Topics on Fiscal Federalism
Lecture 1: Soft budget constraints and bailouts in federations

M. Besfamille

Pontificia Universidad Católica de Chile

CES Lectures, Ludwig-Maximilians-Universität, Munich.
January - February, 2019

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment
  - Goodspeed (2002), Wildasin (1997), Crivelli and Staal (2013).

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment
  - Goodspeed (2002), Wildasin (1997), Crivelli and Staal (2013).
  - Qian and Roland (1998).

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment
  - Goodspeed (2002), Wildasin (1997), Crivelli and Staal (2013).
  - Qian and Roland (1998).
- Besfamille and Lockwood (2008)

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment
  - Goodspeed (2002), Wildasin (1997), Crivelli and Staal (2013).
  - Qian and Roland (1998).
- Besfamille and Lockwood (2008)
  - The basic model.

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment
  - Goodspeed (2002), Wildasin (1997), Crivelli and Staal (2013).
  - Qian and Roland (1998).
- Besfamille and Lockwood (2008)
  - The basic model.
  - Extension I

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment
  - Goodspeed (2002), Wildasin (1997), Crivelli and Staal (2013).
  - Qian and Roland (1998).
- Besfamille and Lockwood (2008)
  - The basic model.
  - Extension I
  - Extension II

Outline of the Lecture

- Brief outline of the literature on intergovernmental transfers with commitment
- Literature on intergovernmental transfers without commitment
  - Goodspeed (2002), Wildasin (1997), Crivelli and Staal (2013).
  - Qian and Roland (1998).
- Besfamille and Lockwood (2008)
  - The basic model.
  - Extension I
  - Extension II
- Conclusions

Intergovernmental transfers with commitment

- Federal government (FG) designs a grant, taking into account the reaction of a subnational government (SNG).

Intergovernmental transfers with commitment

- Federal government (FG) designs a grant, taking into account the reaction of a subnational government (SNG).
- Implicit assumption: the FG can commit to its grant policy.

Intergovernmental transfers with commitment

- Theory of grants under full information

Intergovernmental transfers with commitment

- Theory of grants under full information
  - Scott (1952), Wilde (1968): response of a SNG in isolation.

Intergovernmental transfers with commitment

- Theory of grants under full information
  - Scott (1952), Wilde (1968): response of a SNG in isolation.
  - Boadwayd and Flatters (1982): optimal equalization system of grants, with mobile capital and population in a federation.

Intergovernmental transfers with commitment

- Theory of grants under full information
  - Scott (1952), Wilde (1968): response of a SNG in isolation.
  - Boadwayd and Flatters (1982): optimal equalization system of grants, with mobile capital and population in a federation.
  - Barrow (1986): first game-theoretic model of how SNG react to a given system of intergovernmental transfers, taking into account the strategic interaction of all SNG's.

Intergovernmental transfers with commitment

- Transition to a modern approach

Intergovernmental transfers with commitment

- Transition to a modern approach
- King (1984) "(...) in practice, it may need a lengthy trial and error process to fix grant levels at their efficient level"

Intergovernmental transfers with commitment

- Modern approach: asymmetric information.

Intergovernmental transfers with commitment

- Modern approach: asymmetric information.
  - Important assumption: perfect commitment to be able to use the “Revelation Principle”

Intergovernmental transfers with commitment

- Modern approach: asymmetric information.
  - Important assumption: perfect commitment to be able to use the "Revelation Principle"
- Levaggi (1991): first Principal-Agent model of optimal intergovernmental grants under asymmetric information.

Intergovernmental transfers with commitment

- Modern approach: asymmetric information.
  - Important assumption: perfect commitment to be able to use the "Revelation Principle"
- Levaggi (1991): first Principal-Agent model of optimal intergovernmental grants under asymmetric information.
- Large literature on the optimal design of intergovernmental transfers under asymmetric information: Levaggi and Smith (1994), Cremer, Marchand and Pestieau (1996), Bucovetsky, Marchand and Pestieau (1998), Lockwood (1999), Boadway et al. (1999), Cornes and Silva (2002), Besfamille (2004).

Intergovernmental transfers with commitment

- Modern approach: asymmetric information.
  - Important assumption: perfect commitment to be able to use the "Revelation Principle"
- Levaggi (1991): first Principal-Agent model of optimal intergovernmental grants under asymmetric information.
- Large literature on the optimal design of intergovernmental transfers under asymmetric information: Levaggi and Smith (1994), Cremer, Marchand and Pestieau (1996), Bucovetsky, Marchand and Pestieau (1998), Lockwood (1999), Boadway et al. (1999), Cornes and Silva (2002), Besfamille (2004).
- Optimal design of intergovernmental transfers when SNGs can collude with construction firms: Besfamille (2004)

Problems with the previous literature

- Empirical observations that were at odds with the positive prescriptions of the previous literature

Problems with the previous literature

- Empirical observations that were at odds with the positive prescriptions of the previous literature
- The flypaper effect: empirical regularity that subnational governments spend a fraction of a given increase in federal lump-sum transfers that exceeds by far the share they should have spent if private income were to raise by the same amount.

Problems with the previous literature

- Empirical observations that were at odds with the positive prescriptions of the previous literature
- The flypaper effect: empirical regularity that subnational governments spend a fraction of a given increase in federal lump-sum transfers that exceeds by far the share they should have spent if private income were to raise by the same amount.
  - See Gramlich (1977), Hines and Thaler (1985), Bailey and Connolly (1998), Gamkhar and Shah (2007) and Inman (2008).

Problems with the previous literature

- Empirical observations that were at odds with the positive prescriptions of the previous literature

- The flypaper effect: empirical regularity that subnational governments spend a fraction of a given increase in federal lump-sum transfers that exceeds by far the share they should have spent if private income were to raise by the same amount.
    - See Gramlich (1977), Hines and Thaler (1985), Bailey and Connolly (1998), Gamkhar and Shah (2007) and Inman (2008).

- Subnational governments in deep financial problems in well-established federations: Brazil, India, Germany.

Problems with the previous literature

- Empirical observations that were at odds with the positive prescriptions of the previous literature
- The flypaper effect: empirical regularity that subnational governments spend a fraction of a given increase in federal lump-sum transfers that exceeds by far the share they should have spent if private income were to raise by the same amount.
  - See Gramlich (1977), Hines and Thaler (1985), Bailey and Connolly (1998), Gamkhar and Shah (2007) and Inman (2008).
- Subnational governments in deep financial problems in well-established federations: Brazil, India, Germany.
- What if SNG's expect the FG to react after they choose their policy?

Problems with the previous literature

- Empirical observations that were at odds with the positive prescriptions of the previous literature
- The flypaper effect: empirical regularity that subnational governments spend a fraction of a given increase in federal lump-sum transfers that exceeds by far the share they should have spent if private income were to raise by the same amount.
  - See Gramlich (1977), Hines and Thaler (1985), Bailey and Connolly (1998), Gamkhar and Shah (2007) and Inman (2008).
- Subnational governments in deep financial problems in well-established federations: Brazil, India, Germany.
- What if SNG's expect the FG to react after they choose their policy?
  - This issue had not been modelled before.

Problems with the previous literature

- Empirical observations that were at odds with the positive prescriptions of the previous literature
- The flypaper effect: empirical regularity that subnational governments spend a fraction of a given increase in federal lump-sum transfers that exceeds by far the share they should have spent if private income were to raise by the same amount.
  - See Gramlich (1977), Hines and Thaler (1985), Bailey and Connolly (1998), Gamkhar and Shah (2007) and Inman (2008).
- Subnational governments in deep financial problems in well-established federations: Brazil, India, Germany.
- What if SNG's expect the FG to react after they choose their policy?
  - This issue had not been modelled before.
  - If this were possible, then all incentives would be altered.

Intergovernmental transfers without commitment

- Consider seriously the issue of commitment

Intergovernmental transfers without commitment

- Consider seriously the issue of commitment
- Approach #1: within the framework of the traditional local public finance theory.

Intergovernmental transfers without commitment

- Consider seriously the issue of commitment
- Approach #1: within the framework of the traditional local public finance theory.
- Approach #2: adopting a contractual framework, à la Dewatripont-Kornai-Maskin.

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$
- No discounting between periods.

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$
- No discounting between periods.
- Players: central government (CG), 2 regional governments (RG) $i = 1, 2$.

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$
- No discounting between periods.
- Players: central government (CG), 2 regional governments (RG) $i = 1, 2$.
- n_i : population of identical individuals in region i.

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$
- No discounting between periods.
- Players: central government (CG), 2 regional governments (RG) $i = 1, 2$.
- n_i : population of identical individuals in region i.
- Intra-period utility of representative agent in region i at $t = 2$.

$$v_i(G_{i2}) + z_i(C_{i2}).$$

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$
- No discounting between periods.
- Players: central government (CG), 2 regional governments (RG) $i = 1, 2$.
- n_i : population of identical individuals in region i.
- Intra-period utility of representative agent in region i at $t = 2$.

$$v_i(G_{i2}) + z_i(C_{i2}).$$

- Intertemporal utility of representative agent in region i :

$$\mathcal{U}_i = u_i(G_{i1}) + w_i(C_{i1}) + v_i(C_{i2}) + z_i(G_{i2}).$$

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$
- No discounting between periods.
- Players: central government (CG), 2 regional governments (RG) $i = 1, 2$.
- n_i : population of identical individuals in region i.
- Intra-period utility of representative agent in region i at $t = 2$.

$$v_i(G_{i2}) + z_i(C_{i2}).$$

- Intertemporal utility of representative agent in region i :

$$\mathcal{U}_i = u_i(G_{i1}) + w_i(C_{i1}) + v_i(C_{i2}) + z_i(G_{i2}).$$

- In each period, each individual receives exogenous private income Y_{it}.

Goodspeed (2002)

The model

- Two-period model: $t = 1, 2$
- No discounting between periods.
- Players: central government (CG), 2 regional governments (RG) $i = 1, 2$.
- n_i : population of identical individuals in region i.
- Intra-period utility of representative agent in region i at $t = 2$.

$$v_i(G_{i2}) + z_i(C_{i2}).$$

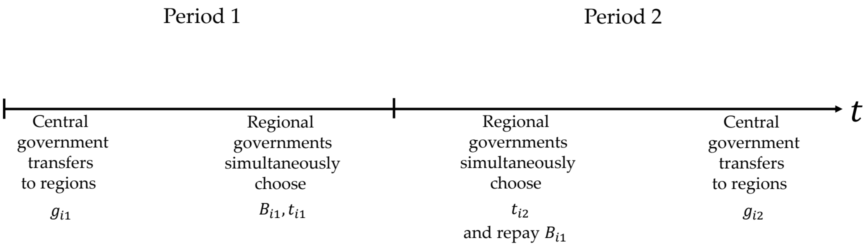
- Intertemporal utility of representative agent in region i :

$$\mathcal{U}_i = u_i(G_{i1}) + w_i(C_{i1}) + v_i(C_{i2}) + z_i(G_{i2}).$$

- In each period, each individual receives exogenous private income Y_{it}.
- Let's denote by $Y_t = \sum_{i=1}^{2} n_i Y_{it}$ the national income.

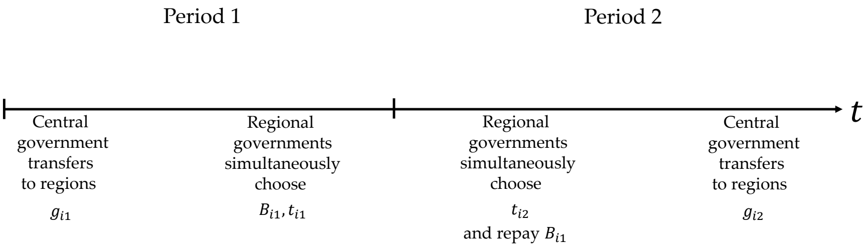
Goodspeed (2002)

The timing

- 

Goodspeed (2002)

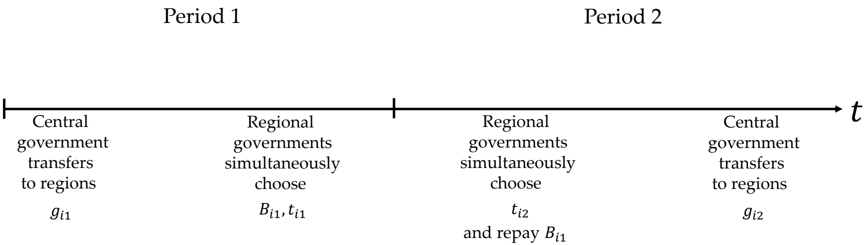
The timing

- 

- In $t = 1$: Nash interaction between RG's, anticipating what will happen in $t = 2$.

Goodspeed (2002)

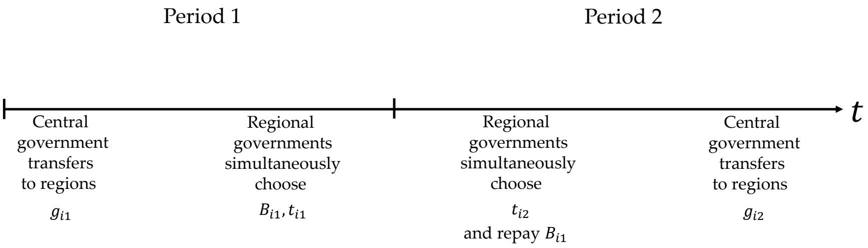
The timing

- 

- In $t = 1$: Nash interaction between RG's, anticipating what will happen in $t = 2$.
- In $t = 2$: Nash interaction between RG's and CG, observing the choices made at $t = 1$.

Goodspeed (2002)

The timing

- 

- In $t = 1$: Nash interaction between RG's, anticipating what will happen in $t = 2$.

- In $t = 2$: Nash interaction between RG's and CG, observing the choices made at $t = 1$.

- The model is solved by backward induction.

Goodspeed (2002)

Equilibrium at $t = 2$

- CG solves

$$\underset{g_{i2}, g_{j2}}{Max} \sum_{i=1}^{2} n_i p_i[\mathcal{U}_i]$$
$$s.t$$
$$C_{i1} = Y_{i1}(1 - t_{i1})$$
$$G_{i1} = g_{i1} + t_{i1} Y_{i1} + B_{i1}$$
$$C_{i2} = Y_{i2}(1 - t_{i2} - t_c)$$
$$G_{i2} = g_{i2} + t_{i2} Y_{i2} - (1 + r) B_{i1}$$
$$t_c Y_2 = \sum_{i=1}^{2} n_i g_{i2}$$

Goodspeed (2002)

Equilibrium at $t = 2$

- First-order conditions

$$n_i \frac{\partial p_i}{\partial \mathcal{U}_i} \frac{\partial v_i}{\partial G_{i2}} = \sum_{j=1}^{2} n_j \frac{\partial p_j}{\partial \mathcal{U}_j} \frac{\partial z_j}{\partial C_{j2}} \frac{n_i Y_{j2}}{Y_2}$$

or

$$\frac{\partial p_i}{\partial \mathcal{U}_i} \frac{\partial v_i}{\partial G_{i2}} = \frac{\partial p_j}{\partial \mathcal{U}_j} \frac{\partial v_j}{\partial G_{j2}} \qquad (1).$$

Goodspeed (2002)

Equilibrium at $t = 2$

- First-order conditions

$$n_i \frac{\partial p_i}{\partial \mathcal{U}_i} \frac{\partial v_i}{\partial G_{i2}} = \sum_{j=1}^{2} n_j \frac{\partial p_j}{\partial \mathcal{U}_j} \frac{\partial z_j}{\partial C_{j2}} \frac{n_i Y_{j2}}{Y_2}$$

or

$$\frac{\partial p_i}{\partial \mathcal{U}_i} \frac{\partial v_i}{\partial G_{i2}} = \frac{\partial p_j}{\partial \mathcal{U}_j} \frac{\partial v_j}{\partial G_{j2}} \qquad (1).$$

- Reaction function of CG

Goodspeed (2002)

Equilibrium at $t = 2$

- At $t = 2$, RG solves

$$\begin{aligned}
&\underset{t_{i2}}{Max}\, v_i(G_{i2}) + z_i(C_{i2}) \\
&s.t \\
&C_{i2} = Y_{i2}(1 - t_{i2} - t_c) \\
&G_{i2} = g_{i2} + t_{i2} Y_{i2} - (1 + r) B_{i1}
\end{aligned}$$

Equilibrium at $t = 2$

- At $t = 2$, RG solves

$$
\begin{aligned}
&\underset{t_{i2}}{Max}\, v_i(G_{i2}) + z_i(C_{i2}) \\
&s.t \\
&C_{i2} = Y_{i2}(1 - t_{i2} - t_c) \\
&G_{i2} = g_{i2} + t_{i2} Y_{i2} - (1 + r) B_{i1}
\end{aligned}
$$

- First-order conditions

$$
\frac{\partial v_i}{\partial G_{i2}} = \frac{\partial z_i}{\partial C_{i2}} \qquad (2).
$$

Goodspeed (2002)

Equilibrium at $t = 2$

- At $t = 2$, RG solves

$$\begin{array}{l} \underset{t_{i2}}{Max}\, v_i(G_{i2}) + z_i(C_{i2}) \\ s.t \\ C_{i2} = Y_{i2}(1 - t_{i2} - t_c) \\ G_{i2} = g_{i2} + t_{i2}Y_{i2} - (1+r)B_{i1} \end{array}$$

- First-order conditions

$$\frac{\partial v_i}{\partial G_{i2}} = \frac{\partial z_i}{\partial C_{i2}} \qquad (2).$$

- Reaction functions of RG's.

Goodspeed (2002)

Equilibrium at $t = 2$

- Using (1) and (2), the Nash equilibrium $(t_{i2}^{*}, t_{j2}^{*}, g_{i2}^{*}, g_{j2}^{*})$ is obtained.

Equilibrium at $t = 2$

- Using (1) and (2), the Nash equilibrium $(t_{i2}^*, t_{j2}^*, g_{i2}^*, g_{j2}^*)$ is obtained.
- How does the CG react when a RG borrows more?

Goodspeed (2002)

Equilibrium at $t = 2$

- Using (1) and (2), the Nash equilibrium $(t_{i2}^*, t_{j2}^*, g_{i2}^*, g_{j2}^*)$ is obtained.
- How does the CG react when a RG borrows more?
- Applying the Implicit Function Theorem to (1) and (2), one can obtain

$$\frac{\partial g_{i2}^*}{\partial B_{i1}} > 0$$

$$\frac{\partial g_{j2}^*}{\partial B_{i1}} < 0.$$

Goodspeed (2002)

Equilibrium at $t = 2$

- Using (1) and (2), the Nash equilibrium $(t^*_{i2}, t^*_{j2}, g^*_{i2}, g^*_{j2})$ is obtained.
- How does the CG react when a RG borrows more?
- Applying the Implicit Function Theorem to (1) and (2), one can obtain

$$\frac{\partial g^*_{i2}}{\partial B_{i1}} > 0$$

$$\frac{\partial g^*_{j2}}{\partial B_{i1}} < 0.$$

- The first reaction characterizes a soft budget constraint behavior.

Goodspeed (2002)

Equilibrium at $t = 1$

- Each RG solves

$$
\begin{aligned}
&\underset{t_{i1},B_{i1}}{Max}\, u_i(G_{i1}) + w_i(C_{i1}) + v_i(C_{i2}) + z_i(G_{i2}) \\
&s.t \\
&C_{i1} = Y_{i1}(1 - t_{i1}) \\
&G_{i1} = g_{i1} + t_{i1}Y_{i1} + B_{i1} \\
&C_{i2} = Y_{i2}(1 - t_{i2}^* - t_c^*) \\
&G_{i2} = g_{i2}^* + t_{i2}^* Y_{i2} - (1 + r)B_{i1} \\
&t_c^* Y_2 = \textstyle\sum_{i=1}^{2} n_i g_{i2}^*
\end{aligned}
$$

Goodspeed (2002)

Equilibrium at $t = 1$

- Each RG solves

$$\begin{aligned}
&\underset{t_{i1},B_{i1}}{Max}\, u_i(G_{i1}) + w_i(C_{i1}) + v_i(C_{i2}) + z_i(G_{i2}) \\
&s.t \\
&C_{i1} = Y_{i1}(1 - t_{i1}) \\
&G_{i1} = g_{i1} + t_{i1} Y_{i1} + B_{i1} \\
&C_{i2} = Y_{i2}(1 - t_{i2}^{*} - t_c^{*}) \\
&G_{i2} = g_{i2}^{*} + t_{i2}^{*} Y_{i2} - (1 + r) B_{i1} \\
&t_c^{*} Y_2 = \textstyle\sum_{i=1}^{2} n_i g_{i2}^{*}
\end{aligned}$$

- First-order condition with respect to B_{i1}

$$\frac{\partial u_i / \partial G_{i1}}{\partial v_i / \partial G_{i2}} = 1 + r - \frac{\partial g_{i2}^{*}}{\partial B_{i1}} \left(1 - \frac{n_i Y_{i2}}{Y_2} \right) + \frac{n_j Y_{j2}}{Y_2} \frac{\partial g_{j2}^{*}}{\partial B_{i1}}$$

Goodspeed (2002)

Equilibrium at $t = 1$

- Each RG solves

$$\begin{aligned}
&\underset{t_{i1},B_{i1}}{Max}\, u_i(G_{i1}) + w_i(C_{i1}) + v_i(C_{i2}) + z_i(G_{i2}) \\
&s.t \\
&C_{i1} = Y_{i1}(1 - t_{i1}) \\
&G_{i1} = g_{i1} + t_{i1}Y_{i1} + B_{i1} \\
&C_{i2} = Y_{i2}(1 - t^*_{i2} - t^*_c) \\
&G_{i2} = g^*_{i2} + t^*_{i2}Y_{i2} - (1 + r)B_{i1} \\
&t^*_c Y_2 = \textstyle\sum_{i=1}^{2} n_i g^*_{i2}
\end{aligned}$$

- First-order condition with respect to B_{i1}

$$\frac{\partial u_i/\partial G_{i1}}{\partial v_i/\partial G_{i2}} = 1 + r - \frac{\partial g^*_{i2}}{\partial B_{i1}}\left(1 - \frac{n_i Y_{i2}}{Y_2}\right) + \frac{n_j Y_{j2}}{Y_2}\frac{\partial g^*_{j2}}{\partial B_{i1}}$$

- RG face a lower oportunity cost of debt, and thus borrows more than it would be efficient to do because both G_{i1} and G_{i2} are normal goods.

Goodspeed (2002)

Extension I: "Too big to fail" hypothesis

- Wildasin (1997) presented a similar model, but with a major difference.

Goodspeed (2002)

Extension I: "Too big to fail" hypothesis

- Wildasin (1997) presented a similar model, but with a major difference.
- RG's decide upon the provision of local public goods with spillovers.

Goodspeed (2002)

Extension I: "Too big to fail" hypothesis

- Wildasin (1997) presented a similar model, but with a major difference.
- RG's decide upon the provision of local public goods with spillovers.
- Particular formalization: the value of spillovers in j depended upon the population size of the region where these spillovers originated.

Goodspeed (2002)

Extension I: “Too big to fail” hypothesis

- Wildasin (1997) presented a similar model, but with a major difference.
- RG’s decide upon the provision of local public goods with spillovers.
- Particular formalization: the value of spillovers in j depended upon the population size of the region where these spillovers originated.
- After RG’s have decided their choice of local public goods, the CG can intervene and supplement the regional provision with grants.

Goodspeed (2002)

Extension I: "Too big to fail" hypothesis

- Wildasin (1997) presented a similar model, but with a major difference.
- RG's decide upon the provision of local public goods with spillovers.
- Particular formalization: the value of spillovers in j depended upon the population size of the region where these spillovers originated.
- After RG's have decided their choice of local public goods, the CG can intervene and supplement the regional provision with grants.
- Wildasin (1997) found that small regions do not trigger bailouts (i.e., they provide the efficient amount of local public goods). On the other hand, large localities provide less than an efficient level of local public goods, triggering bailouts from the CG.

Goodspeed (2002)

Extension I: "Too big to fail" hypothesis

- Wildasin (1997) presented a similar model, but with a major difference.
- RG's decide upon the provision of local public goods with spillovers.
- Particular formalization: the value of spillovers in j depended upon the population size of the region where these spillovers originated.
- After RG's have decided their choice of local public goods, the CG can intervene and supplement the regional provision with grants.
- Wildasin (1997) found that small regions do not trigger bailouts (i.e., they provide the efficient amount of local public goods). On the other hand, large localities provide less than an efficient level of local public goods, triggering bailouts from the CG.
- In particular, in the second case, the amount of bailouts is positively related to the size of the region.

Goodspeed (2002)

Extension II: "Too cheap to bailout" hypothesis

- Crivelli and Staal (2013) presented a similiar albeit simpler model than Wildasin (1997), but with a twist in the way they formalize spillovers.

Goodspeed (2002)

Extension II: “Too cheap to bailout” hypothesis

- Crivelli and Staal (2013) presented a similiar albeit simpler model than Wildasin (1997), but with a twist in the way they formalize spillovers.
- The value of spillovers in j did not depend upon the population size of the region where these spillovers originated.

Goodspeed (2002)

Extension II: "Too cheap to bailout" hypothesis

- Crivelli and Staal (2013) presented a similiar albeit simpler model than Wildasin (1997), but with a twist in the way they formalize spillovers.
- The value of spillovers in j did not depend upon the population size of the region where these spillovers originated.
- Crivelli and Staal (2013) found that small regions trigger bailouts because they provide an inefficiently low amount of local public goods.

Decentralized leadership literature

- Caplan, Cornes and Silva (2000), Köthenbürger (2004).

Decentralized leadership literature

- Caplan, Cornes and Silva (2000), Köthenbürger (2004).
- They presented models with similar timings than Wildasin (1997) and Goodspeed (2002), but with significant changes in the first stage that sharply modified the results.

Decentralized leadership literature

- Caplan, Cornes and Silva (2000), Köthenbürger (2004).
- They presented models with similar timings than Wildasin (1997) and Goodspeed (2002), but with significant changes in the first stage that sharply modified the results.
  - Caplan, Cornes and Silva (2000): RG's under provide a local public good because it has perfect spillovers (indeed, it is a national pure public good).

Decentralized leadership literature

- Caplan, Cornes and Silva (2000), Köthenbürger (2004).
- They presented models with similar timings than Wildasin (1997) and Goodspeed (2002), but with significant changes in the first stage that sharply modified the results.
  - Caplan, Cornes and Silva (2000): RG's under provide a local public good because it has perfect spillovers (indeed, it is a national pure public good).
  - Köthenbürger (2004): RG's under provide local public goods because they finance them with a tax on capital invested in their region, in a context of capital mobility and tax competition.

Decentralized leadership literature

- Caplan, Cornes and Silva (2000), Köthenbürger (2004).
- They presented models with similar timings than Wildasin (1997) and Goodspeed (2002), but with significant changes in the first stage that sharply modified the results.
  - Caplan, Cornes and Silva (2000): RG's under provide a local public good because it has perfect spillovers (indeed, it is a national pure public good).
  - Köthenbürger (2004): RG's under provide local public goods because they finance them with a tax on capital invested in their region, in a context of capital mobility and tax competition.
- Bailouts correct pre-existing distortions in such a way that the efficient level of local public goods is finally obtained.

Qian and Roland (1998)

- First paper that formalizes the problem of SBC à la Kornai-Maskin-Dewatripont.

Qian and Roland (1998)

- First paper that formalizes the problem of SBC à la Kornai-Maskin-Dewatripont.
- Model taylored to Chinese economic problems prevailing at this time: RG rescuing state enterprises when their projects failed.

Qian and Roland (1998)

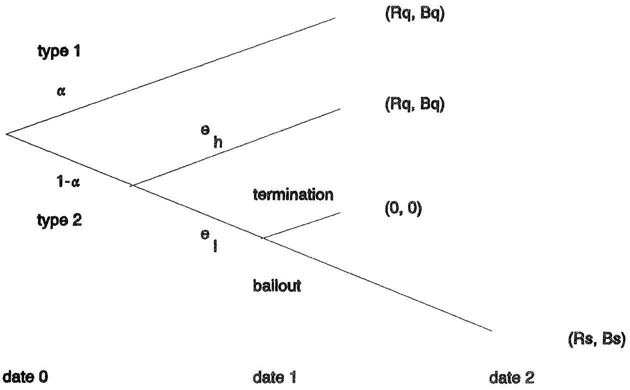


FIGURE 1. THE MECHANISM OF THE SOFT AND HARD BUDGET CONSTRAINT

Qian and Roland (1998)

- If RG bailout state-owned enterprises, they loose resources to invest in infrastructure.

Qian and Roland (1998)

- If RG bailout state-owned enterprises, they loose resources to invest in infrastructure.
- These investments in infrastructure attract mobile capital, which enhances private production and thus local incomes.

Qian and Roland (1998)

- If RG bailout state-owned enterprises, they loose resources to invest in infrastructure.
- These investments in infrastructure attract mobile capital, which enhances private production and thus local incomes.
- Qian and Roland analyzed SPNE of their game, under two different institutional settings: total centralization and fully decentralization.

Qian and Roland (1998)

- If RG bailout state-owned enterprises, they loose resources to invest in infrastructure.
- These investments in infrastructure attract mobile capital, which enhances private production and thus local incomes.
- Qian and Roland analyzed SPNE of their game, under two different institutional settings: total centralization and fully decentralization.
- Under total centralization, they found that (provided some functional conditions hold), the unique SPNE is a SBC one.

Qian and Roland (1998)

- If RG bailout state-owned enterprises, they loose resources to invest in infrastructure.
- These investments in infrastructure attract mobile capital, which enhances private production and thus local incomes.
- Qian and Roland analyzed SPNE of their game, under two different institutional settings: total centralization and fully decentralization.
- Under total centralization, they found that (provided some functional conditions hold), the unique SPNE is a SBC one.
- Under full decentralization, they obtained the opposite result (again provided some functional conditions hold) . As tax competition for mobile capital increases the oportunity cost of regional bauilouts, the unique SPNE is the HBC one, where the efficient level of effort is exerted.

Besfamille and Lockwood (2008)

The basic model: individuals

- Three periods $t = 2, 3$. No discounting between periods.

Besfamille and Lockwood (2008)

The basic model: individuals

- Three periods $t = 2, 3$. No discounting between periods.
- 2 regions.

Besfamille and Lockwood (2008)

The basic model: individuals

- Three periods $t = 2, 3$. No discounting between periods.
- 2 regions.
- Each region $\ell \in 1, 2$ has a continuum of measure 1 of identical, risk-neutral, immobile residents, each of whom has an endowment of w units of a private consumption good.

Besfamille and Lockwood (2008)

The basic model: individuals

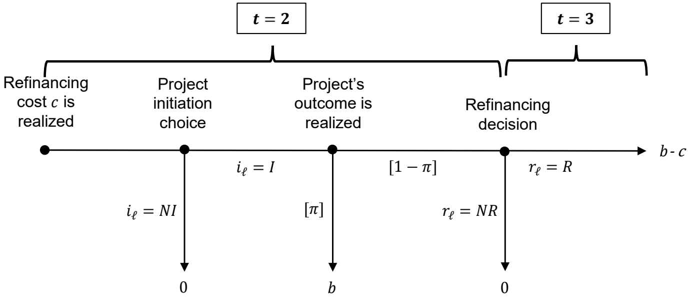
- Three periods $t = 2, 3$. No discounting between periods.
- 2 regions.
- Each region $\ell \in 1, 2$ has a continuum of measure 1 of identical, risk-neutral, immobile residents, each of whom has an endowment of w units of a private consumption good.
  - Let $w_T \equiv 2w$.

Besfamille and Lockwood (2008)

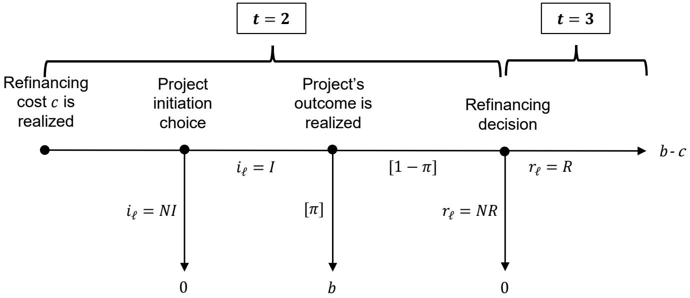
The basic model: individuals

- Three periods $t = 2, 3$. No discounting between periods.
- 2 regions.
- Each region $\ell \in 1, 2$ has a continuum of measure 1 of identical, risk-neutral, immobile residents, each of whom has an endowment of w units of a private consumption good.
  - Let $w_T \equiv 2w$.
- In the last period, each resident derives utility from consumption of this good and from a local project.

The basic model: the local project



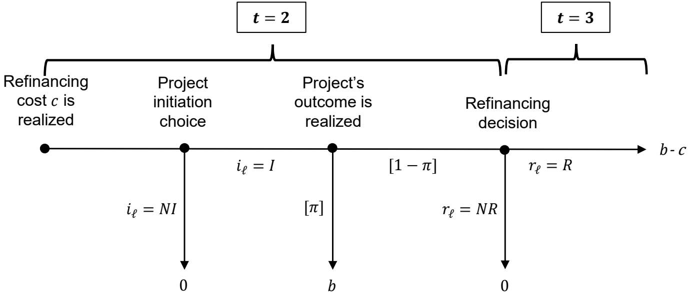
The basic model: the local project



- Across regions, ex ante and interim identical projects; ex post outcomes can differ.

Besfamille and Lockwood (2008)

The basic model: the local project



- Across regions, ex ante and interim identical projects; ex post outcomes can differ.
- We assume that $c \in [0, b]$.

Besfamille and Lockwood (2008)

The basic model: governments

- Two levels of government: central and regional, both benevolent.

Besfamille and Lockwood (2008)

The basic model: governments

- Two levels of government: central and regional, both benevolent.
- Regional governments have just enough resources to fund the initial cost $c_0 \in [0, b/2]$.

The basic model: governments

- Two levels of government: central and regional, both benevolent.
- Regional governments have just enough resources to fund the initial cost $c_0 \in [0, b/2]$.
  - In other words, projects have a benefit-to-cost ratio higher than 2.

The basic model: governments

- Two levels of government: central and regional, both benevolent.
- Regional governments have just enough resources to fund the initial cost $c_0 \in [0, b/2]$.
  - In other words, projects have a benefit-to-cost ratio higher than 2.
- Regional governments face the same probability of completing a project early: $\pi \in [0, 1]$.

Besfamille and Lockwood (2008)

The basic model: institutional regimes

- After the refinancing cost is realized but before the initiation of the project, the central government decides whether to commit to not refinancing any incomplete local project (a hard budget constraint, HBC) or not (a soft budget constraint, SBC).

Besfamille and Lockwood (2008)

The basic model: institutional regimes

- After the refinancing cost is realized but before the initiation of the project, the central government decides whether to commit to not refinancing any incomplete local project (a hard budget constraint, HBC) or not (a soft budget constraint, SBC).
- If the central government does not commit to not refinancing incomplete projects, it can refinance them with a **uniform** lump sum tax on individual endowments.

Besfamille and Lockwood (2008)

First best

- Social planner who makes all decisions.

First best

- Social planner who makes all decisions.
- **Continuation decision**

Besfamille and Lockwood (2008)

First best

- Social planner who makes all decisions.
- **Continuation decision**
  - As utilities are linear in income and the planner maximizes the sum of utilities, the planner's problem is separable between regions.

First best

- Social planner who makes all decisions.
- **Continuation decision**
  - As utilities are linear in income and the planner maximizes the sum of utilities, the planner's problem is separable between regions.
  - Refinancing an incomplete project is always better because $c \leq b$.

Besfamille and Lockwood (2008)

First best

- Social planner who makes all decisions.
- **Continuation decision**
  - As utilities are linear in income and the planner maximizes the sum of utilities, the planner's problem is separable between regions.
  - Refinancing an incomplete project is always better because $c \leq b$.
- **Project initiation decision**

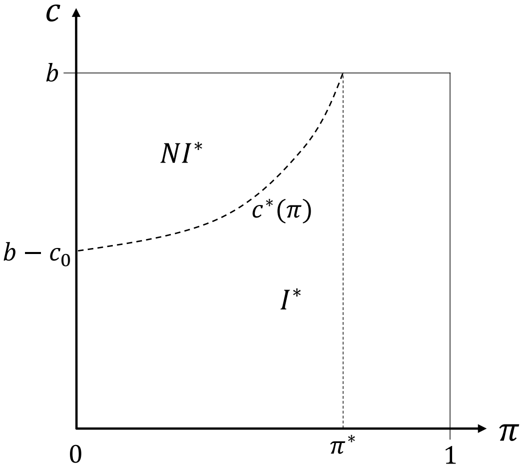
Besfamille and Lockwood (2008)

First best

- Social planner who makes all decisions.
- **Continuation decision**
  - As utilities are linear in income and the planner maximizes the sum of utilities, the planner's problem is separable between regions.
  - Refinancing an incomplete project is always better because $c \leq b$.
- **Project initiation decision**
  - The social planner initiates the project if the expected, net regional welfare is positive

$$\Leftrightarrow c \leq c^*(\pi) = \frac{b - c_0}{1 - \pi}.$$

First best



where $\pi^* \equiv \frac{c_0}{b}$

Besfamille and Lockwood (2008)

Soft budget constraint

- As $c \leq b$, incomplete projects are always refinanced by the central government.

Soft budget constraint

- As $c \leq b$, incomplete projects are always refinanced by the central government.
- Simultaneous game between regions.

Soft budget constraint

- As $c \leq b$, incomplete projects are always refinanced by the central government.
- Simultaneous game between regions.

  1. Regions choose $i_\ell \in \{I, NI\}$.

Besfamille and Lockwood (2008)

Soft budget constraint

- As $c \leq b$, incomplete projects are always refinanced by the central government.
- Simultaneous game between regions.
  1. Regions choose $i_\ell \in \{I, NI\}$.
  2. The central government taxes and refinances.

Soft budget constraint

- As $c \leq b$, incomplete projects are always refinanced by the central government.
- Simultaneous game between regions.
  1. Regions choose $i_\ell \in \{I, NI\}$.
  2. The central government taxes and refinances.
- The game is solved backwards.

Besfamille and Lockwood (2008)

Soft budget constraint

- Let $\mathbb{1}_{\{i_\ell = I\}}$ be an indicator function that takes the value of 1 if region ℓ has initiated the project and 0 otherwise.

Besfamille and Lockwood (2008)

Soft budget constraint

- Let $\mathbb{1}_{\{i_\ell = I\}}$ be an indicator function that takes the value of 1 if region ℓ has initiated the project and 0 otherwise.
- When it decides on initial investment, region ℓ's expected welfare is

$$\mathbb{E}W_\ell^{PD}(i_\ell, i_m) = w(1-\tau^\epsilon) + \mathbb{1}_{\{i_\ell = I\}}[b - c_0].$$

Besfamille and Lockwood (2008)

Soft budget constraint

- Let $\mathbb{1}_{\{i_\ell = I\}}$ be an indicator function that takes the value of 1 if region ℓ has initiated the project and 0 otherwise.
- When it decides on initial investment, region ℓ's expected welfare is

$$\mathbb{E}W_\ell^{PD}(i_\ell, i_m) = w(1 - \tau^\epsilon) + \mathbb{1}_{\{i_\ell = I\}}[b - c_0].$$

- What is the value of the expected tax τ^ϵ?

Besfamille and Lockwood (2008)

Soft budget constraint

- Let ω be a profile of realized projects' outcomes at the end of $t = 2$, and let's denote by $N(\omega)$ the number of completed projects in this particular realization of outcomes.

Besfamille and Lockwood (2008)

Soft budget constraint

- Let ω be a profile of realized projects' outcomes at the end of $t = 2$, and let's denote by $N(\omega)$ the number of completed projects in this particular realization of outcomes.
- At the beginning of $t = 3$, for any profile ω, the central government mechanically sets a tax τ_ω to cover the cost of refinancing $\sum_\ell \mathbb{1}_{\{i_\ell = I\}} - N(\omega)$ incomplete projects.

Besfamille and Lockwood (2008)

Soft budget constraint

- Let ω be a profile of realized projects' outcomes at the end of $t = 2$, and let's denote by $N(\omega)$ the number of completed projects in this particular realization of outcomes.
- At the beginning of $t = 3$, for any profile ω, the central government mechanically sets a tax τ_ω to cover the cost of refinancing $\sum_\ell \mathbb{1}_{\{i_\ell = I\}} - N(\omega)$ incomplete projects.
- As this tax is lump sum, the central government refinances incomplete projects with non-distortionary national taxation.

Besfamille and Lockwood (2008)

Soft budget constraint

- Let ω be a profile of realized projects' outcomes at the end of $t = 2$, and let's denote by $N(\omega)$ the number of completed projects in this particular realization of outcomes.
- At the beginning of $t = 3$, for any profile ω, the central government mechanically sets a tax τ_ω to cover the cost of refinancing $\sum_\ell \mathbb{1}_{\{i_\ell = I\}} - N(\omega)$ incomplete projects.
- As this tax is lump sum, the central government refinances incomplete projects with non-distortionary national taxation.
- Hence, under the profile ω, the central government's budget constraint is

$$\tau_\omega . w_T = [\sum_\ell \mathbb{1}_{\{i_\ell = I\}} - N(\omega)].c$$

Besfamille and Lockwood (2008)

Soft budget constraint

- Let ω be a profile of realized projects' outcomes at the end of $t = 2$, and let's denote by $N(\omega)$ the number of completed projects in this particular realization of outcomes.
- At the beginning of $t = 3$, for any profile ω, the central government mechanically sets a tax τ_ω to cover the cost of refinancing $\sum_\ell \mathbb{1}_{\{i_\ell = I\}} - N(\omega)$ incomplete projects.
- As this tax is lump sum, the central government refinances incomplete projects with non-distortionary national taxation.
- Hence, under the profile ω, the central government's budget constraint is

$$\tau_\omega . w_T = [\sum_\ell \mathbb{1}_{\{i_\ell = I\}} - N(\omega)].c$$

- So, when regions decide on initial investment, the expected tax τ^ϵ satisfies

$$\tau^\epsilon w_T = \underbrace{\left[\sum_\ell \mathbb{1}_{\{i_\ell = I\}}(1-\pi)\right]}_{\textit{Expected number of bailouts}}.c$$

Besfamille and Lockwood (2008)

Soft budget constraint

- Substituting these results into the expected welfare, we obtain

$$\mathbb{E}W_{\ell}^{SBC}(i_{\ell}, i_m) = \quad w + \mathbb{1}_{\{i_{\ell}=I\}}[b - c_0 - (1-\pi)\tfrac{c}{2}] - \mathbb{1}_{\{i_m=I\}}(1-\pi)\tfrac{c}{2}$$

Besfamille and Lockwood (2008)

Soft budget constraint

- Substituting these results into the expected welfare, we obtain

$$\mathbb{E}W_{\ell}^{SBC}(i_{\ell}, i_m) = \quad w + \mathbb{1}_{\{i_{\ell}=I\}}[b - c_0 - (1-\pi)\frac{c}{2}] - \mathbb{1}_{\{i_m=I\}}(1-\pi)\frac{c}{2}$$

- The effect of i_{ℓ} on $\mathbb{E}W_{\ell}^{SBC}(i_{\ell}, i_m)$ is independent of i_m, $m \neq \ell$.

Soft budget constraint

- Substituting these results into the expected welfare, we obtain

$$\mathbb{E}W_{\ell}^{SBC}(i_{\ell}, i_m) = \quad w + \mathbb{1}_{\{i_{\ell}=I\}}[b - c_0 - (1-\pi)\tfrac{c}{2}] - \mathbb{1}_{\{i_m=I\}}(1-\pi)\tfrac{c}{2}$$

- The effect of i_{ℓ} on $\mathbb{E}W_{\ell}^{SBC}(i_{\ell}, i_m)$ is independent of i_m, $m \neq \ell$.
- So we can analyze the choice of i_{ℓ} just for a representative region ℓ.

Soft budget constraint

- Substituting these results into the expected welfare, we obtain

$$\mathbb{E}W_{\ell}^{SBC}(i_{\ell}, i_m) = \quad w + \mathbb{1}_{\{i_{\ell}=I\}}[b - c_0 - (1-\pi)\tfrac{c}{2}] - \mathbb{1}_{\{i_m=I\}}(1-\pi)\tfrac{c}{2}$$

- The effect of i_{ℓ} on $\mathbb{E}W_{\ell}^{SBC}(i_{\ell}, i_m)$ is independent of i_m, $m \neq \ell$.
- So we can analyze the choice of i_{ℓ} just for a representative region ℓ.
  - Despite the fact that there are interactions between regions (due to the central government's budget constraint), the equilibrium will be in dominant strategies.

Besfamille and Lockwood (2008)

Soft budget constraint

- Substituting these results into the expected welfare, we obtain

$$\mathbb{E}W_\ell^{SBC}(i_\ell, i_m) = \quad w + \mathbb{1}_{\{i_\ell = I\}}[b - c_0 - (1-\pi)\tfrac{c}{2}] - \mathbb{1}_{\{i_m = I\}}(1-\pi)\tfrac{c}{2}$$

- The effect of i_ℓ on $\mathbb{E}W_\ell^{SBC}(i_\ell, i_m)$ is independent of i_m, $m \neq \ell$.
- So we can analyze the choice of i_ℓ just for a representative region ℓ.
  - Despite the fact that there are interactions between regions (due to the central government's budget constraint), the equilibrium will be in dominant strategies.
- *Common − pool fiscal externality* generated by the aggregate budget constraint: the resident of each region only pays 1/2 of the cost of refinancing its incomplete project.

Soft budget constraint: Equilibrium

- The government of region ℓ undertakes the project if

$$\mathbb{E}W_\ell^{SBC}(I_\ell, i_m) = w + [b - c_0 - (1-\pi)\tfrac{c}{2}] - \mathbb{1}_{\{i_m = I\}}(1-\pi)\tfrac{c}{2}$$

$$\geq \mathbb{E}W_\ell^{SBC}(NI_\ell, i_m) = w - \mathbb{1}_{\{i_m = I\}}(1-\pi)\tfrac{c}{2}$$

Soft budget constraint: Equilibrium

- The government of region ℓ undertakes the project if

$$\mathbb{E}W_{\ell}^{SBC}(I_{\ell}, i_m) = w + [b - c_0 - (1-\pi)\tfrac{c}{2}] - \mathbb{1}_{\{i_m = I\}}(1-\pi)\tfrac{c}{2}$$

$$\geq \mathbb{E}W_{\ell}^{SBC}(NI_{\ell}, i_m) = w - \mathbb{1}_{\{i_m = I\}}(1-\pi)\tfrac{c}{2}$$

- The government of region ℓ undertakes the project if its expected, net regional value is positive.

Besfamille and Lockwood (2008)

Soft budget constraint: Equilibrium

- The government of region ℓ undertakes the project if

$$\mathbb{E}W_{\ell}^{SBC}(I_{\ell}, i_m) = w + [b - c_0 - (1-\pi)\tfrac{c}{2}] - \mathbb{1}_{\{i_m = I\}}(1-\pi)\tfrac{c}{2}$$

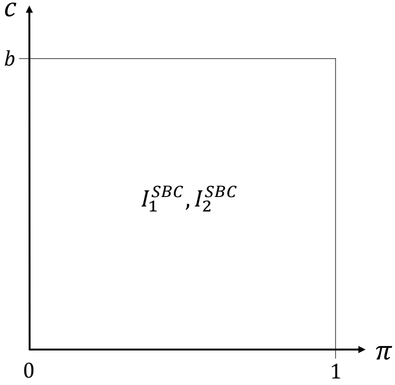
$$\geq \mathbb{E}W_{\ell}^{SBC}(NI_{\ell}, i_m) = w - \mathbb{1}_{\{i_m = I\}}(1-\pi)\tfrac{c}{2}$$

- The government of region ℓ undertakes the project if its expected, net regional value is positive.
  - threshold decision: initiate the project provided $c \leq c^{SBC}(\pi) \equiv 2\frac{b-c_0}{1-\pi}$.

Soft budget constraint: Equilibrium

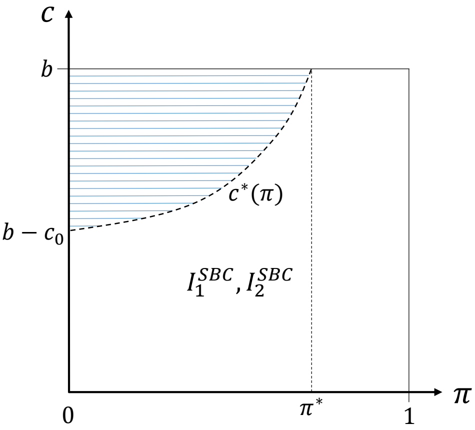
Proposition

Consider the project initiation game under SBC. As $b \geq 2c_0$, both regions initiate their project in the unique dominant strategy equilibrium.



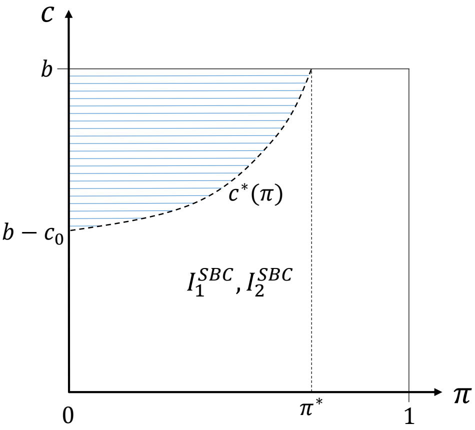
Besfamille and Lockwood (2008)

Soft budget constraint: Inefficiencies



Besfamille and Lockwood (2008)

Soft budget constraint: Inefficiencies



- Overinvestment in both regions.

Besfamille and Lockwood (2008)

Hard budget constraint

- Incomplete projects are never refinanced by the central government.

Besfamille and Lockwood (2008)

Hard budget constraint

- Incomplete projects are never refinanced by the central government.
- No interaction between regions.

Besfamille and Lockwood (2008)

Hard budget constraint

- Incomplete projects are never refinanced by the central government.
- No interaction between regions.
- Regions choose $i_\ell \in \{I, NI\}$ individually.

Besfamille and Lockwood (2008)

Hard budget constraint: Equilibrium

- The government of region ℓ undertakes the project if

$$\mathbb{E}W_{\ell}^{HBC}(I_{\ell}) = w + \pi b - c_0$$

$$\geq \mathbb{E}W_{\ell}^{HBC}(NI_{\ell},) = w$$

Besfamille and Lockwood (2008)

Hard budget constraint: Equilibrium

- The government of region ℓ undertakes the project if

$$\mathbb{E}W_{\ell}^{HBC}(I_{\ell}) = w + \pi b - c_0$$

$$\geq \mathbb{E}W_{\ell}^{HBC}(NI_{\ell},) = w$$

- Again, the government of region ℓ undertakes the project if its expected, net regional value is positive.

Besfamille and Lockwood (2008)

Hard budget constraint: Equilibrium

- The government of region ℓ undertakes the project if

$$\mathbb{E}W_{\ell}^{HBC}(I_{\ell}) = w + \pi b - c_0$$

$$\geq \mathbb{E}W_{\ell}^{HBC}(NI_{\ell},) = w$$

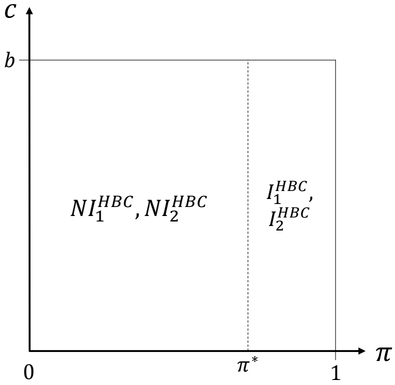
- Again, the government of region ℓ undertakes the project if its expected, net regional value is positive.
  - threshold decision: initiate the project provided $\pi \leq \pi^* \equiv \frac{c_0}{b}$.

Besfamille and Lockwood (2008)

Hard budget constraint: Equilibrium

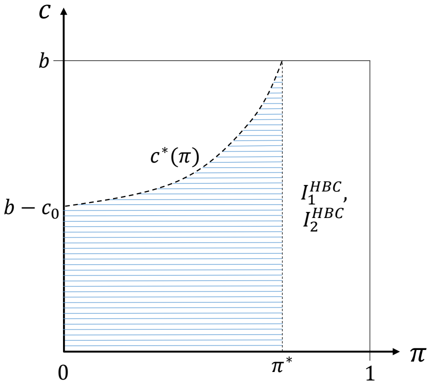
Proposition

Consider the project initiation game under HBC. Both regions initiate their project provided $\pi \geq \pi^* \equiv \frac{c_0}{b}$.



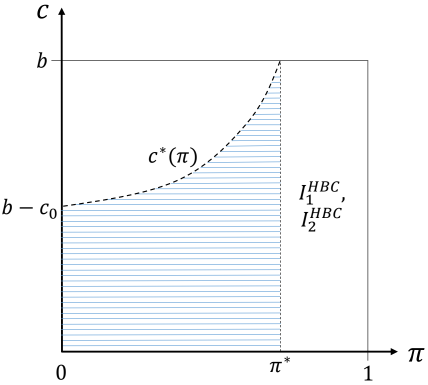
Besfamille and Lockwood (2008)

Hard budget constraint: Inefficiencies



Besfamille and Lockwood (2008)

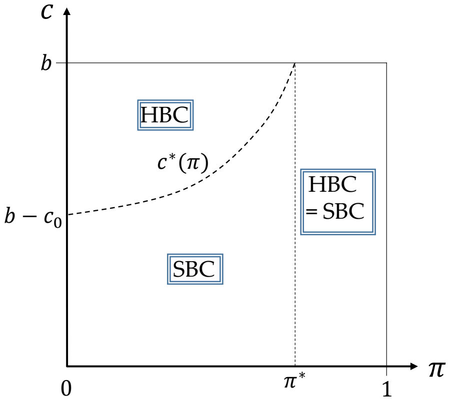
Hard budget constraint: Inefficiencies



- Underinvestment in both regions.

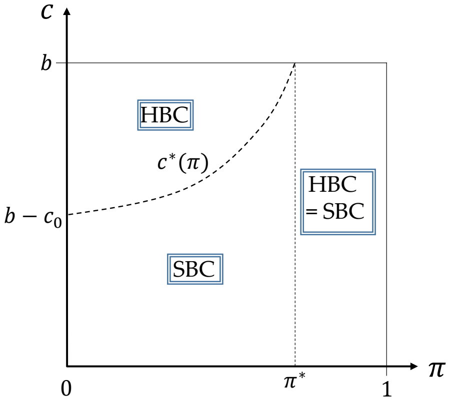
HBC vs. SBC: Interim comparison

- After the refinancing cost is realized but before the initiation of the project, the central government decides whether to implement a HBC or a SBC.



HBC vs. SBC: Interim comparison

- After the refinancing cost is realized but before the initiation of the project, the central government decides whether to implement a HBC or a SBC.
- Utilitarian normative criterion.



Besfamille and Lockwood (2008)

Extension I: Ex ante comparison of regimes

- Assume now that the central government decides whether to implement a HBC or a SBC, but before the realization of the refinancing cost c.

Extension I: Ex ante comparison of regimes

- Assume now that the central government decides whether to implement a HBC or a SBC, but before the realization of the refinancing cost c.
- The refinancing cost is distributed according to the probability density function $h(c)$, with full support on $[0, b]$.

Extension I: Ex ante comparison of regimes

- Assume now that the central government decides whether to implement a HBC or a SBC, but before the realization of the refinancing cost c.
- The refinancing cost is distributed according to the probability density function $h(c)$, with full support on $[0, b]$.
- Expected welfares:

Extension I: Ex ante comparison of regimes

- Assume now that the central government decides whether to implement a HBC or a SBC, but before the realization of the refinancing cost c.
- The refinancing cost is distributed according to the probability density function $h(c)$, with full support on $[0, b]$.
- Expected welfares:
  - $\mathbb{E}W^{SBC}(\pi) = 2\left[b - c_0 - (1-\pi)\overline{c}\right]$, where $\overline{c} = \int_0^b ch(c)dc$

Besfamille and Lockwood (2008)

Extension I: Ex ante comparison of regimes

- Assume now that the central government decides whether to implement a HBC or a SBC, but before the realization of the refinancing cost c.
- The refinancing cost is distributed according to the probability density function $h(c)$, with full support on $[0, b]$.
- Expected welfares:
  - $\mathbb{E}W^{SBC}(\pi) = 2\left[b - c_0 - (1-\pi)\bar{c}\right]$, where $\bar{c} = \int_0^b ch(c)dc$
  - $\mathbb{E}W^{HBC}(\pi) \begin{cases} 0 & \text{if } \pi < \pi^* \\ 2\left[b - c_0 - (1-\pi)\bar{c}\right] & \text{if } \pi \geq \pi^* \end{cases}$

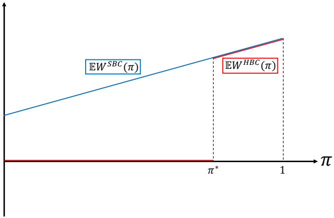
Extension I: Ex ante comparison of regimes

- $b - c_0 \geq \overline{c}$: SBC always (weakly) dominates.

Besfamille and Lockwood (2008)

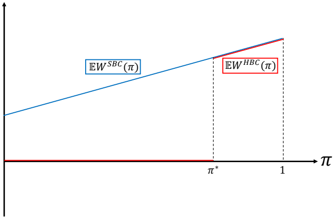
Extension I: Ex ante comparison of regimes

- $b - c_0 \geq \overline{c}$: SBC always (weakly) dominates.



Extension I: Ex ante comparison of regimes

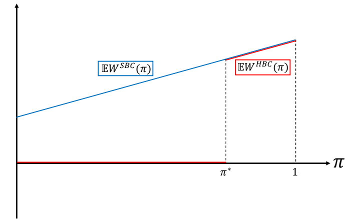
- $b - c_0 \geq \overline{c}$: SBC always (weakly) dominates.



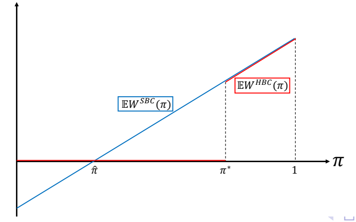
- $b - c_0 < \overline{c}$: HBC dominates if $\pi \leq \widehat{\pi} \equiv 1 - \frac{b-c_0}{\overline{c}}$; otherwise, SBC (weakly) dominates.

Extension I: Ex ante comparison of regimes

- $b - c_0 \geq \bar{c}$: SBC always (weakly) dominates.



- $b - c_0 < \bar{c}$: HBC dominates if $\pi \leq \widehat{\pi} \equiv 1 - \frac{b - c_0}{\bar{c}}$; otherwise, SBC (weakly) dominates.



Extension II: Imperfect commitment

- In the baseline model, the central government **can** commit to a HBC.

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- In the baseline model, the central government **can** commit to a HBC.
- Rodden et al. (2003): in many countries this is clearly an unrealistic assumption.

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- In the baseline model, the central government **can** commit to a HBC.
- Rodden et al. (2003): in many countries this is clearly an unrealistic assumption.
- Imperfect commitment, along the lines of Inman (2003) or Dovis and Kirpalani (2017).

Extension II: Imperfect commitment

- Two types of central government: a committed type, and an uncommitted type.

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- Two types of central government: a committed type, and an uncommitted type.
- The former abides to its promise, while the latter does not.

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- Two types of central government: a committed type, and an uncommitted type.
- The former abides to its promise, while the latter does not.
- Only the central government observes its type, which is not revealed until the refinancing stage.

Extension II: Imperfect commitment

- Two types of central government: a committed type, and an uncommitted type.
- The former abides to its promise, while the latter does not.
- Only the central government observes its type, which is not revealed until the refinancing stage.
- Bailouts are thus uncertain when regional governments initiate projects.

Extension II: Imperfect commitment

- Two types of central government: a committed type, and an uncommitted type.
- The former abides to its promise, while the latter does not.
- Only the central government observes its type, which is not revealed until the refinancing stage.
- Bailouts are thus uncertain when regional governments initiate projects.
- Let $\eta \in [0, 1]$ denote the probability that the central government is of a committed type.

Extension II: Imperfect commitment

- In this context, if the central government chooses a SBC regime, the equilibrium does not changes under this regime.

Extension II: Imperfect commitment

- In this context, if the central government chooses a SBC regime, the equilibrium does not changes under this regime.
- But this does not hold if the central government chooses to implement a HBC.

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- In this context, if the central government chooses a SBC regime, the equilibrium does not changes under this regime.
- But this does not hold if the central government chooses to implement a HBC.
- Now, under this regime, there may be regional interaction, because bailouts can emerge.

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- In this context, if the central government chooses a SBC regime, the equilibrium does not changes under this regime.
- But this does not hold if the central government chooses to implement a HBC.
- Now, under this regime, there may be regional interaction, because bailouts can emerge.
- The equilibrium under HBC is as follows.

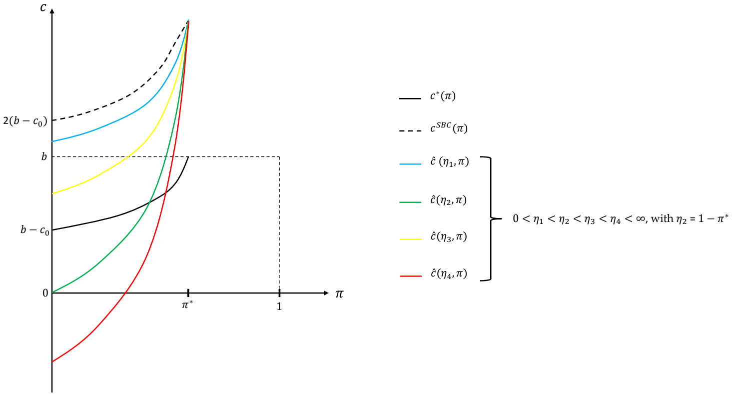
Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- Let $\widehat{c}(\eta, \pi) \equiv \frac{2[b - c_0 - (1-\pi)\eta b]}{(1-\pi)(1-\eta)}$.

Extension II: Imperfect commitment

- Let $\widehat{c}(\eta, \pi) \equiv \frac{2[b - c_0 - (1-\pi)\eta b]}{(1-\pi)(1-\eta)}$.



-

Extension II: Imperfect commitment

Proposition

Consider the project initiation game under HBC. The unique Nash equilibrium is as follows. Both regions initiate their project provided $c \geq \widehat{c}(\eta, \pi)$*. Otherwise, no region initiates its project.*

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- Is the lack of commitment detrimental to the choice of a HBC or to expected welfare? NOT ALWAYS

Besfamille and Lockwood (2008)

Extension II: Imperfect commitment

- Is the lack of commitment detrimental to the choice of a HBC or to expected welfare? NOT ALWAYS

Proposition

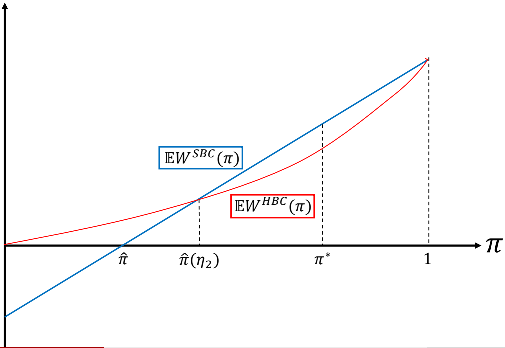
Assume that c is distributed uniformly on $[0, 1]$ *and* $b > 1$. *If* $\eta = \eta_2 < 1$, *HBC dominates if* $\pi \leq \widehat{\pi}(\eta_2)$; *otherwise, SBC dominates.*

Extension II: Imperfect commitment

- Is the lack of commitment detrimental to the choice of a HBC or to expected welfare? NOT ALWAYS

Proposition

Assume that c is distributed uniformly on $[0,1]$ and $b > 1$. If $\eta = \eta_2 < 1$, HBC dominates if $\pi \leq \widehat{\pi}(\eta_2)$; otherwise, SBC dominates.



Conclusions

- VFI and intergovernmental transfers is an unavoidable issue in many coutries.

Conclusions

- VFI and intergovernmental transfers is an unavoidable issue in many coutries.
- Lack of commitment of CG and constitutional incompleteness are at the heart of the bailout problem.

Conclusions

- VFI and intergovernmental transfers is an unavoidable issue in many coutries.
- Lack of commitment of CG and constitutional incompleteness are at the heart of the bailout problem.
- But commitment to a HBC may not be always efficient.

Conclusions

- VFI and intergovernmental transfers is an unavoidable issue in many coutries.
- Lack of commitment of CG and constitutional incompleteness are at the heart of the bailout problem.
- But commitment to a HBC may not be always efficient.
- Need more research on the commitment issue in federations.

Conclusions

- VFI and intergovernmental transfers is an unavoidable issue in many coutries.
- Lack of commitment of CG and constitutional incompleteness are at the heart of the bailout problem.
- But commitment to a HBC may not be always efficient.
- Need more research on the commitment issue in federations.
- Thank you!