Corruption and Economic Growth Revisited

NBU Research Seminar 2018

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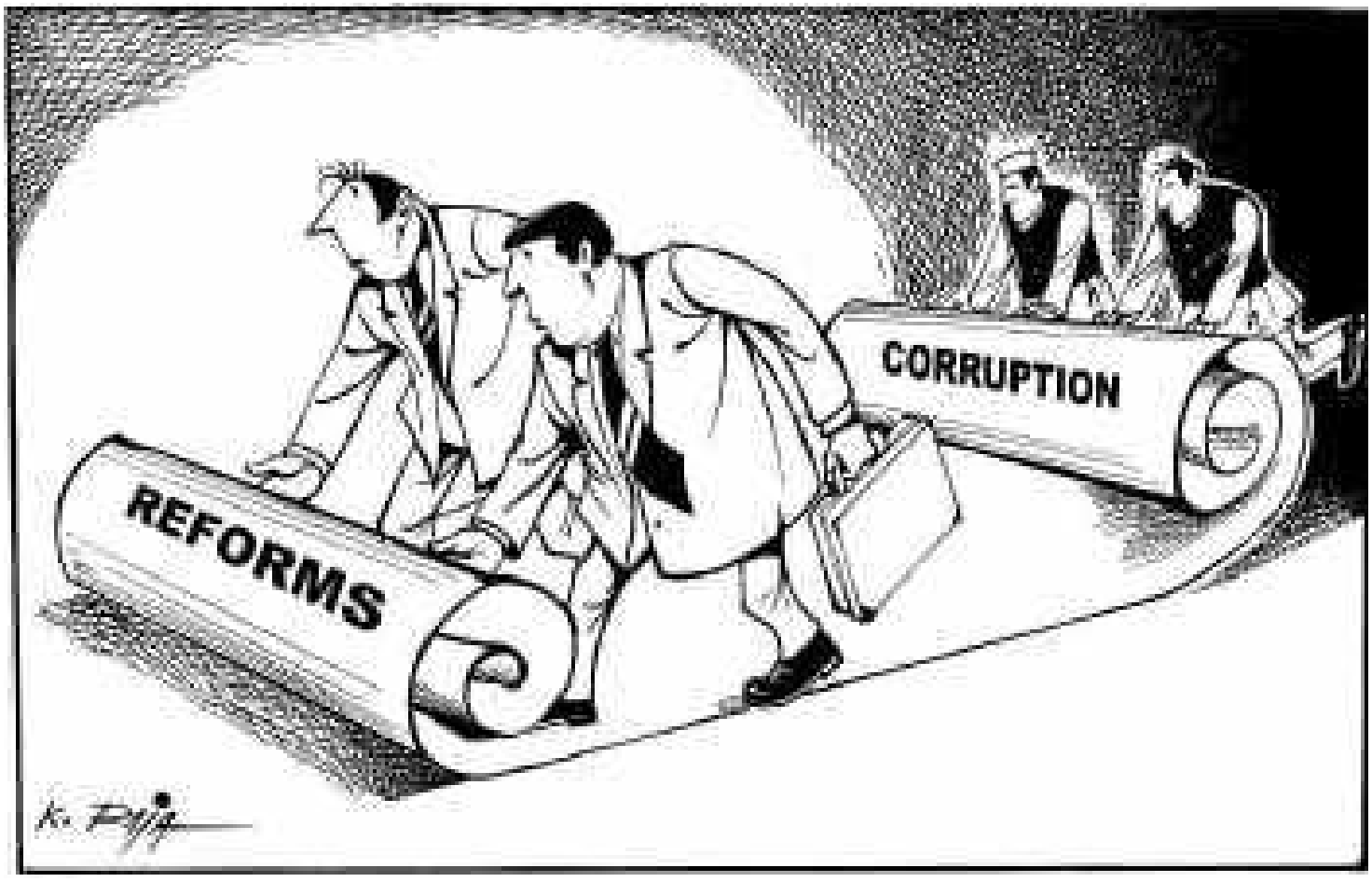
NBU, 2018



Corruption and economic growth revisited

Introduction

What do we do?

- Based on three research papers
- Corruption and tax evasion in GE growth model
- Following Slemrod's "tax morale" assumption: introduce link between tax evasion of private residents and corruption of politicians - not through tax evasion/tax inspection link, but through trust in government
- Goals:
  - Quantify the joint effects of corruption and evasion on fiscal policy (level of taxation, debt) and growth
  - Comparative statics: efficiency wages, crackdown on corruption vs. evasion
  - Revisit link between corruption and economic growth (paper 3)

Introduction

Why is it important? Corruption and tax evasion

- Strong negative relationship between corruption and GDP per capita
- Corruption - major impediment to growth
- Tax evasion/unofficial economy - pervasive phenomenon in all countries
- Average size of unofficial economy varies from 22.5% to 34.5% depending on method of estimation (La Porta and Shleifer'2008)
- According to WBES: tax evasion varies from 8% in rich countries (75-100th percentile) to 29% in poor countries (0-25th percentile)

Introduction

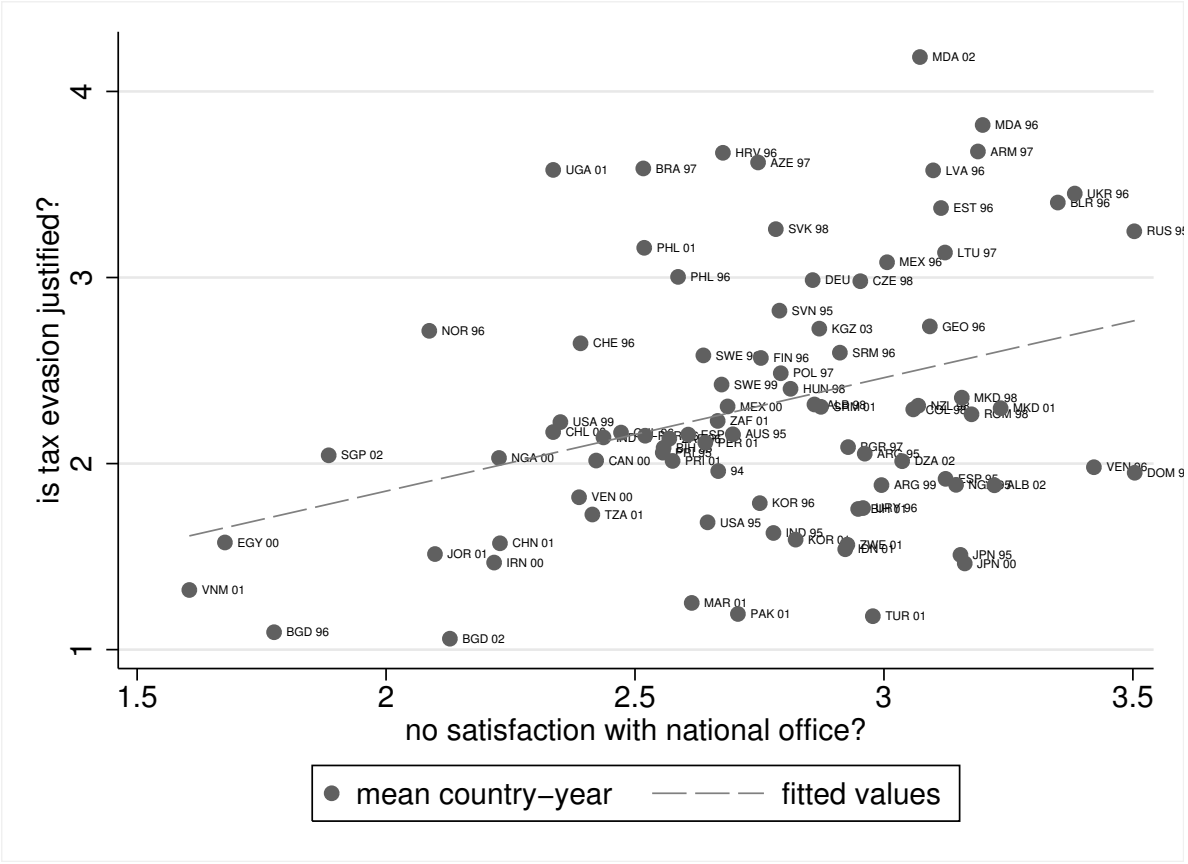
Why is it important? Aversion to illegal activities

- Non-compliance is overpredicted, at least, in developed countries using standard crime-punishment models
- Need for unrealistically high degree of risk-aversion
- "Tax morale" argument by Slemrod(2003) - intrinsic motivation to pay taxes
- Empirical support for tax morale in Switzerland (Frey, 1997; Feld, 2002) and in the U.S. (Cullen et al, 2017)
- Tax morale depends on person's opinion about government's policies, Slemrod(2008)

Introduction

Why is it important? Link between corruption and tax evasion

- Some empirical evidence from World Values Survey:



- Slope coefficient of trend line is 0.61 (stat. significant at 1%)
- Country-specific regressions: negative relationship in 120/139 surveys

Introduction

Why is it important? Linkages between corruption and fiscal policy

- Corruption-evasion are mostly studied in partial equilibrium models ("petty" corruption)
- Small literature on general equilibrium effects of corruption in dynamic growth models
- Small literature on links between "petty" corruption and macro fiscal policies (e.g. "grand" corruption) - taxation, size of government, public debt

Introduction

Why is it important? Corruption and economic growth

- Corruption - detrimental to economic growth and efficiency
  - Plentiful micro-economic empirical evidence...
- At a macro level the link has been hard to demonstrate
  - Measurement error? Does corruption help growth? Too small to detect?
- Third paper: an alternative explanation
  - Reverse causality from economic growth to corruption in short and medium term
  - ...which offsets in the data negative impact of corruption on long-term growth

Benchmark Economy without Corruption-Evasion

Private households

- N young households
- Work to earn wages, consume and save to maximize:

$$U_{y,t} = \ln c_{y,t} + \beta \ln c_{o,t+1} \tag{1}$$

subject to

$$c_{y,t} + \frac{c_{o,t+1}}{(1 + r_{t+1})} = (1 - \tau_t) w_t, \tag{2}$$

- c_y - consumption when young,c_o - consumption when old
- r - rate of return to households saving, w - wage rate, τ - tax rate on wage income

Benchmark Economy without Corruption-Evasion

Private households

- Maximizing (1) s.t. (2) yields:

$$c_{o,t+1} = \beta(1 + r_{t+1})c_{y,t}, \tag{3}$$

$$c_{y,t} = \frac{(1 - \tau_t)w_t}{1 + \beta}. \tag{4}$$

- Savings can be written as:

$$s_t = (1 - \tau_t)w_t - c_{y,t} = \frac{\beta(1 - \tau_t)w_t}{1 + \beta}. \tag{5}$$

Benchmark Economy without Corruption-Evasion

Public officials

- Fixed number of public officials - ϵN (ϵ is exogenous parameter)
- Identical preferences with private households in no-corruption case
- Exogenously selected from private households
- Public wage is proportional to private sector wage - ηw_t (η is exogenous parameter)

Benchmark Economy without Corruption-Evasion

Public officials

- Same results as for private households:

$$c^g_{o,t+1} = \beta(1 + r_{t+1})c^g_{y,t}, \tag{6}$$

$$c^g_{y,t} = \frac{(1 - \tau_t)\eta w_t}{1 + \beta}. \tag{7}$$

- Savings can be written as:

$$s^g_t = (1 - \tau_t)w_t - c^g_{y,t} = \frac{\beta(1 - \tau_t)\eta w_t}{1 + \beta}. \tag{8}$$

- g means "public"

Benchmark Economy without Corruption-Evasion

Firms

- Cobb-Douglas technology, physical and human capital combined:

$$Y_t = K_t^{\alpha}(D_t N)^{1-\alpha}, \tag{9}$$

- Y - output, $0 < \alpha < 1$ - exogenous parameter, K - private capital, N - working population, D - productivity index
- D is a function of disembodied technology A and public capital per adult worker $G/(1+\epsilon)N$

$$D_t = A_t^{1-\mu}(G_t/(1+\epsilon)N)^{\mu}, \tag{10}$$

Benchmark Economy without Corruption-Evasion

Firms

- Firms operate in perfectly competitive factor and output markets:

$$\delta + r_t = \alpha g_t^{\mu(1-\alpha)} k_t^{\alpha-1}, \tag{11}$$

$$w_t = (1-\alpha) A_t g_t^{\mu(1-\alpha)} k_t^{\alpha}, \tag{12}$$

  where $g \equiv G_t/A(1+\epsilon)N$, $k \equiv K/AN$

- δ - depreciation rate of private capital, assume δ=1 (as one period is about 20 years)
- Average worker's productivity is

$$y_t = \frac{Y_t}{AN} = g_t^{\mu(1-\alpha)} k_t^{\alpha}. \tag{13}$$

Benchmark Economy without Corruption-Evasion

Capital market equilibrium

- Government's budget constraint:

$$\tau_t w_t(1+\epsilon\eta)N = \eta w_t \epsilon N + G_{t+1}, \tag{14}$$

- Capital market equilibrium condition:

$$K_{t+1} = Ns_t + \epsilon N s_t^g, \tag{15}$$

- De-trending (15), using (14) k_{t+1} can be expressed as a function of k_t, g_t, g_{t+1}, τ_t, and exogenous parameters

Benchmark Economy without Corruption-Evasion

Optimal fiscal policy

- Collectively public officials choose τ and G_{t+1} subject to government budget constraint (14)
- Their preferences are identical, resulting in common preferred τ, and G_{t+1}
- Collective preferences:

$$\max_{\tau_t, B_{t+1}, G_{t+1}} \ln c^g_{y,t} + \beta \ln c^g_{o,t+1} + \gamma(\ln y^t + \beta \ln y^{t+1}), \qquad (16)$$

- γ - exogenous parameter: gauges altruism (care about general state of economy)/political constraints

Economy with Corruption-Evasion

Private choices

- Introduce possibility for illegal activities
- Public sector consider diverting public funds
- Private households consider hiding income from government to evade taxation
- All households have aversion to illegal activity, it varies inversely with average level of corruption in economy

Benchmark Economy with Corruption-Evasion

Private households

- Modified preferences. Maximize:

$$U_{y,t} = \ln c_{y,t} + \beta \ln c_{o,t+1} - \frac{\phi}{2\bar{u}_t} v_t^2 \tag{17}$$

subject to

$$c_{y,t} + \frac{c_{o,t+1}}{(1 + r_{t+1})} = (1 - \tau_t) w_t (1 - v_t) + \theta^{\tau} w_t v_t, \tag{18}$$

- v - fraction of income that is hidden from government; then $w_t(1 - v_t)$ - taxable income
- $\phi > 0$ - exogenous parameter, captures strength of distaste for illegal activity
- $0 < \theta^{\tau} < 1$ - exogenous parameter, fraction of unreported income that can be recovered for private use
- θ^{τ} reflects probability of tax audit and fine (assuming households are risk-neutral)

Benchmark Economy with Corruption-Evasion

Private households

- Maximizing (20) s.t. (21) yields optimal tax evasion:

$$v_t = \frac{1}{2}\left(\sqrt{T^2 + \frac{4(1+\beta)\bar{u}_t}{\phi}} - T\right), \tag{19}$$

where $T \equiv \frac{1-\tau_t}{\theta_\tau - (1-\tau_t)}$

Benchmark Economy without Corruption-Evasion

Public officials

- Preferences identical to private households, only type of illegal activity is different:

$$U_{y,t} = \ln c^g_{y,t} + \beta \ln c^g_{o,t+1} - \frac{\phi}{2\bar{u}_t} u_t^2 \tag{20}$$

subject to

$$c^g_{y,t} + \frac{c^g_{o,t+1}}{(1 + r_{t+1})} = (1 - \tau_t)\eta w_t + \theta^g u_t \left(\frac{\hat{G}_{t+1}}{\epsilon N} \right), \tag{21}$$

- Investment in public projects is decentralized. $\frac{\hat{G}_{t+1}}{\epsilon N}$ - budget allocated to each official
- u - embezzlement - fraction of public budget to divert for private use; "petty" corruption
- $0 < \theta^g < 1$ - exogenous parameter, fraction of diverted public funds that can be recovered for private use
- θ^g captures institutional safeguards to make it difficult to steal public funds

Benchmark Economy without Corruption-Evasion

Public officials

- Similar results as for private households:

$$u_t = \frac{1}{2}\left(\sqrt{\Gamma^2 + \frac{4(1+\beta)\bar{u}_t}{\phi}} - \Gamma\right), \tag{22}$$

where $\Gamma \equiv \frac{1-\tau_t}{\theta_g \frac{\hat{G}_{t+1}/\epsilon N}{\eta w_t}}$

Economy with Corruption-Evasion

Corruption and evasion

- Government's budget constraint:

$$\tau_t(w_t(1-v_t)N + \epsilon\eta w_t N = \eta w_t \epsilon N + \hat{G}_{t+1}, \qquad (23)$$

- Substituting $\bar{u}_t = u_t$, we can express u_t and v_t as functions of state variables, exogenous parameters, and fiscal policy instrument τ_t
- Also k_{t+1} and g_{t+1} as functions of state variables, exogenous parameters and τ_t
- g_{t+1} is only fraction of public budget now because of corruption

Benchmark Economy with Corruption-Evasion

Optimal fiscal policy

- As in the baseline, public officials collectively choose τ and G_{t+1} subject to government budget constraint (23)
- Collective preferences:

$$\max_{\tau_t, B_{t+1}, G_{t+1}} \ln c^g_{y,t} + \beta \ln c^g_{o,t+1} - \frac{\phi}{2} u_t + \gamma(\ln y^t + \beta \ln y^{t+1}), \quad (24)$$

- Similar to baseline + aversion to corruption

Benchmark Economy without Corruption-Evasion

Calibration

- As in baseline:
  - Conventional estimates for output elasticities: $\alpha = 0.33$, $\mu = 0.3$
  - One time period - 20 years; annual growth due to exogenous technological change - 2%; so $d = 0.5$
  - Initially, no efficiency wages: η=1
  - $\epsilon = 0.15,\ \beta = 0.2$
- New parameters:
  - Set $\theta^{\tau} = \theta^{g} = 1$
  - Set ϕ to target size of informal economy $v = 0.3$

Economy with Corruption-Evasion

Results: Culture-of-Corruption effect

- Culture-of-Corruption effect is needed to target $v = 0.3$ with reasonable tax rates

Table 1 The Need for a Culture-of-Corruption Effect

	$\kappa = 1$	$\kappa = 0$
ϕ	1.07	7.3
τ	0.38	0.86
u	0.58	0.39
v	0.33	0.33

- $\kappa = 1$ turns on dependence on $\bar{u}_t$ in distaste for illegal activity

Economy with Corruption-Evasion

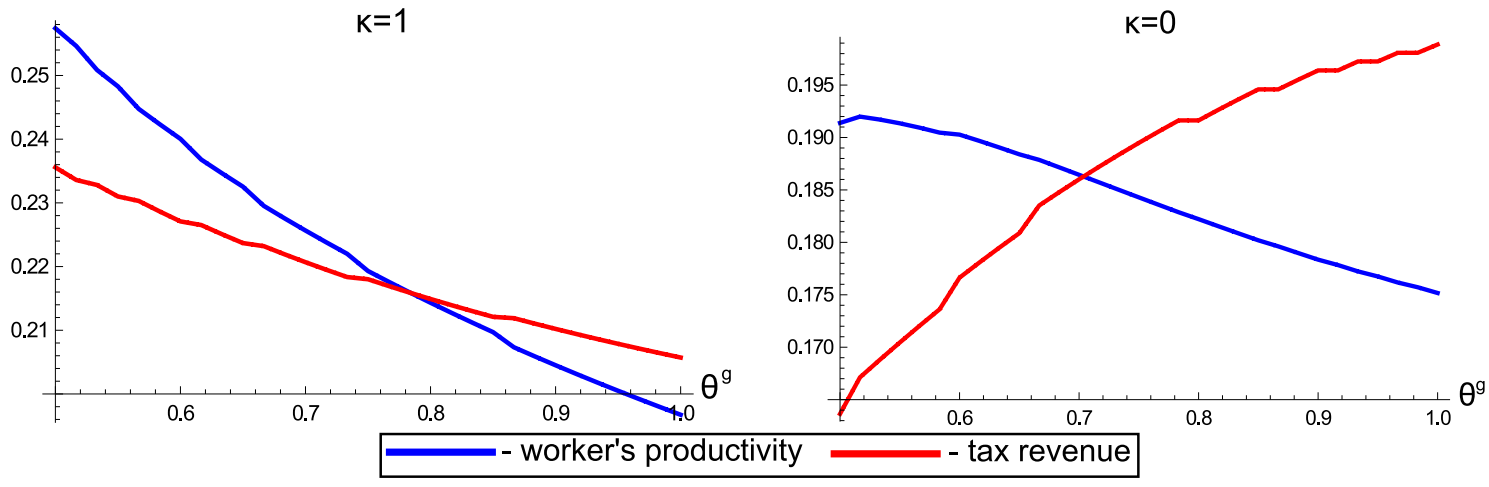
Results: comparing with baseline

- Tax rate is higher than in baseline: 38% vs. 25%, when $\kappa = 1$ and $\phi = 1.07$; consistent with empirical observations
  - DBI: total tax rate in OECD - 43% of profits, East Asia - 35%, South Asia - 40%; Latin America - 47%, SSA - 58%
- Corruption is greater than evasion: 58% vs. 30%; consistent with empirical observations
  - Tanzi and Davoodi(1997): up to 50% of public budgets stolen in Italy
  - Reinikka and Svensson (2004): up to 85% of public school budgets stolen in Uganda

Economy with Corruption-Evasion

Results: comparing with baseline

- Worker's productivity lower by 22%; consistent with empirical observations
- Tax revenue decreases by 16%; consistent with empirical observations



Economy with Corruption-Evasion

Effects of institutional change

- Effects of 10% fall (rise) in η, θ_g, and θ_τ:

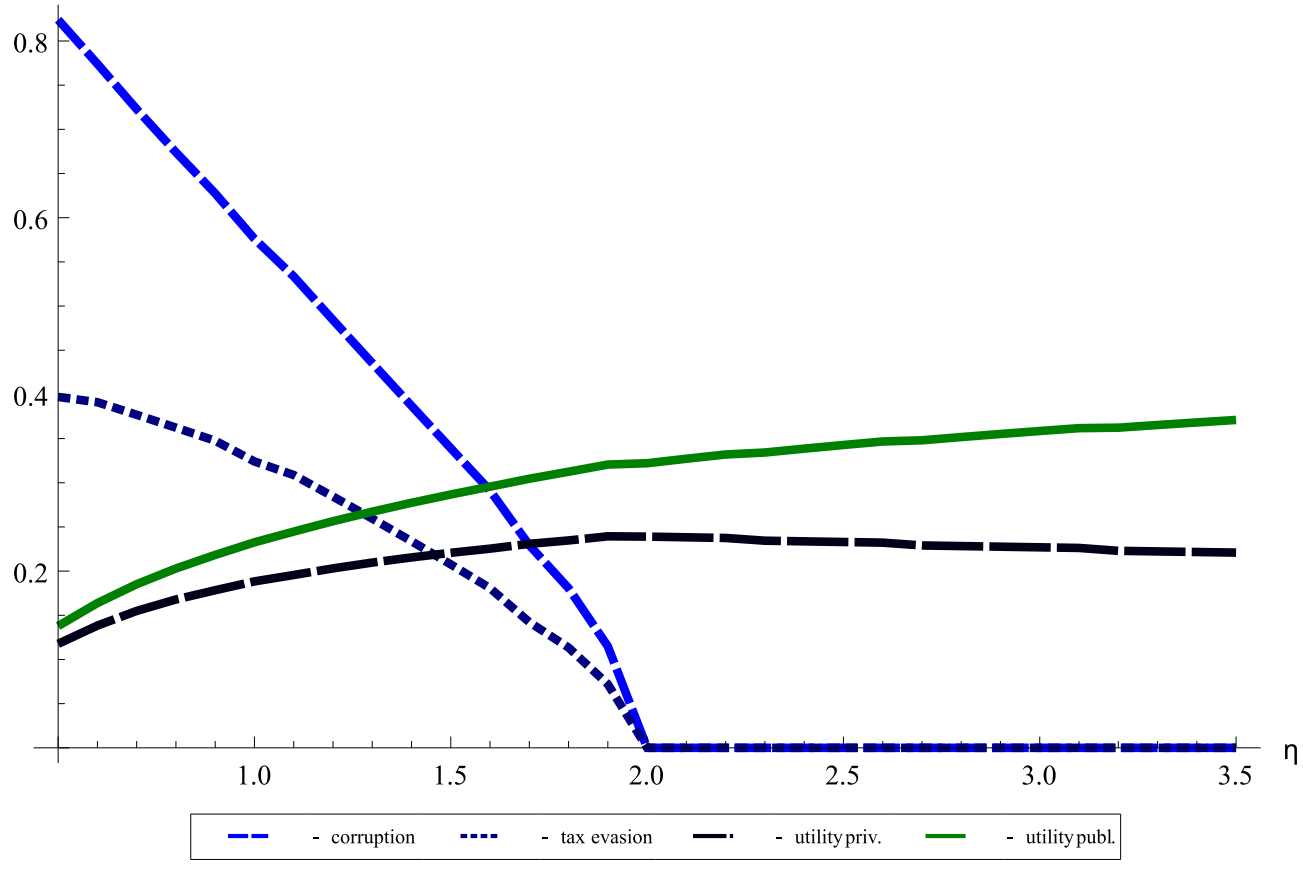
Table 2 Comparative Steady States

Parameter Changes	$\%\Delta u$	$\%\Delta v$	$\%\Delta \tau$	$\%\Delta REV$	$\%\Delta y$
rise in η	-9.1	-6.9	0.8	4.9	4.0
fall in θ^g	-7.6	-7.2	0.5	1.9	4.0
fall in θ^τ	11.1	-11.3	2.1	5.8	-4.5

Economy with Corruption-Evasion

Increase in public officials' wages

- Optimal public sector wage premium:



Economy with Corruption-Evasion

Reducing benefits of illegal activity

- If one-time cost to reduce θ_g then it may be less expensive than permanent increase in η
- Decrease in θ_τ leads to decrease in y, increases in τ, u
  - Evasion provides check on selfish motives of public officials
  - In low-corruption countries cracking-down on evasion is beneficial
- Changes in θ_g and θ_τ are costly... and it is not in the model

Extensions

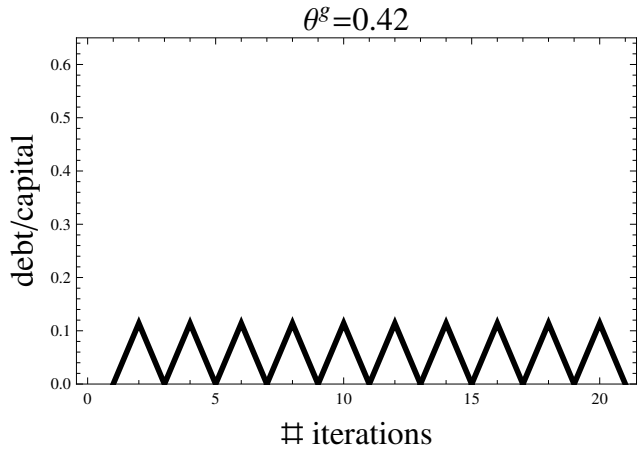
Introducing public debt

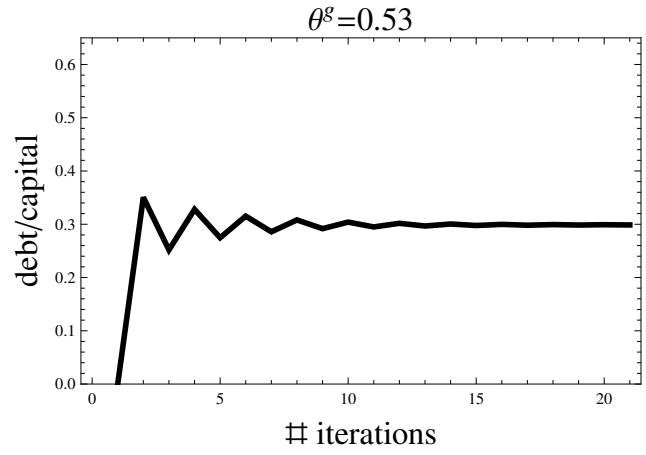
- Second paper: the model extended to allow for domestic borrowing
  - results of the first paper hold
  - corruption creates incentives to issue debt even if without corruption optimal debt level is zero
  - corruption-caused debt/capital ratio ranges from 0 to 100 within the range of evasion estimates across developed countries
  - interesting system dynamics due to interaction of corruption and debt, f.e. debt cycles - endogenous explanation for debt piling up/fiscal consolidations

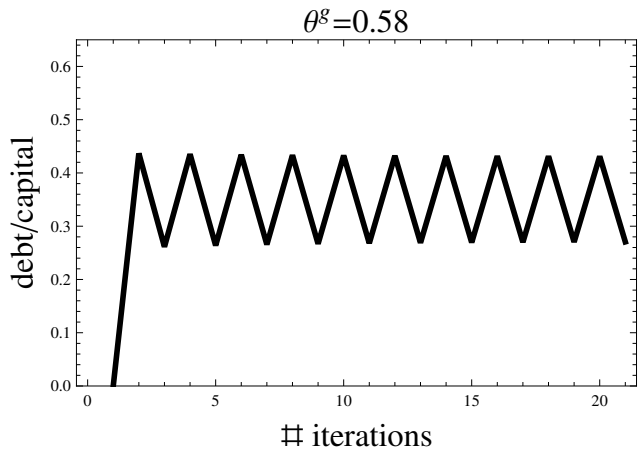
Economy with Corruption-Evasion

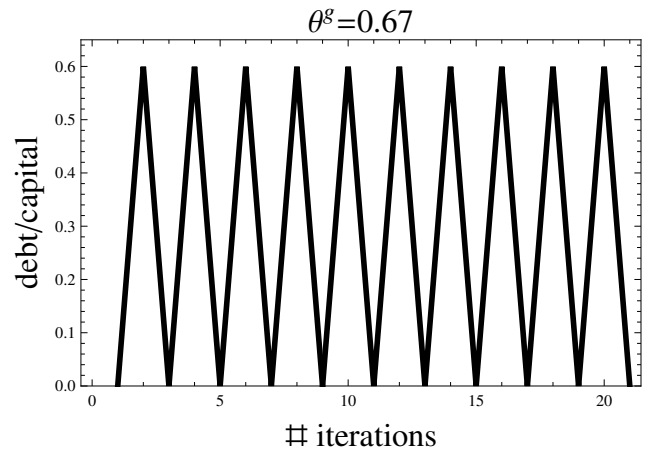
Interaction of debt and corruption

- Debt-capital ratio dynamics:









Extensions

Corruption and economic growth revisited

- Reverse causality: what is the effect of exogenous economic growth on corruption?
- Same model PLUS...
  - Aggregate productivity is subject to stochastic shocks - source of exogenous growth
  - Shocks affect private sector wages, and hence the tax paid
  - Public sector wages adjust too, but the pass-through is not perfect
- Same calibration based on an average emerging market economy...

Corruption and economic growth revisited

Changes to the model

- A (disemodied technology) grows at rate $d + \xi$ every period
  - d - long-run average growth rate
  - ξ - exogenous shock (cyclical component): business cycles, financial and asset price cycles

Corruption and economic growth revisited

Changes to the model

- Public wage is proportional to private sector wage - equals ηw_t
- Proportion is different in long and short run:

$$\eta = \frac{\eta_1}{1 + \eta_2 \xi} \tag{25}$$

  - η_1 - long-run ratio (when $\xi = 0$)
  - η_2 - degree of short-run sluggishness: varies from 0 to 1

Corruption and economic growth revisited

Results

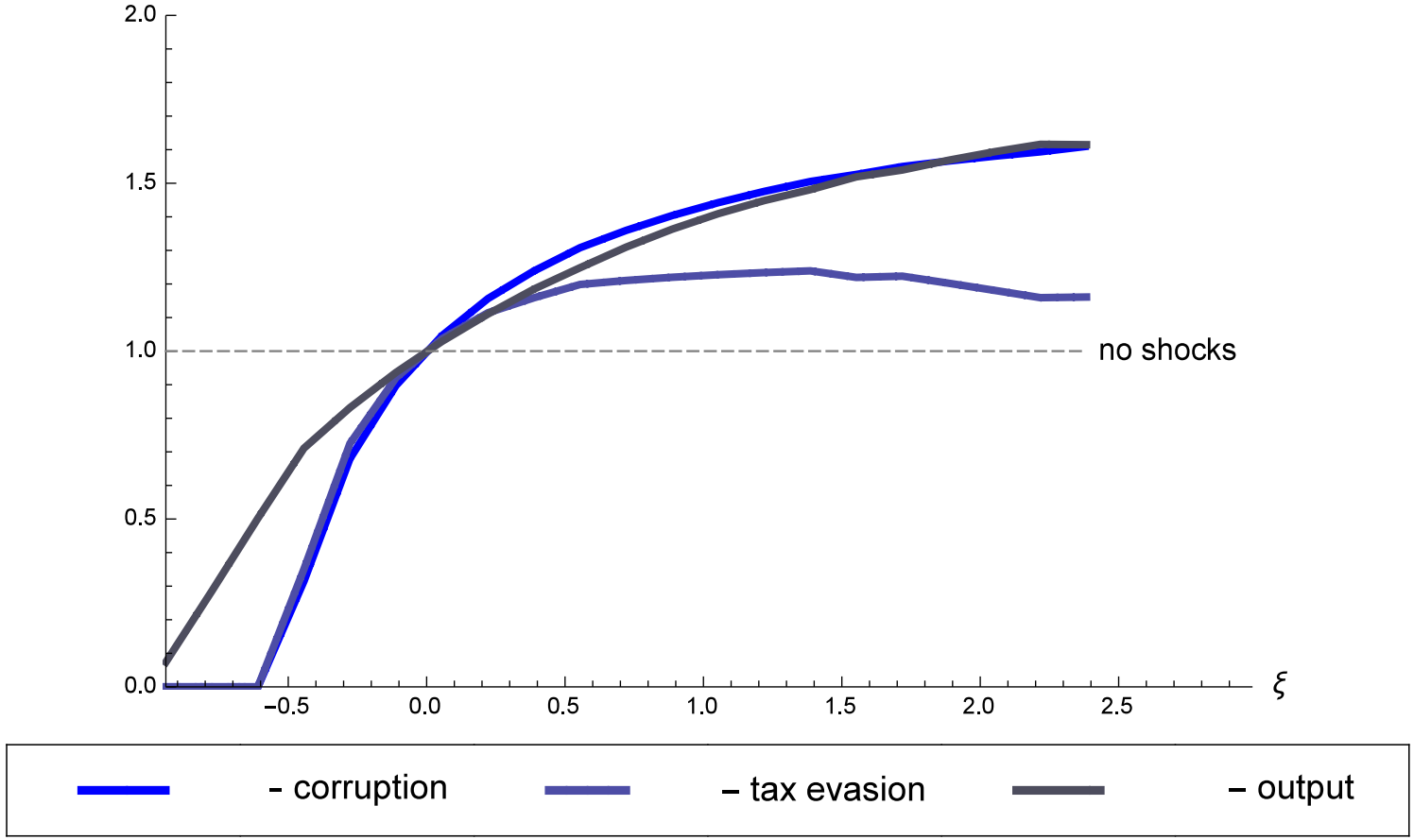


Figure: Aggregate productivity shocks: Response of corruption, tax evasion and output

Note Figure shows response of corruption, tax evasion and output for a range of aggregate productivity shocks ξ. All variables are expressed as ratio to the corresponding value in the baseline without shocks ($\xi = 0$).

Corruption and economic growth revisited

Results

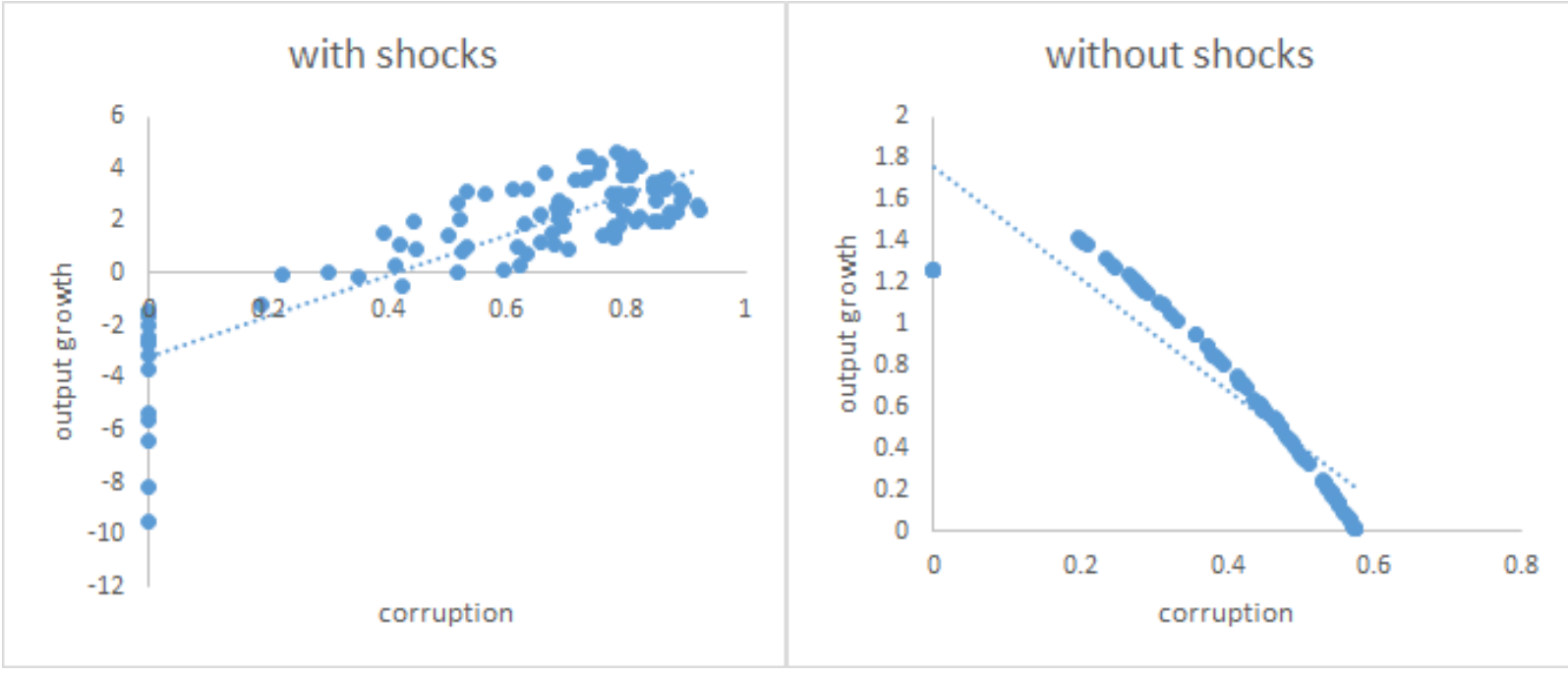


Figure: Growth regression simulations with and without shocks

Note Figure simulates from the model the growth regressions with corruption included as the independent variable. Sample of countries is formed using 100 independent draws from uniform [0.45,1] distribution for θ_g and uniform [-0.95,2.4] distribution for ξ. All other variables for all countries are left the same as in the baseline.

Corruption and economic growth revisited

Results

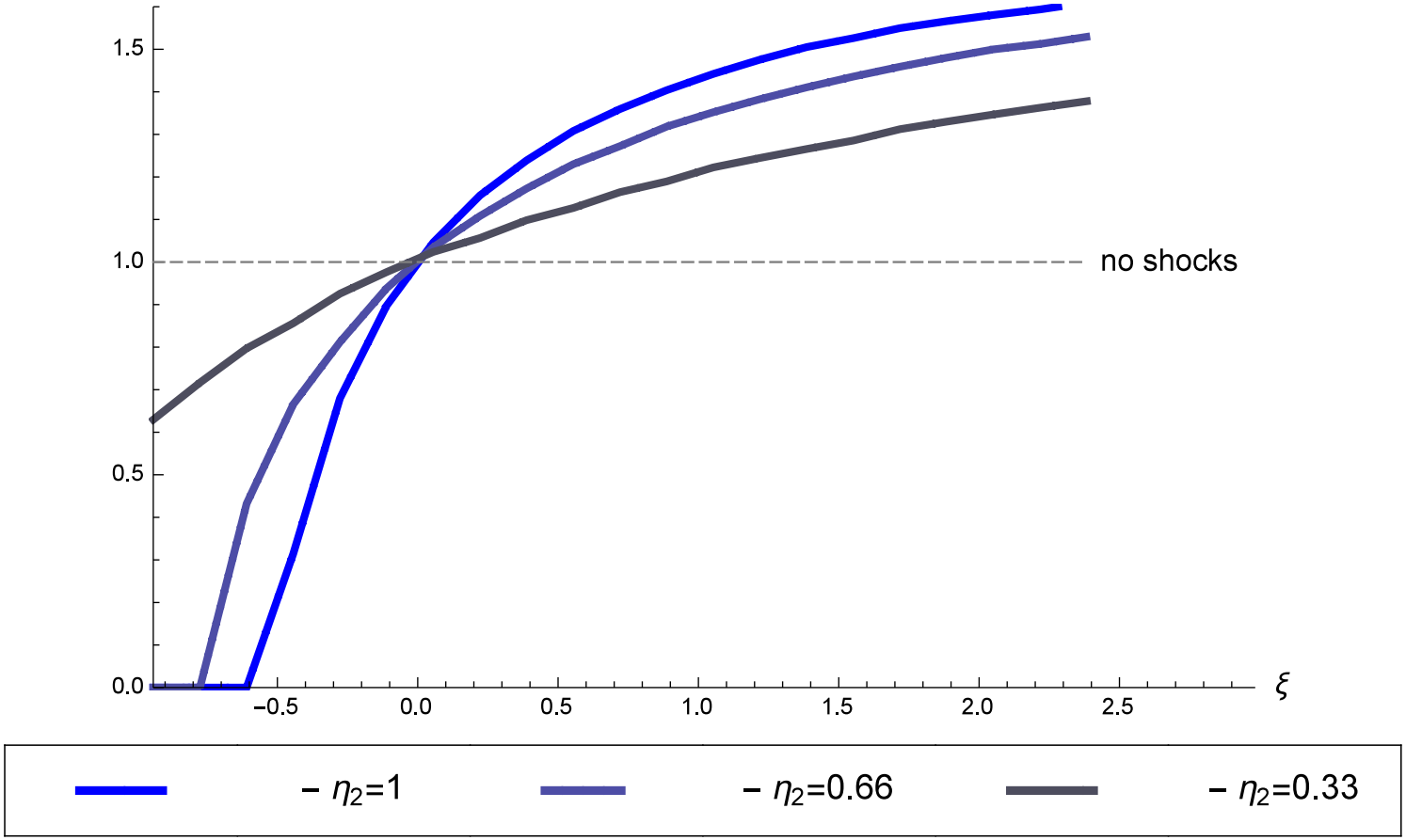


Figure: Corruption, shocks, and sluggishness of public officials' salaries

Note Figure shows response of corruption for a range of aggregate productivity shocks ξ and when responsiveness of public officials' salary to

Empirical evidence

Main results

Main parsimonious specification:

$$< bribery >_{it} = \beta_0 + \beta_1 * < GDP\ per\ capita >_{it} + + < output\ gap >_{it} + < terms - of - trade\ gap >_{it} + \psi_{it} \quad (26)$$

	all countries				RRCs	non-RRCs
	(1)	(2)	(3)	(4)	(5)	(6)
log GDP per capita	-6.94***	-7.29***	-7.81***	-7.94***	-5.39**	-7.15***
	(1.03)	(1.09)	(1.14)	(1.13)	(2.36)	(1.26)
output gap, % GDP	1.34***	1.33***	1.53***	1.59***	2.21**	1.34**
	(0.50)	(0.48)	(0.57)	(0.56)	(1.08)	(0.52)
terms of trade gap		0.06	0.08*	-0.08	-0.01	-0.65***
		(0.05)	(0.05)	(0.09)	(0.10)	(0.19)
L.output gap, % GDP				0.06	-0.44	0.69
				(0.51)	(1.16)	(0.63)
L.terms of trade gap				0.19**	0.18*	0.52***
				(0.08)	(0.11)	(0.20)
Constant	80.07***	83.05***	73.82***	74.92***	72.10***	75.73***
	(9.37)	(9.87)	(11.00)	(11.30)	(24.80)	(12.00)
year effects	No	No	Yes	Yes	Yes	Yes
Observations	238	218	218	218	71	138
R-squared	0.24	0.26	0.31	0.33	0.29	0.47

Empirical evidence

Corruption vs. evasion

	bribery procurement		bribery tax inspection		shadow economy	
	(1)	(2)	(3)	(4)	(5)	(6)
log GDP per capita	-6.73***	-6.41***	-5.22***	-8.43***	-7.18***	-7.03***
	(1.25)	(1.34)	(1.21)	(1.03)	(1.17)	(1.12)
output gap, % GDP	1.21*	1.16	0.71	1.06*	-0.34	0.10
	(0.66)	(0.82)	(0.58)	(0.59)	(0.48)	(0.52)
terms of trade gap	0.13**	0.14**	-0.08*	0.04	0.03	0.01
	(0.06)	(0.06)	(0.05)	(0.04)	(0.05)	(0.05)
Constant	88.65***	83.08***	67.41***	119.69***	116.36***	109.71***
	(11.26)	(12.60)	(10.97)	(10.00)	(10.25)	(10.48)
year effects	No	Yes	No	Yes	No	Yes
Observations	277	277	284	284	208	208
R-squared	0.14	0.19	0.09	0.48	0.14	0.30

Empirical evidence

Corruption perception vs. bribery

	WGI CoC		TI CPI	
	(1)	(2)	(3)	(4)
	all observations	WBES sample	all observations	WBES sample
log GDP per capita	0.56***	0.56***	1.30***	1.30***
	(0.01)	(0.01)	(0.03)	(0.03)
output gap, % GDP	-0.00	-0.00	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
terms of trade gap	-0.00***	-0.00***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	-5.09***	-5.07***	-7.62***	-7.61***
	(0.10)	(0.10)	(0.24)	(0.24)
year effects	No	Yes	No	Yes
Observations	2552	2552	2384	2384
R-squared	0.50	0.50	0.53	0.54

Conclusions and policy implications

- GE framework to analyze corruption and tax evasion
- Corruption major impediment to growth:
  - Underprovision of public capital
  - Inefficient policies
- Its harm is likely underestimated in cross-country growth regressions

Conclusions and policy implications

- “Efficiency” wages can be effective tool to fight corruption
- Policy priorities:
  1. Reduce grand corruption / inefficient regulation (e.g. high tax rate)
  2. Crackdown on violation of rules (e.g. tax evasion)
- Fiscal rules (e.g. restriction on debt and taxation) may be beneficial

Conclusions and policy implications

- Corruption likely to increase during booms
  - Remain particularly vigilant during these periods (e.g. increase control)
- Counter-cyclical fiscal policy is more nuanced. During booms:
  - Bad idea: Reducing/freezing public wages
  - Good idea: Reducing/freezing public investment and purchase of G& S