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Socio-Political Instability and Growth Dynamics

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Abstract

Since 2006, almost 60 percent of global protest events have been exclusively driven by economic injustice. Standard determinants of socio-political instability reported in the literature, do not fully explain the effect of monetary and fiscal policy decisions on the intended target audience of those policy outcomes. We develop an overlapping generations monetary endogenous growth model characterized by socio-political instability, to analyse growth dynamics and specifically, monetary policy outcomes in the presence of this augmentation. Socio-political instability is specified as the fraction of output being lost due to strikes, riots and protests and is positively related to inflation. Interesting, two distinct growth dynamics emerge, one convergent and the other divergent, if socio-political instability is a function of inflation. And by using a sample of 170 countries during the $1980 - 2012$ period, and allowing for time and fixed effects, the results indicate that inflation correlates positively with socio-political instability. Policy makers should be cognisant that it is crucial to maintain long-run price stability, as failure to do so may result in high inflation emanating from excessive money supply growth, and high (er) socio-political instability, and ultimately, the economy being on a divergent balanced growth path.

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1 Introduction

> "Inflation is a disease, a dangerous and sometimes fatal disease, a disease that if not checked in time can destroy a society." – Milton Friedman[1]

In the 13th Century, a combination of purveyance and a general lack of food due to inefficiencies in production and storage methods, contributed in no small part to the negotiation and signing of the **Magna Carta** with King John in 1215. The Revolutions of 1848, or the **People's Spring**[2], could partly be traced to a subsistence crisis in large parts of Europe, which were accompanied by a steep rise in prices for wheat[3]. In the aftermath of the $2010-2012$ **Arab Spring**, it has been widely observed that food prices were again crucial in driving the uprising[4]. Moreover, Ianchovichina et al. (2014) report convincing estimates of the asymmetric fragility in Arab countries to global food price shocks. However, in this manuscript we build on from the impact of prices of certain goods (food) on instability in certain countries, and using a global macroeconomic perspective, we postulate that unrest or uprisings in countries could partly be ascribed to a general rise in prices of all goods, or plainly, inflation. Though, modern unrest or uprisings may look a lot different than those observed throughout history in the Middle Ages or during the 19th Century and here is termed socio–political instability. Furthermore, we observe a number of countries where there is a positive correlation between high(er) inflation and high(er) levels of socio–political instability (SPI). This is not only true from an "over time" perspective, but it also holds from an "across countries" perspective.

The study of political instability is not new. There are a number of theoretical and empirical studies that focus on the relation between socio/political instability, economic growth and fiscal policy. Edwards and Tabellini (1991) provide some of the first empirical evidence of the linkage between fiscal policy and political instability. Interestingly, they simultaneously link inflation with political instability and political "polarisation". Devereux and Wen (1998) report how higher levels of SPI leads to both an increase in the share of government expenditure in gross domestic product (GDP) and simultaneously to lower economic growth rates. Persson and Tabellini (1999) use fiscal policy to analyse the credibility of tax policy, and then identify some political determinants of budget deficits.

Asteriou et al. (2000) find that it is electoral uncertainty (some *political* instability) that leads to both a higher tax burden and changes in the composition of government expenditures, and this often reduces economic growth. Electoral uncertainty is also the main driver for the suboptimal growth outcomes – through short–sighted, inefficient tax policies – observed in some countries, as reported in Economides et al. (2003). Ghate et al. (2003) present a model of optimal fiscal policy when those policy choices may cause or exacerbate SPI. Finally, Mierau et al. (2007) find that it is only upcoming elections (again, some *political* instability) that increases the likelihood of rapid fiscal policy adjustment.

Our focus, as stated earlier, is on inflation rather, and hence, monetary policy. Paldam (1987) is one of the first empirical studies[5] that emphasizes the role of inflation as a possible

[1] *Free to Choose: A Personal Statement* (1980).

[2] Also loosely referred to as the Food Revolutions.

[3] See Berger and Spoerer (2001) for an illuminating economic exposition of this period in history.

[4] Clear evidence of the link between food prices and unrest is detailed in Campante and Chor (2012), Bellemare (2015) as well as Asongu and Nwachukwu (2016).

[5] We must recognise the rather forgotten work of Adelman and Morris, published in The American Economic Review in 1968. The authors posit an econometric model to measure socio–economic and political change in developing countries, that is remarkably detailed and inclusive of variables that are still being studied today for inclusion in such studies. Although there is no place for inflation in their work, it is a worthy attempt at understanding how policy choices may be influencing or are influenced by instability in the political or societal sphere.

determinant of *socio–political* instability, and a noticeable exception to the strand of literature that details how SPI leads to high(er) inflation. One of the arguments advanced in Paldam, lead to the term *inflationary conflict* being coined, and we will use the notion of conflict based on inflation throughout this manuscript. Of course, his study is restricted to 8 Latin American countries during a tumultuous period in their respective history, and we endeavour to offer some broader generalisable findings here.

The work of Cukierman et al. (1992) established that more unstable political systems rely more heavily on seigniorage. The direction of causality, based on their work, runs from SPI to inflation, however. This is an empirical finding corroborated by Edwards and Tabellini (1991) as well as Carmignani (2003) who finds that political instability should be a determinant of growth, fiscal policy and monetary policy decisions.

Aisen and Veiga (2006) are the first to present findings that political instability leads directly to higher inflation, using panel data of 100 countries over the period $1960 - 1999$. Aisen and Veiga (2008) further find a direct impact of political instability on inflation volatility, this time with 160 countries over the same sample period as before. Jong-A-Pin (2009) uses inflation as a variable in robustness tests of the political instability–economic growth relationship, while Klomp and de Haan (2009) only includes the growth rate of $M2$ as a control variable in modelling the impact of political instability on economic volatility. Most of these studies focus on the impact of (socio)political instability on economic growth, and highlight it as another channel through which inflation is detrimental to growth.

To analyse growth dynamics and to investigate the possible impact of inflation on the observance of high(er) levels of SPI, we develop an overlapping generations (OLG) monetary endogenous growth model characterized by SPI. We define SPI in a narrow way, as the fraction, say λ, of output that is lost due to crime, riots and other disruptive (labour–related) activities. This formulation follows the work of Ghate et al. (2003) closely. Although this is an ad–hoc specification of SPI, there is adequate support in episodes of strikes and riots that justify the use of λ as an augmentation to our standard OLG model. In effect, we are narrowing our focus to the "socio" part of *socio–political* more so than on the "political" part. This should be seen as differentiating between external and internal causes of political instabilities.

The intuition for our ad–hoc representation of SPI is very simple: inflation depresses the *real* wage and subsequently leads to strikes/riots/demonstrations. This results in output being lost, not only through the destruction of production, but also in the loss of production since time is now allocated to SPI activities instead of productive activities. Collectively, this is our definition of SPI. To the best of our knowledge, this is the first theoretical model detailing how high(er) inflation leads to high(er) socio–political instability. In addition, we show otherwise non-existent growth dynamics emerge if socio–political instability is a function of inflation.

And for completness, we use a panel of 170 countries during the $1980 - 2012$ period to test the theoretical prediction. This period captures enough variation in SPI, including the Arab Spring, inflation and economic activity, which allows us to generalise the results. By allowing for time and country fixed effects, the results indicate that inflation, as predicted, correlates positively with SPI.

Section 2 presents our theoretical model with the optimisation solutions. Section 3 contains the empirical analysis and subsequent discussion of our findings. Finally, Section 4 offers some concluding remarks and policy advise based on the findings.

2 The Model

2.1 Economic Setting

Time is divided into discrete segments with $t = 1, 2, ...$ The principal economic activities are: (i) Two-period lived overlapping generation consumers/labourers, who start with a positive young-age labour endowment of unit one, retire and consume only when old[6]. At time t, there exist two co-existing generations of young-age and old-age consumers, with N people born at each $t \geq 1$. At $t = 1$, there exist N people in the economy, say the initial old, who live for only one period. The young-age consumers supply their labour endowment inelastically to earn a wage income. The after-tax wage income earned in $t = 1$ is deposited into banks for future consumption; (ii) Infinitely-lived identical producers which use the same production technology to produce a single final good from the inelastically supplied labour, physical capital which is borrowed from the banks and the per capita capital stock in the economy. The representative firm maximizes its discounted streams of profit flows subject to the constraints it faces; (iii) There is a competitive banking sector that performs a simple pooling function [7] by collecting first-period deposits from the consumers and lending it to the firms, subject to obligatory cash reserve requirements. Furthermore, we assume that banks perform this intermediary function at zero cost [8]; and (iv) There is an infinitely-lived government which balances its budget on a period-by-period basis by collecting taxes from wage incomes and purchases g_t units of goods, assumed to be a productive input in the firms' production functions. Government also controls the setting of the reserve requirement. There is a continuum of each type of economic agent with unit mass.

2.2 Consumers

All consumers have the same preferences, hence in each period there is a representative agent. This representative consumer supplies its endowment of time inelastically, n_t, to earn a real wage, w_t and pay a lump-sum tax, T_t. The after-tax wage is wholly saved and deposited with the bank, d_t in period $t = 1$. When old, the consumer retires and consumes c_{t+1} from the total investment of young-age after-tax savings. Formally, the representative young-age consumer wants to [9]:

$$\max U\left(c_{t+1}\right) \tag{1}$$

subject to:

$$p_t d_t = p_t w_t - p_t T_t \tag{2}$$

$$p_{t+1} c_{t+1} = \left(1 + i_{dt+1}\right) p_t d_t \tag{3}$$

where U is a utility function of a general form but assumed to be twice-differentiable, such that $U^{'}(c) > 0$ and $U^{''}(c) < 0$. $1 + i_{dt+1}$ is the nominal interest rate received on deposits at $t + 1$, p_t and p_{t+1} are the price levels in periods t and $t + 1$, respectively. From the fact that $d_t = \frac{D_t}{p_t}$, it is clear that D_t is the amount of nominal deposits held by consumers. The feasibility constraint

[6]This assumption abstracts from the consumption-savings decision and ensures tractability as the analysis is now independent from the consumers utility function. Woodford (1984) offers a detailed discussion on this, even though it is by now a standard assumption in the OLG literature. Gupta and Stander (2018) use a similar formulation in their work on endogenous fluctuations and inflation targeting.

[7]We assume that capital is illiquid and that individual consumers cannot finance the firm's demand for investment, and it is only through the creation of large minimum denominations by the banks that the firm's minimum level of supply of capital can be met.

[8]Again a simplifying assumption, although Gupta and Stander (2018) show that it is straightforward to adapt the profit function of the bank to account for a fraction of the deposits spent as resource cost.

[9]Optimisation solutions for the different economic agents are fully set out in the Appendix

is presented by (2) (first-period budget constraint) for the young-age consumer, and (3) is the budget constraint of the old-age consumer.

2.3 Financial Intermediaries/Banks

There exist a finite number of competitive banks in this economy, subject to an obligatory cash reserve requirement, γ_t, controlled by the government. To guarantee that all competitive banks levy the same cost on their loans, the nominal loan rate, i_{lt}, and guarantee the depositor the same nominal deposit rate, i_{dt}, we assume that operating the banking system comes at zero cost and that bank deposits are one period contracts. Banks maximize their profit function by pooling deposits [10], choosing the level of loans to be extended and the required cash reserves to hold and then extend loans to firms. Banks receive interest income from these loans to firms and subsequently meet their deposit rate obligations to consumers. The balance sheet is constrained by the mandatory reserve requirement, and is represented by $(1-\gamma_t)\,D_t = L_t$. Hence, all banks attempt to:

$$\max \prod\nolimits_{Bt} = i_{lt}L_t - i_{dt}D_t \tag{4}$$

subject to:

$$M_t + L_t \leq D_t \tag{5}$$

$$M_t \geq \gamma_t D_t \tag{6}$$

with $\prod_{Bt}$ the bank's net profit function [11]; M_t is the cash reserves held by the banks to meet the reserve requirement and L_t are the amount of nominal loans extended to the firms. The feasibility constraint is represented by (5) resulting from optimal financing contracts and (6) is the reserve requirement constraint. As a competitive banking sector is characterised by free entry, new entrants will drive profits to zero. Given that (5) and (6) binds, the solution to the bank's problem reduces to:

$$i_{lt} = \frac{i_{dt}}{1-\gamma_t} \tag{7}$$

It is clear that cash reserve requirements induce a wedge between the interest rate on deposits and the lending rates [12], as evident from (7). Total cash reserves M_t is rate-of-return dominated by loans, hence (5) will be binding as banks will hold just enough real money balances to satisfy the mandatory reserve requirements.

2.4 Firms

In this economy, we consider infinitely-lived identical firms that each produce a single final good, y_t, using the same Romer (1986)-type production technology. The firms employ physical capital, k_t, labour, n_t, and economy-wide average capital, $\bar{k}_t$, to produce the single good, such that:

$$y_t = Ak_t^{\alpha}\left(n_t\bar{k}_t\right)^{1-\alpha} \tag{8}$$

[10] See Gupta and Stander (2018) and the references cited therein for a clear description of this solitary function of the banks.

[11] The cash reserves, M_t only forms part of the bank's gross profit function as in Haslag and Young (1998) and Basu (2001), even though it is part of the bank's total portfolio.

[12] The simplifying assumption that banks operate at zero cost, could also be replaced with an assumption that banks spend a portion of the deposits as resource cost in operating the bank system. This would imply that the bank's net profit function would be $\max \prod_{Bt} = i_{lt}L_t - i_{dt}D_t - cD_t$, with c being the fraction of deposits banks spend on its operations. The optimisation solution (with the same constraints) would become $i_{lt} = \frac{i_{dt}}{1-\gamma_t-c}$. It is evident that our results would not be affected if we redefined $\gamma_t^c = (\gamma_t + c)$.

where $A > 0$ is a technology parameter, $0 < \alpha(1-\alpha) < 1$ represents the elasticity of output with respect to capital and labour or publicly-provided infrastructure, respectively. At time t, the final good can either be allocated for consumption, c_t, or stored. Firms' investment in physical capital, i_{k_t}, is constrained by the availability of funding to the firms, which they can access from banks as loans. This is so since we assume that firms are able to convert borrowed funds, L_t, into fixed capital formation such that $p_t i_{k_t} = L_t$. We follow Diamond and Yellin (1990) and Chen et al. (2008), in assuming that firms are residual claimers in that they use up the unsold consumption good in a way that is consistent with lifetime value maximization of the firms. The representative firm therefore maximizes its discounted stream of net profit flows subject to the evolution of capital and the loan constraints. Formally, the firm's problem is outlined as follows:

$$\max_{k_{t+1}, n_t} \sum_{i=0}^{\infty} \rho^i \left[p_t(1-\lambda_t)y_t - p_t w_t n_t - (1+i_{lt})L_t \right] \tag{9}$$

Subject to:

$$k_{t+1} \leq (1-\delta_k)k_t + i_{k_t} \tag{10}$$

$$p_t i_{kt} \leq L_t \tag{11}$$

$$L_t \leq (1-\gamma_t)D_t \tag{12}$$

where ρ is the firm owners' (constant) discount rate and δ_k is the (constant) rate of capital depreciation. λ_t is the socio-political instability (SPI) factor, defined as the fraction of output lost due to crime, riots and other disruptive (labour-related) activities (Ghate et al., 2003). The SPI is explicitly expressed as

$$\lambda_t = 1 - B\frac{\frac{g_{1t}}{w_t}}{\frac{T_t}{w_t}(\Pi_t)^{\phi}} \tag{13}$$

where g_{1t} is policing expenditure directed at restoring or maintaining law and order, hence making it more difficult for rioters to destroy output during demonstrations. B is a constant that is restricted and meant to keep (13) well-defined, hence $B \in \left(0, \frac{\frac{T_t}{w_t}(\Pi_t)^{\phi}}{\frac{g_{1t}}{w_t}}\right)$. Π_t is the gross inflation rate, expressed as the growth in annual consumer price index (CPI) plus one. Note that $\Omega_t \Pi_t = \mu_t$, with Ω_t defined as the gross growth rate of the economy at time t and μ_t is the money growth rate while ϕ is the responsiveness of SPI to inflation.

The firm solves the following recursive problem in order to determine the demand for labour and investment:

$$V(k_t) = \max \left[p_t(1-\lambda_t)Ak_t^{\alpha}\left(n_t\bar{k}_t\right)^{1-\alpha} - p_t w_t n_t - p_t(1+i_{lt})(k_{t+1} - (1-\delta_k)k_t) + \rho V(k_{t+1}) \right] \tag{14}$$

Yielding the following first order conditions:

$$n_t : w_t = (1-\lambda_t)(1-\alpha)A(\frac{k_t}{n_t})^{\alpha}\bar{k}_t^{1-\alpha} \tag{15}$$

This represents the optimal hiring decision for a firm, in that the firm will hire labour up to a point whereby the marginal product of labour is equal to the real wage.

$$k_{t+1} : (1+i_{lt}) = \rho\left(\frac{p_{t+1}}{p_t}\right)\left[(1-\lambda_{t+1})\alpha A\left(\frac{n_{t+1}\bar{k}_{t+1}}{k_{t+1}}\right)^{1-\alpha} + (1+i_{lt+1})(1-\delta_k)\right] \tag{16}$$

The above expression is an efficiency condition that provides for the optimal investment decisions of the firm. The firm compares the cost of increasing investment in the current period with the future stream of benefits generated from the additional capital invested in the current period. If we go by the assumption that there is full depreciation of capital between periods such that $\delta_k = 1$, then, without any loss of generality, (16) simplifies to

$$(1 + i_{lt}) = \rho \left(\frac{p_{t+1}}{p_t} \right) \left[(1 - \lambda_{t+1}) \alpha A \left(\frac{n_{t+1} \bar{k}_{t+1}}{k_{t+1}} \right)^{1-\alpha} \right] \tag{17}$$

2.5 Government

As pointed above, we assume an infinitely-lived government that purchases g_t units of the consumption good such that $g_t = g_{1t} + g_{2t}$ where g_{1t} is policing expenditure and g_{2t} is an input into the firms' production function, as discussed above. These expenditures are financed through taxes on income and seigniorage (inflation tax). The government's budget constraint at time t can be written in real per-capita terms as follows:

$$g_t = T_t + \frac{M_t - M_{t-1}}{p_t} \tag{18}$$

with $M_t = \mu_t M_{t-1}$, where μ_t is the money growth rate. $T_t = w_t \tau_t$ is the tax revenue, with τ_t being the tax rate. It is the consolidated government that coordinates operations of treasury and the central bank, both of which serve the government's interests. The government implements fiscal policy: raising revenue through income taxes and managing government expenditures. Given that $T_t = w_t \tau_t$, $M_t = \mu_t M_{t-1}$, $m_t = \gamma_t d_t$ from (6), $d_t = w_t - T_t$ from (2) and that $\Omega_t \Pi_t = \mu_t$, the government's budget constraint, in real terms, can be expressed as

$$g_t = T_t + \gamma_t d_t \left(1 - \frac{1}{\Omega_t \Pi_t} \right) \tag{19}$$

where Ω_t is the gross growth rate of the economy at time t and Π_t is the gross inflation rate at time t.

2.6 Equilibrium

A competitive equilibrium for this economy is characterised as a sequence of prices $\{p_t, i_{lt}, i_{dt}\}_{t=0}^{\infty}$, allocations $\{c_{t+1}, n_t, i_{kt}\}_{t=0}^{\infty}$, stocks of financial assets $\{m_t, d_t\}_{t=0}^{\infty}$, and policy variables $\{\gamma_t, \tau_t, \mu_t, g_t\}_{t=0}^{\infty}$ such that:

- The consumer maximizes utility given by (1) subject to (2) and (3);
- Banks maximize profits, taking i_{lt}, i_{dt} and γ_t as given and such that (7) holds;
- The real allocations solve the firm's date t profit maximization problem, given prices and policy variables, such that (15) and (16) hold;
- The money market equilibrium conditions: $m_t = \gamma_t d_t$ is satisfied for all $t \geqslant 0$;
- The loanable funds market equilibrium condition: $p_t i_{kt} = L_t$ where the total supply of loans $L_t = (1 - \gamma_t) D_t$ is satisfied for all $t \geqslant 0$;
- The goods market equilibrium condition require: $c_t + i_{kt} + g_t = A k_t^{\alpha} \left(n_t \bar{k}_t \right)^{1-\alpha}$ is satisfied for all $t > 0$;

- The labour market equilibrium condition: $(n_t)^d = 1$ for all $t > 0$;
- The government budget constraint in (18) is balanced on a period-by-period basis;
- d_t, p_t, i_{lt}, i_{dt} and A are positive for all $t > 0$.

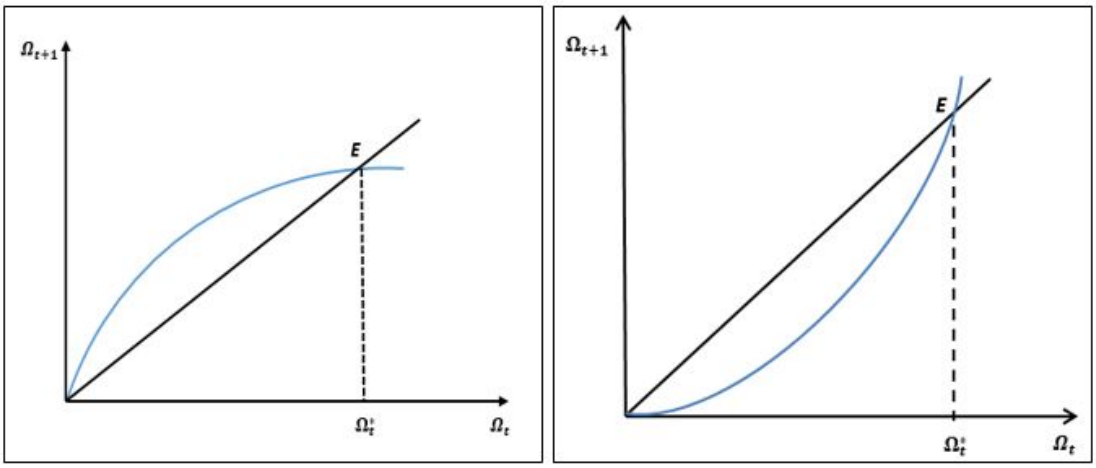
2.7 Growth Dynamics

We analyse the possible growth dynamics for our model using (2), (10), (11), (12) and (18) and the fact that in equilibrium, $n_t = 1$ and $k_t = \bar{k}_t$. We obtain an expression for the relationship between the gross growth rate in time $t+1$, Ω_{t+1} and the gross growth rate in time t, Ω_t. In other words, we obtain $\Omega_{t+1} = f(\Omega_t)$, which is expressed as:

$$\Omega_{t+1} = A(1-\gamma_t)(1-\alpha)B\frac{\theta_1\theta_t\Omega_t^{\phi}}{\mu_t^{\phi}\tau_t}\left[1-\tau_t\right] \tag{20}$$

where $\theta_t = \tau_t + \gamma_t(1-\tau_t)\left(1-\frac{1}{\mu_t}\right)$. Depending on the values of A, α, γ, θ_1, τ, μ and ϕ, we can have two different types of balanced growth paths. In particular, ϕ, the responsiveness of the SPI, λ_t, to inflation, Π_t, is the one that determines the two different growth paths. On one hand, the economy's growth path is concave, and hence convergent to the optimal gross growth rate, Ω_t^*, if $\phi < 1$, as shown in Figure 1. On the other hand, the growth path is convex, and hence divergent from the optimal gross growth rate, Ω_t^*, if $\phi > 1$ (See Figure 1).

Figure 1: Model Growth Dynamics



(a) Convergent Growth Path ($\phi < 1$) (b) Divergent Growth Path ($\phi > 1$).

In the first case, an increase in Ω_t implies an increase in government revenue through higher seigniorage and income tax revenue. The effect of this is a higher ratio of government expenditure to real wage, $\frac{g_t}{w_t} = \theta_t$. An increase in θ, according to (19), leads to an increase in Ω_{t+1}. At the same time, the increase in Ω_t lowers λ_t. An increase in Π_t, emanating from $\phi > 1$ implies a higher growth rate of money and ultimately an increase in λ_t.

In the case of a convergent growth path, the positive effect of Ω_t on Ω_{t+1} is observed for $\Omega_t < \Omega_t^*$, beyond which the Ω_t impacts on Ω_{t+1} negatively. The same cannot be said for the divergent growth path.

3 Data and Results

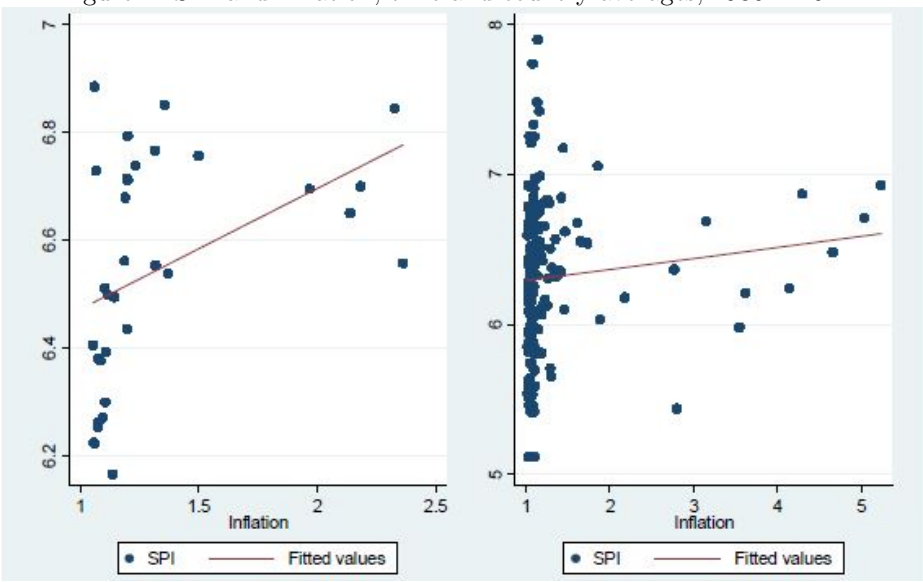
3.1 Data

To test the theoretical prediction that inflation positively affects social-political instability we use annual data from 170 countries over the period 1980 - 2012. Social-political instability (SPI) is an index that consists of six political variables collected from the Cross–National Time–Series (CNTS) database published by Databanks International (DI). DI compiles a comprehensive database containing different political, conflict, legislative and economic variables. The DI database defines SPI differently to the index we use here: whereas DI provides a broad SPI index comprising eight social–political variables, our SPI index excludes the two most–heavily weighted variables, 'Guerilla Warfare' and 'Revolutions'. The DI assigned weighting to each of these excluded variables is 100 and 150. This implies that within the DI SPI index, these two 'radical' variables account for almost 68 percent of the total SPI index. Given that our theoretical interest is on labour decisions such as 'riots', 'strikes' and 'anti-government demonstrations' that might lead to reductions in output, we use a re–weighted index that is more consistent with our theoretical prediction. To capture the gross inflation rate, the variable inflation is the growth in the annual consumer price index plus one, which is consistent with the SPI function of the theoretical model. The data on inflation rate are provided by the World Bank.

3.2 Results

To illustrate how both variables relate to each other over time and across countries, Figure 2 depicts the OLS regression lines between inflation and SPI. In the first panel we take the time average and in the second the country average. No matter which average we take, the correlations between inflation and SPI are, as predicted, positive.

Figure 2: SPI and inflation, time and country averages, 1980 – 2012



(a) Socio-political instability and Inflation average over time (b) Socio-political instability and Inflation average over countries.
Sources: Databanks International and World Bank

In addition, given the dimension of the dataset, $N = 170$ countries and $T = 33$ years, we use the one- and two-way Fixed–Effects (FE) estimator that allows for unobserved heterogeneity and unexpected events affecting SPI, with and without instrumental variables, to further test our theoretical prediction. In such a panel, idiosyncratic characteristics and shocks that can drive some of the differences in SPI across countries and over time include institutional quality, legal frameworks, central bank independence, fiscal regimes, end of the cold war, *etc.*

For completeness, we also include in the FE regressions some controls. First, 'Cabinet Changes' counts the number of times in a year in which a new premier or president is named and/or 50 percent of the cabinet posts are occupied by new ministers, and the data are from the CNTS database. This variable captures internal political turnover and is usually used to control for the effect that political turnover may have on the economy. We expect a positive relation between cabinet changes and SPI. Second, real income *per capita* (GDP_PC), which controls for the effect that the developmental level of countries have on SPI, and the data are from the World Bank. It is expected that richer countries have lower SPI. And the Gini coefficient of income inequality are obtained from the World Bank as well. In this case it is expected that higher inequality is related to higher SPI. The estimated equation is as follows:

$$SPI_{it} = \alpha_i + \eta_t + \beta Inflation_{it} + \gamma CabChanges_{it} + \delta GDP\_PC_{it} + \epsilon Gini_{it} + u_{it} \tag{21}$$

where α_i and η_t are country and time effects.

We first report the statistical correlations in Table 1. Consistent with the OLS regression lines depicted in Figure 2, inflation and SPI are positively correlated to each other at the five percent level. The correlations between the controls and SPI are also consistent with *a priori* predictions.

Table 1: Correlation Matrix

	SPI	Inflation	CabChanges	GDP_PC	Gini
SPI	1				
Inflation	0.071*	1			
CabChanges	0.112*	0.001	1		
GDP_PC	-0.101*	-0.038*	-0.051*	1	
Gini	0.0263	0.018	-0.032	-0.282*	1

$*p < 0.05$

The FE estimates are reported in Table 2. Yet again, for our main variable of interest, inflation, the effects are consistently positive and statistically significant on SPI. Moreover, in column five we add a dummy accounting for high-inflation episodes, with ones when inflation is higher than 15 percent and zeros elsewhere. Interestingly enough, the dummy is not significant, suggesting that the results are not being driven by high-inflation episodes/countries. Although the Davidson and Mackinnon (D-M) test for exogeneity suggests that endogeneity is not a problem here, for completness in column six we instrument inflation with the lags of all right-hand side variables. Reassuringly, the estimates in column six are consistent with all other estimates. Perhaps also worth mentioning, given the differences in scale and units of measurement between the variables, the size of the estimates is not necessarily important. The direction, however, is consistent with our theoretical prediction. About the controls: Cabinet Changes is, as expected, positively related to SPI; income, or development, is negatively related to SPI and inequality is essentially zero.

All in all, although we do not claim causal effects between inflation and SPI, the upward-sloping OLS regression lines, the positive and significant correlations between inflation and SPI, and the positive and significant FE estimates of inflation on SPI are consistent across the board

and therefore reassuring for the specification of the SPI function of the theoretical model, and the growth dynamics that emerge thereafter. At this stage, it is probably important to highlight that the way SPI is measured in the empirical part, does not necessarily has one-to-one correspondence with the SPI function specified in the theoretical part. Hence, while we are able to provide evidence that SPI correlates positively with inflation, as suggested in the theoretical model, it is not possible for us to say with certainty, that the coefficient of less than one on the gross inflation rate obtained from the empirical exercise corresponds to ϕ being less than one as well. In other words, this result does not necessarily translate into convergent growth dynamics.

Table 2: Fixed Effects Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	FE	FE	FE	FE	FE	FE-IV
Inflation	0.0141***	0.0137**	0.0122**	0.0217***	0.0170***	0.0358**
	(0.00493)	(0.00564)	(0.00557)	(0.00508)	(0.00619)	(0.0178)
HighInflation					0.203	
					(0.160)	
CabChanges		0.506***	0.483***	0.536**	0.645***	0.398
		(0.140)	(0.153)	(0.219)	(0.225)	(0.358)
GDP_PC			-0.837**	-0.824*	-0.181	-1.176*
			(0.361)	(0.489)	(0.501)	(0.629)
Gini				-0.537	-0.423	-1.216
				(0.600)	(0.704)	(1.174)
					(0.871)	
Observations	1,516	595	570	373	373	138
R-squared	0.005	0.034	0.068	0.074	0.176	
Number of i	156	131	127	94	94	47
Country FE	YES	YES	YES	YES	YES	YES
Rob SE	YES	YES	YES	YES	YES	YES
Instruments						YES
D-M (P-value)						.6538
Time FE					YES	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4 Conclusion

In order to investigate the possible impact of inflation on the observance of high(er) levels of socio-political instability (SPI) and to analyse the likely growth dynamics, we develop an overlapping generations (OLG) monetary endogenous growth model characterized by SPI. We define SPI in a narrow way, as the fraction of output that is lost due to disruptive activities which include crime, riots and other labour-related activities. Our model suggests that inflation has a positive impact on SPI in that high(er) inflation, emanating from growth in money supply meant to fund government expenditure, depresses the real wage and subsequently leads to strikes/riots/demonstrations. As a result, output is lost, not only through the destruction of production, but also in the loss of production since time is now allocated to SPI activities instead of productive activities. The model has two distinct growth dynamics, one convergent

and the other divergent, informed by the responsiveness of SPI to inflation. And by using a dataset covering 170 countries during the $1980 - 2012$ period, and allowing for time and country fixed effects, we show that higher inflation correlates positively with socio-political instability.

Policy makers in economies where government consumption expenditures are financed by income taxes and seigniorage and in which the government coordinates operations of the central bank through setting the level of reserve requirements, should be cognisant that it is crucial to maintain long-run price stability. Failure to do so may results in episodes of high inflation emanating from excessive money supply growth, and high (er) socio-political instability, which in turn, would put the economies in a divergent balanced growth path.

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A Appendix

A.1 Optimisation solutions for economic agents

Note that from the solution to the consumer's problem, we have:

$$d_t = w_t - T_t \tag{A.1}$$

$$c_{t+1} = (1 + i_{dt+1})d_t \tag{A.2}$$

from (2) and (3). The bank's solution follows directly from its net profit function, and the fact that (5) and (6) holds. We also obtain, from putting (6) into (5) that:

$$l_t = (1 - \gamma_t)d_t \tag{A.3}$$

Recall the firm's optimisation problem, in recursive form:

$$V(k_t) = \max \left[p_t(1 - \lambda_t)Ak_t^{\alpha} \left(n_t \bar{k}_t\right)^{1-\alpha} - p_t w_t n_t - p_t(1 + i_{lt})(k_{t+1} - (1 - \delta_k)k_t) + \rho V(k_{t+1}) \right] \tag{A.4}$$

which yields the following first order conditions (FOC):

$$n_t : w_t = (1 - \lambda_t)(1 - \alpha)A(\frac{k_t}{n_t})\bar{k}_t^{1-\alpha} \tag{A.5}$$

$$k_t : p_t(1 + i_{it}) = \rho V^{'}(k_{t+1}) \tag{A.6}$$

with the solution to the FOC for k_{t+1} found in the derivative of the value function with respect to k_t, updated for one period. Formally:

$$V^{'}(k_{t+1}) = p_{t+1}(1 - \lambda_{t+1})\alpha A \left(\frac{n_{t+1}\bar{k}_{t+1}}{k_{t+1}} \right)^{1-\alpha} + (1 + i_{lt+1})(1 - \delta_k) \tag{A.7}$$

which results in (15). Simply substituting $\delta_k = 1$ and n_{t+1} into (15), yields

$$(1 + i_{lt}) = \rho \left(\frac{p_{t+1}}{p_t} \right) \left[(1 - \lambda_{t+1})\alpha A \left(\frac{n_{t+1}\bar{k}_{t+1}}{k_{t+1}} \right)^{1-\alpha} \right] \tag{A.8}$$

A.2 Derivation of the balanced growth path (BGP) of gross growth rate

Note that from the solution to the consumer's problem, we have, in real terms:

$$d_t = w_t - T_t \tag{A.9}$$

and from the solution of the banks' problem, we have

$$l_t = (1 - \gamma_t)d_t \tag{A.10}$$

From (11), we have

$$l_t = l_{kt} \tag{A.11}$$

Given the assumption that capital fully depreciates between periods such that $\delta = 1$, then (10) reduces to

$$k_{t+1} = i_{kt} \tag{A.12}$$

such that (A.11) can then be expressed as

$$l_t = k_{t+1} \tag{A.13}$$

We can also express (A.13) as

$$k_{t+1} = (1 - \gamma_t)d_t \tag{A.14}$$

Given that $d_t = w_t - T_t$, we have

$$k_{t+1} = (1 - \gamma_t)(w_t - T_t) \tag{A.15}$$

From (14), we have $w_t = (1 - \lambda_t)(1 - \alpha)A(\frac{k_t}{n_t})^{\alpha}\bar{k}_t^{1-\alpha}$. In equilibrium, $n_t = 1$ and $k_t = \bar{k}_t$ such that

$$w_t = (1 - \lambda_t)(1 - \alpha)Ak_t \tag{A.16}$$

Thus, (A.15) can then be expressed as:

$$k_{t+1} = (1 - \gamma_t)\left[(1 - \lambda_t)(1 - \alpha)Ak_t - T_t\right] \tag{A.17}$$

Since $T_t = w_t\tau_t$ and $w_t = (1 - \lambda_t)(1 - \alpha)Ak_t$, we can proceed as follows:

$$k_{t+1} = (1 - \gamma_t)\left[(1 - \lambda_t)(1 - \alpha)Ak_t - ((1 - \lambda_t)(1 - \alpha)Ak_t)\tau_t\right]$$

and dividing the above expression both sides by k_t, we have

$$\frac{k_{t+1}}{k_t} = \frac{(1 - \gamma_t)(1 - \alpha)A(1 - \lambda_t)k_t}{k_t}\left[1 - \tau_t\right]$$

$$\Omega_{t+1} = (1 - \gamma_t)(1 - \alpha)A(1 - \lambda_t)\left[1 - \tau_t\right]$$

The SPI, denoted by λ_t, is explicitly expressed as $\lambda_t = 1 - B\frac{\frac{g_{1t}}{w_t}}{\frac{T_t}{w_t}(\Pi_t)^{\phi}}$ where $B \in \left(0, \frac{\frac{T_t}{w_t}(\Pi_t)^{\phi}}{\frac{g_{1t}}{w_t}}\right)$. Note that $\Omega_t\Pi_t = \mu_t$, with Ω_t defined as the gross growth rate in time t, Π_t is time t gross inflation and μ_t is the money growth rate. ϕ is the responsiveness of SPI to inflation. We have that the infinitely-lived government purchases $g_t = g_{1t} + g_{2t}$ units of the consumption good, with $g_{1t} = \theta_1 g_t$, $g_{2t} = (1 - \theta_1)g_t$ and $\frac{g_t}{w_t} = \theta_t$. These relationships entail that $\frac{g_{1t}}{w_t} = \theta_1\theta_t$ and that $\frac{T_t}{w_t} = \tau_t$ such that we can then express $1 - \lambda_t$ as

$$1 - \lambda_t = B\frac{\theta_1\theta_t\Omega_t^{\phi}}{\mu_t^{\phi}\tau_t} \tag{A.18}$$

Given (A.18), we have

$$\Omega_{t+1} = A(1 - \gamma_t)(1 - \alpha)B\frac{\theta_1\theta\Omega_t^{\phi}}{\mu_t^{\phi}\tau_t}\left[1 - \tau_t\right] \tag{A.19}$$

From the government's budget constrain in (17), and that in equilibrium, $\delta_k = 1$ and $n_t = 1$ we have:

$$g_t = T_t + \frac{M_t - M_{t-1}}{p_t} \tag{A.20}$$

We have that $T_t = w_t \tau_t$ and $M_t = \mu_t M_{t-1}$ such that (A.20) can be expressed as

$$= \tau_t w_t + m_t - \frac{M_{t-1}}{M_t} \frac{M_t}{p_t}$$

$$= \tau_t w_t + m_t - \frac{1}{\mu_t} m_t$$

$$= \tau_t w_t + m_t \left(1 - \frac{1}{\mu_t}\right)$$

From (6), we have $m_t = \gamma_t d_t$, $d_t = w_t - T_t$ and $\frac{T_t}{w_t} = \tau_t$, such that

$$g_t = \tau_t w_t + \gamma_t (w_t - T_t) \left(1 - \frac{1}{\mu_t}\right)$$

and dividing the above expression both sides by w_t, we have

$$\theta_t = \tau_t + \gamma_t (1 - \tau_t) \left(1 - \frac{1}{\mu_t}\right) \tag{A.21}$$