Growth and Fiscal Policy: a Positive Theory

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Introduction

• In the aftermath of the Great Recession:
  – Great concern over public debt;
  – Austerity programs (Budget Control Act of 2011).

• Questions:
  – Will high levels of public debt permanently reduce the growth potential of the economy?
  – Are austerity programs effective in reducing debt/gdp, in increasing growth potential and welfare?
  – How should they be designed?

• We need a theory in which growth and fiscal policy are jointly determined in equilibrium.
• In our theory, growth depends on public investment and, through learning by doing, on labor supply:
  – Taxation distorts labor supply;
  – Deficits distort consumption/savings decision through their effect on the interest rate.

• Policy choices are made by a legislature consisting of elected representatives.

• The level of public debt, private savings and the level of productivity in the economy are state variables and create a dynamic linkage across policy-making periods.
• We use the model:
  – to provide a positive theory of growth and fiscal policy.
  – to evaluate the effects of a variety of austerity programs that limit the ability of the government to issue debt.

• We calibrate the model to the U.S. economy to assess its predictions quantitatively.
Plan for today

I. The model

II. The political equilibrium

III. A calibrated solution

IV. Growth, welfare and austerity programs

V. Conclusion
I. The Model

I. 1 The economy

- A continuum of infinitely-lived citizens live in $n$ identical districts. The size of the population in each district is normalized to be one.

- There are $n+3$ goods: private consumption $c$, and labor $l$, public infrastructure $I$ and $n$ local public goods $\gamma^i$.

- Each citizen's per period utility function is

$$u_i(c_t, l_t, \gamma_t) = \log(c_t (1 - l_t)^\mu) + \omega_0 \log\left((\gamma_t^i)^\alpha (\sum_j \gamma_t^j)^{1-\alpha}\right)$$

- Discount factor: $\delta$. 

• Linear technology: \( c_t = z_t l_t \) and \( MRT_{g,c} = 1 \).

• Productivity may increase because of learning by doing and direct public investments in public infrastructure:
  \[
  z_{t+1} = \eta(l_t) \varphi\left(\frac{I_t}{z_t}\right) z_t
  \]

• There are markets for labor and one period, risk free bonds.

• In a competitive equilibrium:
  – the wage rate is \( z_t \),
  – and the interest rate is denoted as \( \rho_t \)
I.2 Public policies

- The legislature can raise revenues in two ways: a tax on labor income ($\tau$) and borrowing ($\beta$).

- Public revenues can be used to finance local public goods ($\gamma^i$), infrastructure ($I$) and a monetary transfer ($T$).

- A policy choice is described by an $n+4$-tuple:

$$\{\tau, \beta', I, T, \gamma^1, \ldots, \gamma^n\}$$
• The policy choice must satisfy the budget constraint:

\[ \frac{\beta_t'}{\rho_t} - \left[ \beta_t + \sum_j \gamma^j_t + l_t + T_t - \tau z_t \sum_j l^j_t \right] \geq 0 \]

• Minimal maintenance levels: \( l_t/y_t \geq \bar{l}, \quad \gamma^i_t/y_t \geq \bar{g}, \quad T_t/y_t \geq \bar{T} \)
I.3 The private sector

- It is useful to normalize the variables in terms of GDP:
  \[ g_i^t = \frac{\gamma_i^t}{y_t}, \quad I_t = \frac{l_t}{y_t}, \quad T_t = \frac{T_t}{y_t} \]

- We have:
  \[ l(p_t) = \frac{1 - \tau_t}{\mu (1 - I_t - \sum g^j_t) + 1 - \tau_t} \]

- And \( c(p_t, z_t) = z_t c(p_t) \), where:
  \[ c(p_t) = \frac{(1 - \tau_t)(1 - (I_t + \sum g^j_t))}{\mu (1 - I_t - \sum g^j_t) + 1 - \tau_t} \]

- This gives us an indirect utility function \( u(p_t, z_t) \) and the interest rate \( \rho(p_t, p_{t+1}) \).
I.4 Legislative policy-making

• Public decisions are made by a legislature of representatives from each of the $n$ districts.

• One legislator is randomly selected to make the first policy proposal.

  – If the proposal is accepted by $q$ legislators, the plan is implemented and the legislature adjourns.

  – If the first proposal is rejected, another legislator is chosen and the process repeats.
II. The political equilibrium

• We look for a symmetric Markov perfect equilibrium (SME) with state variable $b = \beta / z$:
  
  – All proposers choose the same $\tau(b)$, $I(b)$, $T(b)$, $b'(b)$;
  
  – A proposer provides $g(b)$ to his own district and $g^c(b)$ to a mwc, leaving all others at the reservation utility.

• In equilibrium, $g^c(b) = g(b)^{Q(q)} \cdot g^{(1-Q(q))}$, where $Q(q) \leq 1$.

• In a SME the agents value function $v(b,z)$ is not recursive, but it has a 1-to-1 relationship to a recursive value $V(b)$.

• This allows to characterize the equilibrium.
The planner maximizes his own utility, under feasibility and incentive constraints.

The **incentive compatibility** constraint is:

\[
U(p) + \omega_0 \log \left( \left( g^c \right)^\alpha \left( \sum_j g^j \right)^{1-\alpha} \right) + \delta v(b', z') = v(b, z),
\]

A citizen's expected **continuation value** can be written as:

\[
v(b, z) = U(p) + \omega_0 E \log \left( \left( g^i \right)^\alpha \left( \sum_j g^j \right)^{1-\alpha} \right) + \delta v(b', z').
\]

Hence,

\[
\log g^c = E \log g^i = \frac{1}{n} \left( \log g + (q - 1) \log g^c + (n - q) \log g \right).
\]
II.2 Equilibrium behavior

• The Marginal Cost of Public Funds $MCPF_t$ is the compensating variation for a marginal increase in the tax rate.

• At first best (except at $t_0$): $MCPF(b_t) = MCPF(b_{t+1})$

• In a political equilibrium:

$$MCPF(b_t) = \frac{1 - \alpha(Q(q) - 1)) \Phi(b_{t+1}) \epsilon_g(b_{t+1})}{1 - \epsilon_{\rho}(b_t)} \cdot MCPF(b_{t+1})$$

• Two sources of distortion:
  • Political distortion;
  • Consumption/savings manipulation.

• We obtain a plausible balanced path only with both.
\[
MCPF(b_t) = \frac{1 - \alpha(Q(q) - 1)\Phi(b_{t+1})\varepsilon_g(b_{t+1})}{1 - \varepsilon_\rho(b_{t+1})} \cdot MCPF(b_{t+1})
\]
Without this term, steady state would be zero.
Without this term, debt would grow to upperbound.
III. A calibrated solution

Parameters are chosen to minimize the differences between the eq. steady state values and average data (2001-2010).

These variables include the steady state levels of: public spending, public investment and debt, as fractions of GDP.

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Federal Debt</th>
<th>Public Goods</th>
<th>Public Investment</th>
<th>Tax Revenue</th>
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<td>GDP</td>
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<td>9.3</td>
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</table>
III.1 Dynamics of fiscal variables

- **Public debt, % of GDP**
- **Taxes (net of SS contributions), in %**
- **(Total) Public good, % of GDP**
- **Public Investment, % of GDP**
III.2 Dynamics of growth and labor supply
III.3 Comparative statics: $\alpha$, political conflict
III.4 Wealth effects (GHH utility)
IV. Austerity measures

- **Public debt, % of GDP**
- **Tax Rate, in %**
- **(Total) Public good, % of GDP**
- **Labor supply**
- **Growth Rate, in %**
- **Utility**
IV.2 No commitment
### IV.3 Welfare: commitment

<table>
<thead>
<tr>
<th>Target</th>
<th>Duration</th>
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<td>15</td>
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## V.2 Comparative statics

<table>
<thead>
<tr>
<th>Value of debt/GDP ratio</th>
<th>Implied SS of debt/GDP ratio</th>
<th>Optimal Austerity Measure</th>
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<tbody>
<tr>
<td></td>
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### IV.3 Welfare: no commitment

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<tr>
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<tr>
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<td>-0.03</td>
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<td>-0.64</td>
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</table>
• The taxation smoothing principle, may appear to suggest that debt should be kept constant. Why is austerity good?

• At steady state the policy mix is inefficient: political distortion, interest manipulation distortion.

• By forcing the government to save, the policy mix improves (higher g, higher taxes).
V. Conclusion

• We have proposed a political economy model that delivers an appealing theory of growth and fiscal policy.

• The predictions of the model are broadly consistent with the U.S. data over the last four decades.

• We showed that the model can be useful in evaluating austerity proposals.
V.3 Evolution of fiscal policy

[Graphs showing the evolution of public debt, taxes, public goods, and public investment as a percentage of GDP from 1970 to 2010.]