On the privatization of public debt

Very preliminary and incomplete

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Motivation

- Many governments have had, have and will have high debt
- Usually high debt is associated with high distortionary taxes
- Examples
Debt and Distortions in Japan

Average Wage Tax Rate

Debt to GDP Ratio

Year

Percent

1975
1980
1985
1990
1995
2000
2005
Motivation

- High distortionary taxes involve efficiency loss
- Can debt be reduced without efficiency losses?
- Yes, if lump-sum taxes are used to pay-off debt
- But lump-sum taxation may not politically viable (some agents prefer distortionary taxes)
• The government offers a private contract to each citizen
• Upfront payment from the latter used to pay-off government debt against a reduction of future tax rates
• Pricing trades off participation (distortion reduction) v/s revenue
• The buyers faces less distortions. Since participation is voluntary it is also Pareto improving (abstracting from GE effects).
• Under perfect information on agents’ abilities and complete markets equivalent to lump-sum taxation

• Under private information voluntary only uniform lump-sum taxation is feasible and that would violate the Paretian criterium

• In principle, our scheme not necessarily related to debt-optimal taxation literature

• In practice, we see it as a politically viable tool to reduce debt, particularly when high debt is associated with further welfare costs
Outline

• Debt privatization in a perfect information economy
• Debt privatization in a private information economy
• Quantitative results
• Further Research
Perfect information economy

- Small open economy: agents freely borrow/lend at fixed real rate $r$, no individual nor aggregate uncertainty, all info is public.
- Continuum of consumers characterized by ability $A$ and initial wealth $W$, fixed for the purpose of this talk
  - A consumer of ability $A$ supplies $Al$ units of labor by putting effort $l$
  - $F(A)$ is the distribution over ability
  - Standard period utility identical across consumers $u(c, l)$
  - CRS technology for transforming labor into output
Stationary equilibria

- Government has constant expenditures $g$, initial debt $b$, levies linear earnings taxes $\tau Al$.
- Labor supply
  \[ l = L(rW, A, \tau) \]
- Consumption
  \[ c = rW + (1 - \tau)Al \]
- Government budget constraint
  \[ rb + g = \int \tau L(rW, A, \tau) dF(A) \]
The debt privatization contract

- The government offers each individual to buy $\delta \leq \bar{\delta}$ in permanent reduction in earnings tax rate $\tau$ by paying a fixed amount $d(A, \delta)$
- $\bar{\delta}$ can be set to offset taxation related to debt services
- Given $d(A, \delta)$, each agent chooses the $\delta$ that maximizes utility: FOC
  \[
  \frac{\partial u}{\partial \delta} = \left( -r \frac{\partial d^*}{\partial \delta} + Al \right) \frac{\partial u}{\partial c} = 0
  \]
- Implicitly defines a $\delta(A, d)$
• The gov. chooses the pricing schedule that ensures revenue neutrality for every $A, \delta$ i.e.

\[ rd(A, W, \delta) = \]

\[ \tau AL(rW, A, \tau) - (\tau - \delta) AL(r(W - d), A, \tau - \delta) \]

Tax revenues before contract \hspace{1cm} Tax revenues after contract

• In doing so, it takes into account the agents’ choices $\delta(A, d)$, $L(rW, A, \tau)$
If labor supply is non-decreasing in ability and non-increasing in wealth:

- the previous equation uniquely defines a \( d(A, \delta) \) schedule
- \( d(A, \delta) \) is increasing in \( A \) and \( \delta \)
- Each agent will buy the maximum possible reduction in tax rates, i.e. \( \delta = \bar{\delta} \)
- The contract yields an allocation that Pareto dominates the initial stationary equilibrium
- The contract reduces the debt by an amount \( \int d(A, \delta) dF(A) \)
Private information

• With perfect info equivalent lump-sumize a fraction of distortionary taxes.

• If abilities not perfectly observable, lump-sum taxation not Pareto improving: the government does not know agents future tax liabilities.

• The contract allows, through self-selection, (partial) lump-sumization and Pareto improvement.

• Problem of adverse selection: high ability agents will buy the contract. Potentially disruptive for public finances
Private information, II

- The gov. knows the distribution of abilities in the population and offers a function $d(\delta)$
- The function does not depend on $A$.
- Given $d(\delta)$ an agent of ability $A$ chooses $\delta(A)$ as before.
- The balanced budget requirement is

$$\int_A r d(\delta(A))dF(A) = \int_A \tau A l(A, W, \tau) - (\tau - \delta(A)) A l(A, W - d, \tau - \delta)dF(A)$$

On the privatization of public debt
Results

- Solution in general not unique. In this case, an objective function of the gov. is needed to pin down $d(\delta)$.

- If the pricing function $d(\delta)$ is allowed to be non linear then the contract can implement a large class of tax schedules (Basically all the tax schedules who yield allocations which Pareto dominate the current)
Some quantitative analysis

- Linear contract: $d = p\delta$
- The first order condition w.r.t $\delta$ becomes
  \[
  \frac{\partial u}{\partial \delta} = (-rp + Al) \frac{\partial u}{\partial c}
  \]
- Simple solution: either $\delta = 0$ (Low ability agents), or $\delta = \bar{\delta}$ (High ability agents)
- Fix $\delta$; for each $d$, there is a cutoff value $\tilde{A}(d)$ of ability above which participation is optimal
• Government problem: choose a \((d, \delta)\) schedule such that revenues and losses from those that buy the contract are equalized on average:

\[
rd(1 - F(\tilde{A})) = \int_{A \geq \tilde{A}(d)} \tau Al(A, W, \tau) - (\tau - \delta(A)) Al(A, W - d, \tau - \delta) dF(A)dF(A)
\]

• The (flow) return from the contract’s revenues must be equal to the average losses on tax revenues of those who buy the contract.
Graph showing the price of a 5% permanent tax reduction (in Average GDP). The x-axis represents the price of the tax reduction, while the y-axis represents government losses. The graph indicates a decrease in government losses as the price of the tax reduction increases.
Fraction of Buyers

Price of a 5% permanent tax reduction (in Average GDP)
Numerical results

- Benchmark case: assume a lognormal distribution for abilities and quasilinear utility

\[ u(c, l) = \frac{(c - \phi l^\nu)^{1-\sigma}}{1 - \sigma} \]
Numerical results

Comparative static with respect to variance, elasticity of labor supply, tax reduction, preferences

\[ u(c, l) = \log(c) + \phi \frac{1}{1 - \gamma} l^{1-\gamma} \]

- Choose the mean of the lognormal so that output is 1, \( \phi \) so that time to work is .3, \( \tau = .4, r = .04 \)

- Crucial issue is the variance of \( l \). With quasi linear is proportional to the variance of abilities (where the elasticity is the factor of proportionality). With classic preferences is constant.
<table>
<thead>
<tr>
<th>Tax reduction</th>
<th>% buyers</th>
<th>$\Delta b/y$</th>
<th>d/y</th>
<th>$%\Delta l$</th>
<th>$%\Delta y$</th>
<th>$%\Delta c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2%</td>
<td>74%</td>
<td>37%</td>
<td>0.50</td>
<td>1.2</td>
<td>1.3</td>
<td>1.8</td>
</tr>
<tr>
<td>5%</td>
<td>73%</td>
<td>96%</td>
<td>1.32</td>
<td>2.8</td>
<td>3.2</td>
<td>4.5</td>
</tr>
<tr>
<td>10%</td>
<td>72%</td>
<td>198%</td>
<td>2.77</td>
<td>5.5</td>
<td>6.2</td>
<td>8.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labor$S$ Elasticity</th>
<th>% buyers</th>
<th>$\Delta b/y$</th>
<th>d/y</th>
<th>$%\Delta l$</th>
<th>$%\Delta y$</th>
<th>$%\Delta c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td>19%</td>
<td>50%</td>
<td>2.59</td>
<td>0.3</td>
<td>0.6</td>
<td>0.9</td>
</tr>
<tr>
<td>0.5</td>
<td>73%</td>
<td>96%</td>
<td>1.32</td>
<td>2.8</td>
<td>3.2</td>
<td>4.5</td>
</tr>
<tr>
<td>1.0</td>
<td>91%</td>
<td>93%</td>
<td>1.02</td>
<td>6.8</td>
<td>7.0</td>
<td>9.2</td>
</tr>
</tbody>
</table>

On the privatization of public debt
Max tax rate reduction 5%, Labor Supply Elasticity 0.5

<table>
<thead>
<tr>
<th>Earnings Variance</th>
<th>% buyers</th>
<th>∆b/y</th>
<th>d/y</th>
<th>%Δl</th>
<th>%Δy</th>
<th>%Δc</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>83%</td>
<td>100%</td>
<td>1.2</td>
<td>3.1</td>
<td>3.3</td>
<td>4.6</td>
</tr>
<tr>
<td>0.4</td>
<td>73%</td>
<td>96%</td>
<td>1.32</td>
<td>2.8</td>
<td>3.2</td>
<td>4.5</td>
</tr>
<tr>
<td>0.5</td>
<td>64%</td>
<td>92%</td>
<td>1.44</td>
<td>2.6</td>
<td>3.1</td>
<td>4.4</td>
</tr>
</tbody>
</table>

Changing preferences

<table>
<thead>
<tr>
<th></th>
<th>% buyers</th>
<th>∆b/y</th>
<th>d/y</th>
<th>%Δl</th>
<th>%Δy</th>
<th>%Δc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quasi-linear</td>
<td>74%</td>
<td>96%</td>
<td>1.32</td>
<td>2.8</td>
<td>3.2</td>
<td>4.5</td>
</tr>
<tr>
<td>Classic</td>
<td>11%</td>
<td>20%</td>
<td>2.00</td>
<td>0.4</td>
<td>0.5</td>
<td>0.7</td>
</tr>
</tbody>
</table>
- Enlarge the information set of the gov.: it knows the percentile of the ability distribution an agent belongs to. Then, it can offer to each percentile a specific contract. Result:

The role of information: baseline parameters

<table>
<thead>
<tr>
<th>Govt. Information</th>
<th>% buyers</th>
<th>$\Delta b/y$</th>
<th>$%\Delta l$</th>
<th>$%\Delta y$</th>
<th>$%\Delta c$</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Info</td>
<td>73</td>
<td>96%</td>
<td>2.8</td>
<td>3.2</td>
<td>4.6</td>
</tr>
<tr>
<td>1 Median</td>
<td>97</td>
<td>103.4%</td>
<td>3.4</td>
<td>3.4</td>
<td>4.9</td>
</tr>
<tr>
<td>5 Quintiles</td>
<td>99.6</td>
<td>103.8%</td>
<td>3.5</td>
<td>3.5</td>
<td>5.0</td>
</tr>
<tr>
<td>10 Deciles</td>
<td>99.9</td>
<td>104%</td>
<td>3.5</td>
<td>3.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Full Info</td>
<td>100</td>
<td>104%</td>
<td>3.5</td>
<td>3.5</td>
<td>5.0</td>
</tr>
</tbody>
</table>

- Less distributional consequences but

- Problem of time inconsistency: once-for-all instrument?
In a standard Mirrlees economy, we can show (under some conditions) that the contract can turn an economy with proportional (suboptimal) taxation into the Pareto-efficient allocation.

Idea: 1) for each agent, compute the reduction in tax rates that takes her to the optimal marginal tax rate $\delta$. 2) Compute the pricing function $d(\delta)$ that induces her to purchase that very quantity of tax reduction. The optimal pricing function is convex: High ability agents will buy more and pay more than proportionally.

From a policy perspective, these results suggest careful choice of the pricing function is key for implementing the contract.
Why not make it a permanent option?

In French public finance this has been proposed.

Two problems.

If the pricing of the contract depends on something that can be affected then it loses its non distortionary flavor

Even if it is not the case there is a time inconsistency from the governemt side. By making it easire to escape large debt it may make them more likely
Conclusion

- In theory our contract is a fairly simple way of reducing distortions.
- Simple quantitative work indicate that it is also quantitatively effective
- More work is needed (Life-cycle, Liquidity constraints)