Public Debt and the Political Economy of Reforms

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Introduction

Two-period model of redistributive politics with a possible (reform) policy

Elements of first-period political platform (first-period action):

(1) Policy (all or nothing)
- up-front costs and (uncertain) future benefits
- a portion of benefits in the form of a private good with the remaining portion in the form of a public good

(2) Targeted redistribution

(3) Public debt

Political Platforms: More Details

- **Policy with future private and public good benefits:**

  Efficient: upfront costs with higher expected benefits in the future

  Nature of Policy benefits:

  - a portion of the benefits in the form of a private good and a portion in the form of a public good (i.e. cannot be taxed)

  Examples: reform of legal system that establishes the rule of law (La Porta et al., 2008; Besley and Persson, 2011; Acemoglu and Robinson, 2012)

  - private good: better enforcement of property rights increases GDP (Rodrik et al., 2004; Djankov et al., 2007)
  - public good: higher feeling of safety for citizens (Besley and Persson, 2011; Acemoglu and Robinson, 2012)

- **Targeted spending:** pork-barrel / tactical instrument

  Examples: spending on infrastructure, culture, etc. in particular geographical location (Gagliarducci et al., 2011; Funk and Gathmann, 2013)

Contributions

Methodological: Electoral competition between two politicians over public debt **and** reform

Substantive: Electoral incentives to reform shaped by interaction with choice of public debt.

This interaction depends on:

1. degree to which reform generates private/public good benefits
2. restrictions on use of public debt

Preview of Results (1/3)

Debt and the nature of policy's benefits

(1a) If the proportion of private good policy benefits is sufficiently high
$\implies$ policy implemented with certainty & higher public debt

(1b) If the proportion of public good policy benefits is sufficiently high
$\implies$ efficient policy not implemented with certainty & lower public debt

Preview of Results (2/3)

Constitutional limits on debt/spending

(2) Restrictive limits on debt unambiguously decrease the success of policies in the political process

   less targeted spending $\implies$ less efficient dynamic spending

(3) Debt limits less distortive than spending limits.

Preview of Results (3/3)

Empirical illustration of the importance of debt and targeted transfers in facilitating reforms in the form of public investment:

(4) Descriptive analysis of trends in levels of debt, public investment, and targeted transfers for a number of OECD countries since 1995: Tendency for public investment and targeted transfers to decline when debt levels rise.

> higher levels of "debt capacity" – measured as a distance between the level of debt in the previous period and its mean level of debt over the whole period – lead to above average levels of public investment and targeted spending.

(5) Debt limit policies reduce the ability for governments to implement reforms: stronger negative relationship between debt capacity and our two dependent variables of interest – public investment and targeted transfers – among Eurozone countries compared to the non-Eurozone states.

> Within Eurozone countries that faced a hard debt limit – defined as having a mean debt-to-GDP ratio above the 60% Maastricht Treaty ceiling during this period – have a stronger negative relationship between debt capacity and public investment and targeted transfers with respect to the countries with softer debt limit.

The Model: Electorate

Voters: continuum of mass 1.

- ex-ante homogeneous
- live for two-periods
- risk neutral w/discount factor $= 1$
- endowment: 1 unit of money per period which is perfectly divisible
- utility linear in private good and public good consumption

The Model: Political Process

Two candidates A and B:

- purely office-motivated
- maximize vote share
- same candidates in each period

In each period, each candidate announces a binding platform involving (1) [redistributive] transfers, where the first-period platform also involves:

(2) choice of whether to enact policy

(3) public debt level

The Model: Platforms

- If the policy is enacted in the first-period:

  c: first-period per-capita cost of policy

  e: second-period per-capita benefit of policy, distributed according to the probability mass function Γ_e with the finite set of possible (non-negative) values $\mathcal{E}$ where

  $$1 > E_{\Gamma_e}(e) - c > 0 \quad \& \quad 1 > c$$

  $(1 - \lambda)e$: pure public good benefits of the policy

  λe: private good benefits of the policy $\Rightarrow$ increase in targetable resources in second-period

- $c < 1 \implies$ policy can be financed out of first-period endowment

Feasible First-Period Platforms: Policy and Debt

- Let $\iota_i = 1$ if candidate i implements the policy, else $\iota_i = 0$
- Let $\beta_i \in [0, 1]$ denote the probability that candidate i implements the policy
- Let $\delta^i(e)$ denote level of debt proposed by candidate i conditional on whether she implements the policy and, if so, the policy state $e \in \mathcal{E}$
- Any debt raised in period 1, repaid in period 2
- International debt market with interest rate 0

Natural limits on debt:

- no policy: $\delta^i(\emptyset) \leq 1$
- with policy and state e: $\delta^i(e) \leq 1 + \lambda e$

Set of feasible policy and debt states $(e, \delta(e))$:

$$\mathcal{S}_{pd} = \{(e, \delta(e)) | e \in \mathcal{E} \cup \emptyset \ \& \ \delta(e) \in [-1 + \iota(e)c, 1 + \iota(e)\lambda e]\}.$$

Feasible First-Period Platforms: Transfers

Net Endowment: initial (per period) endowment of 1 unit of the private good net any taxes or transfers

First-Period

- Let $P_{i,1}$ denote the joint distribution of candidate i's first-period state-contingent net endowment offers
    - Set of univariate marginal distributions $\{F_{i,1}(x|e)\}_{e \in \mathcal{E} \cup \emptyset}$ where $F_{i,1}(x|e)$ denotes candidate i's cumulative distribution of first-period net endowment offers conditional on the policy state e

For all $e \in \mathcal{E} \cup \emptyset$, first-period budget constraint:

$$\int_0^{+\infty} x dF_{i,1}(x|e) \leq 1 + \delta_i(e) - \iota_i c; \tag{1}$$

Feasible Second-Period Platforms (Transfers)

Given the policy and debt state $(e, \delta(e)) \in \mathcal{S}_{pd}$, candidate i's second-period platform $p_2^i(e, \delta(e))$ consists of the choice of the conditional cumulative distribution function $F_{i,2}(\cdot | e, \delta(e))$.

Given the outcome of the first-period $(e, \delta(e)) \in \mathcal{S}_{pd}$, second-period budget constraint:

$$\int_0^{+\infty} x \, dF_{i,2}(x | e, \delta(e)) \leq 1 + \iota(e)\lambda e - \delta(e). \tag{2}$$

Timing of the game: Period 1

Three stages in Period 1:

Stage 1   Each vote-share maximizing candidate $i = \{A, B\}$ announces a first-period platform p_1^i.

Stage 2   Each voter observes each candidate i's realized policy position ι_i. If $\iota_i = 1$ [$\iota_i = 0$], then each voter observes:

(i) state-contingent debt levels $\{\delta_i(e)\}_{e \in \mathcal{E}}$ [$\delta_i(\emptyset)$] and
(ii) state-contingent net endowment offers $(\{x_{i,1}(e)\}_{e \in \mathcal{E}}$ [$x_{i,1}(\emptyset)$].

Each voter casts a first-period vote for the candidate that provides the higher first-period expected continuation utility, with ties broken by fair randomization. The candidate with the higher first-period vote share wins the first-period election.

Stage 3   The platform of the winner of the first-period election is implemented. If $\iota(e) = 1$, then the value of the policy benefit $e \in \mathcal{E}$ is observed, and the winning candidate's first-period state-contingent transfers are made.

Timing of the game: Period 2

Given the observable state of policy and debt $(e, \delta(e)) \in \mathcal{S}_{pd}$ from the first-period's political process, there are two stages in period 2:

Stage 1 Each candidate $i \in \{A, B\}$ announces a second-period platform $p_2^i(e, \delta(e))$.

Stage 2 Each voter observes, for each candidate i, a second-period net endowment offer $x_{i,2}(e, \delta(e))$ and then votes for the candidate that provides the higher second-period local utility, with ties broken by fair randomization. The candidate with the higher second-period vote share wins the second-period election.

Strategies

Note that a strategy, denoted $\{p_1^i, p_2^i\}$, consists of a first-period platform p_1^i and the complete set of candidate i's second-period platforms, denoted p_2^i, which specifies a second-period platform $p_2^i(e, \delta(e))$ for each possible realization of $(e, \delta(e)) \in \mathcal{S}_{pd}$.

Policy with private and public good benefits

Let $H = 2c - (1 + \lambda)E_{\Gamma_e}(e)$. Note that holding c and $E_{\Gamma_e}(e)$ constant,

- If the fraction λ of private policy benefits is sufficiently high, then $H \leq 0$
- If the fraction λ of private policy benefits is sufficiently low, then $H > 0$

Theorem 1

(I.) If $H \leq 0$, then in any subgame perfect equilibrium both candidates choose a first-period platform p_1^* that implements the policy with probability $\beta^* = 1$ and for each realization of the policy state $e \in \mathcal{E}$:

    (i) announce the maximum feasible debt: $\delta^*(e) = 1 + \lambda e$, and

    (ii) choose an $(|\mathcal{E}| + 1)$-variate joint distribution $P_1^*(\mathbf{x})$ of first-period net endowments such that the random variable $\widetilde{x}_1^{\Gamma_e}$ is uniformly distributed on the interval $[0, 4 + 2\lambda E_{\Gamma_e}(e) - 2c]$ and for each possible policy state e the random variable $\widetilde{x}_1^*(e)$ satisfies first-period budget balancing as defined in equation (1).

Theorem 1 (continued)

(II.) If $H > 0$, then in the unique subgame perfect equilibrium both candidates choose a first-period platform p_1^* that implements the policy with probability $\beta^* = 1 - \frac{1}{2}H(<1)$ and for each realization of the policy state $e \in \mathcal{E} \cup \emptyset$:

    (i) announce the maximum feasible debt: $\delta^*(e) = 1 + \iota(e)\lambda e$, and

    (ii) choose an $(|\mathcal{E}| + 1)$-variate joint distribution $P_{i,1}^*(\mathbf{x})$ of first-period net endowments such that:

$$F_1^*(x|e = \emptyset) = \begin{cases} 0, & \text{if } x \leq 0, \\ \frac{1}{2}\left(\frac{x}{H}\right), & \text{if } 0 \leq x \leq H, \\ \frac{1}{2}, & \text{if } H \leq x \leq 4 - H, \\ \frac{1}{2}\left(1 + \frac{x - 4 + H}{H}\right), & \text{if } 4 - H \leq x \leq 4, \\ 1, & \text{if } x \geq 4. \end{cases} \quad (3)$$

and for $e \neq \emptyset$, the random variable $\widetilde{x}_1^{\Gamma_e}$ is uniformly distributed on the interval $[0, 4 + 2\lambda E_{\Gamma_e}(e) - 2c]$ such that for each possible policy state e the random variable $\widetilde{x}_1^*(e)$ satisfies first-period budget balancing as defined in equation (1).

Theorem 1 (continued)

Second Period

Given any second-period state $(e, \delta(e)) \in \mathcal{S}_{pd}$, the unique subgame perfect second-period local equilibrium is for each candidate to choose the second-period platform $p_2^*(e, \delta(e))$ that uniformly distributes net endowments on the interval $[0, 2(1 + \iota(e)\lambda e - \delta(e))]$.

Along any equilibrium path, the equilibrium debt level is $\delta^*(e) = 1 + \iota(e)\lambda e$ and the equilibrium distribution of second-period net endowments is degenerate with all mass placed on the net endowment 0.

Intuition: Efficiency versus Targetability

$$\mathbf{E_{\Gamma_e}(e) - \lambda E_{\Gamma_e}(e)}$$

Part of policy benefits with **pure public-good character**

- each voter expects this additional utility in the future
- cannot be targeted

$$\mathbf{c - \lambda E_{\Gamma_e}(e)}$$

- additional resources a no-reform candidate has **to target in first period**

$H \leq 0 \implies \mathbf{E_{\Gamma_e}(e) - \lambda E_{\Gamma_e}(e) > 2(c - \lambda E_{\Gamma_e}(e))}$: Efficiency gain of policy ($E_{\Gamma_e}(e) > c$) outweighs having less resources for voter targeting today

$H > 0 \implies \mathbf{2(c - \lambda E_{\Gamma_e}(e)) > E_{\Gamma_e}(e) - \lambda E_{\Gamma_e}(e)}$: Targeting advantage of non-reformer outweighs efficiency gain of reforming with certainty

Implications

Low share of private good benefits:

- policies that are to high degree a pure public good
  $\rightarrow$ availability of public debt cannot ensure efficient policies
- trade-off: targeted spending versus efficient policy provision

High share of private good benefits:

- ability to raise debt for targeted spending ensures efficient policy provision

Take away message:

Debt-related targeted spending provides an incentive for efficient policy provision, especially when policy has high degree of private good benefits.

Debt limits? Spending limits?

Constitutional Limit on Debt

- Consider a debt limit $\overline{\delta} > 0$, and for all $e \in \mathcal{E} \cup \emptyset$, define
  $\widehat{\delta}^d(e) = \min\{\overline{\delta}, 1 + \iota(e)\lambda e\}$

- Assuming maximum feasible debt, let B_{NP}^d denote the first-period budget
  when the policy is not implemented and $B_P^d(e)$ denote the first-period
  budget when the policy is implemented and the policy state is $e \in \mathcal{E}$ where
  $B_P^d = E_{\Gamma_e}(B_P^d(e))$:

$$B_{NP}^d = 1 + \widehat{\delta}^d(\emptyset), \quad B_P^d(e) = 1 + \widehat{\delta}^d(e) - c, \quad \& \quad B_P^d = 1 + E_{\Gamma_e}(\widehat{\delta}^d(e)) - c. \tag{4}$$

- With a debt limit $\overline{\delta}$, the first-period budget constraint for a candidate i with
  the maximum feasible debt, $\widehat{\delta}^d(e)$ is, for all $e \in \mathcal{E} \cup \emptyset$:

$$\int_0^{+\infty} x dF_{i,1}(x|e) = E_{F_{i,1}|e}(x) \leq \iota_i B_P^d(e) + (1 - \iota_i)B_{NP}^d. \tag{5}$$

- Define $\widehat{H}^d \equiv 2B_{NP}^d - 2B_P^d - 1 - E_{\Gamma_e}(e - \widehat{\delta}^d(e))$.

Constitutional Limit on Debt

Theorem 2 (Summary)

  (I.) If $\widehat{H}^d \leq 0$, then in any subgame perfect equilibrium both candidates choose a first-period platform p_1^* that implements the policy with probability $\beta^* = 1$.

  (II.) If $\widehat{H}^d > 0$, then in the unique subgame perfect equilibrium both candidates choose a first-period platform p_1^* that implements the policy with probability $\beta^* = 1 - \frac{\widehat{H}^d}{B_{NP}^d}(< 1)$.

Intuition: **Debt limit $\downarrow$ similar to pure public good aspect $\uparrow$**

Constitutional Limit on Debt

Take away message:

- Equilibrium probability of implementing policy decreases as debt limit decreases

- Debt-related targeted spending provides an incentive for efficient policy provision, especially when policy has high degree of private good benefits.

Empirical regularities

- Reforms proxied by the OECD measure of public investment
- Targeted transfers proxied by OECD measure of government spending on housing and community amenities
- First analysis reveals a tendency for public investment and targeted transfers to decline when debt levels rise: : particularly the cases for countries that saw a spike of debt after the 2008 crisis (US, UK, Ireland, Portugal, Spain) and to a lesser extend for countries that did not see such sharp increase (Norway, Sweden, Germany)

- Considering a country's "capacity" to go into debt rather than its level of debt directly: how far debt and investment/spending levels are relative to the country's mean levels over the entire period ("de-meaning").

- Assume that a country which sat below its mean level of debt in the previous period (i.e. a country with high debt capacity) has a greater ability to draw upon debt for reform purposes in the existing period. In such cases, we expect to observe higher levels of public investment and targeted spending than when the country's lagged debt level is below its average.
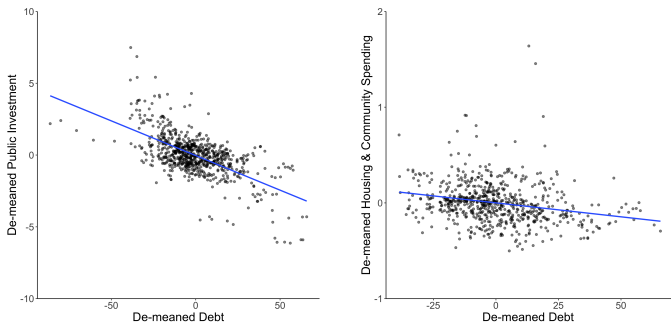
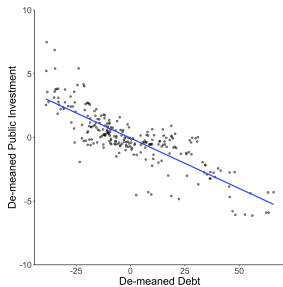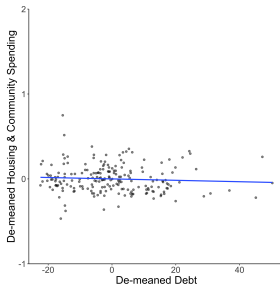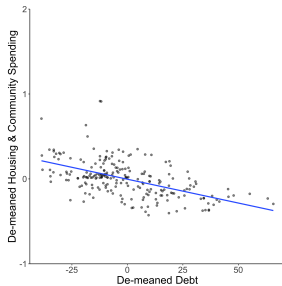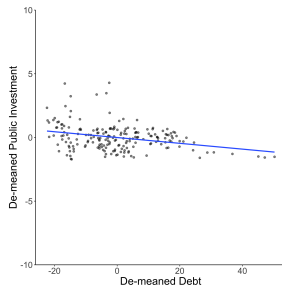Figure: Relationship between debt and reforms
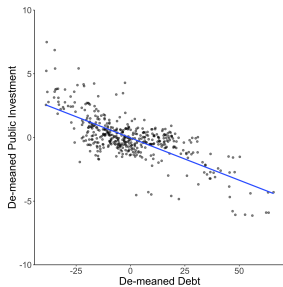
Eurozone   **Non-Eurozone**
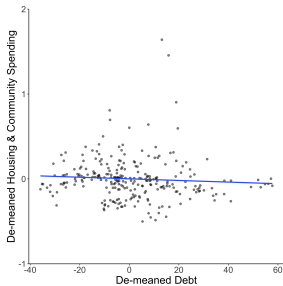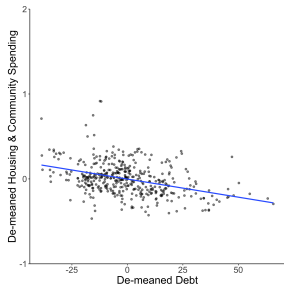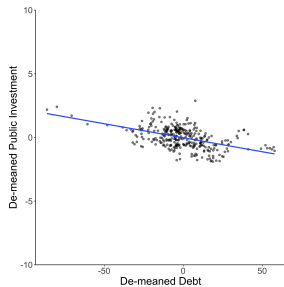
Hard Debt Limit

Soft Debt Limit

Concluding remarks

Equilibrium involves (policy benefit) state-contingent redistribution with an endogenous correlation structure of offers across states

(1a) If the proportion of private good policy benefits is sufficiently high $\implies$ policy implemented with certainty & higher public debt

(1b) If the proportion of public good policy benefits is sufficiently high $\implies$ efficient policy not implemented with certainty & lower public debt

Constitutional limit on public debt

(2) Restrictive limits on debt unambiguously decrease the success of policies in the political process

- less targeted spending $\implies$ less efficient dynamic spending

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