the number of units. K denotes the number of variables including the intercept and excluding dummy variables. The number of time periods is denoted by T . But this test is not used because as Beck (2001) argues this test often tends to reject the null of pooling because of the some reasons; there might be a slight variation in all β_i , at least one country is not fit well by equation 1, or there is some parameter variation because of the large sample size common in TSCS data sets. And later he demonstrates that poolability is preferable if number of the periods covered is less than 30 so that the gain from an increase in

observations generated by poolability outweighs structural differences between countries (Beck, 2006). Baltagi (2005) lists a battery of investigations through which he concludes that homogeneous estimators outperform heterogeneous one. And Beck & Katz (2004) summarize that: "... *The gains from pooling offset the costs of pooling, more than standard statistical theory asserts*". Therefore, I assume that slopes are same across the countries and over time.

4.3.3- Outliers

In this section I try to find out whether there is any country in the panel, which might act as an outlier and therefore needs to be excluded from our estimation. There are two methods for this detection (Beck, 2006). The first is a Box plot of dependent variable and the second is cross validation. The first method is simple. Its result has been shown in figure-B19, appendix B. As the figure demonstrates private investment of *Bulgaria* fluctuates in a pattern totally different from that of the other countries and must be excluded from the panel.

Cross validation needs further calculations. According to Beck (2001) the simplest form of cross validation is to leave out one country, fit an OLS regression with all other countries, and predict the left out country. Then, we can compare the mean square error of predictions. I have done it using all variables except real interest rate, because the number of observations for real interest rate is considerably lower than those for other variables. The result has been shown in table-C9, appendix C. Again, *Bulgaria* with mean square error of about 2.199 stands out as an outlier. Hence, we exclude it from our estimation and pool the other countries with each other.

4.3.4- Fixed Effects

I discussed earlier that fixed effects are proper when we collect our units without any random sampling scheme. Next in the discussion about poolability I have argued that it is better if the data are pooled. This section is dedicated to finding out whether we should have one intercept as in a completely pooled model for all countries or let each country have its own intercept. The application or elimination of fixed effects has its own risks and advantages. If we employ fixed effects, according to Beck (2001) and Baum (2006) we have to exclude time-invariant variables of the model due to their co linearity, because, the demeaning process will eliminate them for all time periods¹. Moreover, fixed effects will “soak up” most of the explanatory power of the variables which vary slowly over time. On the other hand, however we can fix these problems with elimination of the fixed effects and control the effects of exogenous shocks common to all countries. However, as Wilson & Butler (2004) precisely demonstrate, ignoring the fixed effects can lead us to a biased estimation due to omitted variable bias. This bias may even change the sign of coefficients. This is what they have to say about low-moving variables: “*We definitely agree that unit effects soak up the explanatory power of sluggish variables, but in our view this- to the extent that following conservative norms of inference is desirable- is a good thing, not a cost*”.

We can test if the model needs fixed effects or not. The null hypothesis is

$$H_0 = \mu_1 = \dots = \mu_{n-1} = 0$$

¹ - Demeaning process is the subtraction of a variable from its average, which is $(x - \bar{x})$. Including a time invariant variable in a fixed effects model causes its value to be zero for all time periods.

Due to Park (2005) & Greene (2003) this hypothesis is tested by a traditional F test that is based on loss of goodness of fit

$$F_{(n-1, nT-n-k)} = \frac{\frac{R^2_U - R^2_R}{n-1}}{\frac{1 - R^2_U}{nT - n - k}}$$

Where robust (unrestricted) model is Least Square Dummy Variable (LSDV) and efficient (restricted) model is the pooled regression. Subscription U denotes ‘*Unrestricted*’ to a variable and subscription R denotes ‘*Restricted*’ to a variable. n is the number of countries, k is the number of the regressors excluding dummy variables, and nT is the number of total observations. I left *Bulgaria* out of the equation. The F calculated for the panel 36.02 [37, 848] ¹rejects the null hypothesis of pooling at the 0.01 significant level.

4.3.5- Estimator Selection Strategy

If equation 1 is the model, in the process of selection of an estimator for our model then we must take into account the Gauss-Markov assumptions. If the error process meets the assumptions, Ordinary Least Square (OLS) is optimal. The Gauss-Markov assumption explains that each unit error term ε_{it} must be independent and identically distributed:

$$\begin{cases} E(\varepsilon_{it} \varepsilon_{js}) = \sigma^2 & i = j \text{ \& } t = s \\ 0 & \textit{otherwise} \end{cases}$$

If errors do not satisfy this assumption, OLS will be inefficient and estimated standard errors may be incorrect. This assumption may be violated because of

¹ - The numbers in brackets are the degree of freedom.

a) Heteroskedasticity b) contemporaneous correlation and c) serial correlation. Later, these problems will be discussed in greater detail.

One strategy to deal with these problems is estimation by feasible generalized least square (FGLS) as suggested by Park (1967) and popularized later by Kmenta (1986). This method is criticized by Beck & Katz (1995, 96) as it produces standard errors that lead to extreme overconfidence. They report that calculated standard errors understate variability by about 100 percent if the number of observations is less than 30 and by almost 30 percent for more observations. Hence, we should always be wary of downward bias in standard errors and upward bias in t statistics in small samples. Furthermore, this method for contemporaneous correlated errors cannot be applied unless the number of observations becomes as big as the number of countries. Even in this circumstance estimation of standard errors is problematic unless the number of observations per country is considerably larger than the number of countries.

An alternative strategy for TSCS data is OLS with Panel Corrected Standard Errors (PCSE) suggested by Beck & Katz (1995, a). They have demonstrated by Monte Carlo experiments that this strategy has better performance in the presence of either panel heteroskedasticity or contemporaneous correlation. Monte Carlo experiments have shown that PCSEs are very close to OLS standard errors when the Gauss Markov assumptions hold. Chen, Lin & Reed (2005) also reported that PCSE is superior to FGLS when one's main goal is hypothesis testing. However, one must be cautious about the number of observation per units. As Beck (2001) argues:

Theoretically, all asymptotics for TSCS data are in T ; the number of units is fixed and even an asymptotic argument must be based on the N observed units. We can, however, contemplate what might happen as T tends

to infinity, and methods can be theoretically justified based on their Large T behavior.

So, researchers ought to be wary of TSCS methods applied for less than 10 observations per unit. Thus, we can use this method for estimating the first and second panel, but it will not be proper for the third one with just three observations per country. In the following sections the violation of Gauss-Markov assumptions will be detected.

Heteroskedasticity

One of the assumptions which lead to optimality of the OLS process is the homoskedasticity of the error terms i.e. error terms have the same variance across all countries. This assumption might not hold for empirical data. For instance, the level of the inflation in one country might be more volatile than that in the other country.

Any assumption that error terms have the same variance across countries, must be checked by a test for the existence of this problem. I applied a modified Wald statistic for country-wise heteroskedasticity to the residuals of a fixed effect regression model, following Greene (2000). First, the fixed effect model is estimated under the assumption of homoskedasticity. The null hypothesis is that

$$H_0 = \sigma^2_i = \sigma^2, \quad i=1, \dots, g$$

where g is the number of cross-sectional units. The test statistic is distributed as a Chi-squared statistic of order g . *Bulgaria* is left out of the equation again. Because, real interest rate has a lot of missing values the test is performed twice, once with real interest rate included as a variable and once without it. When real interest rate included as a variable in the test the Chi squared statistic calculated for the panel is $5.6 \cdot 10^{30}$, which causes us to reject the null hypothesis of homoskedasticity at the 0.01

significant level. When real interest rate is excluded, the Chi squared statistic is 1858.63 and therefore we reject the null hypothesis of homoskedasticity at the 0.01 level again.

Contemporaneous correlation

Another cause for violation of the Gauss-Markov assumptions is contemporaneous correlation, which is observed if unobserved features of one country relate to unobserved features in other countries (Beck, 2001). Hence we can see contemporaneous correlation where there is a strong economic linkage between countries (e.g. European Union). Following Greene (2000), the Breusch-Pagan test, when applied to the residuals of the fixed effect regression under the null hypothesis of cross sectional independence, can detect contemporaneous correlation. The resulting test statistic is distributed as Chi squared with d degrees of freedom where $d = g*(g-1)/2$ and g is the number of countries. Unfortunately, this test fails to calculate any test statistics because its correlation matrix of residuals becomes singular. Therefore, no evidence can be gathered to test contemporaneous correlation. The solution adopted is to estimate the equation twice, once assuming contemporaneous correlation and once without. As we will see later the results are almost similar together.

Serial correlation

There are vast arguments about the methods to deal with this problem. According to Baltagi (2005), ignoring serial correlation when it exists, lead us to a consistent but inefficient estimate of the regression coefficients and biased standard errors. Wooldridge (2002) suggested a test for serial correlation in the idiosyncratic errors of a linear panel-data model. Drukker(2003) demonstrates that this test has

good size and power properties in reasonable sample sizes. Under the null hypothesis of no auto-correlation the residuals from the regression of the first-differenced variables should have an autocorrelation of -0.5. This implies that the coefficient on the lagged residuals in a regression of the lagged residuals on the current residuals should be -0.5. The Wooldridge test's F-statistic that has been calculated in this case is 6.998 [1, 37] and we therefore reject the null hypothesis of no autocorrelation at the 0.05 significant level. That means we should adjust for serial correlation in the model.

Dealing With Serial Correlation

As I mentioned already, there is a vast debate about the proper methods dealing with the serial correlation in TSCS data. One strategy is the AR(1) process:

$$Y_{it} = X_{it}\beta + \varepsilon_{i,t} \quad (3)$$

$$\varepsilon_{i,t} = \rho\varepsilon_{i,t-1} + v_{i,t} \quad v_{i,t} \approx iid(0, N) \quad (4)$$

I first estimate (3) by OLS. From (3) the residuals are used to estimate ρ for the second equation. In the next step, observations are transformed by the Prais-Winsten transformation to produce serially independent errors. Kmenta (1986) suggests unit specific ρ . Beck & Katz (1995, b) argue that if it is accepted that the coefficients of parameters of interest do not vary in the pooling process, then there is no reason for serial correlation parameters to vary by units. They showed by Monte Carlo experiments that the assumption of a common serial correlation process leads to superior estimates of β even when the data are generated with unit specific ρ_i . This is because ρ_i is estimated using only a small number of observations per country and it is well known that auto regressions estimated from less than 30 observations lead to unreliable results.

They alternatively suggest a lagged dependent variable (LDV) method instead:

$$Y_{i,t} = \Phi_i Y_{i,t-1} + X_{i,t} \beta + \varepsilon_{i,t} \quad (5)$$

One problem of this method is that both the lagged dependent variable and one of the explanatory variables might be correlated. Moreover, Plumper, Troeger & Manow (2005) argued that the LDV method might absorb large parts of the trend without actually explaining whether the dependent variable exhibits a general time trend. Under this condition, estimates can be biased if at least one variable has a persistent effect. If we do not consider this persistence and do not model it, the coefficient of the lagged dependent variable is biased upwards, while the coefficient of the other independent variables are likely to be biased downwards. They then argue that the AR (1) model tends to absorb less time series dynamics and could be superior. However, the least harmful specification of the estimation model depends on the theory of the researcher. Wilson & Butler (2004) claim that apart from AR (1) and LDV, other dynamic methods, which one can think of are the distributed lag (DL) model and the auto regressive distributed lag (ARDL) model. They emphasized that LDV will cause the fixed effects model to be biased, but the bias is relatively small for the independent variables, though a substantial bias can exist for the LDV coefficient. Beck & Katz (2004), with the acceptance of this fact, claimed that the coefficient of the dependent variable in LDV must not be interpreted casually. On the other hand, they added that ARDL is also too general and because of multicollinearity this generality is harmful.

As far as the theory of investment under uncertainty is concerned, uncertainty can arise from the “value of waiting”. Investors might delay decision making to get more information and higher rates of return (Dixit & Pindyck, 1994) and (Novy-Marx, 2007). Therefore, there is uncertainty about exactly when an investor will

invest. As soon as the cost of waiting exceeds the expected rate of return, the investor would abandon the investment or may even exit the industry. On the other hand, Uncertainty in period t is a function of uncertainty in period $t-1$ because they share a common information basing ranging from period 0 to period $t-2$. Hence, I select an AR(1) model to fix the problem of serial correlation.

4.3.6- Multicollinearity

Numerous dummy variables as well as a conceptual relationship among the independent variables causes us to be suspicious about multicollinearity. For instance, a revolution could be accompanied by riots and strikes or a better rule of law which can lead to lower corruption. Even severe multicollinearity does not violate OLS assumptions and its estimate is still unbiased. Nevertheless, the greater multicollinearity will lead to greater standard errors. Thus, confidence intervals for coefficients tend to be very wide and t-statistics tend to be very small. Then, coefficients have to be larger to be statistically significant.

There are several warning signals that indicate multicollinearity. However, there is no irrefutable test for detecting the problem. One of the better methods is detection of the variance inflationary factors (VIF). According to Montgomery, Peck and Vining (2003) a VIF above 10 is an indication of multicollinearity. The results of the VIF test after a simple OLS regression are presented in tables-C13 and C14 of appendix C. It shows that we must be concerned about multicollinearity in the panel. As multicollinearity can be severe due to multiple combinations of some correlated variables (say dummy variables in the panels), use of some dummy variables and a constant in the model may reduce the problem. Further inspection shows that elimination of dummy variables relating to China, Mexico, Nicaragua, Thailand,

Uruguay and Venezuela can decrease all VIF values to a level below 10. With this strategy interpretation of intercepts will change. The intercepts of all countries, for which dummy variables have been eliminated, are considered to be identically equal to the calculated constant term, which is common to all units. The intercept calculated for other countries must be added to the constant term to show the real intercept of each country.

4.3.7- Estimation

I selected a fixed effects model with AR(1) process as follows:

$$y_{it} = c + \alpha_i + X_{it}\beta + \varepsilon_{i,t} \quad (6)$$

$$\varepsilon_{i,t} = \rho\varepsilon_{i,t-1} + v_{i,t} \quad v_{i,t} \approx iid(0, N) \quad (7)$$

where y_{it} is the natural logarithm of private investment rate, α_i is the country specific intercepts, c is constant, X_{it} is the vector of independent variables including natural logarithm of conditional variance of residuals calculated by MA process as explained above: domestic credit to private sector, exchange rate distortion, growth, terms of trade, inflation and real interest rate. 295 observations are eliminated due to missing values if the real interest rate is included in the model. Therefore, I estimate the model twice, once without real interest rate uncertainty to use maximum information and once with real interest rate uncertainty. When interest rate uncertainty is included, the coefficients of dummy variables of Panama, Uruguay and Venezuela are assumed to be equal to zero to reduce VIF test statistic below 10 and avoid severe multicollinearity. Each of these two models is estimated twice, with and without contemporaneous correlation, as explained before (Table-C10, appendix C for more clarity). *Bulgaria* is excluded from the estimation because it will not be explained

well the model. A PCSE method has been used to estimate the model. I select the *autocorrelation of residuals* as a method to compute the autocorrelation.

The results are presented in table-C10, appendix C. The results in the case of assumed contemporaneous correlation exhibit lower standard errors as compared to the case of no contemporaneous correlation. In the case of uncertainty about growth and terms of trade, their coefficients are significant when we consider contemporaneous correlation. This means that common external shocks (e.g. oil prices or financial crisis) affects terms of trade and growth of countries. Chi squared statistics of all equations lead to rejection of the null hypothesis of the Wald test that coefficients are jointly equal to zero. When real interest rate is excluded from the equation (1 and 2), uncertainty over all macroeconomic variables has a negative effect on private investment. Uncertainty in the form of exchange rate distortion and that relating to trade, growth and terms of trade have a negative significant effect on private investment. The effect of uncertainty regarding domestic credit to private sector, inflation and real interest rate is negative but insignificant.

4.4-Uncertainty about Socio-Political Institutions and conflicts

Most of the variables are observed from 1970 to 1993. However, *coups* and *constitutional changes* are only observed till 1988. Data on index of *inequality* are available from 1970 to 1993. However, there are a lot of missing values. Hence to make a trade-off between variables and observations I will proceed as follows: I will carry out all tests and estimations in three steps. In the first step I shall include all variables except for *coups*, *constitutional changes* and *inequality* in order to use maximum information (panel *a* hereafter). In the next step I include *coups* and

constitutional changes but not *inequality*. All other variables are included in the panel to check the effect of the first two variables between 1970 and 1988 (panel *b* hereafter). In this step *Benin*, *Nicaragua* and *Poland* will be excluded automatically, because, variables of these countries do not have common time period observations with other countries. And finally, in addition to the variables in panel *a* I will exclude *coups* and *constitutional changes* and include *inequality* instead (panel *c* hereafter). *Benin*, *Cote d'Ivoire* and *Nicaragua* will drop out according to unequally observation of variables.

Diagnostic tests are started by unit root as I have done so for macroeconomic uncertainty. Table-C8 of appendix C indicates the result of a Maddala and Wu test for panel unit root that uses augmented Dickey-Fuller transformation. The Chi squared statistics lead us to reject the null hypothesis of unit root for all variables at the 0.01 significant level.

For the diagnoses of outliers, a box plot diagram is presented in figure-B20 of appendix B. Again *Bulgaria* shows behavior which is different from the other countries. The result of cross validation test for panel *a*, is presented in table-C9, appendix C. It confirms that Bulgaria with mean squared errors of 7.819 is totally different from other countries. As, this odd behavior is caused by the fluctuations of private investment, the test is not repeated for the other panels because their results will be the same.

As I explained above, as the average number of observations does not exceed 18 per country, I pooled the coefficients of variables in equation (1) to attain greater efficiency in estimation. However, the heterogeneity of countries in intercepts must be examined. The traditional F-test statistics equals 1135.9 with [37, 635] degree of freedom for fixed effects leading us to reject the null hypothesis of pooling at the 0.01

level of significance for the panel *a*, after excluding *Bulgaria* as outlier. The F-statistic of 1083.57 [34, 448] causes us to reject the null hypothesis of pooling in panel *b* and in the same way F-statistic 36.61 [34,523] lead us to reject the null hypothesis of pooling in panel *c*. These are all significant at 0.01 level.

Diagnosis of country-wise heteroskedasticity by a Modified Wald test yields a Chi squared statistics of 2371.89 [38] for panel *a*, 2.7×10^{28} [35] for panel *b* and 2579.99 [35] for panel *c*. All of them cause us to reject the null hypothesis of homoskedasticity in error terms.

The test for contemporaneous correlation fails to produce any outcome regarding singularity of correlation matrix of residuals. I apply contemporaneous correlation correction for more assurance.

The Wooldridge test for autocorrelation in panel data yields an F-statistic 6.494 [1, 37] for panel *a*, which leads us to reject the null hypothesis of no first order autocorrelation at the 0.05 level of significance. This test for panel *b* yields an F-statistic 5.167 [1, 33], which causes us to reject the null hypothesis of no serial correlation at 0.05 level of significance. However, it is accepted at the 0.1 level. The test result is 5.817 [1, 34] for panel *c*, causing us to reject the null hypothesis of no serial correlation at the 0.05 level. Outcomes of diagnosis test for multicollinearity have presented in tables-C15, C16 and C17, appendix C. Results do not show severe multicollinearity in panel *a*, *b* and *c*. Like above, I use AR (1) process for estimation applying PCSE:

$$y_{it} = \alpha_i + X_{it}\beta + \varepsilon_{i,t}$$

$$\varepsilon_{i,t} = \rho\varepsilon_{i,t-1} + v_{i,t} \quad v_{i,t} \approx iid(0, N)$$

The results are presented from 1 to 3 in table-C11 of appendix C. All equations yielded Chi squared statistics are large enough and we can reject the null

hypothesis that all coefficients are jointly equal to zero. The level of democracy has direct but insignificant sign. Civil war has absolutely negative and significant effect on private investment at the 0.01 significant level. Purges also affects private investment negatively at the 0.05 significant level. Other variables, revolutions and strikes adversely and assassinations positively affects private investment but all of them are insignificant. Riots show a positive effect on private investment which is significant at 0.01 level for panel *a*, but is not significant in other panels especially in equation 4. Coups and constitutional changes affect private investment adversely and their effect is significant at the 0.01 level in panel *b*. Inequality in panel *c*, shows a positive effect but its effect is insignificant.

We may be suspicious about the coefficients and standard errors of war, because it might be correlated with fixed effects due to the fact that it is a slowly moving variable as discussed before. I have applied Fixed Effects Vector Decomposition (FEVD) suggested by Plumper and Troeger (2004) and retested panel *a* to control for these sluggish variables. FEVD acts as following: in the first step, the unit fixed effects is estimated by running a fixed effects estimate of the baseline model. In the next step, the unit effects are split into an explained and an unexplained part by regressing the unit effects on the time-invariant and rarely changing explanatory variables of the original model. Finally, a pooled OLS estimation of the baseline model will be performed by including all explanatory time variant, time invariant and the rarely changing variables plus the unexplained part of the fixed effects vector. Plumper and Troeger show by a series of Monte Carlo experiments that FEVD is the least biased estimator when time variant and time invariant variables are correlated with unit effects. This procedure produces unbiased estimates of time varying variables regardless of whether they are correlated with unit effects or not and

unbiased estimates of time invariant variables that are not correlated. Only when the estimated coefficients of the time invariant variables are correlated with the unit effects this method suffer from omitted variable bias. Desirable small sample properties and unbiasedness in estimating the coefficients of time variant variables, which are correlated with the unit effects are the advantages of this method.

The outcomes of retests have been presented in Table-C11, appendix C as *fevd*. I applied OLS again with PCSE and AR (1) estimation in the third step. The high F-statistic rejects the null hypothesis that coefficients are jointly equal to zero. A value of the Durbin-Watson statistic near 2 implies that the Prais-Winsten transformation has fixed the problem of autocorrelation in this panel. Riots have become insignificant in this panel. However, its effect has remained positive. The effect of democracy has remained insignificant. Other results are similar to that for panel *a* other than that for purges. This variable is significant at the 0.01 level.

4.5- Uncertainty about The Quality of Public Governance

This panel contains regulatory burden, control of corruption, rule of law, natural logarithm of property rights and natural logarithm of government intervention as right hand side independent variables. Each variable has been observed over 1996, 1998 and 2000. As Beck (2001) mentioned we cannot use PCSE method if the number of observations is less than 10 per unit. Hence, we must look for proper panel estimators that allow for confined observations. But before proceeding, the properties of data must be detected.

The box plot of figure-B21, appendix B indicates that *Malawi* fluctuates with a different pattern as compared to other countries. Outcomes of cross validation test confirm this result in table-C9, appendix C. The mean squared error of 2.361 for this

country is very different from that for the other ones. Therefore, this country will be excluded from the next tests and estimations.

The F-statistic being 30.10 [37,56], we can reject the null hypothesis that coefficients of the unit effects are jointly equal to zero at the 0.01 significance level. Therefore, unit dummies will be included in the model to portray country heterogeneity, but the coefficients of variables are assumed to be constant across the countries through a pooling process as we discussed earlier.

The modified Wald test for country-wise heteroskedasticity yields a Chi squared statistics equal to 8.1×10^{32} [38] and we reject the null hypothesis of homoskedasticity between countries at the 0.01 significance level. Because contemporaneous correlation is a problem for TSCS data and not panel data, I do not test for existence of this phenomenon. The Wooldridge test for serial correlation in panel data yields a F-statistic 26.819 (1, 23), causing us to reject the null hypothesis of no first order correlation among the residuals.

The VIF test for multicollinearity in table-C18 of appendix C indicates a problem. Thus, the coefficients of dummy variables of Argentina, Chile, El Salvador, South Korea, Madagascar, Malaysia, Philippines, Poland, Thailand and Trinidad and Tobago are assumed to be zero to reduce the VIF test statistic below 10.

Regarding the outcomes of diagnostic tests we need to utilize an estimator, which allows for heteroskedasticity and serial correlation. According to Baum(2006), the cluster covariance matrix estimator allows for difference in the variance of the errors between clusters. Furthermore, it allows for correlations between errors in the same cluster. Kezdi (2003) demonstrates on the basis of a Monte Carlo study that robust clustered estimator, when utilized for the fixed effects model, is not only consistent but also behaves well in finite samples. Hence, I estimated a fixed effects

model, applying a robust clustered estimator. The outcomes are presented in table-C12 of appendix C. LSDV does not report F statistic due to the clustering process. R squared is 0.879 in LSDV, which is proper. The *regulatory burden*, *rule of law* and *property rights* all have a positive effect and are significant at the 0.05 level but only the *regulatory burden* is significant at the 0.01 level. Government intervention has a negative but insignificant effect. The most surprising effect is about the control of corruption. It affects private investment negatively and is significant at the 0.1 significant level.

4.6- Outcomes Analysis

As we discussed earlier, we expect that each kind of uncertainty restrains investment. Among macroeconomic variables, uncertainty about credit to private sector adversely affects investment. Admasu (2002) concludes that difference in the level of credit to private sector is the strongest explanation for variation in private investment across countries and over time. Our finding is that however uncertainty about the future level of the credit to private sector deters investment but its effect is not significant.

The second source of uncertainty stems from exchange rates. Articles in this field have often considered the effect of real exchange rate uncertainty on investment. As Serven (1998) explains it is related to the relative profitability of investment in domestic market v.s international market oriented activities. If the volatility of real exchange rate rises, it makes price signals less informative about the relative profitability of investment across different sectors in a way that hampers investment decisions. There are some studies which report an adverse and significant effect of

real exchange rate uncertainty on investment (e.g. Serven 1997, 2002a, 2002b and Cottani et al, 1990). However Darby et al (1999) adds that this effect is not conclusive and depends upon circumstances and Byrne and Davis (2005) conclude that it is the transitory and not the permanent component, which adversely affects investment. We instead consider uncertainty about distortions of real exchange rate in the manner proposed by Dollar (1992). It is interpreted as uncertainty about the direction of government trade policy i.e. whether is outward or inward oriented. Outward oriented policies are reflected in relatively little variability of the real exchange rate so that incentives are consistent over time and encourage exports. Brunetti and Weder (1997) show that uncertainty about distortions of real exchange rate is very important for investment. My study also confirms this negative effect of uncertainty regarding exchange rate distortion on private investment rate.

Unpredictability about growth is another source of uncertainty. As Serven(1998) explains, uncertainty of output growth is a measure of the unpredictability of future demand. Fuss and Vermeulen(2004), Darku(2000) and Fedderke(2004) have reported a significant and negative impact of uncertainty regarding growth on the investment rate. Our outcomes also confirm this result and it shows that if investors are uncertain about future demand, they hesitate to invest.

Terms of trade are related to the relative profitability of investment in the exportable merchandise sector versus import substitutive merchandise sector (Serven, 1998). According to Easterly et al (1993), depending upon the terms of trade, capital might flow from domestic saving or from abroad into the export sector or the import substituting sector. Thus, given the terms of trade, more uncertainty makes price signals less informative about the relative profitability of investment and hampers the decision to invest. Cardoso(1993) and Serven (1997)have reported significant and

negative impact of uncertainty regarding the terms of trade on private investment. Our results confirm a negative significant effect of terms of trade uncertainty on the private investment rate.

It is very common in developing countries that governments abruptly ban export or import of some merchandise because of the need to protect customers or producers. An investor needs long-term policy stability in marketing, exporting or importing commodities. This kind of intervention mentioned above is a bad signal and discourages investors. Our study shows that trade policy uncertainty has adverse effect on the private investment rate.

The effect of uncertainty about inflation on investment is quite complicated and ambiguous. At first we must aware that there is a distinction between inflation uncertainty and uncertainty about prices. As Cecchetti (1993) demonstrates:

One can easily imagine a case where the monetary authorities target a low or zero inflation rate but allow random base drift in the price level. In this case, the inflation rate could become quite predictable whereas the price level could remain unpredictable in the sense that its conditional variance could rise without bound with forecast horizon.

With this point of view Able (1980) explains that inflation should not have any direct effect on private investment, except for effects on the tax structure. Therefore, its uncertainty also should not have any direct impact. However he does not reject some possible indirect effects¹. For instance, Yigit (2002) shows that inflation uncertainty will adversely affect credit markets by reducing credit availability and raising the cost

¹ -Because the effect of inflation on future streams will offset by its effect on real discount rate when we calculate the net present value. For more information financial management textbook might be studied.

of borrowing. Thus, investment could be affected through this route. According to Oshikoya(1994) and Serven(1998) inflation is related to the aggregate level of profitability of capital. Therefore, its uncertainty and unpredictability can affect private investment adversely. Huizinga (1993) argues that inflation uncertainty affect investment through its impact on uncertainty regarding the net present value of future streams. One might argue that however the uncertainty about prices cannot be interpreted as inflation uncertainty but we cannot reject its converse, which means that inflation uncertainty cannot rise without any increase in uncertainty about prices. Thus, these two could be synonymous when we think about inflation uncertainty. The complexity of the relationship between inflation uncertainty and investment is because of the fact that uncertainty about inflation affects investment through two separate channels: uncertainty about future output prices and uncertainty about future variable factor costs (e.g. wages, input material prices, etc). Hartman (1972, 1973) and Abel (1983) demonstrate that an increase in uncertainty about ratio of output price to variable cost should increase capital investment. This is because of the fact that concavity of the production function means the benefits of investing in capital stock in those times when the price-cost ratio is high outweighs the costs of investing in capital stock in those times when the price-cost ratio is low.

Bar-Ilan and Strange (1996) show that especially in the case of investment projects (especially those which run for a long period) it is possible that an increase in uncertainty hastens the decision to invest. Including a lag between decision to invest and receipt of the first revenue of the project can change the investment decision. Under this circumstance, the investor cannot enter the market immediately. Thus, the opportunity cost of waiting does not depend on the price during the lag. Instead it will be related to the future prices. Longer intervals will increase the probability of higher

prices. Thus the opportunity cost of waiting rises with uncertainty. This means that an increase in uncertainty may hasten investment in order to catch the higher prices.

These conclusions are opposite to those of Pindyck (1991) who concludes that increased uncertainty about output prices decreases investment (see the literature review in chapter 1 for more details). On the other hand, there is no doubt uncertainty about costs reduces the investment because it increases the critical expected rate of return. Pindyck (1992) starts his argument by analogy with the put option in financial markets. This is based on a rule that implies that the investor invests until the expected cost to complete the project is not higher than a critical number. Costs of construction inputs vary whether or not investment is taking place. Hence, there is a value of waiting for information (i.e. probability of lower costs) before committing resources. Therefore, uncertainty about input costs reduces critical expected cost.

Empirical results are also different. Abel (1980) finds out that an increase in uncertainty about future inflation – which he considers synonymous with high rate of inflation- reduces the investment spending. Serven (1998) also shows that inflation uncertainty has negative effect on investment. Byrne and Davis (2004) demonstrate that inflation uncertainty can have two components (one permanent and the other temporary). Both of them affect investment adversely but the temporary component is more significant. The empirical study of Huizinga (1993) shows interestingly the complexity of the effect of inflation uncertainty on investment. He argues that inflation uncertainty leads to uncertainty about real wages, real output price, profit rate and the real price of materials inputs. Then, based on analysis of quarterly data from aggregate U.S. manufacturing from 1954-1989, he verifies that temporary increase in real wage uncertainty and permanent increase in output price uncertainty reduces investment and higher profit uncertainty leads to higher investment. And he

shows that on the basis of cross sectional analysis during the 1958 - 1986, that industries with higher real wages uncertainty and with higher real price of material inputs uncertainty had lower investment and industries with higher real output price uncertainty had higher investment rate. My study shows that uncertainty with regard to inflation has a negative effect on the private investment rate. However its effect is insignificant.

It seems that unpredictable changes in the real interest rate (which is the cost of money holding) must adversely affect private investment. Zalewski (1994) finds out there is a positive relation between risk premium and interest rate volatility. Bo(1999) confirms that interest rate volatility influences investment. My study shows that uncertainty about the real interest rate does not have a significant effect on private investment, though it is negative in sign.

There is not a consensus among experts about the effect of democracy on private investment. This effect is vague and indirect. Keefer (2004) argues that more democracy means more accountability of the government. Government has to provide more security for property rights otherwise it will be punished either in the process of elections or by free media. This argument has been confirmed by Adsera et al (2003), Fox (2000), Stasavage (2000), Goodin (2004), Li (2005), Li and Resnick (2001), Kaufman and Vicente (2005), Weingast (1995). Iyigun and Rodrik (2004) illustrate that the fiscal link between government and its citizens is also needed to increase accountability. Adsera et al (2003) demonstrates that along with accountability the degree of information also matters. An article published by OECD (2003) shows that the transparency of government is important in generating clear information and Bovens(2005) adds that media have an important role in this field. It has also been mentioned that democracy can affect investment. Ulubasoglu and Doucouliagos

(2004) and Feng (2001) confirm that the accumulation of human capital and democratic behavior can facilitate the processing and aggregation of local knowledge in the best possible manner. Papaioannou and Siourounis(2004) quote from some scholars that this relation can be direct due to lower political instability and sounder structural policies.

On the other hand, Przeworski and limongi (1993) demonstrate that politics matters but regimes do not capture the relevant difference. Papaioannou and Siourounis(2004) quote (from Becker,1983) that democratic regimes can yield inefficient outcomes by enabling various interest groups to compete. Feng (2003) adds that it can spur a desire for immediate consumption that can hamper investment. Moreover, it allows the median voter to redistribute incomes toward the poor, reducing incentives to save and invest. And finally, Wu (2004) shows that in the presence of some structural factors autocrats do better than democracies. The result of my study shows however there is a positive correlation between the degree of democracy and private investment, but it is not significant. So, we cannot confirm any relationship between the level of democracy and the rate of private investment. It is quite possible that the mentioned positive factors are neutralized by negative factors.

Barro(1999) has elaborated routes through which inequality can affect private investment: first, if the poor tend to invest more in human capital, a reduction in inequality tends to encourage investment through a higher accumulation of human capital. Second, greater inequality makes government redistribute income because of the political pressures. This results in more transfer of resources, which discourages investment. Third, inequality can lead to more crimes, riots and sociopolitical unrest, which result in higher waste of resources and lower investment. But, the author finds out little overall relation between income inequality and the rate of investment

through his empirical study. He also acknowledges that inequality can have different consequences in poor and richer countries. According to Hoft (2003) societies that began with more extreme inequality are more likely to make and develop redistributive institutions. My outcomes, however, confirm the results of Barro (1999) that there is no significant relationship between inequality and the rate of private investment.

At the first glance, it seems there are sufficient reasons for war to increase uncertainty and discourage private investment. It destroys properties, increases taxes, causes more government intervention, monetary policy disturbance, dislocation of export and import trade and diversion of normally productive efforts to advance unproductive aims. But as Dulles (1942) mentioned:

Destruction itself creates a need for new consumer goods. The conversion of industry to wartime purposes necessitates the production of new capital goods or the reconditioning of old plant, ..., the need, in the past, has been so great that although surpluses of various types of commodities exist side by side with shortage, the opportunity to invest has been so spectacular that funds have been forthcoming from many varied types of sources.

Thus, shortage of commodities in the wartime generates price increases, which cover the high discount rates attributable to existing uncertainties. But, there is a condition. If there is a long continued political uncertainty, it will prevent expansion even if the economic condition is ready for further investment (Dulles, 1942). Hence, from this point of view there is a big difference between war and civil war. War is more likely to tend to national unity and smoothen differences in a country and generate political stability. Civil war, on the other hand, is a consequence of extreme and long lasting divergence and conflict within a society, which coexist with political instability.

Therefore, we can expect that there is a likelihood of a higher private investment rate in wartime but there is no reason for civil war to encourage private investment. My empirical outcomes confirm the aforementioned argument that wars increase the private investment rate whereas civil wars reduce it significantly.

There are some different routes through which sociopolitical unrest and instability can affect private investment. As Feng (2001) mentions, during political instability consumers reduce their saving and consumption rises since saving may become worthless. Furthermore, investors prefer to keep their properties and portfolios in liquid and portable forms like gold and foreign currencies that have better potential of retaining value. Carmignani (2001) demonstrates that political instability can lead to policy uncertainty and reduce security of property rights. Thus, a “*risk averse economic agent may hesitate to take economic initiatives or may exit the economy by investing abroad*”. Sterb (2001) concludes that political instability can imply uncertainty about the rules of the game. Fielding (2003) argues that political instability can affect investment by increase in the degree of insecurity that is felt by investors along with disruption of economic activities caused by associated extensive unrest. My findings show that not all kinds of political instability matter for private investment. Purges and coups have a negative influence on private investment while assassinations, revolutions and strikes do not affect significantly private investment. The effect of riots, however, is not stable. It shows a positive significant effect in equations *a* and *b* of table-C11 of appendix C but its effect becomes insignificant in *fevd* method. Therefore, there is some evidence which justifies rejection of the hypothesis that riots have a negative effect on private investment.

Constitutional change results in a kind of uncertainty about policies. It can signal more extensive and deeper changes in social, political and economical policies.

Investors are often sensitive to such signals as these signals endanger their future rights and profits. Constitutional change can lead to higher perceived costs of capital (Rodrik, 1989 and Berg, 2001 and Jeong, 2002). Therefore, we should expect that investors adversely react to constitutional changes. Our findings also confirm this inference.

Apart from the fact that arbitrariness and unpredictability of regulation discourages investment, regulations themselves as a burden could be a source of uncertainty: Klapper et al (2004) and Alesina et al (2003) shows that entry regulation hampers entry but regulation that enhances the enforcement of intellectual property rights or those that lead to a better condition of the financial sector encourages more investment. Evenett (2003) demonstrates that competition law (e.g. laws, which deter bid rigging, monitor mergers and acquisition and regulates new entry into industry) fosters the investment climate in the country. Dollar et al (2003) adds that the monetary and time cost of regulations have negative implications for private investment. North (1993) demonstrates that countries with extensive “securities regulation” and strong enforcement mechanisms exhibit lower cost of capital. Jamison et al (2005) shows that regulatory instruments that promote policy stability lead to higher investment. Snodgrass (1996) shows how good quality regulations can foster micro finance programs. According to Loayza et al (2004) entry regulation, labor regulation, fiscal burden, trade barriers and financial market regulations tend to reduce investment as well as growth.

Another point of view is that not only quality but also extent of regulations matter: Johnson and Kaufman (2001) conclude that regulation associated with a larger unofficial (illegal) economy implies less investment. Frye and Zhuravskaya (2000) show that unofficial firms have problem in enforcing their contracts, because

they cannot use official routes for this purpose. Guadch and Hahn (1997) explain that unnecessary regulations can have adverse effect on investment through the costs imposed by them. Bolaky and Freund (2004) show that excessive regulations prevent resources from moving into the most productive sector and the most efficient firms within sectors. My empirical outcomes also confirm the negative effect of regulatory burdens on private investment.

According to Lovei and Mckechnie there are different types of corruption in a country (e.g. petty corruption, managerial and bureaucratic corruption, and grand corruption) and its patterns can vary among countries and over time (Doig and Riley). But there is no reason to think that corruption can foster private investment. It has a direct and indirect adverse effect on private investment. McMillan and Woodruff (2002) point out that official corruption makes operating difficult for business and leads to expropriation of profits. It can affect entrepreneurs by increasing costs and operating time (Miralles, 2002). Thus, investors can lose their confidence (Ferrarini, 2003). It can raise transaction costs and uncertainty in different parts of the economy (Gray and Kaufmann, 1998) and its cost can act as an unpredictable tax (Mauro, 1997; Everhart and Sumlinski, 2001). It can lessen the competition in a country (Perotti and Volpin, 2004) because it distorts the rules of the game (Klitgaard, 1998; Khwaja and Mian, 2004; Sapienza, 2004; Hellman and Kaufmann, 2003 and Zemanovicova et al). Bribes divert productive resources, thus adversely affecting efficiency and outputs of the firms (Rodionova, 2001 and Scharfstein and Stein, 2000).

Corruption can adversely affect private investment through low quality public services and infrastructure (OECD, 2005; Tanzi and Davoodi, 1997 and Mauro, 1997). It can influence the contracts on public goods and reduce public revenues

(Gray and Kaufmann, 1998 and Tanzi and Davoodi, 1997). Along with lowering of the quality of public output and services it drives up the prices of services (Lee and Ng, 2003). Furthermore, corruption can ruin the economy and private investment through other channels: bureaucrats react to the opportunities for corruption by actually increasing red tape and reducing their bribe-free performance (Keefer, 2004). Thus, it can lead to heavy and unnecessary regulation and procedural formalism to generate bribe opportunities (Djankov et al, 2002).

On the other hand, according to some scholars, it can speed up procedures like governmental permission to carry out legal activities and sometimes even illegal activities (Gray and Kaufmann, 1998). Such action leads to a large unofficial economy with hidden underground activities (Johnson and Kaufman, 2001). Corruption can also hamper the enforcement of regulation in a country (Klapper et al, 2004).

Most of the evidence is in favor of control of corruption fostering private investment, but my results indicate that control of corruption reduces the private investment rate. There are some studies that argue that corruption can act as grease for fostering private investment (e.g. Bayley, 1966 and Lui, 1985). Thus, if the procedure for an official certification takes a month's time without corruption, then in its presence the procedure can become faster. However, bribe taking itself has a transaction cost in form of time. Therefore, the net effect on time taken would be positive (see Shahid Alam, 1989). According to Shahid Alam (1989) there are different ways in which funds allocated for investment can be diverted for corrupt activities. It is likely the funds that seemingly showed as allocated for making loans (which often is contained within government subsidies to encourage investors to invest), are often overstated through collusion between government and investors and

are diverted to meet political desires or shared out between phony investors and bureaucrats. In this circumstance, since there is no real commitment to control the usage of the loans, they are more likely to be diverted to consumption. A second way in which investment funds can be diverted into corruption proceeds occurs when bribes are used to influence the gains of public contracts for investment projects. In this condition, the bribe is generally paid out of savings from cheating on the terms of the contract. Often there can be little question of a net contribution to investment from such corruption because the loss in the economic value of the project resulting from corruption will generally exceed the saving there from.

There is no doubt that in both ways mentioned above the book value of investment declared by investors is higher than real capital formation by investors. So when there is any action to control such corruption the book value of investment declines in a country.

On the other hand, according to Lambsdorff (1999 a, b) along with the investment, corruption can affect the productivity of capital. And because we use the ratio of investment to GDP as the left hand side variable:

[Because] the productivity of capital declines, total output - that is GDP - drops in relation to the capital stock, meaning that the ratio of investment to GDP is likely to increase in reaction to corruption.

So it is likely that when we are trying to control corruption we observe a decline in the rate of private investment.

Those aspects of rule of law that encourage private investment include contract enforcement mechanisms, commercial norms and rules, habits and beliefs which lead to shared values and accumulation of human capital (Shirley, 2003). This is because these aspects can lessen the cost of capital (Hail and Leuz, 2004 and

Pinheiro and Cabrel, 1999). The high cost of commercial dispute can discourage private investment (Broadman and Anderson, 2004) and deter firms from taking more chances (Bigsten et al, 1999). Well-functioning courts encourage entrepreneurs to test new suppliers. This is important when specific investment is needed for a relationship to develop (Johnson et al, 2002a). Many firms do not rely on written contracts. They limit their conduct to customers they know properly and incur costs when suppliers deliver goods late or that are below agreed upon quality (Hallward-Driemeier and Stewart, 2004) in the absence of contractual safeguards. Moreover, the weak legal environment is associated with a larger unofficial economy with hidden under ground activities (Johnson and Kaufman, 2001).

Furthermore, the enforcement of rules maybe equal or even more important than legal rules. Thus, the existence of a strong legal enforcement is as important as strong laws (La Porta and Lopez-de-Silanes, 1998). The market is unlikely to function in the absence of contract enforcement that encourages exchange and investment (Davis, 2004).

The other determinant of private investment is crime. It diverts resources to protection efforts, leads to health costs because of increased stress and creates an environment unfriendly to productive activity (Demombynes and Ozler, 2002). For instance, in the case of Ugandan firms, 54 percent of firms had been victims of robbery and 37 percent have been victims of fraud (Reinikka and Svensson, 1999). In severe circumstances it can affect investment through brain drain (Demombynes and Ozler, 2002). My study results confirm this analysis (see Brunetti and Weder 1997 , Lamech and Saeed 2003, and Sharifazadeh and Bahreini 2003 for corroborative results).

Property rights constitute one of the most important factors that determine private investment. Investors will not invest if they expect to be unable to reap the fruits of their investment (Johnson et al, 2002b). This can happen through the confiscation and expropriation of their properties by government (Besley, 1995 and Fafchamps and Minten, 2001 and Keefer, 2004), inadequate enforcement of intellectual property rights (Fink and Maskus, 2005), restriction in transfer of properties (Besley, 1995), theft and embezzlement (Fafchamps and Minten, 2001). Property rights can encourage investment through improvement in the allocation of resources (Claessens and Leaven, 2003). Otherwise, investors might not have ownership rights for turning their wealth into more productive uses (The Heritage Fund, 2005). For example, according to Heinsz (2000), institutional environments in which entrepreneurs can keep their profits through political channels leads investors to reallocate resources from economic to political activity. My empirical output confirms the direct and significant effect of property rights on the private investment rate. This relationship has been confirmed by other studies (e.g. Serven, 1997 and Do and Lye, 2003).

Government participation in the economy through consumption and production may wipe out the private sector and lead to lower level of private investment. This can occur through two routes: higher the consumption of government as a percentage of GDP, the more are the resources the government is pulling from the private or free market and second, business activities of the government might crowd out private initiative and investment due to construction of government-owned monopolies in the country. However our findings do not show a significant relationship between government contribution in the economy and the private investment rate.