A Dynamic Analysis Inefficiency in Legislative Policymaking: A Dynamic Analysis

Battaglini, Marco      Coate, Stephen

American Economic Review

Presented by Ruben Veiga

January 2018
1. Introduction
2. The model
3. Social planner
4. Equilibrium
   - Definition
   - Policy proposals
   - Three types of equilibrium
   - Existence and uniqueness
5. Implications
6. Conclusions
**Motivation:** The apparent tension between productive spending and pork-barrel in a legislature.
- Does government becomes "too big" because of this?
- What is the path of investment in public goods?
- Why some legislatures have good (or bad) governments?
Motivation: The apparent tension between productive spending and pork-barrel in a legislature.

- Does government becomes "too big" because of this?
- What is the path of investment in public goods?
- Why some legislatures have good (or bad) governments?

Model: infinite horizon model of public spending (productive and pork-barrel) and distorsionary taxation determined by collective bargaining.
**Motivation:** The apparent tension between productive spending and pork-barrel in a legislature.
- Does government becomes "too big" because of this?
- What is the path of investment in public goods?
- Why some legislatures have good (or bad) governments?

**Model:** infinite horizon model of public spending (productive and pork-barrel) and distorsionary taxation determined by collective bargaining.

**Contribution:** A dynamic model with infinite horizon and public good does not fully depreciates. This provides results on long run size of gov., efficiency and some positive implications on legislative dynamics.
**Motivation:** The apparent tension between productive spending and pork-barrel in a legislature.
- Does government becomes “too big” because of this?
- What is the path of investment in public goods?
- Why some legislatures have good (or bad) governments?

**Model:** infinite horizon model of public spending (productive and pork-barrel) and distortionary taxation determined by collective bargaining.

**Contribution:** A dynamic model with infinite horizon and public good does not fully depreciates. This provides results on long run size of gov., efficiency and some positive implications on legislative dynamics.

**Why in a Macro reading group?** Dynamics of an investment public good in a context of distortionary taxes and political failure.
Outline

1. Introduction
2. The model
3. Social planner
4. Equilibrium
   - Definition
   - Policy proposals
   - Three types of equilibrium
   - Existence and uniqueness
5. Implications
6. Conclusions
The model

Environment

- Discrete time
- Continuum of infinitely lived, identical citizens
- Distributed in measure 1 (identical) districts: \( i = 1, \ldots, n \).

Three goods:
- Labor \( l \) (elastic).
- Consumption good \( z \). (produced from labor \( z = w^l \)).
- Public good \( g \). (produced from cons. good \( g = z / p \)).

\[ g_{t+1} = (1 - d) g_t + I_t \]

Utility:
\[ u(z, g, l) = z + Ag \alpha - l^{1/\epsilon} + 1/\epsilon \]

Indirect utility
\[ u(w, g) = Ag \alpha + 1/\epsilon w^{1/\epsilon} + 1/\epsilon \]

Battaglini-Coate (American Economic Review)
Presented by Ruben Veiga

January 2018
The model

Environment

- Discrete time
- Continuum of infinitely lived, identical citizens
- Distributed in measure 1 (identical) districts: \( i = 1, \ldots, n \).
- Three goods:
  - Labor \( l \) (elastic).
  - Consumption good \( z \). (produced from labor \( z = wl \))
  - Public good \( g \).(produced from cons. good \( g = z/p \)).

\[
g_{t+1} = (1 - d)g_t + l_t
\]
The model

Environment

- Discrete time
- Continuum of infinitely lived, identical citizens
- Distributed in measure 1 (identical) districts: \( i = 1, \ldots, n \).
- Three goods:
  - Labor \( l \) (elastic).
  - Consumption good \( z \). (produced from labor \( z = wl \))
  - Public good \( g \). (produced from cons. good \( g = z/p \)).

\[
g_{t+1} = (1 - d)g_t + l_t
\]

- Utility:

\[
u(z, g, l) = z + Ag^\alpha - \frac{l^{1+1/\epsilon}}{\epsilon + 1}
\]

- Indirect utility

\[
u(w, g) = Ag^\alpha + \frac{\epsilon^\epsilon w^{\epsilon+1}}{\epsilon + 1}
\]
Each period congress have to decide labor tax $r$, new level of public good $x$ and pork-barrel transfers to each district $s_i$. 
The model
Public decisions

- Each period congress have to decide labor tax $r$, new level of public good $x$ and pork-barrel transfers to each district $s_i$.
- Representatives of $n$ districts meet.
Each period congress have to decide labor tax $r$, new level of public good $x$ and pork-barrel transfers to each district $s_i$. Representatives of $n$ districts meet. Random representative makes a proposal $\{r, s_1, \ldots, s_n, x\}$ that is budget balanced.

$$\sum_{i}^{n} s_i \leq B(r, x : g) = nrw_l^*(w(1 - r)) - p[x - (1 - d)g]$$

If accepted by $q$ legislators, is implemented. If not, new round. $T$ rounds. After that there is a legislator have to propose a "default allocation" that treats districts uniformly.
The model
Public decisions

- Each period congress have to decide labor tax \( r \), new level of public good \( x \) and pork-barrel transfers to each district \( s_i \).
- Representatives of \( n \) districts meet.
- Random representative makes a proposal \( \{ r, s_1, \ldots, s_n, x \} \) that is budget balanced.

\[
\sum_{i}^{n} s_i \leq B(r, x : g) = nrw^{\ast}(w(1 - r)) - p[x - (1 - d)g] \]

- If accepted by \( q \) legislators, is implemented. If not, new round.
Each period congress have to decide labor tax $r$, new level of public good $x$ and pork-barrel transfers to each district $s_i$.

Representatives of $n$ districts meet.

Random representative makes a proposal $\{r, s_1, \ldots, s_n, x\}$ that is budget balanced.

$$\sum_{i}^{n} s_i \leq B(r, x : g) = nrwl^* (w(1 - r)) - p[x - (1 - d)g]$$

If accepted by $q$ legislators, is implemented. If not, new round.

$T$ rounds. After that there is a legislator have to propose a ”default allocation” that treats districts uniformly.
Outline

1. Introduction
2. The model
3. Social planner
4. Equilibrium
   - Definition
   - Policy proposals
   - Three types of equilibrium
   - Existence and uniqueness
5. Implications
6. Conclusions
Social planner

- Social planner problem:

\[ V(g) = \max_{x,r} \ nu(w(1 - r), g) + \sum_{i} s_i + \delta V(x) \]

s.t. \[ \sum_{i} s_i \leq B(r, x; g) \]
\[ x = (1 - d)g + l_g \]

- Since utilities are linear in consumption, particular \( s_i \) don’t matter.
Social planner

- Social planner problem:

\[ V(g) = \max_{x,r} \; \; n u(w(1 - r), g) + \sum_i s_i + \delta V(x) \]

\[ \text{s.t. } \sum_{i}^{n} s_i \leq B(r, x; g) \]

\[ x = (1 - d)g + l_g \]

- Since utilities are linear in consumption, particular \( s_i \) don’t matter.

- Two regimes:
  - \( g < \hat{g} \): Planner wants to invest. Raise taxes just to finance optimal public good \( x^0(g) \): \( B(r, x^0(g); g) = 0 \). Optimal public good is given by Euler eq:

\[ [x] : \; \delta V'(x^0) = \left[ \frac{1 - r(x^0, g)}{1 - r(x^0, g)(1 + \epsilon)} \right] p \]

  - \( g > \hat{g} \): Planner wants to disinvest. Set \( r = 0 \) and \( x^0(g) = (1 - d)\hat{g} \)
At steady state, \( \exists ! x^0 = x^0(x^0) \) s.th \( x^0 < \hat{g} \).
Focus on symmetric Markov equilibria that do not last more than one round.

An equilibrium is \( \{ r_\tau(g), s_\tau(g), x_\tau(g) \}^T_{\tau=1} \) that solves:

\[
\max_{(r,s,x)} u(w(1-r), g) + B(r, w; g) - (q - 1)s + \delta v_1(x) \\
\text{s.t. } u(w(1-r), g) + s + \delta v_1(x) \geq v_{\tau+1}(g) \\
B(r, s; g) \geq (q - 1)s ; \quad s \geq 0
\] (2)

where

\[
v_1(g) = u(w(1-r_1(g)), g) + \frac{B(r(g), x_1(g); g)}{n} + \delta v_1(x_1(g))
\] (3)

We restrict to concave equilibria. (concave always exist, nonconcave may exist)
The model
Policy proposals

- How to design a winning proposal?
  - If $g \leq g^*$, set $s_i = 0$ and choose tax and $x$ that maximizes global utility. (win by unanimity).
    \[
    x_u^*(g) = \arg \max \quad u(w(1 - r_{sp}(x, g)), g) + \delta v_1(x(g))
    \]
  - If $g > g^*$, maximize the utility of a *minimum winning coalition* using pork-barrel. (win by one vote)
    \[
    (r^*, x_m^*) = \arg \max \quad q [u(w(1 - r(x, g)), g) + \delta v_1(x(g))] + B(r, x; g)
    \]
    \[
    r^* = \frac{1 - q/n}{1 + \epsilon - q/n} ; \quad x_m^* = \arg \max \delta qv_1(x) - px
    \]

- $x_m^*$ and $x_u^*(g)$?
- At $g^*$, solutions coincide, then we can look for $g^*$ with $B(x^*, r^*; g^*) = 0$
Three types of equilibrium according to (foc of $g \leq g^*$ problem):

$$\delta v'_1(g^*) \geq \left[ \frac{1 - r(x, g^*)}{1 - r(x, g^*)(1 + \epsilon)} \right] \frac{p}{n}$$

RHS: Marginal cost of taxes times price of public good | benefit of pork-barrel.

LHS: Discounted marginal benefit of public good. The value of an additional unit of public good has 2 components:

- More consumption next period (both at minimum coalition and unanimity regime)
- Less investment necessary next period. In the unanimity means less taxes and in the min. coal. means higher pork. But reducing taxes is better!

Then, LHS has a discontinuity at $g^*$
Three types of equilibrium

Type 1: Minimum coalition in steady state.

- $g \in [0, g']$: normal capital accumulation under unanimity.
- $g \in [g', \hat{g}]$: Deterred from going into pork barrel region.
- $g \in [\hat{g}, g^*]$: go into pork barrel region for next period.
Three types of equilibrium

Type 2: Unanimity in steady state.

- Normal capital accumulation under unanimity until we reach the Pareto optimal level of public good.
Three types of equilibrium

Type 3

- Similar to type 2, but accumulation stops at $g^*$. 

- The threat of pork barrel prevents the confederation of reaching the Pareto allocation.
Reminder, $A$ is the taste for public good:

$$u(z, g, l) = z + Ag^\alpha - \frac{l^{1+1/\epsilon}}{\epsilon + 1}$$

If $A \in (0, A)$, $\exists!$ type 1 (min. coalition)
- Public good is too low and taxes too high.
Reminder, $A$ is the taste for public good:

$$u(z, g, l) = z + Ag^\alpha - \frac{l^{1+1/\epsilon}}{\epsilon + 1}$$

- If $A \in (0, A)$, $\exists!$ type 1 (min. coalition)
  - Public good is too low and taxes too high.
- If $A \in (\overline{A}, \infty)$, $\exists!$ type 2 (unanimity)
  - Equilibrium is efficient.
Equilibrium
Existence, uniqueness and efficiency

• Reminder, $A$ is the taste for public good:

\[
u(z, g, l) = z + Ag^\alpha - \frac{l^{1+1/\epsilon}}{\epsilon + 1}\]

• If $A \in (0, \underline{A})$, $\exists!$ type 1 (min. coalition)
  • Public good is too low and taxes too high.

• If $A \in (\underline{A}, \infty)$, $\exists!$ type 2 (unanimity)
  • Equilibrium is efficient.

• If $A \in (\underline{A}, \overline{A})$, $\exists$ one equilibrium of each type.
  • Type 2, efficient.
  • Type 3, tax and public good too low, but no pork barrel.
  • Type 1, tax and public good too low and pork barrel.
Outline

1. Introduction
2. The model
3. Social planner
4. Equilibrium
   • Definition
   • Policy proposals
   • Three types of equilibrium
   • Existence and uniqueness
5. Implications
6. Conclusions
Implications
When do we expect inefficiency?

Factors needed for inefficiency:
- Majoritarian rule
- Availability of distributive policies.
- Political uncertainty.
- Lack of commitment.

Political equilibrium is more likely to be inefficient when:
- Citizens are more impatient ($\delta$ low).
- Public goods are more expensive ($p$ high).
- Required majority is smaller ($q$ low).
- Private sector is more productive ($w$ high).
- Depreciation rate is sufficiently small.
- Elasticity of labor supply is low. (when taxes are more costly, they are less likely spent in pork).

Implications

When do we expect inefficiency?

- Factors needed for inefficiency:
  - Majoritarian rule
  - Availability of distributive policies.
  - Political uncertainty.
  - Lack of commitment.

- Political equilibrium is more likely to be inefficient when:
  - When citizens are more impatient ($\delta$ low).
  - Public goods are more expensive ($p$ high).
  - Required majority is smaller ($q$ low).
  - Private sector is more productive ($w$ high).
  - Depreciation rate is sufficiently small.
  - Elasticity of labor supply is low. (when taxes are more costly, they are less likely spent in pork).
Implications

Positive implications

Dynamics of legislative coalitions:

Consider $A < A$ and sufficiently low $g$. At the beginning decisions will be taken unanimously but quality and consensus of legislature decrease gradually.

Consider $A < A$ and sufficiently high $g$. A sudden increase in the value of public good (a war against a foreign enemy maybe) may lead to unanimity and efficiency.
Dynamics of legislative coalitions:

Consider $A < A$ and sufficiently low $g$. At the beginning decisions will be taken unanimously but quality and consensus of legislature decrease gradually.

Consider $A < A$ and sufficiently high $g$. A sudden increase in the value of public good (a war against a foreign enemy maybe) may lead to unanimity and efficiency.

Elasticity of labor supply.

Societies with a high elasticity of labor will have better quality governments.
**Conventional wisdom:** geographical districts will produce a government that is too large with levels of national public goods that are too low.
Conclusions

- **Conventional wisdom:** geographical districts will produce a government that is too large with levels of national public goods that are too low.

- **Yes:** when taxable capacity is large enough.

- **Yes:** when taxable capacity is small enough, legislative decisions will actually be efficient.

Besides, the distortions of a district legislature could lead to opposite results: legislators could be deterred. This leads to (relatively) small government with no pork-barrel.

Possible extension: government borrowing?

**Conclusions**

- **Conventional wisdom:** geographical districts will produce a government that is too large with levels of national public goods that are too low.
- **Yes:** when taxable capacity is large enough.
- **BUT:** when taxable capacity is small enough, legislative decisions will actually be efficient.
- **Besides:** the distortions of a district legislature could lead to opposite results: legislators could be deterred! This leads to (relatively) small government with no pork-barrel.
Conclusions

- **Conventional wisdom**: geographical districts will produce a government that is too large with levels of national public goods that are too low.
- **Yes**: when taxable capacity is large enough.
- **BUT**: when taxable capacity is small enough, legislative decisions will actually be efficient.
- **Besides**: the distortions of a district legislature could lead to opposite results: legislators could be deterred!. This leads to (relatively) small government with no pork-barrel.
- **Possible extension**: government borrowing?
Value function

- Value at round 1:

\[ v_1(g) = u(w(1 - r_1(g)), g) + \frac{B(r(g), x_1(g); g)}{n} + \delta v_1(x_1(g)) \]

- Chosen to propose \((1/n)\):

\[ u(w(1 - r_1(g)), g) + B(r(g), x_1(g); g) - (q - 1)s_1(g) \]

- Included in the coalition \( ((q - 1)/n) \):

\[ u(w(1 - r_1(g)), g) + s_1(g) \]

- Excluded

\[ u(w(1 - r_1(g)), g) \]

- Value if \( \tau \) proposal is rejected \((\tau + 1 \text{ will be approved})\):

\[ v_{\tau+1}(g) = u(w(1 - r_{\tau+1}(g)), g) + \frac{B(r_{\tau+1}(g), x_{\tau+1}(g); g)}{n} + \delta v_1(x_{\tau+1}(g)) \]