# Optimal Fiscal Policy in an Economy Facing Socio-Political Instability*

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**Abstract**

We present a model of optimal government policy when policies may exacerbate socio-political instability (SPI). We show that optimal policy that takes into account SPI transforms a standard concave growth model into a model with both a poverty trap and endogenous growth. The predictions of the model are tested by developing three new measures of SPI for a panel of 58 countries. Estimating the optimal government policy from the model reveals strong support for the theory. In particular, we show via simulations that optimal policy causes the economy to expand on a quasi-balanced growth path, with the level of SPI determining whether growth is positive or negative.

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# 1 Introduction

An extensive theoretical and empirical literature has shown that social upheaval and political violence hinder economic development (Venieris & Gupta, 1985, 1986; Venieris & Stewart, 1987; Barro, 1991; Gupta, 1990; Alesina & Perotti, 1996; Alesina, Ozler, Roubini & Swagel, 1996; Zak, 1997, 2000). The notion that socio-political instability (SPI) affects economic performance can be traced to Haavelmo (1954) and Adam Smith (1776). In this paper, we characterize optimal government policies to stimulate economic development when policies raise output but may exacerbate instability. Optimal policies are then embedded in a general equilibrium growth model to examine the resulting development paths.

Because of differences among individuals in adapting to new economic opportunities, income inequality generally increases during development. SPI arises when the political system is unable or unwilling to mediate disputes over changes in the distribution of income (Venieris & Gupta, 1986; Feng, Kugler & Zak, 2000). Because most developing countries have underdeveloped polities (Feng, 1997), SPI is endemic, diminishing a country's development potential. As a result, governments have an interest in designing policies that can both counteract SPI and stimulate income growth.

The model in this paper demonstrates how the interplay between the marginal efficiency of the police at quelling SPI and the marginal sensitivity of SPI to changes in the income distribution determine a country's growth trajectory. While we find that optimal policy can lead to endogenous growth, this outcome is not guaranteed; a poverty trap exists in the model, and conditions are derived under which optimal policy is insufficient to permit the economy to escape from poverty.

After presenting the model in Section 2, we generate three measures of SPI in Section 3 in order to test the model empirically. In Section 4, we estimate the derived optimal policies and growth equations. Statistical tests reveal strong support for the

model's predictions. Next, using the estimated coefficients, we simulate the model's equilibrium dynamics. These simulations show that the optimal government policies for an average developing country generate a quasi-balanced growth path. If the baseline SPI is not too high, an economy with optimal policies exhibits near AK growth in the transitional dynamics and balanced growth in the limit; if the baseline SPI is beyond an identified threshold, the economy's expansion path remains nearly linear, but the growth rate is negative, leading the economy into a poverty trap. Section 5 concludes with a review of our findings.

# 2 Government Policy and Socio-Political Instability

SPI reflects the myriad coordination failures–both economic and political–that occur during development. Because income growth raises support for the government (Lewis-Beck, 1990; Fiorina, 1981; Tufte, 1978), it is a goal of nearly every politician.[1] Following a large literature in political science and economics, we model government policy-makers are being concerned with maintaining themselves in power. Government longevity is enhanced when policies are chosen that raise government resources and bolster support among constituents. A government risks raising SPI if policy choices do not take into account their effect on income inequality (Zak, 2000). That is, policy choices are constrained by their impact on SPI.

In addition, SPI weakens the government by reducing the tax base as violent demonstrations reduce production. As tax revenue falls, the government's ability to implement policies of all types diminishes. If SPI sufficiently weakens the govern-

[1]McGuire & Olson (1996) show that only predatory autocrats with short time-horizons will set policies that will cause the economy to contract rather than grow. Political conditions under which this obtains are derived by Bueno de Mesquita, Morrow, Siverson & Smith (1998).

ment, the ruling regime will be overthrown (Feng & Zak, 1999). Thus, the threat of SPI restricts the range of policy choices by the government. Further, policies may be chosen to explicitly to reduce SPI. In sum, the policy problem faced by the government balances policies that reduce SPI with those that raise income growth but may exacerbate inequality thereby raising SPI.

## 2.1 The Model

Consider a standard neoclassical growth model with a single good and one accumulable factor, private capital $K$. The government's objective is to maximize income growth for the population, which obtains in aggregate by maximizing capital accumulation. This approach follows models in which politicians set policy to increases their chances of re-election in the following period (Magee, Brock, & Young, 1989; Arbetman & Kugler, 1995; Alesina, Roubini, & Cohen, 1997). This goal is realized via two policy instruments: public investment, $\lambda$, and police expenditures, $P$.[2] Policies are funded by a lump-sum tax, $\tau$, and for simplicity, population in the model is constant and normalized to unity. Although government policies can enhance growth, taxes reduce income and thus capital accumulation, and also magnify income inequality. The latter occurs because lump-sum taxes are regressive.[3]

In each period, a fraction $\pi$ of output is destroyed by SPI, with $\pi_t(P_t, \psi(\tau_t)) : \mathbb{R}^+ \times \mathbb{R}^+ \to [0,1]$, where $\psi \geq 1$ is income inequality. When $\psi = 1$ there is perfect equality, while $\psi > 1$ measures the degree of income inequality. Barro (2000) writes "Inequality of wealth and income motivates the poor to engage in crime, riots, and other disruptive activities"(p.7).[4] As a result, inequality raises SPI, $\frac{\partial \pi}{\partial \psi} > 0$. Since

[2]The optimal policy choice problem follows Zak (2000), Ghate & Zak (1999a), and Ghate (1999).

[3]Many types of taxes are equivalent to lump-sum taxes. For example, a proportional tax on labor income when labor supply is indivisible (e.g. with a 40 hour work week) is equivalent to a lump-sum tax.

[4]The microfoundations of SPI are contained in Zak (2000); see also Venieris & Gupta (1986).

taxes are regressive, a tax increase raises inequality, $\frac{\partial \psi}{\partial \tau} > 0$. For simplicity, we model inequality as increasing linearly in taxes, $\psi(\tau_t) = \tau_t$. Police expenditures have the opposite effect, reducing SPI by making it more difficult for demonstrators to destroy output during demonstrations, $\frac{\partial \pi}{\partial P} < 0$.

Police expenditures, $P$, indirectly raise growth by preventing the destruction of output, while the second policy instrument, public investment, $\lambda$, directly raises output by complementing private capital in production. Output is produced using a Cobb-Douglas production function, $Y = K^{\alpha}\lambda^{1-\alpha}$ with $\alpha \in (0, 1)$, and, as in Barro (1990), public investment does not accumulate. As our purpose is to characterize the aggregate dynamics induced by fiscal policy choices, we concretize the model by choosing a functional form for $\pi$,

$$\pi_t = 1 - DP_t^{\omega}\tau_t^{-\eta}, \tag{1}$$

where $\eta$, is the sensitivity of SPI to changes in income inequality, and $\omega$ is the productivity of the police at reducing SPI. The constant $D$ is restricted to keep (1) well-defined, $D \in (0, P^{-\omega}\tau^{\eta}]$, with related restrictions on government policies, $\tau, \lambda, P \geq 1$.[5] The value $1 - D$ is the baseline level of SPI absent government policy (i.e. when $P = \tau = 1$).

The optimal fiscal policy for the government is a solution to a modified planning problem in which policy-makers maximize capital deepening[6]

$$Max_{\lambda,P,\tau}\frac{K_{t+1}}{K_t} \tag{2}$$

[5]Minimum funding levels for $P, \lambda$ and $\tau$ can be thought of as maintaining minimal institutions that specify the rules of exchange, without which economic transactions will not be undertaken.

[6]Ghate & Zak (1999b) prove that, absent externalities, maximizing capital deepening is equivalent to a standard Pareto allocation problem. The advantages of this approach are that a social welfare function need not be defined, and that this problem is consistent with politicians' agendas.

s.t.

$$C_t + I_t = DP_t^{\omega}\tau_t^{-\eta}K_t^{\alpha}\lambda_t^{1-\alpha} - \tau_t \quad (3)$$

$$K_{t+1} = I_t + (1-\delta)K_t \quad (4)$$

$$\tau_t = \lambda_t + P_t. \quad (5)$$

The first term on the right-hand side of resource constraint (3) is output net of SPI, $(1-\pi_t)Y_t$ using the functional forms for production and SPI. Net output funds aggregate consumption, $C_t$, and private investment, $I_t$, and is used to pay tax, $\tau$, to the government. Equation (4) is the standard stock accounting relation for capital accumulation, with $\delta \in [0,1]$ the depreciation rate. Lastly, equation (5) is the government budget constraint in which tax revenue, $\tau$, funds expenditures on the police, $P$, and public investment, $\lambda$.

Optimal government policies which solve (2) - (5) are

$$\lambda_t^{\star} = AK_t^{\frac{\alpha}{\alpha+\eta-\omega}} \quad (6)$$

$$P_t^{\star} = \frac{\omega A}{1-\alpha}K_t^{\frac{\alpha}{\alpha+\eta-\omega}} \quad (7)$$

$$\tau_t^{\star} = \frac{(1-\alpha+\omega)A}{1-\alpha}K_t^{\frac{\alpha}{\alpha+\eta-\omega}}, \quad (8)$$

where $A \equiv [D(1-\alpha)^{1-\omega+\eta}(1-\alpha+\omega)^{-\eta-1}\omega^{\omega}(1-\alpha+\omega-\eta)]^{\frac{1}{\alpha+\eta-\omega}}$. For this solution to be well-defined, we impose

Assumption 1 (A1): $1-\alpha+\omega-\eta > 0$.

We will consider A1 to be satisfied throughout, though it is insufficient to fully characterize optimal policies.

**Proposition 1** *Optimal policies* $\{\lambda_t^{\star}, P_t^{\star}, \tau_t^{\star}\}$ *are convex in* $K$ *if* $\omega > \eta$*; are linear in* $K$ *if* $\omega = \eta$*; and are concave in* $K$ *if* $\omega < \eta$.

Proposition 1 shows that the interplay between the marginal efficiency of the police at suppressing SPI, $\omega$, and the sensitivity of SPI to income equality, $\eta$, determines how optimal policies evolve during development.[7] Countries with efficient police forces optimally increase policy funding rapidly with growth in the capital stock, while inefficient police forces lead to optimal policies that increase slowly with growth. Equivalently, countries in which instability is highly sensitive to income inequality have optimal policies that grow more slowly than capital.

Next, we embed optimal policies into an equilibrium growth model to determine the resulting dynamics. In constructing the capital market equilibrium condition, we use the Solow (1956) assumption that a constant proportion $s \in (0,1)$ of income net of SPI and taxes is saved each period,[8]

$$K_{t+1} = s[(1-\pi)Y_t - \tau_t] + (1-\delta)K_t, \tag{9}$$

or, using the functional forms for $\pi$ and $Y$,

$$K_{t+1} = s[DP_t^{\omega}\tau_t^{-\eta}K_t^{\alpha}\lambda_t^{1-\alpha} - \tau_t] + (1-\delta)K_t. \tag{10}$$

Substituting optimal policies $\lambda_t^{\star}$, $P_t^{\star}$, and $\tau_t^{\star}$, into the capital market clearing condition (10) produces the law of motion for capital,

$$K_{t+1} = sBK_t^{\frac{\alpha}{\alpha+\eta-\omega}} + (1-\delta)K_t, \tag{11}$$

where $B \equiv D(1-\alpha)^{\eta-\omega}\omega^{\omega}(1-\alpha+\omega)^{-\eta}A^{\omega-\eta+1-\alpha} - (1-\alpha+\omega)(1-\alpha)^{-1}A$, which is strictly positive under A1.

Proposition 1 characterizes the dynamics of the economy given by (11).

**Corollary 1** *The economy's growth path is convex if $\omega > \eta$; is linear if $\omega = \eta$; and is concave if $\omega < \eta$.*

[7] The proofs of the propositions are standard and are not reported to save space.

[8] Blinder & Deaton (1985) find robust support showing that savings is proportional to income; see also Deaton (1992).

Corollary 1 demonstrates that the economy inherits the growth properties of optimal policies. Endogenous growth obtains if SPI is insensitive to inequality relative to the effectiveness of police ($\omega > \eta$) and initial capital $K_0$ exceeds a threshold, $\overline{K}$, where

$$\overline{K} = [\frac{sB}{\delta}]^{\frac{\alpha+\eta-\omega}{\eta-\omega}}. \tag{12}$$

If initial capital is less than the threshold, $K_0 < \overline{K}$, then investment net of tax and SPI is insufficient to sustain positive growth when $\omega > \eta$ and the economy contracts permanently. This occurs because a shortage of tax revenue results in policies that are insufficient to both combat SPI and stimulate growth.

There are two other growth paths in this economy as identified in Corollary 1, one with concave policies which obtains when SPI increases rapidly in income inequality, $\eta > \omega$, producing concave growth to a steady state; the other is the knife-edge case when $\eta = \omega$ which produces an AK model where the economy grows endogenously at a constant rate $sB - \delta + 1$.[9] Figure 1 depicts all three growth paths that the model admits.

[Figure 1 here]

The next result shows that regardless of government policies, countries may be caught in a poverty trap.

**Proposition 2** *There is a base value of SPI, $\overline{\pi} = 1 - \overline{D}$, such that if $\pi > \overline{\pi}$ then the economy is caught in a poverty trap even when government sets policy optimally.*

This proposition demonstrates that if underlying SPI is sufficiently high, government policy is an insufficient lever to move the economy out of a poverty trap. When the growth path is convex ($\omega > \eta$) and $\pi > \overline{\pi}$, the area of attraction to the poverty trap at the origin under Proposition 2 includes the entire real line so that positive

[9] As long as $sB > \delta$, the economy grows rather than contracts.

growth is unattainable for any initial condition (i.e. $\overline{K} \to \infty$). This is a disturbing result since convex government policies are the most effective at stimulating growth. Thus, even with the most effective government policy, sufficiently high SPI causes an economy to be permanently trapped in poverty. When the economy's growth path is concave ($\eta > \omega$), the steady state merges to the origin if $\pi > \overline{\pi}$, also resulting in a global poverty trap. In the case of linear growth ($\eta = \omega$), an increase in base SPI shifts the growth path below the 45 degree line so that for any initial level of capital, the economy contracts to the origin.

The results above show that the baseline SPI and the amount of initial capital significantly affect an economy's growth prospects. Thus, we have shown that SPI not only affects savings and output as in Venieris et al, and Barro, but fundamentally determines whether growth is possible at all, *even when the government sets policy optimally.* This result obtains because policy-makers are myopic in that they maximize period-to-period growth, rather than the entire sequence of the capital stock. Politicians' myopia arises because they simply focus on the next election cycle.

Conversely, if a country is growing (i.e. $\pi < \overline{\pi}$), in the limit SPI vanishes. To wit, when $K_t \geq [(\frac{1}{D})\omega^{\omega}(1-\alpha)^{\eta-\omega}(1-\alpha+\omega)^{\eta}A^{\eta-\omega}]^{\frac{\alpha+\eta-\omega}{\alpha(\omega-\eta)}} \equiv \kappa$, then $\pi = 0$. With continued growth, the government simply funds the police at the fixed rate $P(\kappa)$ and uses all the remaining tax revenue for public investment.

We show in the Appendix that for growing economies with $K_t > \kappa$, optimal policy produces an economy with endogenous balanced growth. The exception to this scenario occurs for countries with concave growth paths for which steady state capital is less than the no-SPI capital stock $\kappa$. For initial capital less than the steady state, these countries are caught at a "middle-income trap," as they reach a steady state with positive levels of SPI but are unable to reach the balanced growth path. Thus, developing countries with sufficiently low base SPI to escape a poverty trap generally

grow rapidly in the transitional dynamics, and then exhibit long-run balanced growth. Put differently, the model predicts that SPI is less important in developed countries than in developing ones.

As the base value of SPI rises, but does not exceed the poverty trap threshold, ($0 < \pi < \overline{\pi}$), a higher value of initial capital is required to obtain endogenous growth in convex economies. In addition, as $\pi$ rises but remains below $\overline{\pi}$, the rate of convergence to the balanced growth path is retarded for all economies. Nevertheless, barring external events, countries with convex growth that do not begin too poor ($K_0 > \overline{K}$) and in which baseline SPI is not too high ($\pi < \overline{\pi}$), eventually reach a balanced growth path. Countries with concave growth are less likely to reach the balanced growth path as base SPI rises.

## 2.2 Testable Implications of the Model

The model of growth with optimal policy-setting generates four testable implications:
*i)* optimal police and public investment expenditures are increasing and log-linear in capital, by equations (6) and (7);
*ii)* by Corollary 1, output growth is convex, linear, or concave if the marginal impact of police expenditures, $\omega$, exceeds, equals, or is less than, the marginal sensitivity of SPI to income inequality, $\eta$, respectively;
*iii)* by equation (11), growth slows as the base level of SPI rises;
*iv)* by Proposition 2, if the base level of SPI is sufficiently high, the economy will be caught in a poverty trap.

In the following sections we test each of these predictions of the model.

# 3 Construction of Socio-Political Instability Indices

Since SPI subsumes both domestic conflict as well as major government crises, we attribute SPI to two types of political activities: *i)* violent and nonviolent antigovernment uprisings, and *ii)* violent and nonviolent actions undertaken by the government to suppress uprisings. Following Francisco (1996) and Gupta, Singh & Sprague (1993), the construction of our indices also accounts for the possibility of interactive effects between the government and agents who engage in SPI; in some situations there is a possibility that punitive government action exacerbates the virulence of demonstrations.

For robustness, we estimate three SPI indices using two different methods.[10] The first SPI index is generated by estimating a logit equation relating major government crises to domestic conflict events following Banks (1996).[11] This measure of SPI uses assassinations [$ASSASS$], guerrilla warfare [$GUERWAR$], purges, [$PURGES$], general strikes [$GSTRIKES$], riots [$RIOTS$], and antigovernment demonstrations [$ANTIGOVDEM$] as explanatory variables for the incidence of major government crises, and is estimated using the following equation.

$$\begin{aligned} SPIL &= \alpha_0 + \alpha_1 ASSASS + \alpha_2 GSTRIKES + \alpha_3 GUERWAR + \alpha_4 PURGES \\ &+ \alpha_5 RIOTS + \alpha_6 ANTIGOVDEM + \epsilon. \end{aligned} \tag{13}$$

[10] A more detailed description of the SPI index for 142 countries is provided in Le (1998). These data are available from http://fac.cgu.edu/ zakp. Related methods to construct SPI indices are outlined in Gupta (1990), Ozler & Tabellini (1991), Cukierman, Edwards, & Tabellini (1992), and Alesina & Perotti (1996). All these SPI indices are statistically correlated, but not identical.

[11] Appendix B describes of each of the variables used in the construction of the SPI indices. For statistical superiority, we use the logit model instead of discriminant analysis. See Press and Wilson (1978) for a lucid discussion on the superiority of the former over the latter.

All the estimated coefficients are positive and significant indicating that the explanatory variables raise the likelihood of SPI.[12] The predicted values of equation (13), which are continuous on (0,1), corresponds to our first measure of SPI, $SPIL$.

Following Hibbs (1973), we use principal components analysis to generate two alternative measures of SPI. Principal components analysis categorizes coincident variation among a set of variables. This separates the sources of SPI into discrete dimensions producing two factors for SPI, denoted by $SPIF1$ and $SPIF2$.[13] The first factor, $SPIF1$, includes general strikes, riots, and anti-government demonstrations. This factor captures collective protests. The second factor, $SPIF2$, includes purges, guerrilla warfare, and assassinations. This factor captures violent uprisings. The correlations of the first measure, $SPIL$, with $SPIF1$ and $SPIF2$ are 0.57 and 0.79, respectively. The correlation between $SPIF1$ and $SPIF2$ is negative and significantly lower, -0.0001, showing a weaker relationship between collective protests and violent rebellions. The lack of correlation between $SPIF1$ and $SPIF2$ occurs because there is virtually no connection between collective protests and violent rebellions in developed countries.

# 4 Empirical Tests of the Model

## 4.1 Data and Sample Period

The data set consists of 58 countries over the period 1980-1995.[14] The constraint on the number of countries and initial year of coverage is the availability of data on police expenditures. We utilize public order & safety expenditures from *Government Finance Statistics Yearbook* (GFS) to measure police expenditures. Tax revenue and

[12]See Table C1 in the Appendix for the estimation results of the logit model.

[13]See Table C2 in the Appendix for the results of estimated principal components.

[14]There are 16 developed countries and there are 42 developing countries in the sample.

public investment data are also taken from GFS.[15] Data for GDP per capita, growth rate of GDP per capita, and primary education enrollment rate are taken from the World Bank's *World Development Indicators*. Government policy variables are all measured as a proportion of GDP to control for scale effects.

## 4.2 Empirical Evidence

We test the five implications of the model using panel data. Since panel data provides more variation than cross-sectional analysis, the dynamic structure of the model is more likely to be evident. In addition, growth regressions using panel data permit unobserved country-specific heterogeneity.[16] Generalized least squares (GLS) estimates are reported for optimal policies and growth.

Table 1 presents the estimation of the optimal policy rules for public investment (6) and police expenditures (7), with GDP per capita proxying the physical capital stock. The coefficients on GDP per capita in the police and public investment equations have the predicted positive sign and are highly significant. In addition, the adjusted $R^2$ are very near one showing that GDP per capita explain almost all of the variation in these policies as the theory predicts. A 1-percent increase in GDP per capita results in a 0.09 percent increase in police expenditures. Furthermore, as the theory predicts, countries provide more public investment as they grow: a 1-percent increase in GDP per capita results in a 0.40 percent increase in public investment. This demonstrates strong support for implication *i)* above.[17]

[15]Tax revenue data is contained in Table A: Revenue and Grants Consolidated Central Government. Public investment data is listed under Table B: Expenditure by Function Consolidated Central Government. There are 14 categories in Table B, and we use education, health, social security & welfare, and transportation & communication as the constituents of public investment.

[16]See Durlauf & Quah (1998) for an excellent survey of growth empirics using panel data.

[17]Dividing the data into developed and developing countries and estimating each policy separately, tests for differences in estimated coefficients reveal at the 1% significance level, developing countries

[Table 1 here]

Next, we test the model's predictions relating SPI to growth using panel regressions with each SPI index described above. We estimate a log-linear approximation of (9) where SPI enters the growth equation directly. The regressions control for primary education enrollment rates as well as initial GDP are standard in growth regressions (Barro, 1997).[18]

Table 2A shows that two of the three SPI measures have negative and significant impacts on growth revealing substantial support for implication *iii).* $SPIF1$, which measures strikes and demonstrations, has a negative, but not statistically significant effect on growth. This indicates that violent demonstrations, not protests, are the aspect of SPI that has the strongest impact on the economy. Moreover, the estimation results indicate that SPI has a substantial quantitative growth effect: a 1-percent increase in $SPIL$ decreases annual per capita output growth by 0.44 percent, while a 1-percent increase in $SPIF2$ has nearly twice that effect.

As the theory predicts, public investment has a positive, highly statistically significant, and quantitatively stable impact on growth in all three specifications. A 1-percent increase in public investment increases annual per capita output growth by 0.70 percent. Conversely, taxes have a negative and significant impact on growth. A 1-percent increase in taxes decreases annual per capita output growth by just under 0.70 percent in each specification–interestingly roughly the same elasticity for public investment.

The third government policy the theory predicts affects economic growth is police spending. Since the optimality conditions (6) and (7) show that public investment

spend less on police but more on public investment as income rises than do developed countries.

[18]We use three lags for the control variables primary education enrollment rate and initial GDP to instrument these potentially endogenous variables. An F-test indicates that there is no significant difference between using one, two or three lags.

and police expenditures are collinear, we drop public investment from the equation (3) and replace it with police expenditures. For this specification reported in Table 2B (and also when using $SPIFL$ and $SPIF1$ as well), the estimated coefficient on police expenditures is positive but insignificant. This suggests that police expenditures may have other uses besides securing public order and thus are only weakly related to growth in this sample.

The final estimation reported in Table 2B investigates the existence of an SPI-caused poverty trap. One test of a poverty trap would be a lack of a growth advantage for poor countries that have high levels of SPI. Recall that the theory demonstrates that SPI has only a small impact on developed countries but can be quite pernicious in poor countries. Based on the growth regressions in Table 2A, only the regression that includes the SPI measure for violent uprisings, $SPIF2$, has a significant and negative estimated coefficient on the level of GDP per capita. As a result, we use this specification in our search for a poverty trap (though similar results obtain when $SPIL$ or $SPIF1$ are used). Equation (5) in Table 2B adds to the base specification of equation (3) the interactive term $GDP \times SPIF2$ which captures the impact of SPI on low income countries. The estimated coefficient on this term is negative and significant and the coefficient on $SPIF2$ itself remains significant. More importantly, the coefficient on initial GDP falls in value and is insignificantly different than zero at convention levels. This is evidence that SPI causes a poverty trap in low income countries *even when government policy is taken into account.*

The results in this section taken as a whole show strong support for the theory relating SPI and government policy to growth.

[Table 2 here]

## 4.3 Estimation of $\omega$ and $\eta$, and Simulations of Growth Trajectories

Our next task is to estimate $\omega$ and $\eta$ in order to examine the model's predictions for the slope of economy's growth trajectory. Recall that by Corrollary 1, the dynamics of the economy are determined by the relative values of the marginal efficiency of the police at reducing SPI, $\omega$, and the sensitivity of SPI to income equality, $\eta$. Taking logs of equation (1) produces the estimable equation

$$\ln(1-\pi_t) = D_0 + \omega \ln(P_t) - \eta \ln(\tau_t), \tag{14}$$

where $D_0 \equiv \ln(D)$ is a constant.

Table 3 reports the estimation of $\omega$ and $\eta$ via (14) using each measure of SPI to generate a measure of socio-political *stability*, $1-\pi$. In two of the three cases, $\omega <\mid \eta \mid$, indicating that optimal policies and output growth are generally concave for the average country. The exception occurs when (14) is estimated using $SPIF1$. As in the growth regressions above, we discount this result as $SPIF1$ does not appear to capture the impact of SPI on the economy well. The estimation results show that political stability is relatively sensitive to both police expenditures and taxes. Using the average values of $\eta$, a 10-percent increase in taxes causes political stability to decrease by 0.13 percent. On the other hand, a 10-percent increase in police expenditures raises political stability by 0.12 percent.

[Table 3 here]

Next, we determine the growth path induced by the estimated government policies for police spending and public investment found above. We do this by simulating the economy's dynamics via the capital market equilibrium condition (11) using the average estimates of $\omega$ and $\eta$ from Table 3, $\omega = 0.0122$ and $\eta = 0.0125$. Additional

parameter values in (11) are: savings rate, $s = 0.10$, capital depreciation rate, $\delta = 0.10$; share of labor, $\alpha = 0.40$ (Cooley, 1995).

Figure 2 shows that optimal policies result in quasi-AK growth for an economy with low base SPI ($D = 0.95$). Increasing the marginal efficiency of the police, $\omega$, shifts the line upward, while increasing the sensitivity of SPI to inequality, $\eta$, shifts the line downward, toward the 45 degree line. Thus, the model shows that optimal policies that internalize their effect on SPI result in near balanced growth in the transitional dynamics with concave production and absent technological change.

[Figure 2 here]

Figure 3 displays the economy's growth path when the base SPI is high ($D = 0.10$). As before, a quasi-AK growth also obtains, but in this case growth is negative and the economy contracts to a poverty trap. Raising the marginal efficiency of the police, $\omega$, does not have a significant impact on the growth path; in particular, for high levels of SPI, positive growth is unattainable even with an effective police force. On the other hand, increasing the sensitivity of SPI to inequality, $\eta$, shifts the line further downward, while decreasing it shifts the line upward.

[Figure 3 here]

The simulations show that countries with high levels of SPI cannot escape a poverty trap–even with optimal government policies which take into account the SPI. Put differently, public investment alone is not enough to generate endogenous growth when taxes raise SPI: *both* the maintenance of public order and public investment are required for poor countries to successfully develop.

# 5 Conclusions

The model of optimal policy-setting in a growing economy presented in this paper shows that raising taxes to fund policies may have an unintended effect–raising SPI. Even when government policy take this into account and includes police expenditures to directly reduce SPI, positive growth still may not be possible. Simulating the model using the estimated coefficients for optimal government policies demonstrates that an average country will grow on a quasi-linear trajectory in the transitional dynamics as long as the baseline level of SPI is not too high. In the long run, all growing countries reach a balanced growth path; economies that are contracting will continue to do so absent outside intervention. The primary lesson to be drawn from this analysis is that government development policy is seldom neutral vis-à-vis SPI, and policies meant to stimulate the economy significantly impact a country's growth trajectory.

# 6 Appendix

## 6.1 Appendix A: Optimal Policy without SPI

Consider the case when the capital stock is so high ($K_t \geq \kappa$) that there is no SPI ($\pi = 0$), and police spending is therefore constant ($P_t = P(\kappa) > 0$ for all $t$ such that $K_t \geq \kappa$). In this case, the government's policy problem is to choose values for $\lambda$ and $\tau$ that solve

$$Max_{\lambda,\tau} \frac{K_{t+1}}{K_t} \tag{15}$$

s.t.

$$K_{t+1} = K_t^{\alpha} \lambda_t^{1-\alpha} - C_t - \tau_t + (1-\delta)K_t \tag{16}$$

$$\tau_t = \lambda_t + P(\kappa). \tag{17}$$

The solution to (15)-(17) is $\lambda_t^{\star} = (1-\alpha)^{\frac{1}{\alpha}} K_t$, and $\tau_t^{\star} = \lambda_t^{\star} + P(\kappa)$. Note that these are linear in $K$. Embedding these optima into the growth model with a constant savings rate, $s$, produces an AK model,

$$K_{t+1} = [s\alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}} + 1 - \delta]K_t - sP(\kappa).$$

As long as the savings rate is not too low, $s > \frac{\delta}{\alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}}$, and capital exceeds $sP(\kappa)$, balanced endogenous growth obtains.

This derivation shows the marked difference that optimal policies have on the dynamics of developing versus developed economies: optimal policy in developing economies produces various growth paths depending on local factors, while in developed economies optimal policy always results in balanced growth.

## 6.2 Appendix B: Description of Variables Used to Construct SPI Indices

We use Banks' (1996) data set on domestic conflict events to construct the SPI indices. A sample of 142 countries are included in the data set, of which, 57 countries have data available for the entire period 1948-1995. Banks does not include years prior to a country's independence, and many countries begin to have records on domestic conflicts only several years after gaining independence. For this reason, the data for many countries begin after 1948.

The following domestic conflict variables are included in the data set. Banks uses the variable definitions from Rummel (1963). These definitions are:

- Assassinations [$ASSASS$]: Any politically motivated murder or attempted murder of a high government official or politician.
- General Strikes [$GSTRIKES$]: Any strike of 1,000 or more industrial or service workers that involves more than one employer and that is aimed at national government policies or authority.
- Guerrilla Warfare [$GUERWAR$]: Any armed activity, sabotage, or bombing carried out by independent bands of citizens or irregular forces and aimed at the overthrow of the present regime.
- Purges [$PURGES$]: Any systematic elimination by jailing or execution of political opposition within the ranks of the regime or the opposition.
- Riots [$RIOTS$]: Any violent demonstration or clash of more than 100 citizens involving the use of physical force.
- Anti-Government Demonstrations [$ANTIGOVDEM$]: Any peaceful public gathering of at least 100 people for the primary purpose of displaying or voicing

their opposition to government policies or authority, excluding demonstrations of a distinctly anti-foreign nature.

## 6.3 Appendix C: Estimation Results for the SPI Indices Using the Logit Model and Principal Components Analysis

[Table C1 here]

[Table C2 here]

# References

Alesina, Alberto, and Perotti, Roberto, 1996, Income Distribution, Political Instability, and Investment, *European Economic Review*, 4:1203-1228.

Alesina, Alberto, Ozler, Sule, Roubini, Nouriel, and Swagel, Phillip, 1996, Political Instability and Economic Growth, *Journal of Economic Growth*, 1(2):189-212.

Alesina, Alberto, Roubini, Nouriel, and Cohen, Gerald, 1997, *Political Cycles and the Macroeconomy*, MIT Press.

Arbetman, Marina and Kugler, Jacek, 1997, *Political Capacity and Economic Behavior*, Westview Press.

Banks, Arthur S., 1996, *Cross-National Time Series Data*, SUNY Binghamton.

Barro, Robert J., 2000, Inequality and Growth in a Panel of Countries, *Journal of Economic Growth*, 5(1):5-32.

Barro, Robert J., 1997, *Determinants of Economic Growth*, MIT Press.

Barro, Robert J., 1991, Economic Growth in a Cross-Section of Countries, *Quarterly Journal of Economics*, 106(2):407-443.

Barro, Robert J., 1990, Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy*, 98:103-25.

Blinder, Alan, and Deaton, Angus, 1985, The Time-Series Consumption Function Revisited, in *Brookings Papers on Economic Activity 2*, William C. Brainard and George L. Perry, eds.

Bueno de Mesquita, Bruce, Morrow, James, Siverson, Randy, and Smith, Alastair, 1998, Bad Policy or Good?: Political Institutions and Policy Incentives, *Hoover Institution Working Paper*.

Cooley, Thomas F., editor, 1995, *Frontiers of Business Cycle Research*, Princeton University Press.

Cukierman, Alex, Edwards, Sebastien, and Tabellini, Guido, 1992, Seignior-

age and Political Instability, *American Economic Review*, 82:537-555.

Deaton, Angus, 1992, *Understanding Consumption*, Oxford University Press.

Durlauf, Steven N. and Quah, Danny T., 1998, The New Empirics of Economic Growth, *NBER Working Paper No.6422.*

Feng, Yi, 1997, Democracy, Political Stability and Economic Growth, *British Journal of Political Science*, 27:391-418.

Feng, Yi, and Zak, Paul J., 1999, The Determinants of Democratic Transitions, *Journal of Conflict Resolution*, 43(2):162-177.

Feng, Yi, Kugler, Jacek, and Zak, Paul J., 2000, The Politics of Fertility and Economic Development, *International Studies Quarterly,* forthcoming.

Fiorina, Morris, P., 1981, *Retrospective Voting in American National Elections*, Yale University Press.

Francisco, Ronald A., 1996, Coercion and Protest: An Empirical Test in two Democratic States, *American Journal of Political Science*, 40:1179-1204.

Ghate, Chetan, 1999, Socio-Political Instability and Economic Growth: A Theoretical Analysis. *Claremont Graduate University Working Paper.*

Ghate, Chetan, and Zak, Paul J., 1999a, Cycles, Thresholds and Growth: The Politics of Fiscal Policy, *Claremont Graduate University Working Paper.*

Ghate, Chetan, and Zak, Paul J., 1999b, Endogenous Growth through Government Policy, *Claremont Graduate University Working Paper.*

Government Finance Statistics Yearbook, *various issues*, International Monetary Fund.

Gupta, Dipak, 1990, *The Economic of Political Violence*, Praeger.

Gupta, Dipak, Singh, Harinder, and Sprague, Tom, 1993, Government Coercion of Dissidents: Deterrence or Provocation?, *Journal of Conflict Resolution*, 37:301-39.

Haavelmo, Tyrgve, 1954, *A Study of the Theory of Economic Evolution*, North

Holland.

Hibbs, Douglas A., 1973, *Mass Political Violence: A Cross-National Causal Analysis*, John Wiley & Sons, Inc.

Le, Quan Vu, 1998, Socio-Political Instability: Issues, Measures, and Explanations, *Claremont Graduate University Working Paper.*

Lewis-Beck, Michael S., 1990, *Economics and Elections: The Major Western Democracies*, University of Michigan Press.

Magee, Stephen P., Brock, William A., and Young, Leslie, 1989, Three Simple Tests of the Stolper-Samuelson Theorem, in *Black Hole Tariffs and Endogenous Policy Theory*, Cambridge University Press.

McGuire, Martin C. and Olson, Mancur, 1996, The Economics of Autocracy and Majority Rule: The Invisible Hand and the Use of Force, *Journal of Economic Literature*, 34: 72-96.

Ozler, Sule, and Tabellini, Guido, 1991, External Debt and Political Instability, *NBER Working Paper No.3772.*

Press, S.J. and Wilson, S., 1978, Choosing Between Logistic Regression and Discriminant Analysis, *Journal of the American Statistical Association*, 73(364):699-705.

Rummel, Rudolph, 1963, Dimensions of Conflict Behavior Within and Between Nations, *General System Yearbook*, 8:1-50.

Smith, Adam, 1776, An Inquiry into the Nature and Causes of the Wealth of the Nations, Random House, 1937.

Solow, Robert, 1956, A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, 70(1):65-94.

Tufte, Edward, 1978, *Political Control of the Economy*, Princeton University Press.

Venieris, Yiannis and Gupta, Dipak, 1985, Sociopolitical and Economic Di-

mensions of Development: A Cross-Sectional Model, *Economic Development and Cultural Change*, 31:727-756.

Venieris, Yiannis and Gupta, Dipak, 1986, Income Distribution and Socio-Political Instability as Determinants of Savings: A Cross-Sectional Model, *Journal of Political Economy*, 94(4):873-883.

Venieris, Yiannis and Stewart, Douglas, 1987, Sociopolitical Instability, Inequality and Consumption Behavior, *Journal of Economic Development*, 12(2):7-20.

World Development Indicators, 1999, The World Bank.

Zak, Paul J., 1997, Institutions, Property Rights and Growth, *Louvain Economic Review*, forthcoming.

Zak, Paul J., 2000, Socio-Political Instability and the Problem of Development, ch. 6 in *Governing for Prosperity*, Bruce Bueno de Mesquita and Hilton Root, eds., Yale University Press.

FIGURE 1: GROWTH PATHS OF AN ECONOMY WITH SPI

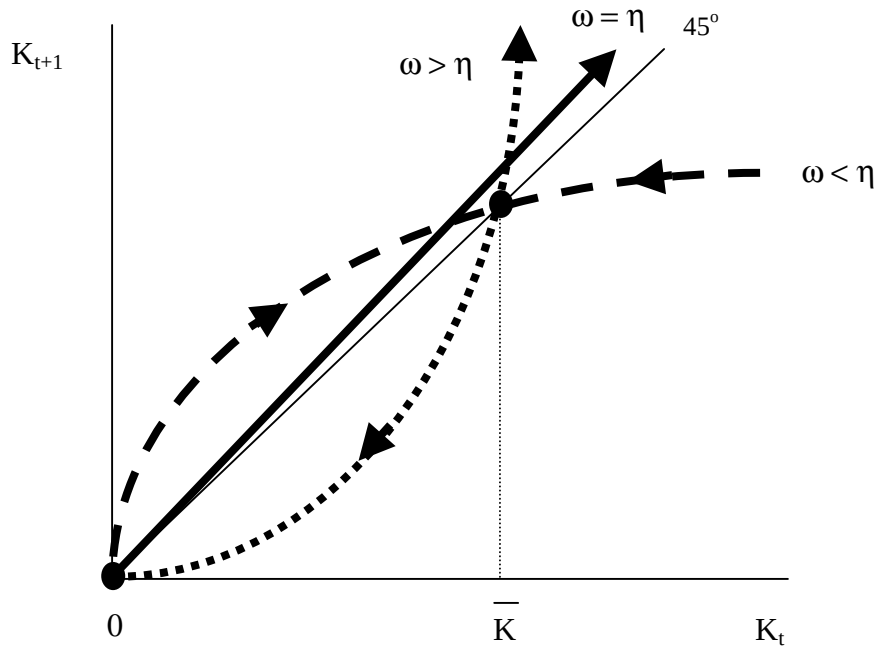

FIGURE 2: GROWTH PATH OF AN ECONOMY WITH LOW BASE SPI

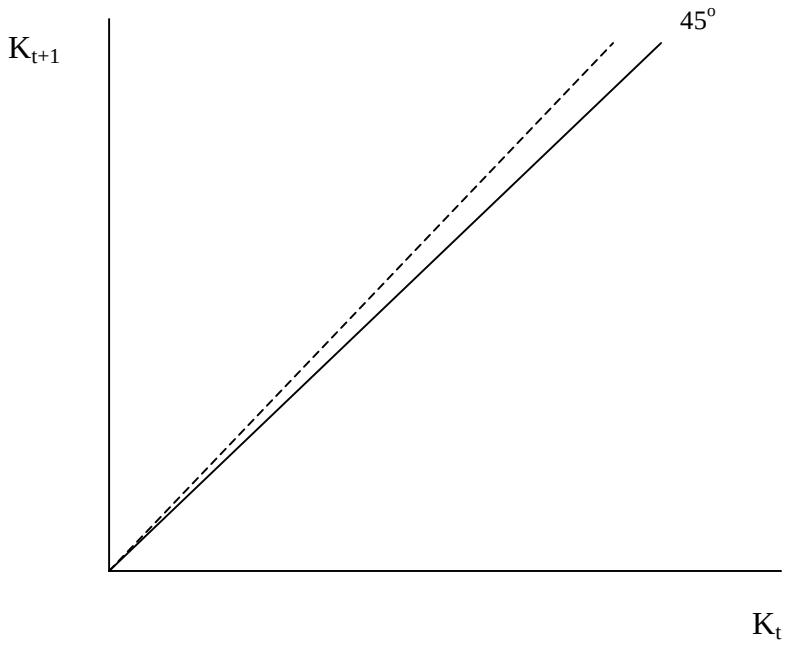

FIGURE 3: GROWTH PATH OF AN ECONOMY WITH HIGH BASE SPI

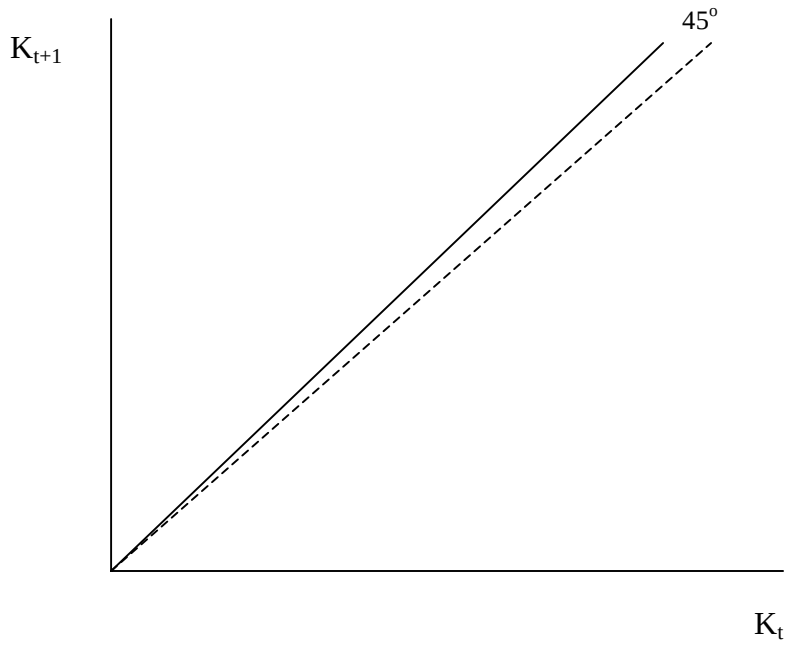

TABLE 1: ESTIMATION RESULTS FOR POLICE EXPENDITURES AND PUBLIC INVESTMENT

| 58 DEVELOPED AND DEVELOPING COUNTRIES 1986-1995 | | |
|---|---|---|
| DEPENDENT VARIABLE | LN(POLICE) | LN(PUBINV) |
| INDEPENDENT VARIABLE | | |
| LN(GDP) | 0.091**<br>(0.001) | 0.379**<br>(0.004) |
| CONSTANT | -5.298**<br>(0.013) | -5.364**<br>(0.031) |
| NO. OF OBSERVATIONS | 578 | 578 |
| ADJUSTED R-SQUARED | 0.997 | 0.955 |

Notes: White heteroskedasticity-consistent standard errors are in parentheses. ** Statistically significant at the 1-percent level.

TABLE 2: ESTIMATION RESULTS FOR PER CAPITA GROWTH RATE

| TABLE 2A: ESTIMATION RESULTS FOR PER CAPITA GROWTH RATE AND SPI | | | |
|---|---|---|---|
| 58 DEVELOPED AND DEVELOPING COUNTRIES 1986-1995 | | | |
| INDEPENDENT VARIABLE | (1) | (2) | (3) |
| LN(SPIL) | -0.437**<br>(0.156) | -- | -- |
| LN(SPIF1) | -- | -0.072<br>(0.102) | -- |
| LN(SPIF2) | -- | -- | -0.786**<br>(0.124) |
| LN(PUBINV) | 0.697**<br>(0.055) | 0.704**<br>(0.052) | 0.689**<br>(0.059) |
| LN(TAX) | -0.681**<br>(0.253) | -0.676**<br>(0.253) | -0.618**<br>(0.252) |
| LN(LAGGDP) | -0.133<br>(0.101) | -0.118<br>(0.101) | -0.173*<br>(0.096) |
| LN(LAGEDU) | 1.963**<br>(0.443) | 1.943**<br>(0.454) | 1.916**<br>(0.447) |
| CONSTANT | -3.359<br>(2.419) | -3.446<br>(2.196) | -2.699<br>(2.137) |
| NO. OF OBSERVATIONS | 364 | 364 | 364 |
| ADJUSTED R-SQUARED | 0.437 | 0.431 | 0.441 |

Notes: White heteroskedasticity-consistent standard errors are in parentheses. ** Statistically significant at the 1-percent level. * Statistically significant at the 5-percent level.

| TABLE 2B: ESTIMATION RESULTS FOR PER CAPITA GROWTH RATE AND SPI<br>58 DEVELOPED AND DEVELOPING COUNTRIES<br>1986-1995 | | |
|---|---|---|
| INDEPENDENT VARIABLE | (4) | (5) |
| LN(SPIF2) | -0.917**<br>(0.127) | 3.304**<br>(1.047) |
| LN(SPIF2*LAGGDP) | -- | -0.496**<br>(0.124) |
| LN(POLICE) | 0.175<br>(0.144) | -- |
| LN(PUBINV) | -- | 0.723**<br>(0.052) |
| LN(TAX) | -0.252<br>(0.317) | -0.615**<br>(0.243) |
| LN(LAGGDP) | -0.091<br>(0.134) | -0.149<br>(0.091) |
| LN(LAGEDU) | 2.013**<br>(0.466) | 2.173**<br>(0.480) |
| CONSTANT | -3.798<br>(2.143) | -4.026*<br>(2.266) |
| NO. OF OBSERVATIONS | 364 | 364 |
| ADJUSTED R-SQUARED | 0.451 | 0.453 |

Notes: White heteroskedasticity-consistent standard errors are in parentheses. ** Statistically significant at the 1-percent level. * Statistically significant at the 5-percent level.

TABLE 3: ESTIMATION RESULTS FOR $\omega$ AND $\eta$

| 58 DEVELOPED AND DEVELOPING COUNTRIES<br>1986-1995 | | |
|---|---|---|
| PARAMETER | $\omega$ | $\eta$ |
| STABL | 0.0109** | 0.0164** |
| STABF1 | 0.0215* | 0.0099 |
| STABF2 | 0.0042 | 0.0111** |
| AVERAGE | 0.0122 | 0.0125 |

Notes: White heteroskedasticity-consistent standard errors are in parentheses. ** Statistically significant at the 1-percent level. *Statistically significant at the 5-percent level.

TABLE C1: LOGIT ESTIMATION RESULTS OF SPI

| ANALYSIS OF MAXIMUM LIKELIHOOD ESTIMATES |
|---|

| VARIABLE | PARAMETER ESTIMATE | STD. ERROR | WALD CHI-SQUARE | PR > CHI-SQUARE |
|---|---|---|---|---|
| INTERCEPT | -2.1822* | 0.0443 | 2422.7568 | 0.0001 |
| ASSASS | 0.1557* | 0.0351 | 19.6826 | 0.0001 |
| GSTRIKES | 0.5266* | 0.0604 | 76.0393 | 0.0001 |
| GUERWAR | 0.3583* | 0.0527 | 46.2777 | 0.0001 |
| PURGES | 0.3519* | 0.0468 | 56.5297 | 0.0001 |
| RIOTS | 0.0790* | 0.0220 | 12.9245 | 0.0003 |
| ANTIGOVDEM | 0.0266 | 0.0213 | 1.5592 | 0.2118 |

Notes: $N_1$, $N_0$ pairs=5069200, -2 log likelihood=423.074 with 6 DF (p=0.0001), Concordant/Discordant (%)=66.5/18.1. * Statistically significant at the 0.001 level. The criterion for significance is the Wald Chi-Square.

TABLE C2: PRINCIPAL COMPONENTS ANALYSIS OF SPI

| SIMPLE STATISTICS | | | | | | |
|---|---|---|---|---|---|---|
| VARIABLE | NUMBER | MIN | MAX | MEAN | STD. DEV. | SUM |
| FACTOR 1 | 6430 | -5.1715 | 21.7872 | 0 | 1 | 0 |
| FACTOR 2 | 6430 | -4.0446 | 34.3255 | 0 | 1 | 0 |

| STANDARDIZED SCORING COEFFICIENTS | | | VARIANCE EXPLAINED BY EACH FACTOR | |
|---|---|---|---|---|
| VARIABLE | FACTOR 1 | FACTOR 2 | FACTOR 1 | FACTOR 2 |
| ASSASS | 0.09013 | *0.27712* | 1.989431 | 1.179004 |
| GSTRIKES | *0.26878* | 0.09436 | | |
| GUERWAR | -0.06418 | *0.60154* | | |
| PURGES | -0.10442 | *0.55828* | | |
| RIOTS | *0.48578* | -0.06464 | | |
| ANTIGOVDEM | *0.49074* | -0.12342 | | |