THE DETERMINANTS OF POLITICAL INSTABILITY: A REGRESSION ANALYSIS

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Abstract

This study is an empirical examination of the effects of various economic, social-demographic, and political variables on the probability of political instability. The dataset consists of 126 observations on 63 nations in the years 1996 and 2006. The method of estimation is Probit. There are two empirical equations. These equations are different based on the nature of their economic variables. The first equation controls for the effects of the level of a nation's economic, while the second equation controls for the effects of a nation's economic variables relative to the region's average. The estimation results suggest that the model that controls for the relative economic variables can predict the probability of political instability better.

Introduction

Why do some countries experience political instability while others don't? Is there a way to predict the probability of political instability? This study focuses on economic, social-demographic and political determinants of political instability. Specifically, I formulate two Probit regression models and utilize a dataset consisting of 63 nations in two years (1996 & 2006) to estimate the net effects of various factors on the probability of political instability.

In recent decades, there have been numerous empirical studies on the determinants of political instability. These studies vary based on their definitions and measurements of political instability, samples, formulation and estimation methods of their empirical models, and their results. The lack of consistency in the literature necessitates further studies on the determinants of political instability.

When it comes to the definition and measurement of political instability, researchers such as Alesina et al (1996), Siermann (1998), Gasiorowski (1999), Fosu (2001), and Miljkovic and Rimal (2008) consider a change of government as a sign of political instability. Generally, the measure of political instability in these studies has to do with the number of the regular and irregular changes within the government. Other studies such as Alesina and Perotti (1996),

Gupta et al (1998), Rodriguez (2000), Blanco and Grier (2000) consider any degree of social unrest as political instability. Hence, their measurement of political instability focuses more on a society's reaction towards government. For example, they may use the number of protests or the episodes of political violence, the crime rate, or the death rate due to internal war as a measure of political instability.

As mentioned above, the literature contains no consistent empirical formulation on the causes of political instability. For example, a few studies (Alesina and Perotti 1996, Aleisna et al 1996 and Rodriguez 2000) are particularly focused on the simultaneous relationship between economic and political instability. These studies formulate and estimate a system of two equations. The first equation has political instability as its dependent variable while the second equation has a measure of economic development as its dependent variable. Others, such as Fosu (2001), Gasiorowski (1999), and Jong-A-Pin (2009), believe that the direction of causality is from political instability to economic development. As a result, their empirical model has a measure of economic development as its dependent variable. Most researchers (such as Gupta et al 1998, Siermann 1998, Miljkovic and Rimal 2008, Blanco and Grier 2008) subscribe to the view that the direction of causality is from economic instability to political instability. Therefore, their empirical model has political instability as its dependent variable and economic development (among other factors) as an independent variable.

Although the exact nature of the independent variables included in various studies differs, generally, these variables fit in three categories: economic, social-demographic and political. The economic variables usually consist of a measure of the level of output, the economic growth rate, the rate of inflation, and a measure of income distribution. The most commonly used social demographic variables are the level of education and the level of urbanization. Among the

political variables that most studies include in their empirical model is a measure of the level of democracy as well as a variable that controls for the political climate in the region.

Depending on the definition and the method of measurement of political instability, the nature of the dataset, as well as the hypothesized direction of causality between economic instability and political instability, previous studies have used a variety of methods of estimation. Specifically, due to their argument that political instability and economic instability are simultaneously determined, Alesina and Perotti (1996) use the two-stage least squares (2SLS) procedure while Alesina et al (1996) use Amemiya's generalized least squares procedure. Among the studies that assume that political instability is caused by economic instability, there is a wide range of estimation methods including ordinary least squares (OLS) (used by Siermann [1998] and Blanco and Grier [2000]), Possion (used by Miljkovic and Rimal [2008]), and the fixed effects model (used by Gasiorowski [1999]).

The dependent variable used in this study measures political instability as a dummy that takes a value of "0" if the state is stable and a value of "1" if the state is unstable. The dataset used to construct the dummy variable is entitled the Major Episodes of Political Violence (MEPV), published by the Center of Systematic Peace. Due to the nature of the dependent variable, this study utilizes the Probit method of estimation. The predicted value of the dependent variable, therefore, is an estimate of the probability of political instability in a given nation. Also, to avoid the potential simultaneity problem between political and economic instability, the economic variables included in the empirical equation of this study are all lagged by one year. This study uses a pooled dataset containing 63 nations in 1996 and 2006.

In addition to the usual economic, social-demographic and political explanatory variables that previous researchers have included in their empirical equations, this study also includes a variable that measures the percentage of the population that uses the internet as well as a measure of the employment rate. Moreover, the empirical models formulated in the literature ignore the Relative Income Hypothesis (Dusenberry, 1949) or the Relative Deprivation Theory (Gurr, 1970). These are well-substantiated theories suggesting that an individual's level of happiness and satisfaction depends, in part, on the level of his income relative to that of others. When it comes to the determinants of political instability, the implication of these theories is that political instability in a nation is affected by the state of the economy in the nation relative to that in neighboring nations. To capture this effect, I formulate and estimate a model in which the nation's economic variables are measured relative to the average of the same variables in the region.

The remainder of this paper is organized as follows. First, various definitions and methods of measurement of political instability are discussed and the method of choice is selected. The next two sections discuss the direction of the causality between economic and political instability as well as the effect of relative economic variables on political instability. The empirical models and the method of estimation are outlined in the next section, followed by a discussion of the diagnostic econometric tests and a brief description of the sample observations. Finally, I discuss the empirical results and conclusions.

Definition and Measurement of Political Instability

There are a variety of definitions of political instability in the literature. These definitions can be divided into two general categories: one with a focus on the frequency of government changes, and the other with a focus on the degree of social unrest.

The first category of definitions of political instability considers a change in the political system as a measure of political instability. For example, Lipset (1960) defines political instability as the lack of persistence or continuity of a certain type of political system. Sanders' (1981) definition of political instability is similar to Lipset's, but he argues that political instability is a relative term. That is, a given state's political instability can only be measured in comparison to other states or compared to itself over time.

The government-change focused definitions of political instability have an advantage in that they result in the collection of consistent data across various nations. This is because it is difficult to ignore or miss the changes in governments across nations. For this reason, researchers, such as Siermann (1998) have used the government-change definition of political instability. The drawback of employing these definitions is that they may result in a measure of political instability that either underestimates or overestimates the true degree of political instability. This approach may underestimate the degree of the true political instability in that it may ignore political unrest until it become so tremendous that it causes a direct change in government. For example, almost all political scientists agree that currently the country of Iran is not politically stable. However, because the government of Iran has not changed, it is regarded to be politically stable based on this definition. On the other hand, this approach may result in the overestimation of political instability as in some cases governmental changes are not the result of instability but

the result of a democratic system. For example, the governments of Italy and Japan may change frequently due to disintegration of political coalitions. These changes do not necessarily reflect political instability, but they may be regarded as such based on this definition.

The second category of definitions focuses on the degree of social unrest as a measure of political instability. According to these definitions, a nation is politically unstable if its residents reveal some degree of unhappiness towards the government or the regime. This unhappiness could be expressed via numerous types of activities such as political violence, strikes, and other forms of political protests. For example, Siermann (1998) argues that the best measure of political instability is "… the frequency with which certain socio-political events occur" (Siermann 1998 p.30), though he admits that this approach is difficult to implement. A similar definition of political instability has been developed by Huntington (1968). This definition associates the degree of political stability in a nation with the strength of its political institutions. Huntington argues that high levels of social frustration motivate the population to act against the government, and if its political institutions are weak, such a conflict would be magnified.

Gurr (1970) also prefers the more general definition of political instability. He argues that political instability occurs when a society's expectations are not met. These expectations could be regarding many different issues. It is not always necessary for populations to tear down the whole system or change government leaders to address these issues. Sometimes, all that is required is for the government to change certain policies. Gurr argues that, in some instances, the process of changing a policy may be regarded as political instability. A more recent measure of political instability adapted by Dutt and Mitra (2008) simply counts the number of demonstrations against the dictatorial regimes in a nation.

The definition of political instability used in this study is consistent with the second category of definitions discussed above. Specifically, this study use the dataset provided by the Center of Systematic Peace on the Major Episodes of Political Violence (MEPV). This dataset includes an index of political instability across many nations during the last five decades. The index of political instability is measured on a scale of 0 to 10 based on the degree of severity of political protest and violence in each nation in any given year. The advantage of this index over other indices of political instability, such as the state fragility index, is that it is raw. That is, it is not a composite measure of political instability that is developed based on the estimation results of various regression equations that have economic and social factors as their independent variables.

This study defines political instability as a dummy variable that takes a value of "0" if the MEPV of a given nation in a given year is 0, and a value of "1" if the MEPV of the nation is between 1 to 10. The reason for this dichotomy set up is the small number of observations on the unstable states.

The Direction of Causality between Political and Economic Instabilities

There seems to be a lack of consensus in the literature on political instability on the direction of causality between political instability and economic instability. For example Alesina and Perotti (1996), Alesina et al (1996) and Rodriguez (2000) use a simultaneous equation model to predict the degrees of political instability and economic instability jointly. On the other hand, Fosu (2001), Gasiorowski (1999), and Jong-A-Pin (2009), examine the effect of political instability on economic instability. Other researches, such as Gupta et al (1998), Siermann

(1998), Mijkovic and Rimal (2008), Blanco and Grier (2008) use political instability as their dependent variable and examine how economic variables affect political instability.

To diminish the potential simultaneity problem between the degrees of economic and political instabilities, the economic variables included in the regression equation utilized in this study are lagged by one year. This formulation is consistent with the reasoning that it takes time for the population of a given nation to react to economic hardships.

The Role of Relative Economic Development on Political Instability

Many scholars (such as Dusenberry [1949], Gurr [1970] ,and Kitingan [1989] argue that political instability is not only caused by a nation's own economic, political, and social conditions but also by the nation's own conditions relative to those conditions in other nations. The Relative Income Hypothesis (Dusenberry, 1949) argues that an individual's utility depends on his income relative to that of others. Also, Kitingan's (1989) System Gap Model and Gurr's (1970) Relative Deprivation Theory point out that the main source of unhappiness (hence, political instability) is the gap between the overall expectations of a given population and those expectations that are fulfilled. According to these theories, the population's overall expectations are not formed in isolation. Rather, the conditions in other nations play a role in forming expectations among a given nation's population. For example, a country that experiences a low rate of economic growth is not likely to experience political instability if most of its neighboring nations have an even lower rate of economic growth. On the other hand, if most of the neighboring nations of a country are economically better off than the country under study, the likelihood of political instability in that country increases. To see if this study can find empirical evidence for the above theories, in addition to a model similar to that of others (where political

instability depends on the level of various variables), this research also estimate a model where political instability depends on the level of certain variables relative to the average of those variables in the region.

The Model Specification

The empirical model used in this study is represented by Equations 1 and 2 below.

Equation1: $PI_{it} = f (GDP\ PERCAP_{it-1} + GDPGRO_{it-1} + INFLAT_{it-1} + EMPLOY_{it-1} + EDUC_{it} + URBAN_{it} + INTERNET_{it} + LIFE_{it} + DEMO_{it} + NEIGHBOR_{it}) + ERROR_{it}$,

Equation 2: $PI_{it} = f (R\text{-}GDP\ PERCAP_{it-1} + R\text{-}GDPGRO_{it-1} + R\text{-}INFLAT_{it-1} + R\text{-}EMPLOY_{it-1} + EDUC_{it} + URBAN_{it} + INTERNET_{it} + LIFE_{it} + DEMO_{it} + NEIGHBOR_{it}) + ERROR_{it}$,

where $i = (1, 2, \ldots 63)$ and $t = (1996 \& 2006)$, the dependent variable in both equations (PI) is a dummy that takes a value of 0 if the state is stable, and 1 otherwise. The predicted value of PI is a measure of the probability of political instability. The list of the independent variables included in Equations 1 and 2 (along with the method of their measurements and the expected signs of their coefficients) is shown in Table 1.

Table 1: The Independent Variables Included in Equations 1 & 2, Their Measurements, and the Expected Sign of Their Coefficients

Variable	Measurement	Data Source	Expect Sign of Coefficient
Economic Variables			
GDP PERCAP $_{it-1}$	Lagged Purchasing Power Parity GDP Per Capita	World Bank	Negative
GDPGRO $_{it-1}$	Lagged RGDP Growth rate	World Bank	Negative
INFLAT $_{it-1}$	Lagged Percentage Annual Change in CPI	World Bank	Positive
EMPLOY $_{it-1}$	Lagged Ratio of Employed to Overall Population	World Bank	Negative
R-GDP PERCAP $_{it-1}$	Lagged PPP Per Capita GDP Divided by the Region's* Average	World Bank	Negative
R-GDPGRO $_{it-1}$	Lagged RGDP Growth Minus the Region's* Average	World Bank	Negative
R-INFLAT $_{it-1}$	Lagged Percentage Change of CPI Minus the Region's* Average	World Bank	Positive
R-EMPLOY $_{it-1}$	Lagged Ratio of Employed Population in the Nation minus the Region's* Average	World Bank	Negative
Social-Demographic Variable			
EDUC $_{it}$	Gross Primary Enrollment Rate	World Bank	Ambiguous
URBAN $_{it}$	The Ratio of Population in Urban Areas to the Overall Population	World Bank	Ambiguous
INTERNET $_{it}$	Numbers of Internet Users per Hundred Population	World Bank	Ambiguous
LIFE $_{it}$	Life Expectancy	World Bank	Negative
Political Variables			
DEMO $_{it}$	An index Taking a Value Between 0 (Extreme Dictatorship) to 10 (Extreme Democracy)	POLITY IV	Negative
NEIGHBOR $_{it}$	A Dummy Variable Taking a Value of 1 if any of the Neighboring Nations (Nations Sharing a Border with Nation i) are Unstable, 0 Otherwise	MEPV dataset	Positive

***** Definition of the region is consistent with the definition used by the World Bank. Specifically, the world is divided into six regions**:** North America, Latin America, Africa, Middle East and North African, Asian, and Europe.

Economic Variables

As shown in Equation 1 and Table 1, this study includes the per capita level of output in its empirical model. The level of output is a key measure of the economic performance. Huntington (1996) considers the level of output as a measure of population's economic satisfaction which consequently influences its satisfaction towards the current government. This variable is one of the most commonly included variables in the previous empirical models (Alesina and Perotti 1996, Siermann 1998, Miljkovic and Rimal 2008). As for the effect of the level of output on political instability, the literature is mixed. Miljkovic and Rimal (2008) find significant and negative correlations between economic output and political instability. However, Alesina and Perotti's (1996) conclude that the correlation between the same variables is negative and insignificant. Siermann's (1998) study shows that the economic output has a significant and positive effect on political instability only when political instability is measured by the number of the regular changes in the government. Otherwise, Siermann finds an insignificant correlation between economic output and other measures of political instability.

The measure of the level of output in this study is the lagged Purchasing Power parity Real GDP per capita (PPP RGDP). Arguably, this is a better way to compare the economic output across countries than the nominal GDP, since it adjusts for the difference in the purchasing power, the inflation rate, as well as the size of the population. This variable is lagged by one year due to the argument that it takes time for a population to react to the level of output. Note that Equation 2 includes the ratio of this variable to the region's average. The expected sign of the coefficient of this variable in both equations is negative.

This study considers the rate of economic growth as a determinant of political instability. Regardless of the level of a nation's GDP, a high rate of economic growth (measured by the lag percentage change in real GDP) is expected to enhance the degree of optimism in the nation, resulting in a lower probability of political instability. The inclusion of a measure of economic growth in an empirical model that aims to predict political instability is not a new idea. In fact, many of the reviewed studies (such as Alesina, et al 1996, Siermann 1998, Gupta 1998, Rodriguez 2000, Asteriou and Costas 2000, Miljkovic and Rimal 2008, and Fosu 2000) regard economic growth as a determinant of political instability. The measure of economic growth across these studies, however, is not consistent. For example, Alesina, et al (1996) and Siermann (1998) use the lagged nominal GDP growth as the measure of economic growth. Gupta (1998), Mijkovic and Rimal (2008) and Fosu (2000) use the current year's growth rate in nominal GDP. Finally, Asteriou and Costas (2000) and Rodriguez (2000) use the per capita real GDP growth rate. Regardless of the way they measure economic growth, all of the reviewed studies report a negative and significant correlation between political instability and the economic growth.

Given that the empirical model of this study has a measure of inflation as one of its explanatory variables and the real GDP is adjusted for inflation, I choose to include the growth rate in real GDP in my model. As discussed before, this variable is lagged to diminish the potential simultaneity problem between economic and political instabilities. To measure the economic growth in a nation relative to that in other nations, I include a variable in Equation 2 that subtracts the average rate of economic growth in the region from the rate of economic growth in the nation under study. The expected sign of the coefficient of this variable is negative in both empirical equations.

The inflation rate is another explanatory variable that is included in this study. This variable is measured by the lagged annual percentage change in CPI in Equation 1. In Equation 2, the relative inflation rate is measured by the rate of inflation in the nation under study minus the average rate of inflation in the region. This variable is included in empirical equations to control for the effect of economic uncertainly on political instability. All else equal, a low and steady rate of inflation increases the level of investment and economic activity in a nation. Moreover, being able to control the rate of inflation enhances government's credibility, hence diminishing the probability of political instability. Recent riots in Tunisia, Egypt, and other African countries are in part due to the high rates of inflation that damaged the state of the economy and the population's confidence towards its government.

Among the reviewed studies, there are only a few that include either the inflation rate (Jong-A-Pin, 2009 and Gasiorowski,1999) or the standard deviation of the inflation rate (Blanco and Grier, 2000) in their models. Only Gasiorowski (1999) finds a significant positive correlation between political instability and inflation.)

The lagged employment rate (the percentage of population with jobs) is another important determinant of political instability. Though I was not able to find a study that includes this variable in its empirical model, I find Huntington's (1996) argument on the effect of the employment rate on political instability appealing. Huntington argues that the employed population has less desire, time, or energy to follow or organize any actions against the government. Thus, I expect to find a negative correlation between the employment rate and the probability of political instability. The relative employment rate in Equation 2 is measured by a nation's employment rate minus the average employment rate in the region.

Social-Demographic Variables

The next category of independent variables included in the empirical Equations 1 and 2 are the social-demographic variables. These variables measure education, urbanization, internet usage, and life expectancy. Due to the nature of these variables, it makes little sense to include a relative version of them in Equation 2. For example, there is no reason to believe that because the residents of a nation use internet more often than the residents in the other nations in the reign, they are more (or less) likely to rise against their government.

The first social-demographic variable included in both variations of the empirical model (Equations 1 & 2) is the gross primary enrollment rate (EDUC). As indicated in Table 1, the expected effect of this variable on the probability of political instability is ambiguous. To the extent that this variable measures the accessibility of primary education in a country, it is expected to have a negative effect on the probability of political instability. This variable may also be considered as a proxy for the level of education in the population. An educated population is expected to be more aware of political, social, or economic problems than an uneducated population, hence more likely to act against government. On the other hand, an educated population may be more likely than an uneducated population to voice its concerns through the regular political channels before getting involved in radical behavior.

Several researchers have studied the effect of a measure of education on political instability. The two measures of education that are used in these studies are the primary enrollment rate (used by Alesina and Perotti 1996 and Alesina et al 1996), and the secondary enrollment rate (used by Haque et al, 2007). However, only Alesina and Perotti (1996) find a negative and significant correlation between the level of education and political instability.

The percentage of the population that lives in urban areas is another social demographic variable that I include in my empirical model. The effect of urbanization is expected to be ambiguous. As Manarik (1984) argues, all else equal, the income distribution tends to be less even in urban areas, resulting in a possible conflict among various economic classes. Moreover, due to the higher population density in urban areas, it is easier (and perhaps more effective) to organize demonstrations against government in those areas. Based on the above two arguments, one may predict a positive correlation between the degree of urbanization and political instability. On the other hand, the basic needs of a population (such as access to hospitals, electricity, clean water, etc.) are more likely to be met in the urban rather than rural areas, enhancing the population's satisfaction. Based on this reason, one may predict a negative correlation between urbanization and political instability. To the best of my knowledge, only one study includes a measure of urbanization in its empirical model. That study is conducted by Blanco and Grier (2000), where the degree of urbanization is measured by the growth rate in population living in the urban areas.

Given the role that social networking devices, such as Facebook and Twitter, have played in recent protests across the Middle East and North Africa, and given Morozov's (2010) argument that the internet promotes political violence, I chose to include a new variable in my empirical model. This variable measures the percentage of the population that uses the internet. The expected effect of this variable on political instability, however, is ambiguous. The reason is that, despite the fact that the internet makes it easier for dissatisfied populations to organize a movement against government, it also provides a channel for the population to diminish the degree of its frustration by sharing it with others. As Gladwell (2010) points out, the internet has provided a place for a population to express its anger online instead of on the streets.

Life expectancy is another variable that this study includes in its empirical equations. This variable is a proxy for factors other than economic variables that reflect the overall quality of life, hence affecting a population's happiness. Arguably, the longer the life expectancy, the better the living condition of the population. This will decrease the possibility of radical actions taken by population. Therefore, I expect to find a negative correlation between life expectancy and the probability of political instability. This expectation is also consistent with the results of Haque et al (2007) study.

Political Variables

The third group of independent variables included in Equations 1 and 2 are the political variables. These variables are a measure of the level of democracy in a nation as well as a dummy that accounts for neighboring states' political instability. Snyder (2000) seems to be arguing for formulating a non-linear (polynomial) relationship between the degree of democracy and political instability. At low levels of democracy (when the democracy has just formed but has not yet matured), it may be positively correlated with political instability. On the other hand, after democracy reaches a certain degree of maturity, it may be negatively correlated with political instability. Thus, an extremely un-democratic or extremely democratic political system is both arguably more stable than a political system in transition.

Among the studies that control for the degree of democracy in their empirical models are Alesina et al (1996) and Gupta (1998). Both of these studies include a dummy variable in their models that takes a value of 1 if the system is democratic and zero otherwise. Miljkovic and Rimal (2008), on the other hand, attempt to account for the degree of democracy in their model by using several dummies that account for democratic, semi-democratic, authoritarian, or

transitional regimes. All of the above studies find a negative correlation between democracy and political instability.

This study uses the POLITY IV datasets provided by the Center of Systematic Peace to measure the level of democracy. The democracy index is measured on a scale of 0 to 10 depending on the degree of democracy in a nation. As discussed above, Snyder (2000) argues for the formulation of a non-linear (polynomial) correlation between the degree of democracy and political instability. However, given the non-linear nature of my estimation method (Probit), I chose to include only the level of democracy in my empirical model.

Due to unavailability of regional data on the degree of democracy, this study does not include a measure of relative democracy in Equation 2. However, both Equations 1 and 2 include a dummy variable that takes a value of "1" if any of the neighboring states experiences political instability and "0" otherwise. Arguably, because of the frequency of the communication and the cultural and religious bonds among states that share borders, political riots are likely to spread easily among neighboring states. Ades and Chua (1997) argues that there is a spillover effect of neighboring countries' instability on domestic politics. Goldstone et al (2010) also includes a measure of neighboring state political instabilities in their empirical model. The real life evidence from the recent sweep of revolution in the Middle East is consistent with this point.

Method of Estimation

This study adopts the Probit estimation method to examine the correlation between various economic, socio-demographic, and political factors and the probability of political instability. Due to the dichotomous nature of the dependent variable, the Probit procedure is preferred to the Ordinary Least Squares (OLS) method of estimation. Given that the dependent

variable of Equations 1 and 2 is a dummy that takes only two values (1 if the nation is unstable and 0 otherwise), the predicted value of the dependent variable can be interpreted as the predicted probability of political instability, which can fall between 0 and 1. However, using a linear method of estimation such as OLS may result in a predicted probability that is either less than 0 or more than 1. Another shortcoming of the OLS procedure is that it may result in an inaccurate coefficient of determination (R^2).

Descriptive Statistics:

As mentioned in the previous section, this study uses a sample of 63 countries in the years 1996 and 2006 to examine the determinants of the probability of political instability. These nations are divided into six regions based on the World Bank's definition. Specifically, the sample of countries consists of 19 European nations, 15 African nations, 3 North American nations, 11 Latin American nations, 5 Middle Eastern and North African nations, and 10 Asian nations. Figure 1 provides a visual display of the sample.

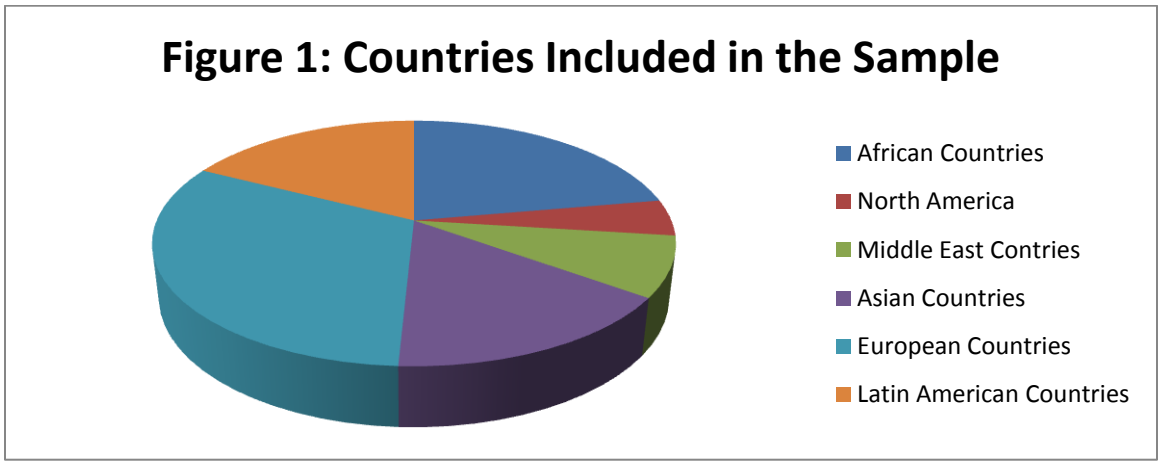

Table 2 displays the list of the nations that are included in the sample.

Table 2: Countries included in the Sample

Regions	**Included Countries**
Africa	Algeria*, Burkina Faso, Cote d'Ivoire, Ghana, Ethiopia, Madagascar, Mali, Niger*, Nigeria**, Senegal*, Tanzania, Togo, Uganda***, and Zimbabwe
Latin America	Argentina, Colombia***, Costa Rica, El Salvador, Ecuador, Guatemala*, Peru*, Panama, Paraguay, Uruguay, and Venezuela
North America	Canada, Mexico***, and United States
Middle East and North Africa	Egypt*, Israel***, Jordan, Kuwait, Morocco, and Syria
Asia	Australia, China*, Japan, India***, Indonesia, Malaysia, New Zealand, Pakistan***, Philippines***, and Thailand**
Europe	Austria, Bolivia, Bulgaria, Czech Republic, Denmark, Finland, France, Greece, Germany, Hungary, Italy, Ireland, Netherlands, Portugal, Romania, Spain, Sweden, Switzerland, United Kingdom.

* unstable in 1996, ** unstable in 2006, *** unstable for both years

As Table 2 indicates, the sample includes 7 nations that were unstable in 1996, 2 nations that were only unstable in 2006, and 7 nations that were unstable in both years. In other words, between the two years, only 23 of the total of 126 observations are politically unstable. Due to the small number of observations on politically unstable nations in the sample (nations that take a value of 1 to 10 in the data set based on the degree of their instability), I simply assigned a value of "0" to the nation if it was stable and "1" if it was unstable.

A summary of descriptive statistics on the variables included in Equations 1 and 2 is reported in Table 3.

Table 3: The Descriptive Statistics on the Quantitative Variables Included in Equations 1 & 2

Independent Variable	Max(1996)	Max(2006)	Min(1996)	Min(2006)	Median(1996)	Median(2006)
GDP PERCAP $_{it-1}$ (Lag of output)	$30648 (Kuwait)	$43560 (Kuwait)	$0.201 (Zimbabwe)	$0.18 (Zimbabwe)	$5387 (Romania)	$7305 (Colombia)
GDPGRO $_{it-1}$ (Lag GDP Growth rate)	11.5 (Uganda)	11.8 (Ethiopia)	-6.57 (Morocco)	-4 (Zimbabwe)	4.0 (Austria)	4.6 (Thailand)
INFLAT $_{it-1}$ (Lag Inflation rate)	14.8 (Algeria)	75 (Zimbabwe)	-0.12 (Japan)	-0.27 (Japan)	3.9 (Italy)	3.7 (Cote d'Ivoire)
EMPLOY $_{it-1}$ (Lag Level of employment)	86.4 (Tanzania)	84.2 Madagascar	37.7 Spain	37.9 Jordan	56.4 Australia	57.3 (Panama)
EDUC $_{it}$ (Level of education)	123 (Portugal)	145.4 (Madagascar)	27 (Niger)	50.35 (Niger)	101 (Hungary)	104 (Spain)
URBAN $_{it}$ (Urban Population rate)	65.8 (Kuwait)	76.0 (Kuwait)	3.72 (Ethiopia)	3.5 (Ethiopia)	18.9 (Morocco)	18.9 (Jordan)
INTERNET $_{it}$ (Number of internet users per 100 people)	16.7 (Finland)	86.5 (Sweden)	0 (Syria)	0.29 (Niger)	0.22 (Panama)	19.7 (Mexico)
LIFE $_{it}$ (Level of democracy)	10 (Sweden)	10 (Sweden)	0 (Niger.)	0 (Syria)	8 (Romania)	8 Philippines
DEMO $_{it}$ (Life expectancy)	80.2 (Japan)	82.3 (Japan)	43.9 (Niger)	42.1 (Zimbabwe)	70.8 (Bulgaria)	73.7 Venezuela

There are a few interesting observations in Table 3. In terms of economic independent variables, the highest per capita GDP between the two years under study belonged to Kuwait and the lowest per capita GDP belonged to Zimbabwe. Note that in the year 2006, Kuwait's per capita GDP was 160,000 times Zimbabwe's per capita GDP. Furthermore, the lowest economic growth belonged to Morocco. More specifically, Morocco's economy shrank by 6.57 % in 1996, which indicates an economic recession. On the other hand, Uganda and Ethiopia experienced the highest rate of economic growth (around 11 percent) in 1996 and 2006 respectively. Another interesting observation is on the rate of inflation. In 2006, Zimbabwe experienced a 75 percent increase in its price level, which indicates a hyperinflation in that country. As for the employment rate, the highest rate (around 85%) belonged to Tanzania and Madagascar, while the lowest rate (around 37%) belonged to Spain.

In terms of social demographic variables, the highest gross primary enrollment rate belonged to Portugal and Madagascar, while the lowest rate was held by Niger. Kuwait had the highest degree of urbanization in both years, while Ethiopia experienced the lowest degree of urbanization in the same years. An interesting observation is that in one decade the percentage of the population that uses the internet increased from a maximum of 16.7 in Finland to a maximum of 86.5 in Sweden. However, the minimum percentage of internet users changed only marginally in ten years.

In terms of political variables, in both years (1996 and 2006), the highest degree of democracy index belonged to Sweden, which had a score of 10 (out of maximum of 10) and the most non-democratic governments were Niger and Syria which had a score of 0 (out of 10).

Diagnostic Tests

Before estimating Equations 1 and 2, three econometric tests must be conducted in order to enhance the reliability of the estimation results. These tests are a multicollinearity test, a heteroskedasticity test and the Chow test. In what follows I describe the results of these tests.

Test for Multicollinearity

The multicollinearity test is conducted to estimate the strength of the correlation coefficient between each pair of independent variables included in the two empirical models. Generally, the correlation coefficient with an absolute value of 0.8 or higher is an indication of a strong multicollinearity problem. A strong correlation between a pair of independent variables is a problem because it increases the standard error of the estimated coefficients on those variables. As Tables 4 and 5 shows, the highest correlation coefficient (0.75) is between the per capita GDP and the percentage of the population that uses the internet. This result meets my expectation, as a higher level of income is expected to be correlated with a higher degree of internet usage. However, given that this correlation coefficient is below the 0.8 threshold, multicollinearity is not a serious problem in this study.

Heteroskedasticity Test

Another problem that may diminish the reliability of the estimation results is heteroskedasticity. This problem arises when the error terms included in Equations 1 or 2 do not have a constant variance across observations. If remained untreated, the heteroskedasticity problem results in unreliable standard errors of the estimates. A popular test of heteroskedasticity is the White test. This test involves three steps. In step one, Equations 1 and 2 are estimated using the OLS procedure and the residuals are saved. In step two, the squared residuals are used

as the dependent variable in a regression equation that includes all of the original independent variables and their squares in the set of its independent variables. Step three involves multiplying this equation's R^2 by the number of observations (n) and comparing the result with the critical chi-square. If nR^2 is lower than the critical chi-square, we conclude that heteroskedasticity is a not a serious problem. The values of nR^2 for Equations 1 and 2 are 17.6 and 23.0 respectively. The critical chi-square at 1 percent level of significance is 37.6. Thus, I conclude that Equations 1 and 2 do not have a serious heteroskedasticity problem.

Chow Test

Recall that the datasets utilized in the study consists of 63 nations in two years (1996 and 2006). Given the small number of observations in each year, the degrees of freedom will rise and the estimates will be more efficient if the observations in both years are combined (pooled). However, this can only be done only if a statistical test such as Chow test reveals that the coefficients of the independent variables did not change substantially between the two years.

To conduct the Chow test, first Equations 1 and 2 are estimated using two separate datasets (derived from1996 and 2006). The residual sum of squares of these equations are then added up and labeled as the unrestricted residual sum of squares. Next, the empirical equations are estimated using the combined 1996-2006 datasets. The residual sum of squares of this equation is labeled as the restricted residual sum of squares. Finally the value of the F-statistic is calculated by dividing the restricted residual sum of squares by the unrestricted residual sum of squares adjusted for degrees of freedom. The resulting F-statistic is compared to the value of the critical F. If the F-statistic is less than the critical F, then we conclude that the coefficients of the explanatory variables included in Equations 1 and 2 did not change significantly between the two

years, concluding that combining the two datasets is appropriate. The F-statistics of Equations 1 and 2 are 1.1 and 1.81 respectively. The critical value of F at five percent level of significance is 1.91. Thus, to increase the efficiency of the estimated results, I choose to combine the two datasets.

Table 4: The Correlation Coefficients Among the Independent Variables in Equation 1

	GDP PERCAP $_{it-1}$	GDPGRO $_{it-1}$	EMPLOY $_{it-1}$	INFLAT $_{it-1}$	EDUC $_{it}$	URBAN $_{it}$	INTERNET $_{it}$	LIFE $_{it}$	DEMO $_{it}$	NEIGHBOR $_{it}$
GDP PERCAP $_{it-1}$	1	-0.24047	-0.23443	-0.33302	0.211705	0.444744	0.758018	0.734758	0.313943	-0.04194
GDPGRO $_{it-1}$		1	0.273871	-0.10843	-0.06661	-0.1104	-0.17453	-0.1859	-0.02248	0.166179
EMPLOY $_{it-1}$			1	0.16308	-0.14979	-0.17499	-0.11451	-0.45374	-0.15119	-0.12548
INFLAT $_{it-1}$				1	-0.04141	-0.16212	-0.19773	-0.44914	-0.10927	-0.03353
EDUC $_{it}$					1	0.319358	0.13782	0.570398	0.268642	-0.02664
URBAN $_{it}$						1	0.181929	0.506578	0.135178	0.038478
INTERNET $_{it}$							1	0.515082	0.219157	0.014104
LIFE $_{it}$								1	0.365625	0.018284
DEMO $_{it}$									1	-0.07572
NEIGHBOR $_{it}$										1

Table 5: The Correlation Coefficient Among the Independent Variables in Equation 2

	R-GDP PERCAP $_{it-1}$	R-GDPGRO $_{it-1}$	R-EMPLOY $_{it-1}$	R-INFLAT $_{it-1}$	EDUC $_{it}$	URBAN $_{it}$	INTERNET $_{it}$	LIFE $_{it}$	DEMO $_{it}$	NEIGHBOR $_{it}$
R-GDP PERCAP $_{it-1}$	1	-0.04706	-0.08347	-0.14799	-0.06371	0.176405	-0.01116	0.019821	-0.01693	0.27033
R-GDPGRO $_{it-1}$		1	0.161276	-0.17019	0.06152	0.03267	0.027538	0.08596	0.071521	-0.09016
R-EMPLOY $_{it-1}$			1	-0.07716	-0.04846	0.023155	0.045665	0.013	-0.02109	-0.05089
R-INFLAT $_{it-1}$				1	0.069547	-0.12688	-0.04535	-0.05582	0.046544	-0.05006
EDUC $_{it}$					1	0.319358	0.13782	0.570398	0.268642	-0.02664
URBAN $_{it}$						1	0.181929	0.506578	0.135178	0.038478
INTERNET $_{it}$							1	0.515082	0.219157	0.014104
LIFE $_{it}$								1	0.365625	0.018284
DEMO $_{it}$									1	-0.07572
NEIGHBOR $_{it}$										1

Estimation Results

The estimation results of Equations 1 and 2 are shown in Tables 6 and 7.

Table 6: Estimation Results of Equation 1, the Dependent Variable is a Dummy Taking a Value of 1 for Unstable Nations; the Method of Estimation is Probit

Independent Variable	Coefficient (z-statistic)	Expected Sign
GDP PERCAP $_{it-1}$ (Lag of output)	-6.05E-05 (-1.67295)**	Negative
GDPGRO $_{it-1}$ (Lag GDP Growth rate)	0.061268 (1.297098)*	Negative
INFLAT $_{it-1}$ (Lag Inflation rate)	0.003362 (0.150757)	Positive
EMPLOY $_{it-1}$ (Lag Level of employment)	-0.01411 (-0.93492)	Negative
EDUC $_{it}$ (Education)	0.001368 (0.136719)	Negative
URBAN $_{it}$ (Urban Population rate)	0.019831 (1.360099)*	Ambiguous
INTERNET $_{it}$ (Number of internet users per 100 people)	-0.00744 (-0.41501)	Ambiguous
LIFE $_{it}$ (Level of democracy)	-0.01237 (-0.41083)	Negative
DEMO $_{it}$ (Life expectancy)	0.002439 (0.133753)	Ambiguous
NEIGHBOR $_{it}$ (Dummy = 1, if a neighboring state is unstable	-0.02471 (-0.13872)	Positive
McFaddenR^2	0.144	

*** Significant at 10%, ** 15%, * 20% respectively. The sample contains 23 unstable states, 103 stable states Total of 126 observations.

Table 7: Estimation Results of Equation 2, the Dependent Variable is a Dummy Taking a Value of 1 for Unstable Nations; the Method of Estimation is Probit

Independent Variable	Coefficient (z-statistic)	Expected Sign
R-GDP PERCAP $_{it-1}$ (Lag of output relative to the region's average)	-0.04416 (-0.32078)	Negative
R-GDPGRO $_{it-1}$ (Lag GDP Growth rate relative to the average region's average)	0.085279 (1.745913)****	Negative
R-INFLAT it-1 (Lag Inflation rate relative to the region's average)	0.021312 (1.425779)**	Positive
R-EMPLOY it-1 (Lag Level of employment relative to the region's average)	-0.03668 (-2.46688)***	Negative
EDUC $_{it}$ (Education)	0.007386 (0.733169)	Negative
URBAN $_{it}$ (Urban Population rate)	0.018108 (1.231637)*	Ambiguous
INTERNET $_{it}$ (Number of internet users per 100 people)	-0.01627 (-1.14084)	Ambiguous
LIFE $_{it}$ (Level of democracy)	-0.03876 (-1.55455)	Negative
DEMO $_{it}$ (Life expectancy)	-0.00615 (-0.35632)	Ambiguous
NEIGHBOR $_{it}$ (Dummy =1 if a neighboring state is unstable)	0.050745 (0.296951)	Positive
McFadden R^2	0.185	

**** Significant at 5%, *** 10%, ** 15%, * 20% respectively. The sample contains 23 unstable states, 103 stable states. Total of 126 observations

As Tables 6 and 7 reveal, the value of McFadden R^2 is low (between 14 to 18 percent). This means that, the variations in the explanatory variables included in the empirical equations explain less than twenty percent of variations in the probability of political instability. Put differently, about eighty percent of variations in the probability of political instability are not explained by variations in the independent variables included in this study. A justification for this result may have to do with the nature of the regression analysis. Despite the large size of the sample (126 observations), there are only 23 observations on the unstable states. In other words, there is not a lot of variation in the value of the dependent variable in my sample, weakening the ability of the explanatory variables to explain the dependent variable.

As it is evident from the value of the McFaddenR^2, the independent variables included in Equation 2 explain the probability of political instability better than those included in Equation 1. This result is consistent with the argument that a population's decision to rise against government depends, in part, on the state of the economy in the nation relative to that in the other nations in the region. There is no doubt that adverse economic conditions lead to an unsatisfied population. However, if an entire region experiences similar economic conditions, then the population in a nation will tolerate the government better.

In Equation 1, there are only three variables that have significant coefficients at 20 percent level or better. The first significant coefficient is on the level of output, measured by the lagged per capita GDP. Specifically, the effect of this variable on the probability of political instability is negative. This is consistent with this study's hypothesis. The second variable that has a positive and significant effect on the probability of political instability is the lagged GDP growth rate. This result is not consistent with my expectations. A possible explanation for the unexpected sign of the coefficient on the measure of economic growth is the omission of a

measure of income distribution from Equation 1. In general, a byproduct of economic growth is a broader distribution of income (Korzeniewicz and Moran 2005). In other words the correlation between the economic growth and a measure of income distribution (such as the GINI Index) is expected to be positive. Moreover, a broader distribution of income is expected to increase the probability of political instability. Thus, since Equations 1 and 2 do not control for the distribution of income, the estimated coefficient of the economic growth is expected to be biased upward. The reason for the exclusion of a measure of income distribution form Equation 1 is the unavailability of data.

Another significant coefficient in Equation 1 is the coefficient of urbanization. Furthermore, this coefficient is positive, suggesting a direct correlation between the degree of urbanization in a nation and its predicted probability of political instability. This makes sense because the population that lives in an urban area can easily gather, exchange ideas and information in order to participate in political activity against government.

In Equation 2, there are four variables that have significant coefficients at the 20 percent level or better. These variables are the relative GDP growth rate, the relative inflation rate, the relative employment rate, and the degree of urbanization. Some of these results are consistent with the results derived from the estimation of Equation 1. For example, not only the level of economic growth in a nation is found to have a positive effect on its probability of political instability, but the economic growth of the nation relative to the region's average growth is also found to affect political instability in the same manner. Moreover, regardless of the formulation of the empirical model, the degree of urbanization in a nation seems to affect its probability of political instability in a positive manner.

One inconsistency between the estimation results of the two empirical equations is that the estimated coefficient of the inflation rate is not significant in Equation 1, but the estimated coefficient of the relative inflation is significant in Equation 2. The sign of this coefficient is positive, suggesting that as the inflation rate in a nation relative to its neighboring countries increases, so does the nation's predicted probability of political instability. The second inconsistency between the estimation results of Equations 1 and 2 is on the effect of employment on the probability of political instability. Specifically, the estimated coefficient of the employment rate is found to be insignificant in Equation 1, meaning that the level of employment rate in a nation does not affect its probability of political instability. However, the estimated coefficient of the variable that measures a nation's employment rate relative to the average employment rate in the region is significant in Equation 2. The sign of this coefficient is negative, implying that as a nation's employment rate increases relative to its neighbors, its probability of political instability declines.

A glance at Tables 6 and 7 reveals that this study does not find any empirical evidence for the hypothesis that the probability of political instability in a nation is significantly affected by how educated its population is, or how much access the population has to the internet. Moreover, neither the life expectancy in a nation nor its degree of democracy is found to have significant effects on its probability of political instability. Finally, the degree of political instability in neighboring nations is also found to affect a nation's probability of political instability insignificantly.

Concluding Remarks

This study is different from others in that it measures political instability by a dummy variable that takes a value of "1" if a nation is unstable and "0" otherwise. Moreover, the method of estimation utilized in this study (Probit) is also different. Another aspect of this project that is unique is its formulation of an empirical model that accounts for the effect of a nation's economic performance relative to the regional economic performance on the probability of political instability.

An interesting result of this study is that its findings suggest that the level of economic variables in a nation relative to the average of those variables in the region can predict the probability of political instability in the nation better than the level of that variable alone. This finding is consistent with Gurr's Relative Deprivation theory. Particularly, while the rates of inflation or employment in a nation do not affect its probability of political instability significantly, the relative measures of these two variables do. Furthermore, among the non-economic variables the only one that is found to have a significant and positive effect on the probability of political instability in both empirical models is the degree of urbanization.

A disappointing result of this study is the low level of its coefficient of determination, R^2 Specifically, my estimations reveal that less than twenty percent of variations in the probability of political instability is explained by the explanatory variables included in my empirical equations. The first explanation for the low value of R^2 is that a small number of politically unstable nations are included in the sample. Another factor that might have contributed toward the low R^2 is the omission of a measure of income distribution from the empirical equations.

Data Sources

Political Instability data collected from Major Episodes of Political Violence dataset. The Center of Systematic Peace

Economic, Social-Demographic data collected from World Bank WDI2010 dataset

Democracy data and neighboring dummy data collected from POLITY IV dataset. The Center of Systematic peace

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