Optimal Fiscal Policy in an Economy Facing Sociopolitical Instability

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Abstract

The paper presents a model of optimal government policy when policy choices may exacerbate sociopolitical instability (SPI). The authors 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 resulting equilibrium dynamics inherit the properties of government policies and need not be monotone. Indeed, for a broad set of conditions, government policy is unable to eliminate the poverty trap; when these conditions do not hold, "most" countries eventually reach a balanced growth path. The predictions of the model are tested by developing three new measures of SPI for a panel of 58 countries. Estimating optimal policies and the growth equation derived from the model reveals strong support for the theory.

1. Introduction

An extensive theoretical and empirical literature has shown that social upheaval and political violence hinders economic development (Venieris and Gupta, 1985, 1986; Venieris and Stewart, 1987; Gupta, 1990; Barro, 1991; Alesina and Perotti, 1996; Alesina et al., 1996). SPI arises when the political system is unable or unwilling to mediate disputes over the distribution of income (Venieris and Gupta, 1986; Feng et al., 2000). Barro (2000, p. 7) writes: "Inequality of wealth and income motivates the poor to engage in crime, riots, and other disruptive activities." In this paper, we characterize optimal government policies that stimulate growth when policies raise output but may exacerbate instability. These policies are embedded in a general equilibrium growth model to examine the resulting development paths.

The model demonstrates that 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. Estimating the model's optimality conditions, we then simulate the model's equilibrium dynamics. These show that if baseline SPI is not too high, an economy with optimal policies exhibits a nearly linear growth path in the transitional dynamics and balanced growth in the limit; if 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.

We also examine several extensions of the model, including quantifying parameters under which balanced growth obtains, and explore the role of ethnic divisions in

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stimulating SPI. The predictions of the model are tested by developing three new measures of SPI for a panel of 58 countries. Estimating optimal policies and the growth equation derived from the model reveals strong support for the theory.

2. Government Policy and SPI

SPI reflects the myriad coordination failures—both economic and political—that occur during different stages of development.[1] Because income growth raises support for the government (Lewis-Beck, 1990), it is a goal of nearly every politician. Hence, we model government policymakers as being concerned with maintaining themselves in power. A government, however, risks raising SPI if policy choices do not take into account their effect on income inequality (Barro, 2000; Zak, 2000). Thus, government policy choices that stimulate the economy may also exacerbate inequality and thereby raise SPI. We show below there exists an optimal policy set that balances these effects.

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 aggregate income growth which is equivalent to maximizing capital accumulation. This objective is consistent with models in which politicians set policy to increases their chances of re-election (Lewis-Beck, 1990; Ghate and Zak, 2002). This goal is realized via two policy instruments: public investment, λ, and police expenditures, P. Policies are funded by a lump-sum tax, τ, 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. Thus, lump-sum taxes are also regressive and can magnify income inequality.[2]

In each period, a fraction π of output is destroyed by SPI, with $\pi_t(P_t, \psi(\tau_t)) : \mathbf{R}^+ \times \mathbf{R}^+ \rightarrow [0, 1]$, where $\psi \geq 1$ is income inequality. When $\psi = 1$ there is perfect equality, while $\psi > 1$ measures the degree of income inequality. The theoretical and empirical literature on SPI robustly shows that inequality raises SPI (e.g., Venieris and Gupta, 1985, 1986; Alesina et al., 1996; Zak, 2000, 2003) which we assume holds in the economy being modeled, $\partial\pi/\partial\psi > 0$. Since taxes are regressive, a tax increase raises inequality, $\partial\psi/\partial\tau > 0$. 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, $\partial\pi/\partial P < 0$.

Police expenditures, P, indirectly raise growth by preventing the destruction of output, while the second policy instrument, public investment, λ, 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 π:

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

where $\eta > 0$ is the sensitivity of SPI to changes in income inequality, and $\omega > 0$ 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, $\tau, \lambda, P \geq 1$. The value $1 - D$ is the baseline level of SPI absent government policy (i.e., when $P = \tau = 1$).

Optimal policy for the government is the solution to a modified planning problem in which policymakers maximize capital deepening:

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

s.t.

$$K_{t+1} = s[(1-\pi)Y_t - \tau_t] + (1-\delta)K_t, \tag{3}$$

$$\tau_t = \lambda_t + P_t, \tag{4}$$

where π is defined in (1). Equation (3) is the standard stock accounting relation for capital accumulation with $\delta \in [0,1]$ the depreciation rate. Savings in (3) are a proportion of income net of SPI and net of taxes, τ.[3] Equation (4) is the government budget constraint in which tax revenue, τ, funds expenditures on the police, P, and public investment, λ.

Using the functional forms for production and SPI, the optimal government policies which solve (2)–(4) are

$$\lambda_t^* = AK_t^{\frac{\alpha}{\alpha+\eta-\omega}}, \tag{5}$$

$$P_t^* = \frac{\omega A}{1-\alpha} K_t^{\frac{\alpha}{\alpha+\eta-\omega}}, \tag{6}$$

$$\tau_t^* = \frac{(1-\alpha+\omega)A}{1-\alpha} K_t^{\frac{\alpha}{\alpha+\eta-\omega}}, \tag{7}$$

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

$$1 > \alpha + \eta - \omega > 0. \tag{C1}$$

We will consider condition (C1) to be satisfied throughout. The optimality conditions imply that SPI depends on income through its dependence on the capital stock K; i.e., optimal policies $P^*(K_t)$ and $\tau^*(K_t)$ are state-dependent. Indeed, it is straightforward to show that as long as $\omega > \eta$ then $\partial\pi/\partial K < 0$; i.e., if SPI is more sensitive to a change in police expenditures than to a change in inequality, then when capital (income) falls, SPI rises. The next result characterizes optimal government policies.

Proposition 1. *Optimal policies* $\{\lambda_t^*, P_t^*, \tau_t^*\}$ *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, ω, and the sensitivity of SPI to income equality, η, determines how optimal policies evolve during development.[4] 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. Observe that the *ratio* of expenditures on public investment to police expenditures is constant as the economy grows and equals the ratio of the marginal products of each policy with respect to output growth, $\lambda_t^*/P_t^* = (1-\alpha)/\omega$.

Next, we embed optimal policies into the capital-market equilibrium condition to determine the resulting dynamics. Substituting the functional forms for π and Y into (3) produces

$$K_{t+1} = s\left[DP_t^{\omega}\tau_t^{-\eta}K_t^{\alpha}\lambda_t^{1-\alpha} - \tau_t\right] + (1-\delta)K_t. \tag{8}$$

Replacing the government policy instruments in (8) with optimal policies λ_t^*, P_t^*, and τ_t^*, the equilibrium dynamics for this economy are

$$K_{t+1} = sBK_t^{\frac{\alpha}{\alpha+\eta-\omega}} + (1-\delta)K_t, \tag{9}$$

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 condition (C1).

Corollary 1 demonstrates that economy (9) inherits the growth properties of optimal policies.

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

Further, endogenous growth obtains if SPI is insensitive to inequality relative to the police ($\omega > \eta$) and initial capital K_0 exceeds a threshold, $\overline{K}$, where

$$\overline{K} = \left(\frac{sB}{\delta}\right)^{\frac{\alpha+\eta-\omega}{\eta-\omega}}. \tag{10}$$

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 $sB + 1 - \delta$. Figure 1 depicts all three growth paths that the model admits.

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

Proposition 2. *There is a baseline 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 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 baseline SPI causes an economy to be permanently trapped in poverty. When the economy's growth path is

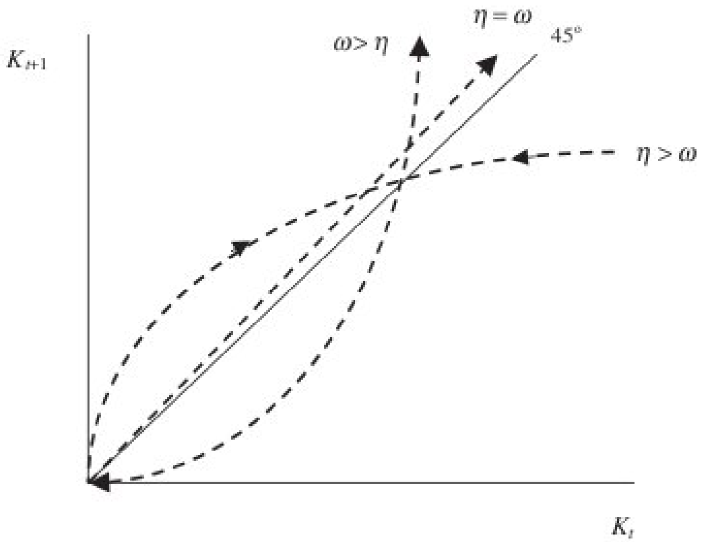

Figure 1. Growth Paths of an Economy with SPI

concave ($\eta > \omega$), the steady state merges to the origin if $\pi > \bar{\pi}$, also resulting in a global poverty trap. In the case of linear growth ($\eta = \omega$), an increase in baseline 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 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*.[5]

In an economy that is growing (i.e., $\pi < \bar{\pi}$), in the limit SPI vanishes. Specifically, when

$$K_t \geq \left[\left(\frac{1}{D}\right)\omega^{\omega}(1-\alpha)^{\eta-\omega}(1-\alpha+\omega)^{\eta}A^{\eta-\omega}\right]^{\frac{\alpha+\eta-\omega}{\alpha(\omega-\eta)}} \equiv \kappa,$$

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. It is straightforward to show 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 κ. 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 baseline SPI to escape a poverty trap typically grow rapidly in the transitional dynamics, and then exhibit long-run balanced growth. Put differently, the model predicts that SPI is substantially more important in developing countries than in developed ones.

Testable Implications of the Model

The model of growth with optimal policy-setting generates four testable implications:

1. Optimal police and public investment expenditures are increasing and log-linear in capital, by equations (5) and (6).
2. By Corollary 1, output growth is convex, linear, or concave if the marginal impact of police expenditures, ω, exceeds, equals, or is less than the marginal sensitivity of SPI to income inequality, η, respectively.
3. By equation (9), growth slows as baseline SPI rises.
4. By Proposition 2, if baseline 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 SPI Indices

Since SPI subsumes both domestic conflicts as well as major government crises, we attribute SPI to two types of political activities: (a) violent and nonviolent antigovernment protests and uprisings, and (b) violent and nonviolent actions undertaken by the government to suppress protests and uprisings. Following Francisco (1996) and Gupta et al. (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 punitive government actions exacerbate demonstrations. This section constructs a set of composite indicators reflecting different types of SPI.[6]

For robustness, we estimate three SPI indices using two different methods. The first SPI index is generated by estimating a logit equation relating major government crises to domestic conflict events from Banks (1996).[7] 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:

$$\begin{aligned} SPIL = \alpha_0 + \alpha_1 ASSASS + \alpha_2 GSTRIKES + \alpha_3 GUERWAR \\ + \alpha_4 PURGES + \alpha_5 RIOTS + \alpha_6 ANTIGOVDEM + \varepsilon. \end{aligned} \tag{11}$$

All the estimated coefficients are positive and significant, indicating that the explanatory variables raise the likelihood of SPI (Table 1). The predicted values of equation (11), which are continuous on (0, 1), is 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 types of SPI into discrete dimensions producing two factors for SPI, denoted by *SPIF*1 and *SPIF*2 (Table 2). The first factor, *SPIF*1, includes general strikes, riots, and antigovernment demonstrations; this factor captures collective protests. The second factor, *SPIF*2, includes purges, guerrilla warfare, and assassinations; this factor captures violent uprisings. The correlations of the first measure, *SPIL*, with *SPIF*1 and *SPIF*2 are 0.57 and 0.79, respectively.

4. Empirical Tests of the Model

Data and Sample Period

The dataset consists of 58 countries over the period 1980–95. There are 16 developed countries and 42 developing countries in the sample. The constraint on the number of

Table 1. Logit Estimation Results of SPI (analysis of maximum-likelihood estimates)

Independent variable	*Parameter estimate*	*Std. error*	*Wald chi-squared*	*Pr > chi-squared*
Constant	−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 = 5,069,200, −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-squared.

Table 2. Principal Components Analysis of SPI (standardized scoring coefficients)

Variable	*SPIF*1	*SPIF*2
ASSASS	0.09013	0.27712
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

Note: Variance explained by each factor: *SPIF*1, 1.989431; *SPIF*2, 1.179004.

countries and initial year of coverage is the availability of data on police expenditures. We utilize public order and safety expenditures from *Government Finance Statistics Yearbook* (GFS) to measure police expenditures. Tax revenue and public investment data are also taken from GFS.[8] Data for GDP per capita, the growth rate of GDP per capita, and the 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.

Empirical Evidence

We test the four implications of the model using panel data. Generalized least squares (GLS) estimates are reported for optimal policies and growth. Table 3 presents the estimation of the optimal policy rules for public investment (5) and police expenditures (6), 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. The results show that a 1% increase in GDP per capita results in a 0.09% increase in police expenditures. Also, as the theory predicts, countries provide more public investment as they grow: a 1% increase in GDP per capita is associated with a 0.40% increase in public investment. This supports Implication 1 in section 2.[9]

Table 3. Police Expenditures and Public Investment

Independent variable	ln(*POLICE*)	ln(*PUBINV*)
ln(*GDP*)	0.091**	0.379**
	(0.001)	(0.004)
Constant	–5.298**	–5.364**
	(0.013)	(0.031)
Adjusted R^2	0.997	0.955
Panel observations	578	578

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

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 (8) where SPI enters the growth equation directly and output proxies capital. The regressions control for primary education enrollment rates as well as initial per capita GDP.[10]

Panel A of Table 4 shows that two of the three SPI measures have negative and significant impacts on growth, revealing support for Implication 3 in section 2. *SPIF*1, which measures strikes, riots and demonstrations, has a negative, but not statistically significant effect on growth. This indicates that violent uprisings (*SPIF*2), not collective protests, are the aspect of SPI that has the strongest impact on the economy. The estimation results show that SPI has a substantial quantitative effect on growth: a 1% increase in *SPIL* decreases annual per capita output growth by 0.44%, while a 1% increase in *SPIF*2 has nearly twice this impact. Public investment has a statistically significant, and quantitatively relevant impact on growth in all three specifications. In contrast, taxes have a negative and significant impact on growth.

The third government policy the theory predicts affects economic growth is police spending. Since the optimality conditions (5) and (6) show that public investment and police expenditures are collinear, we drop public investment from equation (3) and replace it with police expenditures. For this specification, reported in column (4) of panel B of Table 4, and utilizing the measure of violent uprisings, *SPIF*2, the estimated coefficient on police expenditures is positive but insignificant. The same result obtains for the other measures of SPI. 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 investigates the existence of an SPI-caused poverty trap. Recall that the theory demonstrates that SPI has only a small impact on developed countries but can be quite pernicious in poor countries. We therefore examine countries that have SPI 20% above the mean, using the measure of SPI that has the largest impact on growth from the full sample, that being the measure of violent uprisings, *SPIF*2. We re-estimate growth equation (3) for the sample of 18 countries with high SPI, as reported in column (5) of Table 4. The coefficient on SPI doubles in size and remains highly significant. Surprisingly, public investment for these countries has a large negative and significant estimated coefficient, while the estimated coefficient on education is also large, positive, and significant. Most importantly, the estimated coefficient on initial GDP becomes insignificantly different from zero. Thus, when SPI is high, countries lose the growth advantage from being poor. This is indirect evidence for Implication 4 of the theory, the existence of a poverty trap.

Table 4. Per Capita Growth Rate and SPI

Independent variable			
Panel A	(1)	(2)	(3)
ln(*SPIL*)	−0.437**		
	(0.156)		
ln(*SPIF*1)		−0.072	
		(0.102)	
ln(*SPIF*2)			−0.786**
			(0.124)
ln(*PUBINV*)	0.697**	0.704**	0.689**
	(0.055)	(0.052)	(0.059)
ln(*TAX*)	−0.681**	−0.676**	−0.618**
	(0.253)	(0.253)	(0.252)
ln(GDP_{lagged})	−0.133	−0.118	−0.173*
	(0.101)	(0.101)	(0.096)
ln(EDU_{lagged})	1.963**	1.943**	1.916**
	(0.443)	(0.454)	(0.447)
Constant	−3.359	−3.446	−2.699
	(2.150)	(2.196)	(2.137)
Adjusted R^2	0.437	0.431	0.441
Panel observations	364	364	364
Panel B	(4)	(5)	
ln(*SPIF*2)	−0.917**	−1.322**	
	(0.127)	(0.184)	
ln(*POLICE*)	0.175		
	(0.144)		
ln(*PUBINV*)		−1.693**	
		(0.593)	
ln(*TAX*)	−0.252	−0.404	
	(0.317)	(1.434)	
ln(GDP_{lagged})	−0.091	−0.328	
	(0.134)	(0.197)	
ln(EDU_{lagged})	2.013**	6.587**	
	(0.466)	(0.904)	
Constant	−3.798	−27.081**	
	(2.143)	(6.216)	
Adjusted R^2	0.451	0.700	
Panel observations	364	112	

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

Growth Regressions: Robustness Tests

Following Barro (1991), we re-estimate our growth regressions using additional control variables to investigate the robustness of our results. Data for inflation, population growth, and terms of trade (measured by the growth rate of the ratio of export prices to import prices) are taken from the World Bank's *World Development Indicators*. The

Table 5. Per Capita Growth Rate and SPI: Further Tests

Independent variable	(1)	(2)	(3)
ln(*SPIL*)	–0.481**		
	(0.200)		
ln(*SPIF*1)		0.026	
		(0.121)	
ln(*SPIF*2)			–0.944**
			(0.154)
ln(*PUBINV*)	0.545**	0.553**	0.419**
	(0.087)	(0.081)	(0.117)
ln(*TAX*)	–1.556**	–1.604**	–1.635**
	(0.300)	(0.301)	(0.330)
ln(*INF*)	–0.940**	–0.953**	–1.081**
	(0.135)	(0.132)	(0.140)
ln(*POP*)	–0.349**	–0.350**	–0.290**
	(0.121)	(0.122)	(0.117)
ln(*TRADE*)	0.031*	0.031*	0.037**
	(0.014)	(0.015)	(0.015)
ln(GDP_{lagged})	–0.857**	–0.823**	–1.020**
	(0.133)	(0.131)	(0.126)
ln(EDU_{lagged})	2.490**	2.993**	4.239**
	(0.581)	(0.607)	(0.644)
Constant	–0.835	–1.491	–5.439
	(2.907)	(2.987)	(3.025)
Adjusted R^2	0.489	0.478	0.519
Panel observations	323	323	323

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

estimation results reported in Table 5 confirm the findings in the preceding section. Two of the three SPI measures continue to have negative and significant impacts on growth with the additional controls. Further, the coefficients of the significant SPI measures *increase* compared to the preceding results: a 1% increase in *SPIL* decreases annual per capita growth by 0.48%, while a 1% increase in *SPIF*2 decreases growth by almost 1%. As above, the collective protests variable (*SPIF*1) is not statistically significant. Also supporting the previous results, public investment has a positive and highly statistically significant impact on growth with each of the three SPI measures, while taxes are negative and significant. With the additional controls, the elasticity of taxes on growth is about three times the elasticity for public investment. Lastly, the control variables (inflation, population growth, and terms of trade) all have the expected signs and are statistically significant at the 5% level or better.

Estimation and Simulations of Growth Trajectories

Our next task is to estimate ω and η in order to examine the model's predictions for the slope of an economy's growth trajectory. Recall that by Corollary 1, the dynamics

Table 6. Estimation of ω and η

Parameter	ω	η
STABL	0.0109**	0.0164**
*STABF*1	0.0215*	0.0099
*STABF*2	0.0042	0.0111**
Average	0.0122	0.0125

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

of the economy are determined by the relative values of the marginal efficiency of the police at reducing SPI, ω, and the sensitivity of SPI to income equality, η. Taking logs of equation (1) produces the estimable equation

$$\ln(1-\pi_t) = D_0 + \omega \ln(P_t) - \eta \ln(\tau_t), \tag{12}$$

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

Table 6 reports the estimation of ω and η via (12) using each measure of SPI to generate a measure of sociopolitical *stability*, $1 - \pi$. In two of the three cases, $\omega < \eta$, indicating that optimal policies and output growth are generally concave for the average country. The exception occurs when (12) is estimated using *SPIF*1. As in the growth regressions above, we discount this result as *SPIF*1 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 estimated value of η, a 10% increase in taxes causes political stability to decrease by 0.13%. On the other hand, a 10% increase in police expenditures raises political stability by 0.12%.

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 (9) using the average estimates of ω and η from Table 6, $\omega = 0.0122$ and $\eta = 0.0125$. Additional parameter values in (9) are: savings rate, $s = 0.10$, capital depreciation rate, $\delta = 0.10$; capital's share of output, $\alpha = 0.40$ (Cooley, 1995).

Figure 2 shows that optimal policies result in quasi-AK growth for an economy with low baseline SPI ($D = 0.95$). Increasing the marginal efficiency of the police, ω, shifts the line upward, while increasing the sensitivity of SPI to inequality, η, shifts the line downward, toward the 45-degree line. Thus, supporting and extending Implication 2 in section 2, 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 also displays the economy's growth path when baseline SPI is high ($D = 0.10$). As before, a quasi-AK growth obtains, but in this case growth is negative and the economy contracts to a poverty trap. Raising the marginal efficiency of the police, ω, 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, η, shifts the line further downward, while decreasing it shifts the line upward.

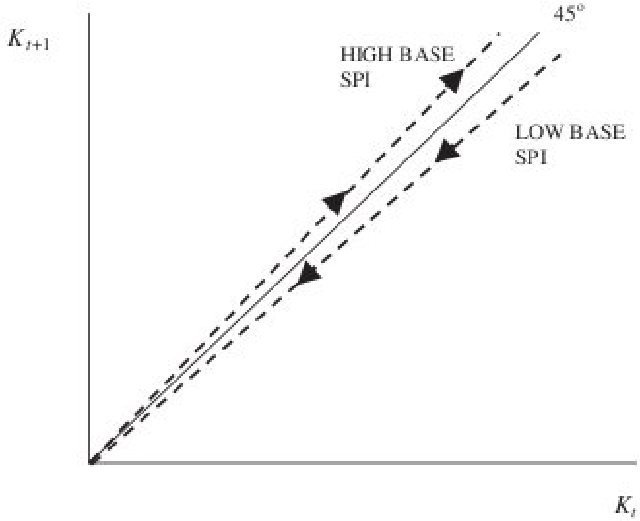

Figure 2. Growth Paths of an Economy with Low and High Base SPI

The simulations show that countries with high levels of SPI cannot escape a poverty trap, even with optimal government policies that take into account 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.

SPI, Ethnicity, and Inequality

In the theory and empirics, SPI was defined independent of its relation to ethnicity, yet there are many examples of ethnic strife fomenting violence, as discussed in Bardhan (1997) and Easterly and Levine (1997). Bates (2000) shows that there are "inflection points" where protest escalates into ethnic violence. Here, we explore the direct role of ethnicity and income inequality at generating SPI by estimating an augmented version of the determinants-of-SPI-equation (1).

The SPI relation (1) is re-estimated using both collective protests, *SPIF*1, and violent uprisings, *SPIF*2, along with a new variable *ETHNIC* which measures ethnolinguistic fractionalization.[11] We also use a direct measure of income inequality, *GINI*, from Deininger and Squire (1996) rather than the indirect measure, taxes, used earlier. Following Bates (2000), we enter *ETHNIC* as a quadratic. Lastly, we also control for policy choices as Easterly and Levine (1997) show that ethnically divided countries have trouble implementing public policies.

Table 7 reports the estimation results. Ethnic divisions have a substantial impact on SPI, especially on collective protests. Column 2 in Table 7 shows that the linear coefficient on *ETHNIC* has positive and significant impact on *SPIF*1 (collective protests), and its squared term is also positive and significant. This indicates that collective protests increase at an increasing rate as ethnic divisions rise. Income inequality also has the expected positive impact on collective protests and is highly significant. The coefficient on police expenditures is negative and significant, consistent with the theory, while the coefficient on public investment is insignificant.

Table 7. SPI, Ethnicity, and Inequality

Independent variable	ln(*SPIF*1)	ln(*SPIF*2)
ln(*ETHNIC*)	0.168***	−0.058**
	(0.070)	(0.027)
ln(*ETHNIC*)^2	0.025*	−0.010*
	(0.014)	(0.006)
ln(*GINI*)	0.350***	0.253***
	(0.110)	(0.089)
ln(POL_{lagged})	−0.050***	−0.021***
	(0.015)	(0.009)
ln($PUBINV_{lagged}$)	−0.019	0.007
	(0.012)	(0.011)
ln(GDP_{lagged})	0.034**	−0.011
	(0.017)	(0.013)
ln(EDU_{lagged})	0.344***	0.066**
	(0.059)	(0.031)
Constant	−3.052***	−1.209***
	(0.466)	(0.368)
Adjusted R^2	0.102	0.014
Panel observations	138	138

Notes: White heteroskedasticity-consistent standard errors are in parentheses. *** Statistically significant at the 1% level. ** Statistically significant at the 5% level. * Statistically significant at the 10% level.

Column 3 in Table 7 shows that ethnic divisions are also associated with fewer violent uprisings. The linear coefficient on *ETHNIC* has a negative and significant impact on *SPIF*2, while its squared term is also negative and significant. Thus, violent revolts strictly decrease as ethnic divisions intensify in this sample, unlike the inflection points found by Bates (2000), though similar to the findings of Bardhan (1997). The coefficient on income inequality remains positive and is significant at better than 1%, consistent with the theory. As we find with collective protests, the coefficients on police expenditures and public investment are negative with only the former being significant. These results show that the government policy model (2)–(4) has ignored an important factor affecting SPI, ethnic divisions.

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 the unintended effect of raising SPI. We demonstrate theoretically and empirically that even when government policy takes into account its impact on SPI, for example funding policies to directly reduce SPI, positive growth still may not occur. In the long run, all countries with positive growth are predicted to reach a balanced growth path, while 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. Policies meant to stimulate the economy can significantly impact a country's growth trajectory, indicating the delicate balance that governments in developing countries face when setting policy.

Appendix: Construction of SPI Indices

We use Banks' (1996) dataset on domestic conflict events to construct the SPI indices. A sample of 142 countries are included in the dataset, of which 57 countries have data available for the entire period 1948–95. 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 dataset. 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.
- Antigovernment 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 antiforeign nature.

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Notes

1. See Bardhan (1997), Easterly and Levine (1997), Bates (2000), and Zak (2000) for recent discussions of the sources of political instability.
2. 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.
3. Following Solow (1956), we assume that a constant proportion $s \in (0, 1)$ of income is saved. Blinder and Deaton (1985) find robust support showing that savings is proportional to income.
4. The proofs of the propositions are straightforward and are not reported to save space.
5. See Ghate et al. (2002) for a more exhaustive treatment of the conditions under which poverty traps obtain.
6. Amongst many, some related methods to construct SPI indices are outlined in Gupta (1990) and Alesina and Perotti (1996).
7. The Appendix describes each of the variables used in the construction of the SPI indices. For statistical superiority, we use a logit model instead of discriminant analysis; see Press and Wilson (1978) for a discussion of these issues. A more detailed description of SPI index construction is provided in Le (1998), with data available at http://spe.cgu.edu/spedata/research.htm.

8. 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 and welfare, and transportation and communication as the constituents of public investment.
9. Dividing the data into developed and developing countries and estimating each policy separately, tests for differences in estimated coefficients reveal that, at the 1% significance level, developing countries spend less on police but more on public investment as income rises than do developed countries.
10. We use three lags for the control variables, primary education enrolment 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.
11. We utilize the same measure of ethnolinguistic fractionalization as Easterly and Levine (1997) and many others, from *Atlas Norodow Mira* (Moscow: Miklukho-Maklai Ethnological Institute at the Department of Geodesy and Cartography of the State Geological Committee of the Soviet Union, 1964).