

11-15-2005

Political Instability and Economic Performance: A Panel Data Analysis

Hazem M. Zureiqat

Macalester College, hzureiqat@macalester.edu

Follow this and additional works at: <http://digitalcommons.macalester.edu/econaward>

Recommended Citation

Zureiqat, Hazem M., "Political Instability and Economic Performance: A Panel Data Analysis" (2005). *Award Winning Economics Papers*. Paper 1.

<http://digitalcommons.macalester.edu/econaward/1>

Political Instability and Economic Performance:

A Panel Data Analysis

Hazem M. Zureiqat
Macalester College
ECON381: Introduction to Econometrics
Advisor: Gary Krueger
St. Paul, MN
May 2005

ABSTRACT

This paper studies the relationship between political instability, measured by a country's Polity2 democratization score, and economic performance, measured by the GDP per capita. We use data from 1985 to 2002 for 25 countries in five different regions: Africa, Central and Eastern Europe, Latin America, the Middle East, and Southeast Asia. The results of the empirical models in this paper show a significant relationship between democracy and economic growth, but no significant sign of endogeneity (joint causality) as suggested by previous research. This paper also finds the 'optimal' Polity2 score that maximizes GDP per capita in each of the five regions.

Special thanks to Professor Gary Krueger, Aaron Albertson, Jean Beccone and Beth Hillemann.

1. Introduction

What is the nature of the relationship between political instability and economic growth in a country? This question has been the subject of a long-standing debate among many economists and political scientists.

In this paper, we examine the relationship between instability and growth. We consider different issues on which social scientists disagree, such as the direction of causality and the measurement of political instability. On the direction of causality, we consider the hypothesis that political instability causes slower economic growth and the hypothesis that both political instability and economic growth are endogenous. We look at data from countries across five different regions to study the correlation between instability and growth and to determine any region-specific factors that affect this relationship. As for the measurement of political instability, this paper provides a description of an ideal data set that, in a perfect world, would be used to study the relationship. Given limitations on data, however, this paper uses a measure that only considers one aspect of political instability: democratization.

This paper adds to some of the previous literature by considering the idea of an optimal level of political instability in different regions. We construct five polynomials, one for each of the regions being studied, and find the level of political instability ‘needed’ in order to maximize economic performance.

This paper is divided into seven sections. Section 2 reviews the theoretical framework and previous literature on the relationship between political instability and economic performance. Section 3 discusses the conceptual models underlying this relationship. Section 4 gives a description of data that would be used in an ideal world to study this subject. Section 5 describes the data and measurements used in

this study. In section 6, we present the empirical models and the results, and, finally, section 7 concludes this study and provides recommendations for further research.

2. Literature Review

2.1 Theoretical Background

The basic theory underlying the relationship between political systems and economic growth was discussed in a paper by McGuire and Olson (1996). The analysis in that paper centered around three forms of political organization: anarchy, dictatorship and democracy. In anarchy, “roving bandits” rule the land and have no interest in the public good. They use their armies to maximize their own income, and citizens have no incentive to produce. Hence, total income in anarchy is very low.

In the McGuire/Olson model, “stationary bandits” settle down and create an autocracy with a monopoly of theft. Since these rulers have a stake in the productivity of their people, they tend to tax moderately and provide some public goods. This leaves the people with an incentive to have a higher level of production. Autocrats, however still seek to maximize their personal wealth and extract a significant amount of rent from the citizenry.

The authors argue democracies will tend to provide a higher level of public goods and engage in less rent extraction than in autocracy. The reason for this is that, even under simple majority rule, citizens’ “encompassing interest” will naturally limit rent seeking when it reduces total income by more than the rent extracted from the minority. McGuire and Olson show that with perfect targeting---in which the rent extracting program goes entirely to the majority—a 51 percent majority will stop rent seeking when it decreases total income by 2 units for every unit of rent. Under

imperfect targeting, in which some fraction of the minority receives the benefit, rent seeking behavior will be even lower. This is equally beneficial to the entire population, which includes all minorities. And since public goods are needed to produce output, the “super-encompassing” nature of democracies leads to higher economic growth.

The key to the McGuire/Olson model is, however, the credibility of the “monopoly of theft” on the part of the government. If the autocrat is in an uncertain position, or if the citizens believe the government’s position is uncertain, the incentive to invest in public goods and increase income is reduced. Hence political instability which undermines the government’s long-run credibility should have detrimental effects on economic performance.

Olson (1991) also gives a theoretical background on the relationship between instability and economic growth. The paper further discusses the “super-encompassing” nature of democracies, citing examples such as the incentives of democratic leaders to lead a stable economy in order to run for reelection. Olson also argues that political instability is the cause for slower economic growth, and not vice versa, although the “demand for democracy” may rise with increased income.

Alesina, Ozler, Roubini and Swagel (1992) and De Haan and Siermann (1996) provide two, more explicit theoretical arguments for why political instability slows down economic growth. The first paper uses the concept of uncertainty. A high propensity of government change (which may be considered as a measure of political instability) often leads to uncertainty about the policies of the new government. As a result, investors would exit the economy, and potential investors would seek a more stable environment. The second paper says that instability reduces the supply of both capital and labor. This, in turn, discourages investment due to the increased risk of capital loss. Also, political turmoil causes capital flight and brain drain and hampers

the establishment of property rights, which are necessary in order to realize productivity gains.

2.2 Previous Empirical Research

While social scientists have long recognized the relationship between political instability and economic performance, our empirical understanding of this relationship is limited. The literature is divided in many dimensions. There is little consensus on the direction of causality, the definition and measurement of political instability and the type of data capable of yielding an accurate test of the various theories.

A central question in this research is the direction of causality: does a more stable political environment lead to economic prosperity, or does economic prosperity set the stage for political stability? The empirical research is divided into three schools of thought. The first argues that political instability causes slower (or, sometimes, faster) economic growth (Campos and Nugent (2000)). The second school of thought argues that economic performance drives political stability (Zablotsky (1996)), while a third group claims that causality runs both ways (Kirmanoglu (2003)).

In addition to approaching the issue of causality from a variety of perspectives, the empirical research is also divided on the issue of how one actually defines and measures political instability. The research papers also vary in the regions (samples) they examine. Alesina, Ozler, Roubini and Swagel (1992) looked at a panel of 113 countries, while Campos, Nugent and Robinson (1999) looked at countries in the Middle East and North Africa). One advantage of a region-specific focus is that it allows for using measures of political instability suitable for the region.

This paper, adopts a global approach while also adding region-specific dummy variables to capture major regional variation.

Alesina, Ozler, Roubini and Swagel (1992) and de Haan and Siermann (1996) assert that political instability causes slower economic development. Both papers used GDP as the dependent economic variable and changes in government as the measure for political instability. The papers differ, however, in the way they quantified changes in government. Alesina et al assigned a numerical value for each country by averaging the probabilities of a change in government for that country over several years. They concluded that in countries and time periods with high propensity of government change, growth is significantly lower than otherwise. De Haan et al, on the other hand, used a dummy variable that takes the value 0 if the number of government transfers exceeds seven and 1 otherwise. Using such a binary variable to measure variations in political instability within a large panel of countries is insufficient and is probably why the authors found no statistically significant relationship between instability and growth (except in Africa).

While also using GDP as the dependent economic variable, Campos and Nugent (2000) and Goldsmith (1987) each constructed their own measures for political instability. Instead of using changes in government, Campos et al constructed two indices to measure political instability, one for mild and another for severe instability. Goldsmith used a similar methodology but also incorporated *changes* in stability between two time periods. He classified his sample into four groups of countries: Consistently Stable (countries that were stable in both time periods), Chronically Unstable (countries that were unstable in both time periods), Stabilizing (countries that became more stable in the later time period, compared to the earlier one), and Destabilizing (countries that became less stable in the later time period, compared to the earlier one). Both Campos et al and Goldsmith found no

statistically significant relationship between political instability and economic growth. However, like de Haan et al, Campos et al found a significant negative relationship in African countries.

The paper by Aisen and Veiga (2003) is also notable. This paper differed from most of the previous literature in its use of inflation, rather than GDP, as the measure for economic performance. Besides studying the relationship between instability and inflation, the authors also considered how instability affects inflation volatility. Aisen et al found a negative relationship between instability and inflation, especially in countries with high inflation (compared to those with 'moderate' or 'low' inflation, according to their classification). The authors used the logarithm of inflation as the dependent variable for studying the relationship between instability and inflation, while they used the logarithm of the standard deviation of inflation to study volatility.

The papers discussed so far have all tested the hypothesis that political instability causes slow economic growth, and not vice versa. Zablotsky (1996) studied the relationship from a different perspective. He proposed that slow economic growth causes political instability. The author measured growth using the percentage of agricultural products in a country's GDP and political instability using the probability of a military coup d'etat. Zablotsky found this probability by using an optimization problem, in which he looked at factors that would cause military leaders to participate in a coup. The results of the paper were consistent with its stated hypothesis.

Before looking into the literature on joint causality, we should mention a paper written by Kirmanoglu (2003) in which the author used Granger tests to study the direction of causality in the relationship between stability and growth. The author included 19 countries in his study and used per capita GDP and an index of political

freedom as variables. After transforming the series into a stationary series in order to be able to conduct the Granger tests, Kirmanoglu found no empirical relationship between instability and economic growth in 14 of the 19 countries. In two countries, he found that political stability seemed to generate economic growth, while, in the three remaining countries, he found that the causality was in the opposite direction.

The third school of thought mentioned earlier in this section argues that causality in the relationship between political instability and economic growth runs in *both* directions. Besides their single equation model discussed above, Alesina et al also included a model with simultaneous equations to address the issue of endogeneity. For their political instability equation, the authors used changes in government as the dependent variable and several independent variables such as GDP per capita, cabinet changes and a dummy variable for whether a country is a democracy or not. In the economic growth equation, average per capita growth in GDP was the dependent variable, while independent variables included proxies for the levels of income and human capital, region-specific dummy variables, as well as other control variables. The instrumental variables used were the enrollment rate in primary schools, the lagged number of occurrences of an “executive adjustment” and the lagged number of occurrences of a coup d’etat. Alesina et al concluded that economic growth and political instability are correlated and jointly endogenous, which means that neither of them can be taken as predetermined.

Finally, we briefly discuss two other papers which studied the effects of political instability on economic growth in specific regions. Campos, Nugent and Robinson (1999) looked at the Middle East and North Africa (MENA), while Brada, Kutan and Yigit (2004) considered countries in Central Europe and the Balkans.

Campos et al hypothesized that domestic instability can have *positive* effects on investment in the MENA region (because governments would be induced to

improve policy), while external instability would have a negative impact on investment.

As mentioned earlier, studying countries in one region allows for the use of region-specific independent variables. Campos et al used such variables, one of which was a variable describing a country's proximity to Israel. Using data from 1970 to 1990, the authors ended up with empirical evidence that supported their hypothesis.

Brada et al studied the effects of transition and political instability on foreign direct investment (FDI) inflows in Central Europe and the Balkans. The authors found that the economic costs of political instability in this region have been quite high, especially in the Balkans. An interesting aspect in the authors' methodology here is their use of other European economies (those that are not undergoing transition and that are not subject to serious political instability). To avoid bias resulting from different sample periods for different transition countries (because of the lack of data), the authors established a relationship between FDI inflows and country characteristics for non-transition European countries. This gave sufficient observations to develop robust, unbiased estimates for transition countries. One of the weaknesses of this paper, on the other hand, is that it did not include a clear measure of political instability but rather several proxies that represent a country's economic characteristics and transition strategies, which, according to the authors, are a reflection of policy changes and stability.

To conclude this section, previous literature has used various models and methodologies to study the relationship between political instability and economic performance. There were clearly differences in the hypothesized direction of causality and the measures of political instability. Most of the literature, however, seemed to argue that political instability causes slower economic growth (although a

TABLE 1

Comparison of regressions predicting economic growth using political instability

Paper	Year Published	Dependent Variable	Measure(s) of political instability	Coefficient estimate for instability	Control Variables
1. Cross-Sectional Regressions¹					
de Haan	1996	GDP growth	Govt. changes	-0.51 (0.5)	Population and capital growth rates
Alesina	1992	Per cap. GDP growth	Govt. changes (-1)	-0.005 (-1.84)	EDUC ² , GROWTH(-1)
Campos	2000	ΔGDP	SPI ³	-0.128 (-0.580)	Institutions and initial income ⁴
Aisen	2003	Log(Inf)	Polity2 ⁵ (among others)	0.025 (2.71)	GDP_gr, Real_Over ⁶ , Oil_ch ⁷
		Log(SDInf)	Cabchg(-1) (among others)	0.210 (1.61)	GDP(ppp, SD(GDP_gr)(-1), Oil_ch, Agric_va, Trade ⁸
Goldsmith	1987	GDP	Assassinations, executive transfers, armed attacks, deaths from violence	N/A	N/A
2. Region-Specific Regressions					
Campos	1999	FDISTORT ⁹	WAR ¹⁰ (among others)	-8.607 (-2.09)	Oil prices, growth(-1), HFDISTORT
Brada	2004	Log(FDI ¹¹)	N/A ¹²	N/A	N/A

¹ Although these regressions are cross-sectional, many of them contained region-specific dummy variables.

² EDUC: the enrollment ratio in primary school.

³ SPI was measured using indices for mild and severe instability.

⁴ The authors ran other regression with different control variables. The results shown were obtained when institutions and initial income were controlled.

⁵ Polity2: overall measure of political stability.

⁶ Real_Over is the real effective overvaluation of the national currency.

⁷ Oil_ch: percentage annual change in oil prices.

⁸ Agric_va and Trade represent the percentage of GDP of the value added from agriculture and from trade, respectively.

⁹ FDISTORT: freedom from distortion index.

¹⁰ WAR takes the value 0 if a country did not participate in a war during a given year, 1 if it participated in a war, and 2 if it participated in a major war.

¹¹ FDI: foreign direct investments.

¹² Brada et al used several proxies to measure both a country's economic characteristics and its transition strategies (which includes the effect of stability)

number of papers yielded no statistically significant results). Like Alesina et al, this paper will include both a single-equation model and a simultaneous equation model to study the relationship between stability and growth.

Table 1 includes a summary of previous empirical research discussed in this section.

3. Conceptual Models

In this paper, we include two models: a single equation model to study the hypothesis that political instability causes slower economic growth, and as simultaneous equations model to study the hypothesis that political instability and economic growth are jointly correlated and endogenous.

3.1 *Single Equation Model*

In this single equation model, economic growth is a function of political instability, as well as the growth in human capital, physical capital and technology.

Economic growth_{it} = f(Human capital_{it}, Physical capital_{it}, Technology_{it}, Political Instability_{it})

The first three arguments in the model above can be explained with basic economic theory. Having more human capital, physical capital and technology in an economy leads to higher levels of growth. As for political instability, the theoretical framework of this study suggests that more political instability leads to lower economic growth.

3.2 *Simultaneous Equations Model*

The simultaneous equations model considers the issue of endogeneity. It examines the hypothesis that neither political instability nor economic growth can be

taken as predetermined, which means that they are both endogenous and jointly correlated.

$$\mathbf{Economic\ growth}_{it} = f(\mathbf{Human\ capital}_{it}, \mathbf{Physical\ capital}_{it}, \mathbf{Technology}_{it}, \mathbf{Political\ Instability}_{it})$$

$$\mathbf{Political\ Instability}_{it} = f(\mathbf{Economic\ growth}_{it}, \mathbf{Non-economic\ factors}_{it})$$

The economic growth equation is similar to the one in the single equation model. The political instability equation, on the other hand, states that instability is a function of economic growth, as well as other non-economic factors (i.e. variables that affect political instability but do not affect economic growth).

4. Ideal Data

Ideally, we would like to measure political instability with variables that capture its different forms. These include (1) executive changes (such as changes in government, changes in policies, coups, etc) and (2) military instabilities (such as armed conflicts, civilian deaths from conflicts, etc). Having such measures would allow us to distinguish between the effects of different forms of political instability on economic growth.

A suitable measure for economic growth would be comprehensive (such as GDP or GDP per capita). Such a measure would give a clear picture of an economy's overall performance in a particular period of time.

Ideal measures for the non-economic factors affecting political instability (specified in the political instability equation of the simultaneous equations model) would capture all such factors, which might include the number of political parties, participation in elections, diplomatic relations with foreign countries, civil liberties, etc. Such factors affect political instability, yet they do not significantly influence economic performance.

As for the control variables, ideal measures for human capital would capture the changes in the population and the quality of the effective labor force, while an ideal measure for physical capital would give an exact value for all the physical capital in an economy in a particular period. Finally, an ideal measure for technology would give a quantitative value of how much new technology is being incorporated in an economy at a particular period of time. Such a variable would measure things like the number and quality of new machines in different industries.

5. Actual Data

Our panel data set includes observations from 25 countries between the years 1985 and 2002. The countries are distributed evenly among five regions: Africa, Central and Eastern Europe, Latin America, the Middle East and Southeast Asia. (See the data set in the Appendix for a full list of countries.)

There is very limited, freely-available data on political instability.¹ Also, much of the available data measures democratization, as opposed to stability per se. However, given the theory underlying the relationship between instability and growth (discussed in section 2.1), such measures of democratization would be good proxies for political instability. In this paper, we use the Polity2 score as a measure for political instability. Polity2 was published in the Polity IV dataset project by Monty G. Marshall of the University of Maryland, College Park and Keith Jagers of Colorado State University in 2002. The score ranges from -10 (strongly autocratic) to +10 (strongly democratic).

¹ The Cross-National Time Series Data Archive (CNTS) includes many of the measures mentioned in the 'Ideal Data' section. However, data in the CNTS is not available for free at Macalester College.

For the non-economic factors affecting political instability, we use the total freedom score published by Freedom House, a non-profit organization based in Washington, DC. The freedom score is the sum of two separate scores, one for political rights and the other for civil liberties. The total score ranges from 1 (low freedom) to 14 (high freedom). Although this score is probably somewhat correlated with economic growth, we believe it is a good proxy for non-economic factors that affect a country's democratization status in a given period of time.

No data was available on school enrollment—the preferred measurement for human capital—for some of the countries being studied. Annual population growth was, therefore, used instead. Energy use (measured in kilograms of oil per capita) was the measure we used for physical capital, while the number of television sets per one thousand people was used to measure technology. Data on GDP per capita, population growth, energy use and the number of TV sets were all obtained from the website of the World Bank's *World Development Indicators*.

6. Empirical Models and Results

6.1 *Single Equation Model*

Given the conceptual model in section 3 and the actual data listed in section 5, we have the following single equation regression:

Regression 1:

$$\text{GDP_PER_CAP}_{it} = \beta_0 + \beta_1 \text{POP_GRWOTH}_{it} + \beta_2 \text{ENG_USE}_{it} + \beta_3 \text{TV_PER_1K}_{it} + \beta_4 \text{POLITY2}_{it}$$

where POP_GROWTH_{it} is the percentage of population growth in country i at year t

ENG_USE_{it} is the energy use (in kilograms of oil equivalent per capita) in

country i at year t

TV_PER_1K_{it} is the number of television sets per 1,000 people in country i at year t

POLITY2_{it} is the Polity2 score for country i at year t

According to the theoretical framework discussed in section 2.1, we hypothesize a positive sign for β_4 . An increase in democracy (i.e. decrease in instability) limits rent extracting and, thus, increases GDP per capita. Also, according to economic theory, we hypothesize positive signs for β_1 , β_2 and β_3 .

The results in Table 3 (on page 19) seem to be in accord with our expectations. A one point increase in the Polity2 score for a country in a particular time period increases GDP per capita by about \$154. Also, the values of all the coefficients (β 's) are all statistically significant.

We also calculated the elasticity of the Polity2 score. Every 1% increase in that score would result in a 5% increase in GDP per capita. This shows that democracy clearly has a significant effect on economic growth.

Furthermore, to test for regional variations in the relationship between political instability and economic performance, we constructed four, region-specific dummy variables and produced the following two regressions:

Regression 2:

$$\text{GDP_PER_CAP}_{it} = \beta_0 + \beta_5 \text{AFRICA}_i + \beta_6 \text{CEEUR}_i + \beta_7 \text{LATAM}_i + \beta_8 \text{SEASIA}_i + \beta_1 \text{POP_GRWOTH}_{it} + \beta_2 \text{ENG_USE}_{it} + \beta_3 \text{TV_PER_1K}_{it} + \beta_4 \text{POLITY2}_{it}$$

where AFRICA_i takes the value '1' if country i is in Africa and '0' otherwise

CEEUR_i takes the value '1' if country i is in Central/Eastern Europe and '0' otherwise

LATAM_i takes the value '1' if country i is in Latin America and '0' otherwise

SEASIA_i takes the value '1' if a country i is in Southeast Asia and '0' otherwise

(Here, β_0 is the intercept for the omitted ‘Middle East’ group, and $\beta_5, \beta_6, \beta_7$ and β_8 are the differences between the intercepts of the respective groups and the intercept of the Middle East group.)

Regression 3:

$$\begin{aligned} \text{GDP_PER_CAP}_{it} = & \beta_0 + \beta_5 \text{AFRICA}_i + \beta_6 \text{CEEUR}_i + \beta_7 \text{LATAM}_i + \beta_8 \text{SEASIA}_i + \\ & \beta_1 \text{POP_GRWOTH}_{it} + \beta_2 \text{ENG_USE}_{it} + \beta_3 \text{TV_PER_1K}_{it} + \\ & \beta_4 \text{POLITY2}_{it} + \beta_9 \text{POLITY2AFRICA}_{it} + \beta_{10} \text{POLITY2CEEUR}_{it} + \\ & \beta_{11} \text{POLITY2LATAM}_{it} + \beta_{12} \text{POLITY2SEASIA}_{it} \end{aligned}$$

where $\text{POLITY2AFRICA}_{it}$ is POLITY2_{it} multiplied by AFRICA_i

POLITY2CEEUR_{it} is POLITY2_{it} multiplied by CEEUR_i

POLITY2LATAM_{it} is POLITY2_{it} multiplied by LATAM_i

$\text{POLITY2SEASIA}_{it}$ is POLITY2_{it} multiplied by SEASIA_i

(Again, β_4 is the Polity2 slope for the omitted ‘Middle East’ group, and $\beta_9, \beta_{10}, \beta_{11}$ and β_{12} are the differences between the Polity2 slopes for the respective groups and the Polity2 slope for the Middle East group.)

Regression 2 only measures the differences in average GDP per capita among the different regions. The results seem to show that, compared to countries in the Middle East, countries in Africa, Central and Eastern Europe and Southeast Asia seem to have a lower average GDP per capita, while countries in Latin America seem to have a slightly larger average GDP per capita. (We should note, however, that some of the values obtained are statistically insignificant.)

Regression 3, on the other hand, measures how economic performance responds to political instability in different regions. The coefficients obtained show that more democracy increases GDP per capita in all five regions. This increase, however, is, by far, the highest for countries in the Middle East (\$396 compared to \$36 for Africa, \$60 for Central/Eastern Europe, \$18 for Latin America and \$54 for Southeast Asia for every one point increase in the Polity2 score). Note that in both

regressions 2 and 3, the coefficients for the control variables (population growth, energy use and the number of television sets) all remained statistically significant in the hypothesized positive direction.

An Optimal Level of Political Instability

Most of the theoretical background discussed in section 2.1 suggests that less political instability (measured by a high democracy score) leads to more economic growth. But can a very high democracy score be detrimental to the economy?²

To examine this question and to see whether there is an ‘optimal’ Polity2 score corresponding to the highest GDP per capita, we produced the following regression:

Regression 4:

$$\begin{aligned} \text{GDP_PER_CAP} = & \beta_0 + \beta_5\text{AFRICA}_i + \beta_6\text{CEEUR}_i + \beta_7\text{LATAM}_i + \beta_8\text{SEASIA}_i + \\ & \beta_1\text{POP_GRWOTH}_{it} + \beta_2\text{ENG_USE}_{it} + \beta_3\text{TV_PER_1K}_{it} + \\ & \beta_4\text{POLITY2}_{it} + \beta_9\text{POLITY2AFRICA}_{it} + \beta_{10}\text{POLITY2CEEUR}_{it} + \\ & \beta_{11}\text{POLITY2LATAM}_{it} + \beta_{12}\text{POLITY2SEASIA}_{it} + \beta_{13}\text{POLITY2}^2_{it} \\ & + \beta_{14}\text{POLITY2}^2\text{AFRICA}_{it} + \beta_{15}\text{POLITY2}^2\text{CEEUR}_{it} + \\ & \beta_{16}\text{POLITY2}^2\text{LATAM}_{it} + \beta_{17}\text{POLITY2}^2\text{SEASIA}_{it} \end{aligned}$$

where POLITY2^2_{it} is the signed square of POLITY2_{it}

$\text{POLITY2}^2\text{AFRICA}_{it}$ is POLITY2^2_{it} multiplied by AFRICA_i

$\text{POLITY2}^2\text{CEEUR}_{it}$ is POLITY2^2_{it} multiplied by CEEUR_i

$\text{POLITY2}^2\text{LATAM}_{it}$ is POLITY2^2_{it} multiplied by LATAM_i

$\text{POLITY2}^2\text{SEASIA}_{it}$ is POLITY2^2_{it} multiplied by SEASIA_i

By adding the signed square of the Polity2 score and the interaction variables to the regression above, we can capture the relationship between political instability (measured by Polity2) and economic growth (measured by GDP per capita) in the

² In his book *The Rise and Fall of Nations*, Mancur Olson, as referenced by Goldsmith (1987), examined this question. According to Olson, a higher level of democracy and political freedom leads to the emergence of interest groups he called “distributional coalitions” whose self-seeking activities can be harmful to economic efficiency and growth.

form of five polynomials, one for each region. From the results of regression 4, we obtain the following (Note: The control variables are held constant):

For Africa:

$$\text{GDP_PER_CAP}_{it} = 26.222 + (256.6178 * \text{POLITY2}_{it}) + (-28.1896 * \text{POLITY2}_{it}^2)$$

For Central/Eastern Europe:

$$\text{GDP_PER_CAP}_{it} = -1347.96 + (185.7444 * \text{POLITY2}_{it}) + (-14.8339 * \text{POLITY2}_{it}^2)$$

For Latin America:

$$\text{GDP_PER_CAP}_{it} = 1641.928 + (699.7906 * \text{POLITY2}_{it}) + (-88.1206 * \text{POLITY2}_{it}^2)$$

For Southeast Asia:

$$\text{GDP_PER_CAP}_{it} = 192.1722 + (-74.348 * \text{POLITY2}_{it}) + (16.70009 * \text{POLITY2}_{it}^2)$$

For the Middle East:

$$\text{GDP_PER_CAP}_{it} = 1064.174 + (287.1965 * \text{POLITY2}_{it}) + (12.58083 * \text{POLITY2}_{it}^2)$$

Following are the graphs for the polynomials above within the range of all possible Polity2 scores (-10 to +10):

FIGURE 1: GDP per capita vs. Polity2 in Africa

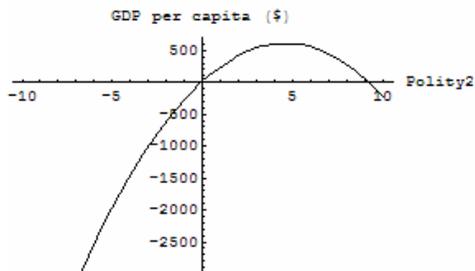


FIGURE 2: GDP per capita vs. Polity2 in Central/Eastern Europe

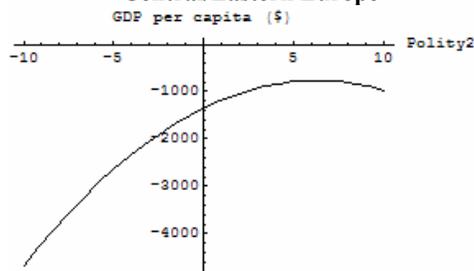


FIGURE 3: GDP per capita vs. Polity2 in Latin America

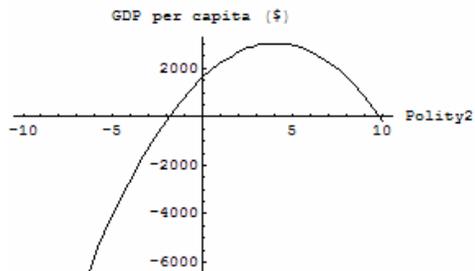


FIGURE 4: GDP per capita vs. Polity2 in Southeast Asia

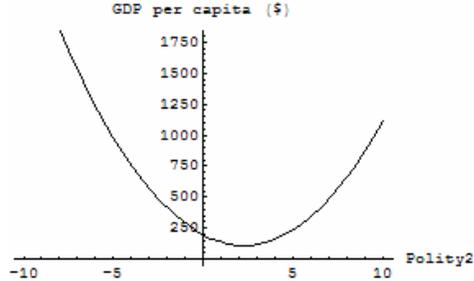
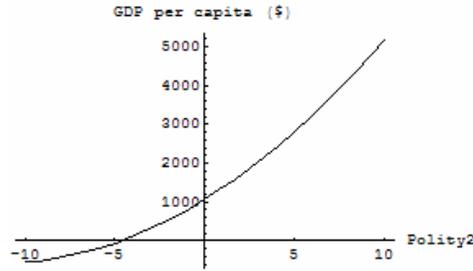


FIGURE 5: GDP per capita vs. Polity2 in the Middle East



From the graphs above, we see that in all regions, except the Middle East, there seems to be an optimal level for the Polity2 score that is below 10. In other words, the Middle East is the only region where increased democracy *always* leads to higher GDP per capita.

Following are the optimal Polity2 scores for each region. These values were found by using the first derivatives of the polynomials above and by looking at the endpoints (-10 and 10). We can see that there are very few cases (from our data set) in which a country was at its region's optimal Polity2 score:

TABLE 2
Optimal Polity2 scores for different regions

Region	Optimal Polity2 Score (rounded to the nearest integer)	Examples from Data
Africa	5	South Africa in 1990, 1991
Central/Eastern Europe	6	None
Latin America	4	None
Southeast Asia	-10	None
Middle East	10	Israel in 1999-2002

Note that for some regions, the optimal Polity2 score yields a negative GDP per capita. This is probably due to the negative intercepts of some of the polynomials.

Finally, we should note that when examining the residuals from the four regressions above (all residual graphs can be found in the Appendix), we noticed that the highest residuals corresponded to observations from Israel. Israel is considered a highly democratic state, yet political unrest in the Middle East in the past few years

TABLE 3Summary of results for the single equation regressions[#]

For all regressions:				
Dependent variable: GDP per capita (constant 2000 international \$)				
Variable	Coefficient (t-statistic in parentheses)			
	Regression 1	Regression 2	Regression 3	Regression 4
Intercept ^o	-1027.087* (-3.366)	108.439 (0.252)	1240.869* (3.228)	1064.174* (2.457)
Dummy variable for Africa	-	-366.259 (-1.243)	-1222.048* (-4.573)	-1037.952* (-3.607)
Dummy variable for Central/Eastern Europe	-	-2364.304* (-6.723)	-2505.904* (-8.021)	-2412.131* (-7.397)
Dummy variable for Latin America	-	84.720 (0.257)	261.320 (0.547)	577.754 (1.175)
Dummy variable for Southeast Asia	-	-514.600 (-1.665)	-1017.338* (-3.633)	-872.002* (-2.818)
Population growth (% annual)	778.295* (9.059)	374.372* (3.872)	339.930* (4.090)	358.265* (4.195)
Energy use (kg of oil equivalent per capita)	2.928* (20.872)	3.054* (20.627)	2.776* (18.467)	2.812* (16.960)
Television sets (per 1,000 people)	8.276* (6.891)	8.810* (6.790)	8.351* (7.070)	8.259* (6.643)
Polity2 score ^o	153.855* (9.337)	135.841* (7.714)	395.680* (14.753)	287.197* (2.224)
Polity2 score interacted with 'Africa' dummy	-	-	-359.722* (-9.332)	-30.578 (-0.165)
Polity2 score interacted with 'Central/Eastern Europe' dummy	-	-	-336.342* (-8.600)	-101.452 (-0.513)
Polity2 score interacted with 'Latin America' dummy	-	-	-378.486* (-6.624)	412.594 (1.764)
Polity2 score interacted with 'Southeast Asia' dummy	-	-	-342.203* (-8.710)	-361.545 (-1.940)
Signed square of Polity2 score ^o	-	-	-	12.581 (0.851)
Signed square of Polity2 score interacted with 'Africa' dummy	-	-	-	-40.770 (-1.835)
Signed square of Polity2 score interacted with 'Central/Eastern Europe' dummy	-	-	-	-27.415 (-1.231)
Signed square of Polity2 score interacted with 'Latin America' dummy	-	-	-	-100.701* (-3.535)
Signed square of Polity2 score interacted with 'Southeast Asia' dummy	-	-	-	4.119 (0.180)
Adjusted R ²	0.759	0.796	0.850	0.855
Sample size**	396	396	396	396
Sum of squared residuals	1.27x10 ⁹	1.06x10 ⁹	7.70x10 ⁸	7.33x10 ⁸

[#] First-order serial correlation was found in some countries for different regressions.^o In regressions which include dummy variables, the omitted group is the 'Middle East' group.

* For intercepts and interaction terms: Statistically different from zero at the 5% level. / For slopes (excluding interaction terms): Statistically different from zero in the hypothesized direction at the 5% level.

** The sample size was originally 450 (25 countries x 18 years), but some data were unavailable for particular countries and years.

has hindered economic growth in Israel. In terms of our measurements, Israel has a high Polity2 score but a low GDP per capita. The case of Israel is an example of why other forms of political instability (besides the degree to which a country is an autocracy or a democracy) should be considered when studying the relationship between instability and growth.

6.2 *Simultaneous Equations Model*

Following are the simultaneous equations that we used to examine the hypothesis of endogeneity (joint causality) between political instability and economic growth:

Regression 5:

$$\begin{aligned} \text{GDP_PER_CAP}_{it} &= \alpha_1 + \alpha_2 \text{POP_GROWTH}_{it} + \alpha_3 \text{ENG_USE}_{it} + \\ &\quad \alpha_4 \text{TV_PER_1K}_{it} + \alpha_5 \text{POLITY2}_{it} \\ \text{POLITY2} &= \alpha_6 + \alpha_7 \text{GDP_PER_CAP}_{it} + \alpha_8 \text{FREEDOM}_{it} \end{aligned}$$

where FREEDOM_{it} is a country's freedom score in a particular year.

By running the above regression using ordinary least squares and two-stage least squares (with POP_GROWTH , ENG_USE , TV_PER_1K and FREEDOM as the instrumental variables) and comparing the resulting standard errors using the Hausman Test³ (shown in the Appendix), we conclude that there is no joint causality between political instability and economic growth. We should note, however, that it is hard to obtain data on a variable that affects political instability but that is not correlated with economic growth. Although we used the freedom score as one of the instrumental variables, there is some degree of correlation between that score and economic growth.

The results of regression 5 are shown in Table 4 below:

³ Special thanks to Professor Gary Krueger for personally conducting the Hausman Test on my results.

TABLE 4

Summary of results for the simultaneous equations regressions

Variable	Coefficient (t-statistic in parentheses)	
	Ordinary Least Squares Method	Two-Stage Least Squares Method
Economic growth equation		
Dependent variable: GDP per capita (constant 2000 international \$)		
Intercept	-1027.087* (-3.366)	-943.565* (-3.05)
Population growth (% annual)	778.295* (9.059)	803.397* (9.212)
Energy use (kg of oil equivalent per capita)	2.928* (20.872)	2.948* (20.737)
Television sets (per 1,000 people)	8.276* (6.891)	6.689* (5.247)
Polity2 score	153.855* (9.337)	205.904* (9.865)
Adjusted R ²	0.759	0.753
Sample size	396	396
Sum of squared residuals	1.27x10 ⁹	1.30x10 ⁹
Political instability equation		
Dependent variable: Polity2 score		
Intercept	-9.336* (-27.373)	-9.123* (-22.819)
GDP per capita (constant 2000 international \$)	0.000122* (2.547)	0.000082 (1.217)
Freedom score	1.603* (30.717)	1.610* (25.506)
Adjusted R ²	0.767	0.739
Sample size	444	396
Sum of squared residuals	4621.923	4488.549
Result of Hausman Test: Do not reject null hypothesis of no joint correlation at 5% level**		

* For intercepts: Statistically different from zero at the 5% level. / For slopes: Statistically different from zero in the hypothesized direction at the 5% level.

** At a 25% level of significance, the Hausman Test yields a result that supports joint causality. However, we will only consider the result at the 5% level.

The table above also shows that there is no strong effect for GDP per capita on the Polity2 score. According to the two-stage least squares coefficient for GDP per capita in the political instability equation, it takes an increase of \$10,000 in GDP per capita to cause only a one-point (0.82) increase in the Polity2 score. The freedom score, on the other hand, has a significant effect on the Polity2 score, which is not surprising. An increase in the freedom score by one point increases the Polity2 score by about two points (1.6). (Note, however, that the freedom score is a fourteen-point score, while the Polity2 score is a twenty-one-point score.)

7. Conclusion and Further Research

Using data from 1985 to 2002 from 25 countries in five different regions, we have found significant evidence supporting the hypothesis that political instability, measured by the lack of democracy, causes slower economic growth. We could not conclude, however, that political instability and economic growth are endogenous and jointly determined.

This paper also examined how economies in different regions respond to political instability. We generated second-order polynomials relating GDP per capita to the Polity2 score and found the score that would generate the highest GDP per capita in each region. Results varied greatly among different regions. Southeast Asia had the highest GDP per capita at the lowest Polity2 score, while the Middle East had the highest GDP per capita at the highest Polity2 score.

Nonetheless, this paper did not investigate the relationship between economic growth and other forms of instability (besides democratization). Political instability is a multidimensional concept that is not very accurately captured with one variable. However, due to the lack of data as well as the theoretical support for measuring instability with the degree of democratization, we used the Polity2 score in our research.

Finally, we believe future research on this subject should take into account region-specific measures of political instability. Government changes may not be considered as signs of instability in some regions, and coup d'états are virtually inexistent in others. Furthermore, we also propose considering the effects of political instability in neighboring countries on economic growth. Many economies suffer greatly due to nearby conflicts and not any domestic instability.

Finally, the relationship between economic performance and political instability is very complex. In this paper, we have shown that at least *some degree* of political instability (measured by the lack of democratization) can be detrimental to growth in the economy.

References

Aisen, Ari; Veiga, Francisco Jose, “*Does Political Instability Lead to Higher and More Volatile Inflation: A Panel Data Analysis*”, NIPE – Universidade do Minho Working Papers, 2003.

Alesina, Alberto; Ozler, Sule; Roubini, Nouriel; Swagel, Philip, “*Political Instability and Economic Growth*”, National Bureau of Economic Research, September 1992.

Brada, Josef C.; Kutan, Ali M.; Yigit, Taner M., “*The Effects of Transition and Political Instability on Foreign Direct Investment Inflows: Central Europe and the Balkans*”, William Davidson Institute at the University of Michigan Business School, November 2004.

Campos, Nauro F.; Nugent, Jeffrey B., “*Who is Afraid of Political Instability?*”, *Journal of Development Economics*, 2000.

Campos, Nauro F.; Nugent, Jeffrey B.; Robinson, James A., “*Can Political Instability be Good for Growth? The Case of the Middle East and North Africa*”, Department of Economics, University of Southern California, January 1999.

Goldsmith, Arthur A., “*Does Political Stability Hinder Economic Development? Mancur Olson’s Theory and the Third World*”, *Comparative Politics*, Vol. 19, No. 4 (July 1987), 471-480.

de Haan, Jakob; Siermann, Clemens L. J., “*Political Instability, Freedom, and Economic Growth: Some Further Evidence*”, *Economic Development and Cultural Change*, Vol. 44, No. 2, January 1996, 339-350.

Kirmanoglu, Hasan, “*Political Freedom and Economic Well-Being: A Causality Analysis*”, International Conference on Policy Modeling, Istanbul, Turkey, 2003.

McGuire, MC; Olson, Mancur, “*The Economics of Autocracy and Majority Rule: The Invisible Hand and the Use of Force*”, *Journal of Economic Literature*, 1996.

Olson, Mancur, “*Autocracy, Democracy, and Prosperity*”, in Richard Zeckhauser, ed., *Strategy and Choice*, 1991.

Zablotsky, Edgardo E., “*Political Stability and Economic Growth*”, *CEMA Working Papers 109*, Universidad del CEMA, 1996.

Appendix

E-Views Regression Outputs and Residual Graphs

Regression 1:

$$\text{GDP_PER_CAP}_{it} = \beta_0 + \beta_1 \text{POP_GRWOTH}_{it} + \beta_2 \text{ENG_USE}_{it} + \beta_3 \text{TV_PER_1K}_{it} + \beta_4 \text{POLITY2}_{it}$$

LS // Dependent Variable is GDP_PER_CAP

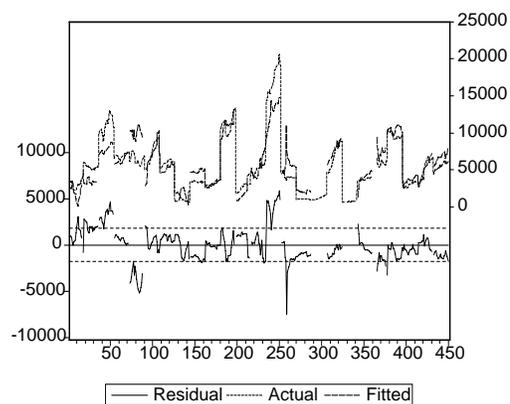
Date: 05/04/05 Time: 13:22

Sample: 1 450

Included observations: 396

Excluded observations: 54

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	-1027.087	305.1321	-3.366039	0.0008
POP_GROWTH	778.2946	85.91299	9.059102	0
ENG_USE	2.928322	0.140301	20.87169	0
TV_PER_1K	8.275814	1.200964	6.890975	0
POLITY2	153.855	16.47887	9.3365	0
R-squared	0.761133	Mean dependent var		5835.141
Adjusted R-squared	0.758689	S.D. dependent var		3661.693
S.E. of regression	1798.748	Akaike info criterion		15.00224
Sum squared resid	1.27E+09	Schwartz criterion		15.05251
Log likelihood	-3527.343	F-statistic		311.4733
Durbin-Watson stat	0.176476	Prob(F-statistic)		0



Regression 2:

$$\text{GDP_PER_CAP}_{it} = \beta_0 + \beta_5\text{AFRICA}_i + \beta_6\text{CEEUR}_i + \beta_7\text{LATAM}_i + \beta_8\text{SEASIA}_i + \beta_1\text{POP_GRWOTH}_{it} + \beta_2\text{ENG_USE}_{it} + \beta_3\text{TV_PER_1K}_{it} + \beta_4\text{POLITY2}_{it}$$

LS // Dependent Variable is GDP_PER_CAP

Date: 05/04/05 Time: 13:24

Sample: 1 450

Included observations: 396

Excluded observations: 54

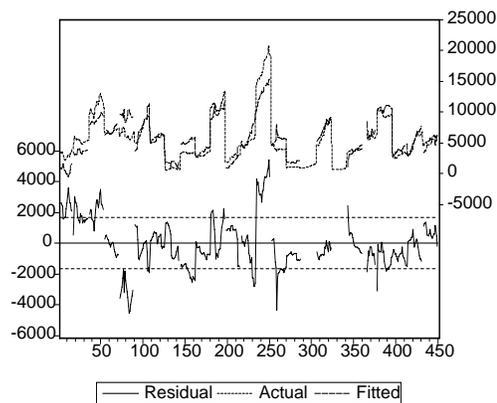
Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	108.4387	429.8966	0.252244	0.801
AFRICA	-366.259	294.6774	-1.242915	0.2147
CEEUR	-2364.304	351.6637	-6.723196	0
LATAM	84.72033	330.0281	0.256706	0.7975
SEASIA	-514.5997	309.1028	-1.664817	0.0968
POP_GROWTH	374.3721	96.69357	3.871737	0.0001
ENG_USE	3.054197	0.14807	20.62667	0
TV_PER_1K	8.810441	1.297655	6.78951	0
POLITY2	135.8405	17.60915	7.714199	0
R-squared	0.800277	Mean dependent var		5835.141
Adjusted R-squared	0.796149	S.D. dependent var		3661.693
S.E. of regression	1653.251	Akaike info criterion		14.84346
Sum squared resid	1.06E+09	Schwartz criterion		14.93395
Log likelihood	-3491.905	F-statistic		193.8358
Durbin-Watson stat	0.15001	Prob(F-statistic)		0

F Test⁴ Comparing Regressions 1 and 2:

F value = $[(1.27 \times 10^9 - 1.06 \times 10^9) / 4] / [1.06 \times 10^9 / (396 - 8 - 1)] = 19.2$

F critical = 3.32

F value > F critical (**Region intercepts significantly reduced SSR**)



⁴ All F tests in this appendix have the null hypothesis that the added coefficients in the second (unconstrained) regression are not statistically different from zero. This null hypothesis is rejected with an F value greater than the critical value.

Regression 3:

$$\text{GDP_PER_CAP}_{it} = \beta_0 + \beta_5 \text{AFRICA}_i + \beta_6 \text{CEEUR}_i + \beta_7 \text{LATAM}_i + \beta_8 \text{SEASIA}_i + \beta_1 \text{POP_GRWOTH}_{it} + \beta_2 \text{ENG_USE}_{it} + \beta_3 \text{TV_PER_1K}_{it} + \beta_4 \text{POLITY2}_{it} + \beta_9 \text{POLITY2AFRICA}_{it} + \beta_{10} \text{POLITY2CEEUR}_{it} + \beta_{11} \text{POLITY2LATAM}_{it} + \beta_{12} \text{POLITY2SEASIA}_{it}$$

LS // Dependent Variable is GDP_PER_CAP

Date: 05/04/05 Time: 13:25

Sample: 1 450

Included observations: 396

Excluded observations: 54

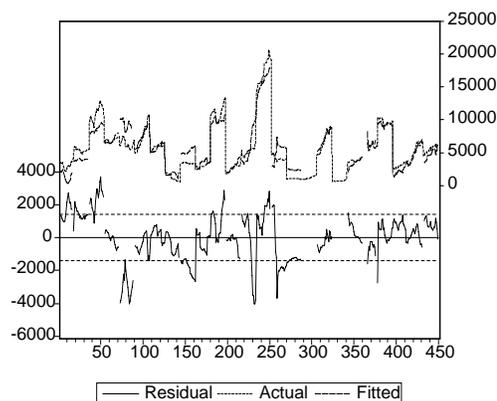
Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	1240.869	384.3982	3.228081	0.0014
AFRICA	-1222.048	267.239	-4.572867	0
CEEUR	-2505.904	312.4209	-8.020924	0
LATAM	261.3203	477.4627	0.54731	0.5845
SEASIA	-1017.338	280.0549	-3.632636	0.0003
POP_GROWTH	339.9304	83.11448	4.089906	0.0001
ENG_USE	2.775928	0.150314	18.46748	0
TV_PER_1K	8.351052	1.1812	7.069976	0
POLITY2	395.68	26.81959	14.7534	0
POLITY2AFRICA	-359.7217	38.54642	-9.332169	0
POLITY2CEEUR	-336.342	39.109	-8.600118	0
POLITY2LATAM	-378.4859	60.41975	-6.264275	0
POLITY2SEASIA	-342.2033	39.28691	-8.710363	0
R-squared	0.854675	Mean dependent var	5835.141	
Adjusted R-squared	0.850122	S.D. dependent var	3661.693	
S.E. of regression	1417.593	Akaike info criterion	14.54571	
Sum squared resid	7.70E+08	Schwartz criterion	14.67641	
Log likelihood	-3428.95	F-statistic	187.7058	
Durbin-Watson stat	0.157658	Prob(F-statistic)	0	

F Test Comparing Regressions 2 and 3:

$$F \text{ value} = [(1.06 \times 10^9 - 7.70 \times 10^8) / 4] / [7.70 \times 10^8 / (396 - 12 - 1)] = 36.1$$

F critical = 3.32

F value > F critical (**Interacting Polity2 with the region dummies significantly reduced SSR**)



Regression 4:

$$\begin{aligned} \text{GDP_PER_CAP} = & \beta_0 + \beta_5\text{AFRICA}_i + \beta_6\text{CEEUR}_i + \beta_7\text{LATAM}_i + \beta_8\text{SEASIA}_i + \\ & \beta_1\text{POP_GRWOTH}_{it} + \beta_2\text{ENG_USE}_{it} + \beta_3\text{TV_PER_1K}_{it} + \\ & \beta_4\text{POLITY2}_{it} + \beta_9\text{POLITY2AFRICA}_{it} + \beta_{10}\text{POLITY2CEEUR}_{it} + \\ & \beta_{11}\text{POLITY2LATAM}_{it} + \beta_{12}\text{POLITY2SEASIA}_{it} + \beta_{13}\text{POLITY2}^2_{it} \\ & + \beta_{14}\text{POLITY2}^2\text{AFRICA}_{it} + \beta_{15}\text{POLITY2}^2\text{CEEUR}_{it} + \\ & \beta_{16}\text{POLITY2}^2\text{LATAM}_{it} + \beta_{17}\text{POLITY2}^2\text{SEASIA}_{it} \end{aligned}$$

LS // Dependent Variable is GDP_PER_CAP

Date: 05/04/05 Time: 13:27

Sample: 1 450

Included observations: 396

Excluded observations: 54

Variable	Coefficient	Std. Error	T-Statistic	Prob.
C	1064.174	433.1838	2.456633	0.0145
AFRICA	-1037.952	287.7742	-3.606826	0.0004
CEEUR	-2412.131	326.0768	-7.39743	0
LATAM	577.7543	491.7291	1.174944	0.2408
SEASIA	-872.0018	309.4925	-2.817521	0.0051
POP_GROWTH	358.2648	85.41218	4.194539	0
ENG_USE	2.811611	0.165779	16.96001	0
TV_PER_1K	8.259081	1.243341	6.642651	0
POLITY2	287.1965	129.139	2.223933	0.0267
POLITY2AFRICA	-30.57875	185.4774	-0.164865	0.8691
POLITY2CEEUR	-101.4521	197.6356	-0.513329	0.608
POLITY2LATAM	412.5941	233.963	1.763501	0.0786
POLITY2SEASIA	-361.5445	186.333	-1.940314	0.0531
SQPOLITY2	12.58083	14.78552	0.850888	0.3954
SQPOLITY2AFRICA	-40.77043	22.21569	-1.835209	0.0673
SQPOLITY2CEEUR	-27.41469	22.27362	-1.230815	0.2192
SQPOLITY2LATAM	-100.7014	28.48635	-3.535075	0.0005
SQPOLITY2SEASIA	4.119261	22.92887	0.179654	0.8575
R-squared	0.861649	Mean dependent var		5835.141
Adjusted R-squared	0.855427	S.D. dependent var		3661.693
S.E. of regression	1392.276	Akaike info criterion		14.52178
Sum squared resid	7.33E+08	Schwartz criterion		14.70275
Log likelihood	-3419.212	F-statistic		138.4816
Durbin-Watson stat	0.179326	Prob(F-statistic)		0

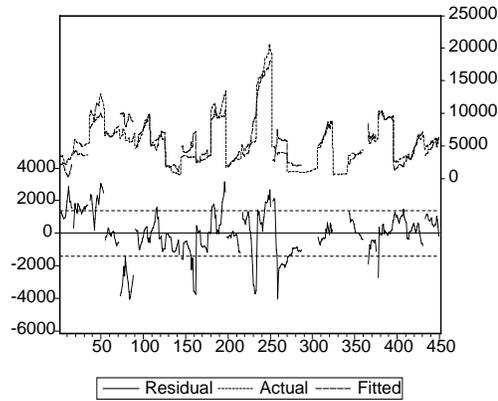
F Test Comparing Regressions 3 and 4:

$$F \text{ value} = [(7.70 \times 10^8 - 7.33 \times 10^8) / 5] / [7.33 \times 10^8 / (396 - 17 - 1)] = 3.82$$

F critical = 3.32

F value > F critical (**Adding the signed square of Polity2 and interacting it with the region dummies significantly reduced SSR**)

Residual graph shown on next page.



Regression 5:

$$\text{GDP_PER_CAP}_{it} = \alpha_1 + \alpha_2 \text{POP_GROWTH}_{it} + \alpha_3 \text{ENG_USE}_{it} + \alpha_4 \text{TV_PER_1K}_{it} + \alpha_5 \text{POLITY2}_{it}$$

$$\text{POLITY2}_{it} = \alpha_6 + \alpha_7 \text{GDP_PER_CAP}_{it} + \alpha_8 \text{FREEDOM}_{it}$$

(Instrumental variables: POP_GROWTH_{it}, ENG_USE_{it}, TV_PER_1K_{it}, FREEDOM_{it})

Ordinary least squares method: Output and residuals graph:

System: SYSTEM
 Estimation Method: Least Squares
 Sample: 1 450
 Date: 05/04/05 Time: 13:29

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	-1027.087	305.1321	-3.366039	0.0008
C(2)	778.2946	85.91299	9.059102	0
C(3)	2.928322	0.140301	20.87169	0
C(4)	8.275814	1.200964	6.890975	0
C(5)	153.855	16.47887	9.3365	0
C(6)	-9.335891	0.341062	-27.37299	0
C(7)	0.000122	4.81E-05	2.547417	0.011
C(8)	1.602985	0.052186	30.71687	0

Determinant residual covariance 31631232

Equation: GDP_PER_CAP = C(1) + C(2)*POP_GROWTH + C(3)*ENG_USE + C(4)*TV_PER_1K + C(5)*POLITY2

Observations: 396

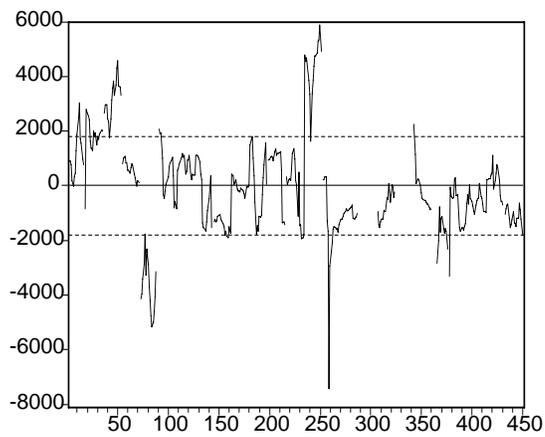
R-squared	0.761133	Mean dependent var	5835.141
Adjusted R-squared	0.758689	S.D. dependent var	3661.693
S.E. of regression	1798.748	Sum squared resid	1.27E+09
Durbin-Watson stat	0.176476		

Equation: $POLITY2 = C(6) + C(7)*GDP_PER_CAP + C(8)*FREEDOM$

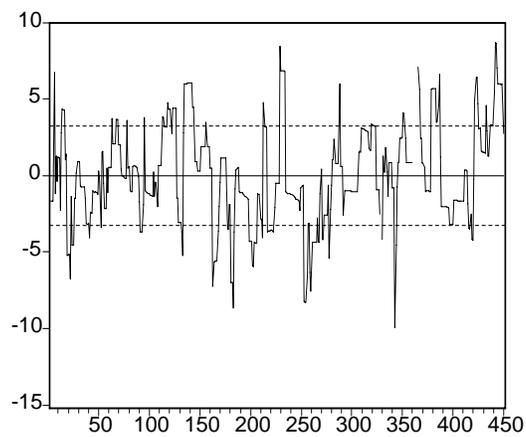
Observations: 444

R-squared	0.767649	Mean dependent var	2.094595
Adjusted R-squared	0.766596	S.D. dependent var	6.70097
S.E. of regression	3.237368	Sum squared resid	4621.923
Durbin-Watson stat	0.396066		

GDP_PER_CAP Residuals



POLITY2 Residuals



Two-stage least squares method: Output and residuals graph:

System: SYSTEM

Estimation Method: Two-Stage Least Squares

Instruments: POP_GROWTH ENG_USE TV_PER_1K FREEDOM C

Sample: 1 450

Date: 05/04/05 Time: 13:30

	Coefficient	Std. Error	T-Statistic	Prob.
C(1)	-943.5646	309.6544	-3.047154	0.0024
C(2)	803.3967	87.21193	9.212004	0
C(3)	2.947993	0.142159	20.73734	0
C(4)	6.688642	1.27486	5.246572	0
C(5)	205.9035	20.87231	9.864912	0
C(6)	-9.122731	0.399791	-22.81875	0
C(7)	8.20E-05	6.74E-05	1.217015	0.224
C(8)	1.610054	0.063124	25.50601	0

Determinant residual covariance 33864897

Equation: $GDP_PER_CAP = C(1) + C(2)*POP_GROWTH + C(3)*ENG_USE + C(4)*TV_PER_1K + C(5)*POLITY2$

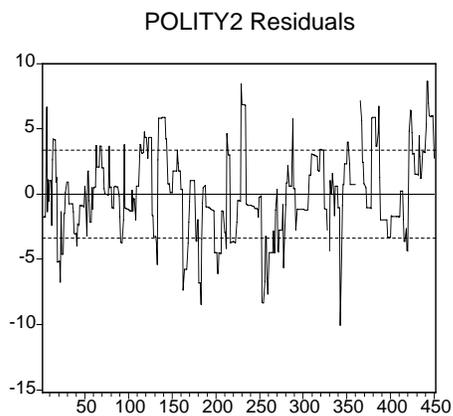
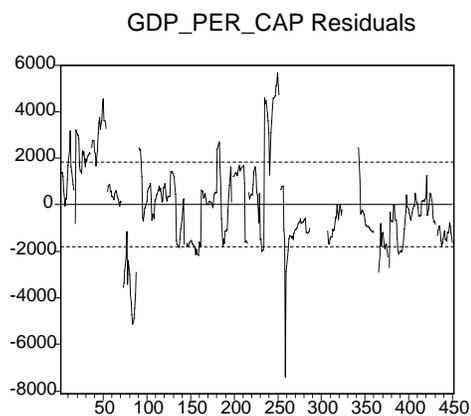
Observations: 396

R-squared	0.755038	Mean dependent var	5835.141
Adjusted R-squared	0.752532	S.D. dependent var	3661.693
S.E. of regression	1821.55	Sum squared resid	1.30E+09
Durbin-Watson stat	0.186121		

Equation: $POLITY2 = C(6) + C(7)*GDP_PER_CAP + C(8)*FREEDOM$

Observations: 396

R-squared	0.740193	Mean dependent var	2.353535
Adjusted R-squared	0.738871	S.D. dependent var	6.61347
S.E. of regression	3.379533	Sum squared resid	4488.549
Durbin-Watson stat	0.332325		



The Hausman Test on Regression 5

(Special thanks to Professor Gary Krueger for personally conducting the Hausman test on my results)

Null hypothesis: GDP per capita and Polity2 are not jointly correlated

Alternative hypothesis: GDP per capita and Polity2 are jointly correlated

Critical value: 1.97

Measured values:

Confidence Level	Value	Conclusion
99%	6.63	Do not reject null hypothesis
97.5%	5.02	Do not reject null hypothesis
95%	3.84	Do not reject null hypothesis
90%	2.71	Do not reject null hypothesis
75%	1.32	Reject null hypothesis

The Polity2 Score

Following is part of the description of the Polity2 score, as well as the Polity, Democ, and Autoc scores on which Polity2 is based. **These descriptions are all from the *Dataset Users' Manual of the Polity IV Project***, prepared by Monty G. Marshall of the University of Maryland, College Park and Keith Jagers of Colorado State University in 2002. For a full description of all Polity IV variables, visit <http://www.cidcm.umd.edu/inscr/polity/>.

POLITY2

Revised Combined Polity Score: This variable is a modified version of the POLITY variable added in order to facilitate the use of the POLITY regime measure in time-series analyses. It modifies the combined annual POLITY score by applying a simple treatment, or “fix”, to convert instances of “standardized authority scores” (i.e., -66, -77, and -88) to conventional polity scores (i.e., within the range, -10 to +10).

POLITY

Combined Polity Score: The POLITY score is computed by subtracting the AUTOC score from the DEMOC score; the resulting unified polity scale ranges from +10 (strongly democratic) to -10 (strongly autocratic).

DEMOC

Institutionalized Democracy: Democracy is conceived as 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, such as 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. We do not include

coded data on civil liberties. The Democracy indicator is an additive eleven-point scale (0-10).

AUTOC

Institutionalized Autocracy: "Authoritarian regime" in Western political discourse is a pejorative term for some very diverse kinds of political systems whose common properties are a lack of regularized political competition and concern for political freedoms. We 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. Most modern autocracies also exercise a high degree of directiveness over social and economic activity, but we regard this as a function of political ideology and choice, not a defining property of autocracy. Social democracies also exercise relatively high degrees of directiveness. We prefer to leave open for empirical investigation the question of how Autocracy, Democracy, and Directiveness (performance) have covaried over time. An eleven-point Autocracy scale is constructed additively.

The Data Set

The next thirteen pages include the complete data set used in this research.