Lessons from the New Dynamic Public Finance

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• Mirrlees (1971) proposed a systematic way to think about optimal taxation.

• People in the world face *skill* risk.

• Some are born with the ability to generate income with relatively little effort. Others are not.
• Why don’t societies perfectly insure their members against these major risks?

• Mirrlees’ answer: skills are often private information.

• A high-skilled person can choose to act like a low-skilled person, without being detected.

• If skills are private information, tax system has to provide high-skilled people incentives to provide effort.

• A good tax system efficiently trades off incentives and insurance.
• Mirrlees characterizes the resulting optimal tax system in a static setting.

• Optimal tax system implements an optimal allocation ....

• Among those that are both feasible AND incentive-compatible.

• Taxes are a (possibly complicated) nonlinear function of incomes.
The recent **new dynamic public finance** expands the analysis to dynamic setting.

Over time, some lose their ability to generate income.

Others become more skilled.

These changes in skills can be hard to detect.

NDPF asks:

What does the optimal tax schedule look like, when hidden skills evolve stochastically over time?
• In this talk, I describe three lessons from this new literature.

• Important: the lessons emerge from a general class of models.
  – no restriction on intertemporal evolution of skills.
  – arbitrary intertemporal nonseparabilities in preferences.
I. All incentives can be provided via social security.

  - Grochulski and Kocherlakota (2007, working paper)

II. Optimal asset taxes are non-zero.

- Diamond and Mirrlees (1978, J. Pub. Econ.)
  - Rogerson (1985, Ecta.)
  - Golosov, Kocherlakota, and Tsyvinski (2003, RES)

III. Optimal taxes on period $t$ assetholdings depend on future labor incomes.

- Albanesi and Sleet (2006, RES)
  - Golosov and Tsyvinski (2006, JPE)
  - Grochulski and Kocherlakota (2007, working paper)
1. Model

• Unit measure of agents in $T$-period economy.

• Agents can work through period $S < T$, but consume through period $T$.

• Preferences are given by the expectation of:

$$V(U(c_1, c_2, ..., c_T), l_1, ...l_S)$$

where $U$ maps into the real line.

• **Weak separability** between $c$ (consumptions) and $l$ (efforts, not hours).
Probability Structure

- Aggregate public shocks \((z)\) and idiosyncratic private shocks \((\theta)\).

- Let \(Z\) and \(\Theta\) be two finite positive sets.

- Before period 1: \(z^S\) is drawn from \(Z^S\) according to pdf \(\pi_Z\).

- \(z^S\) is the lifetime sequence of aggregate shocks that affect the economy.
• Conditional on \( z^S \), Nature draws \( \theta^S \) from \( \Theta^S \) for each agent.

  – lifetime sequence of idiosyncratic shocks for each agent.

• Conditional on \( z^S \), these draws have pdf \( \pi_{\Theta}(\cdot|z^S) \) over \( \Theta^S \).

• Conditional on \( z^S \), draws are independent across agents.

• Restriction: all information about future public shocks is public.

  – That is: \( \theta^t \) and \( (z^{T\_t+1}) \) are independent, conditional on \( z^t \).
• Draws take place before period 1.

• BUT: information is revealed only slowly over time.

• At date $t$, all agents learn $z_t$ and each privately learns own $\theta_t$.

• LLN: fraction of agents with draw $\theta^S$ equals $\pi_\Theta(\theta^S | z^S)$. 
Hidden Productivity

- Suppose agent with draw $\theta_t$ in period $t$ works $l_t$.

- He can generate $y_t = \phi(\theta_t, z_t) l_t$ units of output.

- His output $y_t$ is observable to others, as is $z_t$.

- But neither $\theta_t$ nor $l_t$ (effort) is.
Feasible Allocations

• An allocation specifies individual $c$ and $y$ as a function of shock histories.

• Assume small open economy with interest rate $R$.

• Then, an allocation $(c, y)$ is feasible if it satisfies:

$$
\sum_{\theta^S \in \Theta^S} \sum_{t=1}^{T} R^{-t} [c_t(\theta^t, z^t) \pi(\theta^t | z^t) + G_t(z^t)]
\leq \sum_{\theta^S \in \Theta^S} \sum_{t=1}^{T} R^{-t} y_t(\theta^t, z^t) \pi(\theta^t | z^t), \text{ for all } z^T.
$$

• Here, $G_t$ is government purchases at date $t$. 
Incentive Compatibility

• Informational constraints imply that achievable allocations must be also be incentive-compatible.

• We find the incentive-compatible allocations using the revelation principle.

• Fix an allocation \((c, y)\). Each period, agents report their \(\theta\) realization to a planner.

• Planner gives the agent \((c, y)\) based on his current and past reports.

• The incentive-compatible allocations \((c, y)\) are the ones that induce agents to report the truth.
• An allocation that is both incentive-compatible and feasible is said to be incentive-feasible.

• An optimal allocation is the incentive-feasible allocation that provides maximal ex-ante utility to agents.

• But results can be generalized to allow for any initial weighting of agents.
Generality

• No restrictions on time-series behavior of shocks.

• No intertemporal separabilities in preferences.
  – as in Grochulski-Kocherlakota (2007).
Lack of Generality

- Preferences are weakly separable between $c$ and $l$.

- No private information about aggregate shocks.
2. The Three Lessons

- At each date:
  - agents produce output.
  - buy and sell $z^t$-contingent claims to consumption.
  - pay taxes.

- Taxes are a function of:
  - current and past outputs.
  - current and past asset incomes.

- Question: What kinds of tax systems implement optimal allocations as equilibria?
LESSON 1

All incentives can be provided via a social security system.
• Suppose agents can trade a complete set of $z^t$-contingent claims.

• Then: we have an individual-level version of Ricardian equivalence.

• Consider any two tax systems that:
  – specify the same present value of taxes for all output histories
  – specify the same after-tax rates of return on financial assets

• Then: agents make the same choices.

• Tax systems lead to the same equilibrium outcomes.
• Suppose a tax system $\tau$ is optimal.

• Individual-level Ricardian equivalence says the timing of taxes can be changed.

• In particular: we can roll forward taxes to create a system $\tau'$:
  
  – Before retirement: there are linear taxes
  – After retirement: constant transfers over time.
  – The post-retirement transfers depend on full history of outputs.

• But this new system is exactly a social security system.
LESSON 2

*It is suboptimal to set asset taxes to zero.*
• Consider a two period example.

• No risk in period 1; two equally likely skills in period 2.

• Suppose preferences are additively separable.

• Suppose there are no asset taxes, but \( y_H > y_L \).

• Then:

\[
u'(c_1) = R\beta u'(c_H)/2 + R\beta u'(c_L)/2
\]

\[
c_H > c_L
\]
• We can improve this tax system as follows.

• Increases period 2 labor taxes on $H$ by $\varepsilon_H$ and on $L$ by $\varepsilon_L$.

• We want to be sure that doing so does not change labor supply.

• So: we pick $\varepsilon_H$ and $\varepsilon_L$ so that $u(c_H)$ and $u(c_L)$ fall by same amount.
  
  – Key: $u$ is concave, and so $\varepsilon_H > \varepsilon_L$.

• Then lower period 1 labor taxes by $R^{-1}[\varepsilon_H/2 + \varepsilon_L/2]$. 
• We’ve tilted consumption toward period 1.

• So, now the agent will want to save into period 2.

• To deter savings: we need to tax his assets in some way.
• We’ve changed both labor income taxes and asset taxes.

• We’ve improved insurance in period 2 because $\varepsilon_H > \varepsilon_L$.

• We’ve worsened consumption-smoothing because there’s an asset tax.

• The gain is first-order, and the loss is second-order.

• The agent is made better off.

• But to get this gain: we need an asset tax of some kind.
• This basic argument operates very generally.

• Incentive problems in period \((t + 1)\) generate limited insurance in period \((t + 1)\).

• By introducing taxes on period \((t + 1)\) asset income ....

• ... society can provide better insurance in period \((t + 1)\) ...

• without affecting incentives in that period.
LESSON 3

Optimal taxes on period \( t \) assetholdings depend on period \((t+s)\) labor income, \( s > 0 \).
• If \((c^*, y^*)\) is to be an equilibrium, it must satisfy the optimality condition:

\[
E\{MU_t(\theta^S)|\theta^t\} = R(1 - \tau^W_{t+1})E\{MU_{t+1}(\theta^S)|\theta^t\}
\]

• Here, \(MU_t\) is the marginal utility of period \(t\) consumption.
  
  – depends on \(\theta^S\) because of intertemporal nonseparabilities.

• \(\tau^W_{t+1}\) is the marginal tax rate on wealth in period \((t + 1)\).

• At this point: \(\tau^W_{t+1}\) depends only on \(\theta^t\).
• But: this f.o.c. depends on the probabilities underlying the expectation.

• The agent basically *controls* these probabilities through his reports to the planner.
  
  – that is, through his work decisions at each date.

• Optimal taxes must ensure that the agent’s asset strategy is optimal for *any* reporting strategy.
• We need to set the marginal tax rate so that:

\[ E\{MU_t(\theta^S)|\theta^t\} = R(1 - \tau_{t+1}^W)E\{MU_{t+1}(\theta^S)|\theta^t\} \]

for any choice of probabilities that underlie the expectation operator.

• This means that for all \( \theta^S \):

\[ MU_t(\theta^S) = R(1 - \tau_{t+1}^W)MU_{t+1}(\theta^S) \]

• The marginal tax rate \( \tau_{t+1}^W \) depends on \( \theta^S \), not just \( \theta^t \).
• How does this tax system work?

• Record all asset transactions over working life.

• Then, levy taxes on those past transactions at retirement date \( S \).
  
  – these tax rates can then depend on whole history of labor income
3. Conclusions

- Skills evolve over time, in ways that are often hard to observe.

- Society needs to insure its members against these changes ....

- ... while still providing good incentives for labor supply.
• I have stressed some basic points about how to do so.

• Labor taxes can be simple, except at retirement date.

• But good social insurance requires sophisticated asset taxes.