EXHIBIT I: The Tax Exporting/Grants-Shifting Game

The tax exporting and/or grants-shifting game is a special case of a prisoners' dilemma game in which the local or state government -- more generally, the subordinate division in an organization's hierarchy -- can either choose an action ó ("shift") which provides benefits to its citizens while shifting a fraction of the costs of those benefits to the citizens of all other subnational governments or the action ã ("no shift") which provides the benefits without shifting any of the associated costs. If all subnational governments adopt the strategy of no-shifting, then each of their citizens receives a pay-off of Ðãã. (For simplicity, but without loss of generality, I assume all governments are identical.) If, however, all subnational governments adopt the strategy of shifting, then the citizens of each subnational government receives a pay-off of Ðóó. If one government adopts the strategy ã of no-shifting, but all others choose ó and export their taxes or shift their costs, then the pay-off to the citizens of the "honest" no-shifting government will be Ðãó, while the citizens in a typical government adopting the shifting strategy will receive Ðó‹ã. Conversely, if one government adopts the shifting strategy ó, and all others adopt the honest no-shifting strategy ã, then the citizens of the shifting government receives Ðóã and the citizens of a typical no-shifting government receives Ðã‹ó.

The game presents each subnational government with the following pay-off matrix (with the local government's pay-offs reported first):

		All Other Subnational Governments	
		Do Not Shift (ã)	Shift (ó)
One Local Government	Does Not Shift (ã)	Ðãã; Ðãã	Ðãó; Ðó‹ã
	Does Shift (ó)	Ðóã; Ðã‹ó	Ðóó; Ðóó

For the game to qualify as a prisoners' dilemma game, the pay-offs for each local government must follow the sequence:

$$Ðóã > Ðãã > Ðóó > Ðãó.^{1}$$

In words, each local government will most prefer to tax export and/or grants-shift (ó) and have all other local governments pay for their own services from own fiscal resources. If that outcome cannot occur, then all local governments agreeing to not export or grants-shift is preferred. Having all governments adopt the shifting strategy is each government's third best outcome. In last place is the outcome from the naive strategy of not cost-shifting while all other governments do.

With this ordering of outcomes, each local government prefers the tax exporting/pork barrel cost shifting strategy knowing that all other local governments also prefer that strategy. The outcome of the game is all governments adopting the cost shifting strategy and receiving the socially inefficient pay-off of Ðóó.

EXHIBIT II: The Deficit-Shifting/Fiscal Bailout Game

[1] The other pay-offs in the matrix, Ðó‹ã and Ðã‹ó, are the pay-offs to other governments and are not relevant to each individual government making its own choices. To rule out a randomized strategy as preferred, we also require that $Ðãã > [Ðóã + Ðãó]/2$.

The deficit-shifting/fiscal bailout game is a special case of a sequential game in which the local or state government -- more generally, the subordinate division in an organization's hierarchy -- adopts an action Ä ("unfunded deficit") which provides benefits to the Local Government of B^l (> 0) and benefits to Central Government -- more generally, the center in an organization's hierarchy -- of B^c (≥ or ≤ 0). Following the adoption of action Ä, the Central Government responds by adopting either an action â ("bailout") or an action ç ("no bailout"). If action â is chosen by the Central Government it costs the Center $C_â^c$ (> 0) and the Local Government $C_â^l$ (≥ 0), while if action ç is selected then the Central Government bears a cost of $C_ç^c$ (> 0) and the Local Government $C_ç^l$ (≥ 0). If the Local Government chooses to not adopt action Ä, then the Status Quo remains in place and the Local and Central Governments receive the pay-offs in the status quo, Q^l and Q^c respectively.

This sequential game therefore has the following payoff structure:

CURRENT PERIOD:	Local Government Adopts Action:		
	Ä	OR	Status Quo
FUTURE PERIOD:	Center Adopts Action:		Center Adopts Action:
	â	OR	ç Status Quo
	PAYOFFS		
Center:	$B^c - C_â^c$	$B^c - C_ç^c$	Q^c
Local:	$B^l - C_â^l$	$B^l - C_ç^l$	Q^l

This sequential game becomes the debt-shifting/fiscal bailout game when the Local Government prefers action Ä, the Central Government prefers action â given that the Local Government has chosen Ä, and together these actions reduce aggregate social welfare measured by the combined net benefits to the citizens of the Local and Central Governments. For this to be the case, three restrictions on the values of benefits and costs must apply:

CONDITION 1: Central Government prefers â, given Ä.

$$B^c - C_â^c > B^c - C_ç^c, \text{ or:}$$

$$C_ç^c > C_â^c.$$

CONDITION 2: Local Government prefers Ä, given â, but would prefer the Status Quo, given ç.

CONDITION 2a: $B^l - C_â^l > Q^l$;

CONDITION 2b: $B^l - C_ç^l \leq Q^l$.

CONDITION 3: Aggregate Inefficiency.

$$[B^c - C_â^c] + [B^l - C_â^l] < Q^c + Q^l.$$

In words, the Local Government (i.e., division) adopts an action Ä which is beneficial to its residents (i.e. employees), but which prompts a second-best â response from the Central Government (i.e., center) which is damaging to the country (i.e., organization) as a whole. The problem arises because the Central Government bears a large cost if it does not respond with â (Condition 1), and knowing this, the Local Government prefers the privately beneficial (Condition 2) but socially inefficient (Condition 3) strategy Ä.

EXHIBIT III: Institutions for Enforcing the Hard Budget Constraint

CONSTITUTIONAL RULES

To Control Tax-Exporting and "Pork-Barrel" Spending

1. Assignment of Resident-Based Taxation Only to Local Governments
2. Assignment of Low-Spillover Public Services Only to Local Governments

To Control Deficit Financing of Current Expenditures

1. *NO* Constitutional Guarantee for Local Debt Repayment
2. Assignment of Resident-Based Taxation Only to Local Governments
3. Assignment of Poverty Expenditures to National Government
4. Many Local/Provincial Governments, Consistent with Production Efficiency
5. Portfolio Restrictions to Require Diversified Holding of Local Debts
6. Bankruptcy Code with Required Co-Pay, Penalties, and Oversight
7. Balanced Budget Rules Requiring Ex Post Accounting

INSTITUTIONS FOR ENFORCEMENT

Constitutionally Established Institutions

1. Independent Court or Oversight Authority
2. Presidential Veto

Politically Established Institutions

1. Strong Political Parties with Focus on Economic Efficiency
2. Strong President with Focus on Economic Efficiency