Public Investment, Public Finance, and Growth: the impact of distortionary taxation, recurrent costs, and incomplete appropriability

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Outline

The Buffie et al (2012) model of public investment and growth

- IMF model designed to provide a better integration of public investment, debt and growth into standard DSA
- Standard two-sector small open economy model
  - Traded and a non-traded goods
  - Optimizing (saving) household and rationed household
- Non-optimizing government
  - Public infrastructure a pure public good, but...
  - Inefficient public investment (a dollar of investment produces less than a dollar of public capital)

Model properties

- Real model: no monetary components
- No econometric content: not a forecasting model
- Designed to examine movements in the real exchange rate, crowding-in of private capital by public investment the fiscal adjustments required to maintain balance.
- Model limitations:
  - the tax instrument is a uniform consumption tax
  - operates as a lump-sum tax
  - little attention is paid to the recurrent cost implications of public investment
- Present paper extends the model to explore the difficulty of managing high recurrent costs when taxation is distortionary and returns to public investment may not be fully appropriable.

Distortionary taxation and the marginal cost of funds

- Taxation is generally distortionary and exerts a deadweight loss
- Raising a dollar of government revenue imposes more than a dollar of cost of the private sector
  - Recent estimates for SSA LICs suggest typical values of 1.21 for the system as a whole
    - ★ 1.11 for consumption taxes
    - ★ 1.60 for factor taxes.
  - deadweight loss and MCF typically rises with the tax rate
- Example below assumes MCF = 1.25

Recurrent costs and appropriability

- Public investment imposes recurrent budgetary costs (in addition to the initial capital costs and/or the ongoing costs of debt servicing)
- Responsibility for capital and recurrent costs typically falls on different parts of government
- A nearly universal consequence has been inadequate O&M:
  - Reduction in the service flow
  - Avoidable acceleration in depreciation and expensive rehabilitation

Recurrent costs and appropriability

- Limited appropriability
  - government either cannot, or chooses not, to levy user charges at a level that captures all of the investment's return
- Incomplete appropriability imposes substantial net budgetary costs, even though its social rate of return is high
- Some limited empirical work on what levels of recurrent cost are typical of different types of investment
  - can be approximated as proportional to capital cost (r x capital cost)

r-coefficients for developing countries

Fisheries	0.08
Agriculture	0.10
Rural development	0.08 - 0.43
Primary schools	0.06 - 0.70
Secondary schools	0.08 - 0.72
Rural health centres	0.27- 0.71
Urban health centres	0.17
District hospitals	0.11- 0.30
Buildings	0.01
Feeder roads	0.06 - 0.14
Paved roads	0.03 - 0.07

Heller (1991) *IMF Handbook of Public Expenditure*, 1991

Fiscal and welfare consequences of incomplete appropriability: an illustration

- If project is fuly appropriable, should be undertaken provided benefit cost ratio (BCR) is greater than one
  - where cost includes O&M, financing costs, and depreciation
- Now suppose government recovers only a fraction f of gross return
  - Remainder accrues to private sector
  - Existing taxes recover τ of this but MCF is $1+\theta$

Fiscal and welfare consequences

- Absent fresh taxes, government budget deteriorates unless

$$BCR \geq 1/[f + \tau(1-f)]$$

- If taxes can be raised, or expenditures reduced elsewhere, project yields social gain provided

$$BCR \geq (1+\theta)/(1+f\theta)$$

- Only if this is positive should project be undertaken, otherwise it inflicts a net burden on private sector.

Some numbers

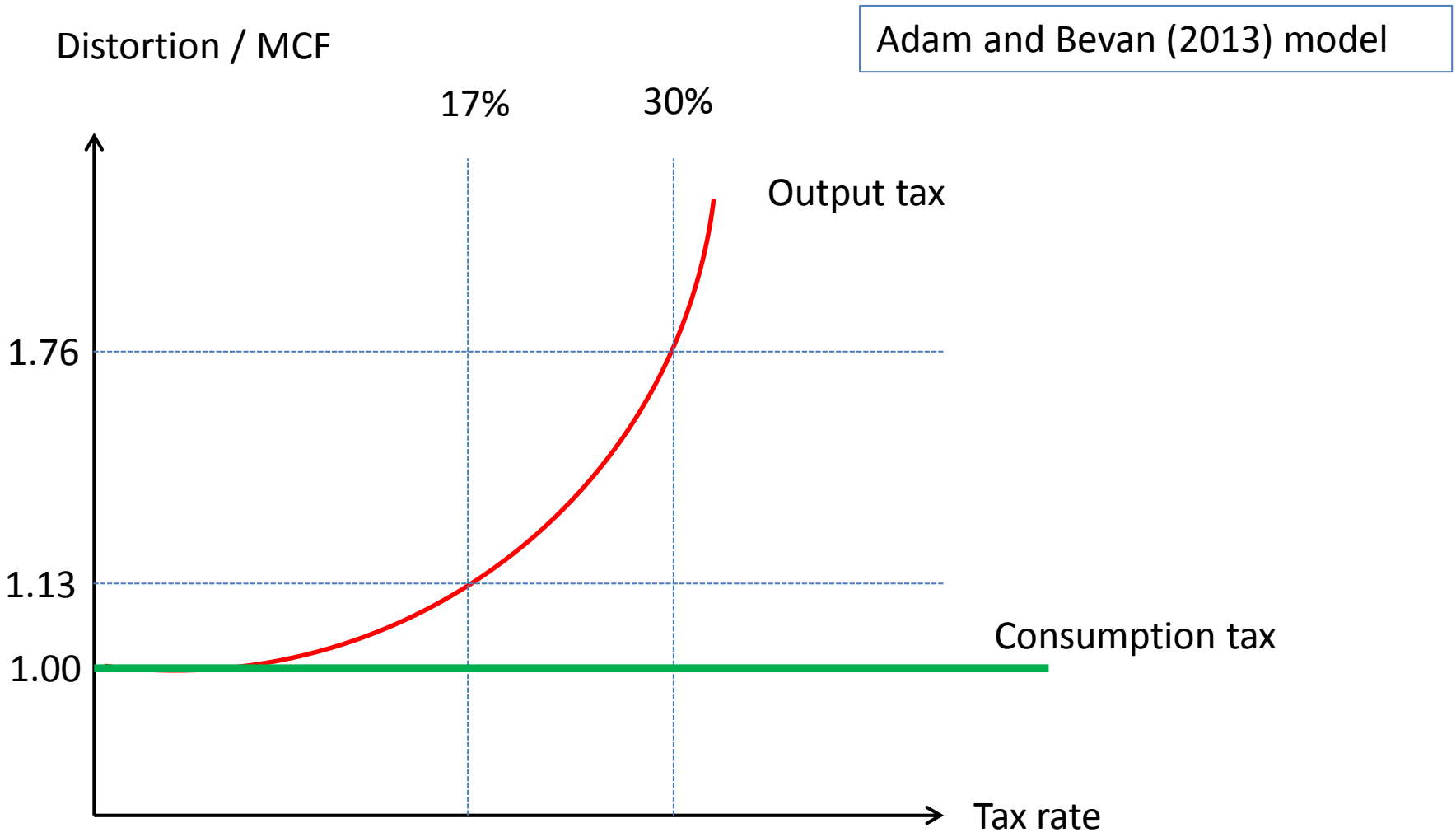
- When does a project induce a budget deficit and when is this still worthwhile?
  - Baseline tax ratio $\tau = 0.18$; and $MCF = 1.25$

Appropriability (f)	Minimum benefit-cost ratio:	
	to avoid deficit	for welfare increase
0.00	5.56	1.25
0.10	3.82	1.22
0.25	2.60	1.18
0.50	1.69	1.11
0.75	1.26	1.05
0.90	1.09	1.02

Modifying Buffie et al (2012)

- Introduce a distortionary tax on output
  - (equivalent to an equal tax on profits and wages)
  - Calibrated to 17% of GDP
  - Raises (approximately) the same revenue a uniform tax of 20% on consumption
- Introduce recurrent cost obligations on government
  - r-coefficient = 0.05 (low end of Heller's estimates) spread equally between Operations and Maintenance
  - Government may seek to 'economize' on either or both
- Partial cost-recovery on recurrent O&M costs as well as depreciation and debt service

Figure 1: model-based MCF schedule



Model calibration and experiments

- Core experiment: 50% increase in public investment (from 6% to 9% of GDP)
  - Subject to inefficiency in capital formation and possible inefficiency in O&M
- Fiscal reform experiments:
  - Improved efficiency of O&M
  - Tax reform: 'revenue neutral' replacement of output tax with consumption tax
- Other parameters similar to Buffie et al (2012)

Distortionary Taxation and Deficient O&M

Table 1: *Initial conditions relative to undistorted baseline.*

	Consumption Tax				*Output Tax*			
Initial tax rate	20%				17%			
Maintenance efficiency	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8
Operations efficiency	1.0	1.0	0.8	0.8	1.0	1.0	0.8	0.8
GDP	100	92.9	89.2	82.9	80.9	75.1	72.1	67.0
Capital in T-sector	100	92.0	87.8	80.8	63.8	58.7	56.0	51.5
Capital in NT-sector	100	92.7	88.9	82.5	66.1	61.2	58.7	54.4
Public capital	100	80.5	71.4	57.5	80.9	65.1	57.7	46.4
Product real wage	1.0	0.93	0.89	0.83	0.67	0.62	0.60	0.55
O&M costs (% GDP)	2.8%	2.2%	2.5%	1.9%	2.9%	2.2%	2.6%	2.0%

Comparative effects of tax-financed public investment

Table 2: *Changes relative to initial steady state.*

	Consumption Tax				*Output Tax*			
Initial tax rate	20%				17%			
Maintenance efficiency	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8
Operations efficiency	1.0	1.0	0.8	0.8	1.0	1.0	0.8	0.8
GDP growth [%]	14.6	14.6	14.6	14.6	12.5	12.9	12.7	13.0
Crowding in [%]	1.8	2.0	2.2	2.5	1.0	1.2	1.2	1.5
Consumption growth [%]	10.3	10.6	10.4	10.7	8.5	9.1	8.7	9.3
Real wage growth[%]	15.0	15.1	14.6	14.5	10.4	11.3	10.0	10.9
Real Exchange Rate[%, 1]	-2.2	-2.3	-2.3	-2.3	-1.6	-1.8	-1.7	-1.9
O&M growth[%age points]	0.82	0.64	0.75	0.57	0.93	0.71	0.83	0.63
Final cons. tax rate	23.1	22.7	23.0	22.6	-	-	-	-
Final output tax rate	-	-	-	-	19.0	18.7	18.9	18.6

Fiscal reforms

TABLE 3: *Fiscal reforms.*

	O&M Reforms		*Tax Reform*	
Final maintenance efficiency ($\gamma_{mo} = 0.8$)	1.0	1.0	0.8	1.0
Final operations efficiency ($\gamma_{po} = 0.8$)	1.0	1.0	0.8	1.0
Final cost recovery (% of O&M costs)	0.00	0.50	0.00	0.50
Real GDP growth[1]	14.6	16.1	29.2	46.1
Real consumption[1]	14.4	15.7	23.9	40.1
Investment crowding-in	2.6	3.2	-	17.2
Real exchange rate	-2.8	-3.3	-10.3	-12.3
Effective public capital[1]	44.2	44.3	0.00	44.2
Final product wage (initial = 0.55)	0.65	0.67	1.0	1.15
Final O&M cost (% GDP, initial = 2.01%)	2.5	2.5	1.5	1.9
Final output tax rate (%)	15.5	14.0	-	-
Final consumption tax rate (%)	-	-	16.5	14.2

Note: [1] Percentage change between steady states.

Figure 2: Debt Financing (output tax)

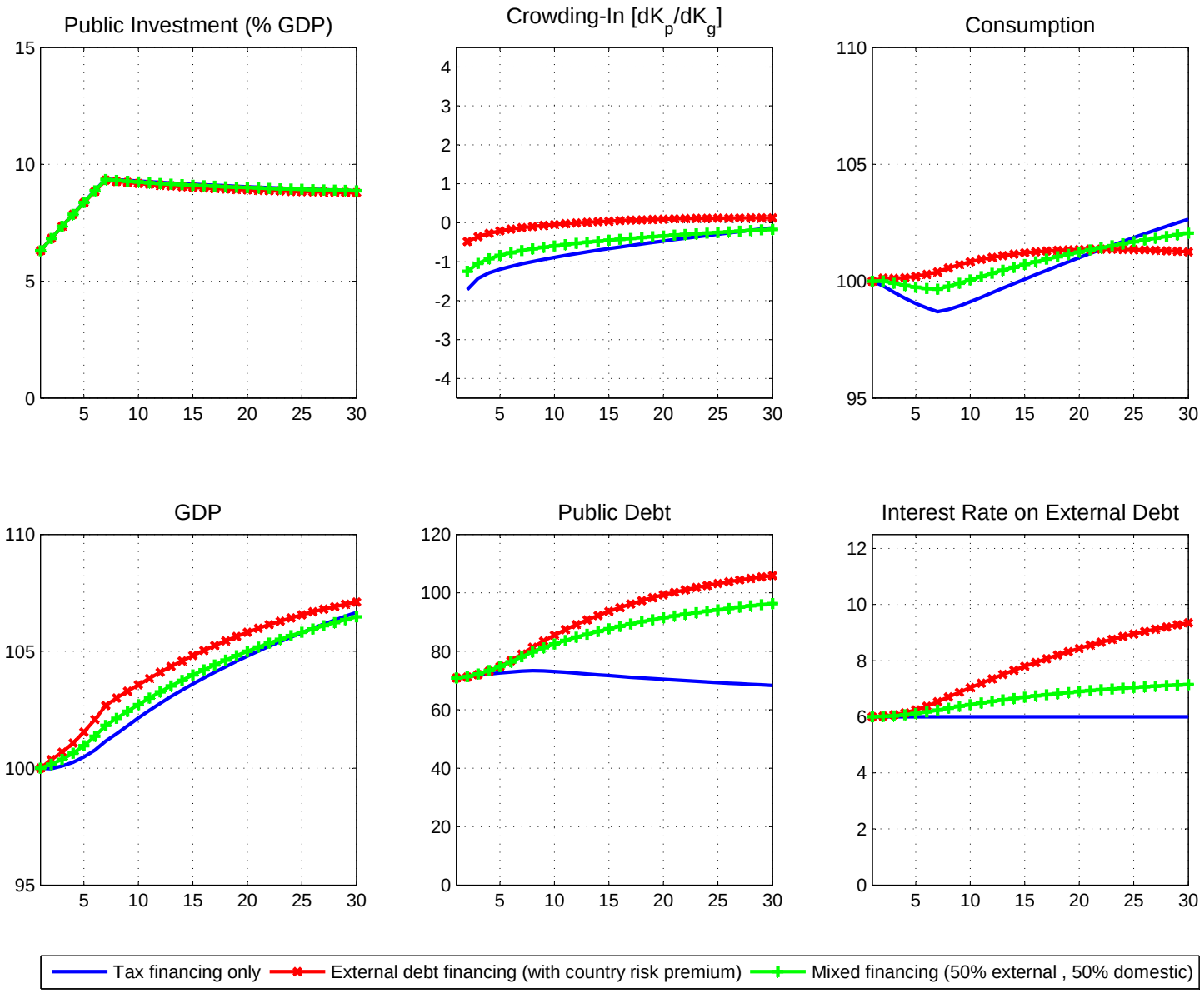
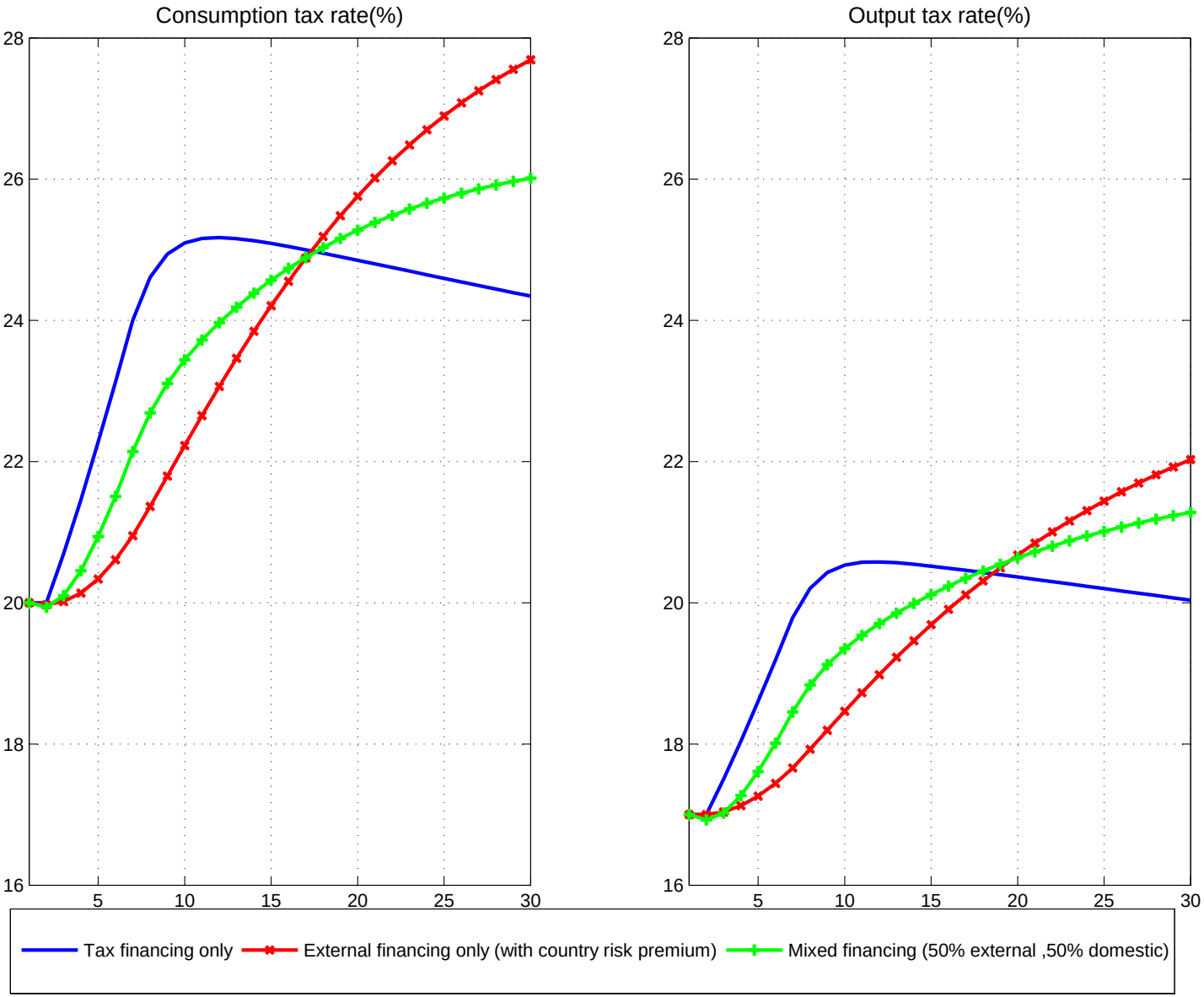


Figure 3: Public debt and tax-smoothing



Tax ceilings and public investment

- There may exist 'hard' constraints to tax adjustment, either administrative and political, that render otherwise feasible public investment strategies infeasible
- We explore how lack of fiscal flexibility interacts with alternative debt financing
- Blending concessional financing may help to navigate fiscal inflexibility.

Tax ceilings and public investment

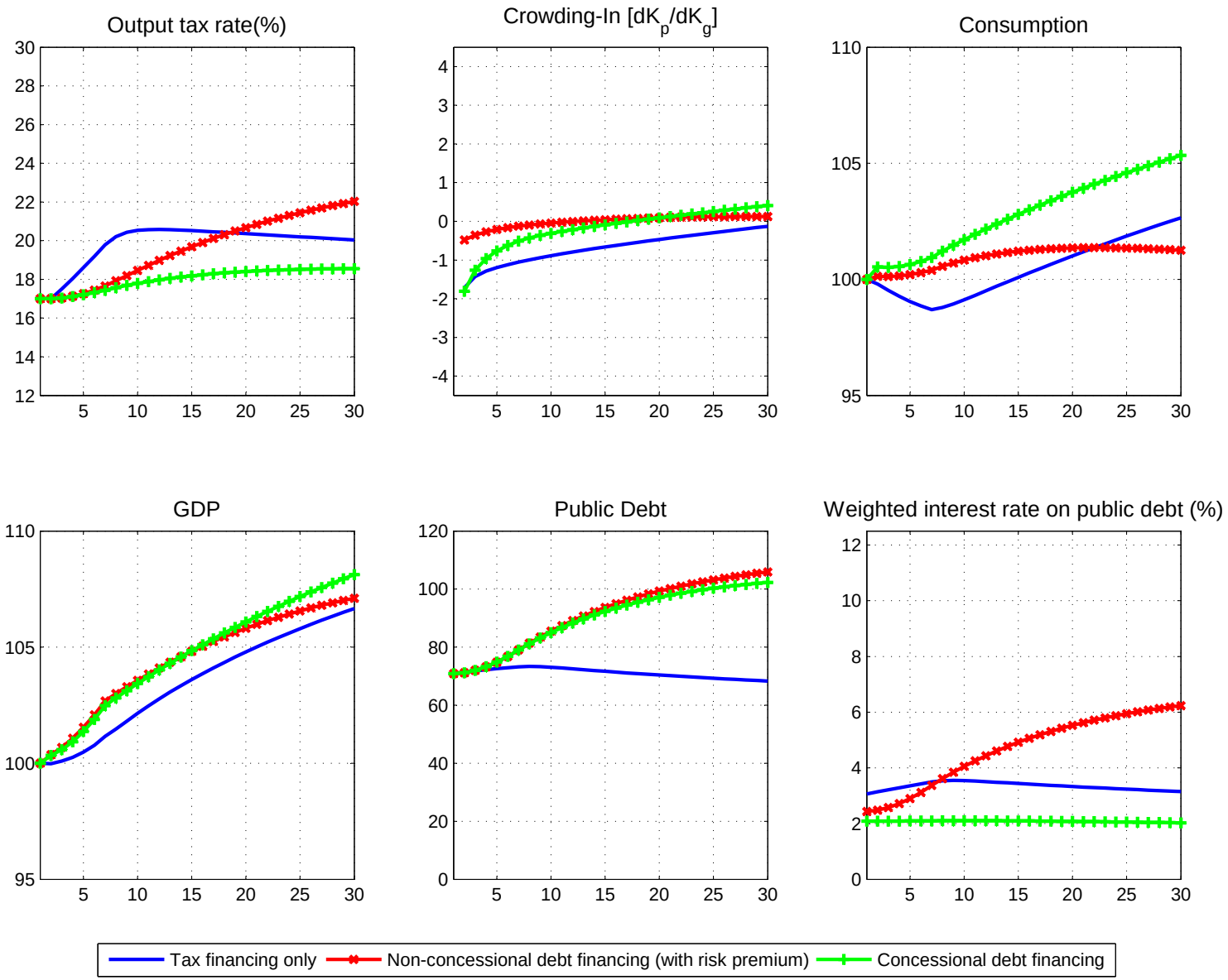
TABLE 6: *Feasible public investment with tax ceiling.*

Baseline settings as Table 1, columns (4) and (8); public investment increased by 3% of GDP

Domestic interest rate 10%; external interest rate $6\% + \theta(dc/y)$

	Consumption Tax			*Output Tax*		
Domestic debt (share of investment surge)	0%	0%	50%	0%	0%	50%
Non-concessional debt (share of investment surge)	0%	100%	50%	0%	100%	50%
Tax ceiling	24.0%	24.0%	24.0%	20.4%	20.4%	20.4%
Maximum unconstrained consumption tax rate	25.5%	28.6%	26.1%			
Maximum unconstrained output tax rate				20.8%	24.1%	22.2%
Financeable share of investment (no cost recovery)	81%	53%	47%	98%	60%	45%
Financeable share (50% cost recovery on O&M)	87%	57%	54%	109%	66%	56%

Figure 4: Concessional financing (output tax)



Conclusions and extensions

- We explore the impact on 'new' DSA analysis of two staples of public finance theory
  - Taxation inflicts deadweight losses
  - Public investment entails ongoing budgetary costs of O&M
- Implications are material and point to important areas for reform
- To take this further requires *much better* information on scale of r-coefficients and the costs of deficient O&M expenditures