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Fiscal Reform To Support Strong and Equitable Growth: Striking The Right Balance

The Impact of Decentralizing Public Good Provisions on Social Welfare

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Motivations

- The existences of spillover across jurisdictions generate inefficiency and induces non-optimal public policy, such as public good provision and taxation.
- Investigating the relationship between degree of spillover and potential gains from decentralization.

Research Questions

1. How can we model the impact of fiscal decentralization on social welfare when the spillovers exist in the context of an urban economy?
2. Does fiscal decentralization benefit cities and society when some degree of spillover is present?
3. Are the results for developed countries consistent with the results for developing countries?

Literature reviews

- Samuelson (1954) provided conditions for allocative efficiency for public good provision. In general, we have no reason to believe that public goods will be provided efficiently.
- Tiebout (1956) conjectured that competition among publicly elected governments for mobile households may yield an efficient provision of local public goods.
- Barr and Davis (1966) provided some of the foundations for a political theory of local expenditures.
- Oates (1972) showed that fiscal federalism is pareto optimum and efficient if there are no spillovers among jurisdictions.

Definition

Literature reviews

- Bewley (1981) shows theoretically that Tiebout equilibrium is not pareto optimum or T.E. will only achieve social optimum in a very specific and restricted assumptions.
- Besley and Coate (2003) provides a theoretical framework for centralized vs. decentralized provision of local public good from a political economy approach.
- Calabrese, Epple, Romano (2012) demonstrates that decentralization is less efficient than centralization using theoretical model and calibrations.

Contributions

Gaps in literature:
In urban economy context, there are extensive work on externality/spillover and on decentralization as separate topics. However, to the best of my knowledge, there is no literature that discuss the impact of various levels of spillover and fiscal decentralization on welfare in the context of urban economy.

Model

Setting:

- There are four agents in the model: households, housing owners, local governments and a central government.
- MA is divided into J jurisdictions
- MA which consists of J jurisdictions, each of them has fixed boundaries
- Each jurisdiction has a local housing market, provides (fully congested) public good, g, and charges property taxes, t
- local PG provision and the property tax rate are determined by majority rule in each jurisdiction
- Households are renters and housing is owned by absentee landlords
- There is a continuum of households (y, α)
- Households behave as price takers and have preferences defined over a local public good, and housing services, h.
- There are spillovers (positive externalities) of local public goods across jurisdictions.

Keys

- The impact of spillover
- Spillover $= [0, 1]$
- $U_i = U(x_i, h_i, g_i, \kappa g_{-i}; \alpha)$
- $U_i = [\beta_x x^\rho + \beta_h h^\rho + \beta_{g_i}(\alpha) g_i^\rho + \beta_{g_j}(\alpha) \kappa g_j^\rho]^{1/\rho}$

Decentralized Policy

Agents:

- Households
- Homeowners
- Governments

Stages:

Stage 1 HHs choose a jurisdiction and rent a house in a jurisdiction

Stage 2 they vote in the corresponding jurisdiction for property tax that used to finance the local PG

Stage 3 local PG is determined from local gov't budget balance

Equations

Pareto optimum characterization

$S \equiv [\alpha, \bar{\alpha}] \times [y, \bar{y}] \subset R^2_+$ More

$$\max_{r(y,\alpha),a_i(y,\alpha),R,T_i,t_i,p_i,g_i,g_{-i}} \sum_{i=1}^{J} \Big[\int_S \omega(y,\alpha) V_i^e(p_i, g_i, \kappa g_{-i}, y + r(y,\alpha) - T_i, \alpha) \\ a_i(y,\alpha) f(y,\alpha)\, dy\, d\alpha + \omega_R \Big(R/J + \int_0^{p_i/(1+t_i)} H_s^i(z)\, dz \Big) \Big] \tag{1}$$

subject to:

$$R + \int_S r(y,\alpha) f(y,\alpha)\, dy\, d\alpha = 0 \tag{2}$$

$$\int_S h_d^i(p_i, y + r(y,\alpha) - T_i, g_i, \kappa g_{-i}, \alpha) a_i(y,\alpha) f(y,\alpha)\, dy\, d\alpha \\ = H_S^i(p_i/(1+t_i)) \tag{3}$$

$$T_i \int_S a_i(y,\alpha) f(y,\alpha)\, dy, d\alpha + \frac{t_i p_i}{1+t_i} H_S^i(p_i/(1+t_i)) \\ = g_i \int_S a_i(y,\alpha) f(y,\alpha)\, dy\, d\alpha \tag{4}$$

$$a_i(y,\alpha) \in [0,1] \ , \ \sum_{i=1}^{J} a_i(y,\alpha) = 1 \quad \forall (y,\alpha) \tag{5}$$

$$\kappa \in [0,1] \tag{6}$$

First-order Conditions

$$\frac{\partial \mathcal{L}}{\partial R} = \Omega + \omega_R = 0 \tag{7}$$

$$\frac{\partial \mathcal{L}}{\partial r} = \sum_{i=1}^{J} \omega U_1^i a_i + \sum_{i=1}^{J} \eta_i (h_d^i)_2 a_i + \Omega = 0 \tag{8}$$

$$\frac{\partial \mathcal{L}}{\partial a_i} = \omega V_i^e + \eta_i h_d^i - \lambda_i (T_i - g_i) = 0 \tag{9}$$

$$\frac{\partial \mathcal{L}}{\partial T_i} = -\omega U_1^i - \eta_i (h_d^i)_2 + \lambda_i = 0 \tag{10}$$

$$\frac{\partial \mathcal{L}}{\partial t_i} = -\omega_R + \lambda_i (1 - t_i \varepsilon_s^i) + \eta_i \frac{(1 + t_i)}{p_i} \varepsilon_s^i = 0 \tag{11}$$

$$\frac{\partial \mathcal{L}}{\partial g_i} = \int_S \omega U_3^i a_i f \, dy \, d\alpha + \eta_i \int_S (h_d^i)_3 a_i f \, dy \, d\alpha - \lambda_i \int_S a_i f \, dy \, d\alpha = 0 \tag{12}$$

$$\frac{\partial \mathcal{L}}{\partial g_{-i}} = \omega U_4^i \kappa + \eta_i (h_d^i)_4 \delta = 0 \tag{13}$$

$$\frac{\partial \mathcal{L}}{\partial p_i} = \left[\eta_i \int_S (h_d^i)_1 a_i f \, dy \, d\alpha - \int_S \omega U_1^i h_d^i a_i f \, dy \, d\alpha \right] \frac{1 + t_i}{H_s^i} + \omega_R + \lambda_i t_i (1 + \varepsilon_s^i) - \eta_i \frac{(H_s^i)'}{H_s^i} = 0 \tag{14}$$

Indirect utility function

$$\max_h \left[\beta_x x^\rho + \beta_h h^\rho + \alpha g_i^\rho + \alpha\kappa g_j^\rho\right]^{1/\rho} \tag{15}$$

$$h_d = \frac{y - r}{(p\frac{\beta_x}{\beta_h})^{\frac{1}{1-\rho}} + p} \tag{16}$$

$$\tilde{V}(.) = \left[(y - r)^\rho \Phi(p) + \alpha g_i^\rho + \alpha\kappa g_j^\rho\right]^{1/\rho} \tag{17}$$

$$\Phi(p) = \frac{\beta_x}{1 + (p\frac{\beta_x}{\beta_h})^{\frac{1}{\rho-1}}} + \frac{\beta_h (p\frac{\beta_x}{\beta_h})^{\frac{\rho}{\rho-1}}}{[1 + (p^\rho\frac{\beta_x}{\beta_h})^{\frac{1}{\rho-1}}]^\rho} \tag{18}$$

Boundary locus

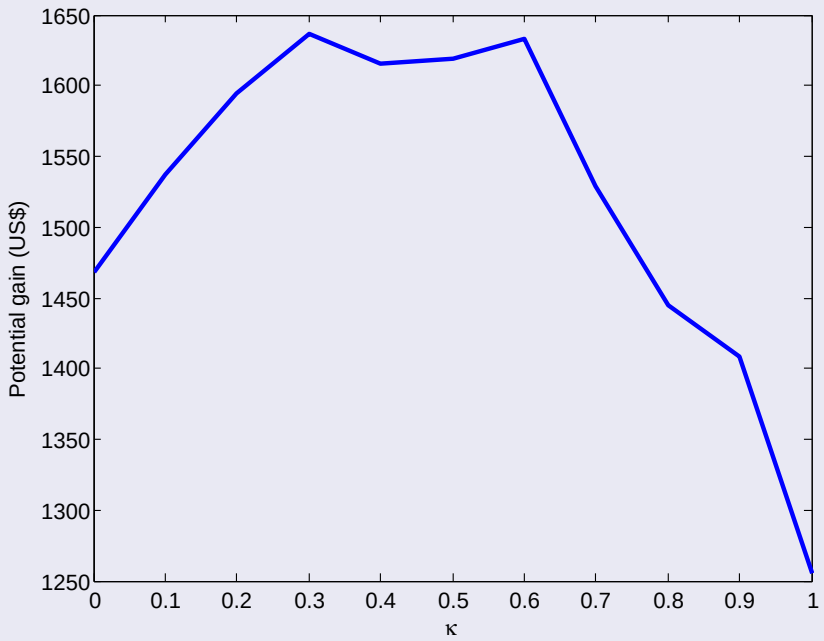
Parameters

Table: Parameters for Each MA

Parameter	United States	Indonesia
ncom	5	5
μ_{lny}	10.5171	9.8614
σ_{lny}	0.8862	0.8310
β_h	0.3559	0.3959
β_x	1	1
ρ	-0.01	-0.01
γ	0.25	0.37
θ	3	1.7
κ	0 to 1	0 to 1

Results: Head Tax

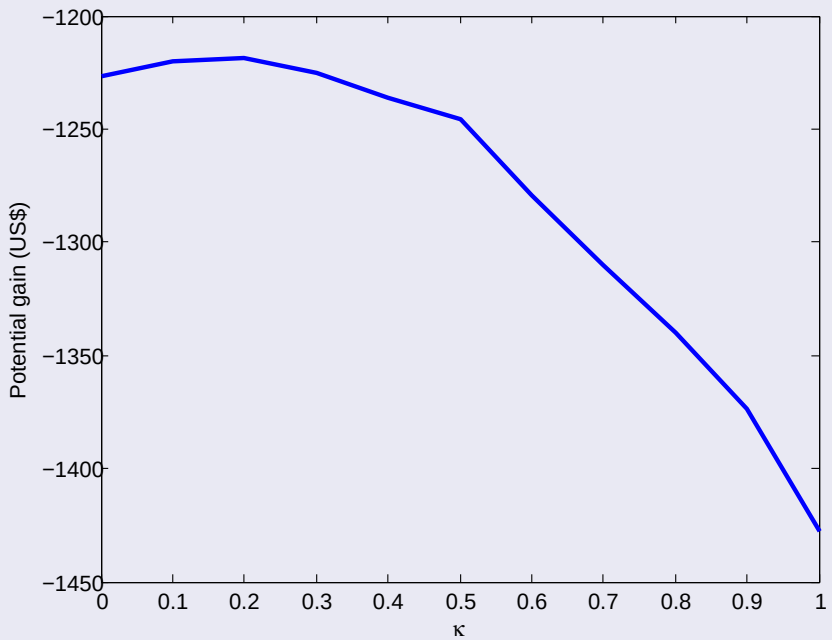
Spillover and welfare in a head-tax world, MA in US



- When the spillover is relatively low, the benefit from having positive spillover (from other jurisdictions) dominates the cost of having "non-optimal" tax rates and public good provisions.
- As the degree of spillover increases, the potential gain of decentralization declines.
- In a different context, this result substantiates Besley and Coate (2003) that there is a critical value of spillover where centralization dominates decentralization.

Results: Head Tax

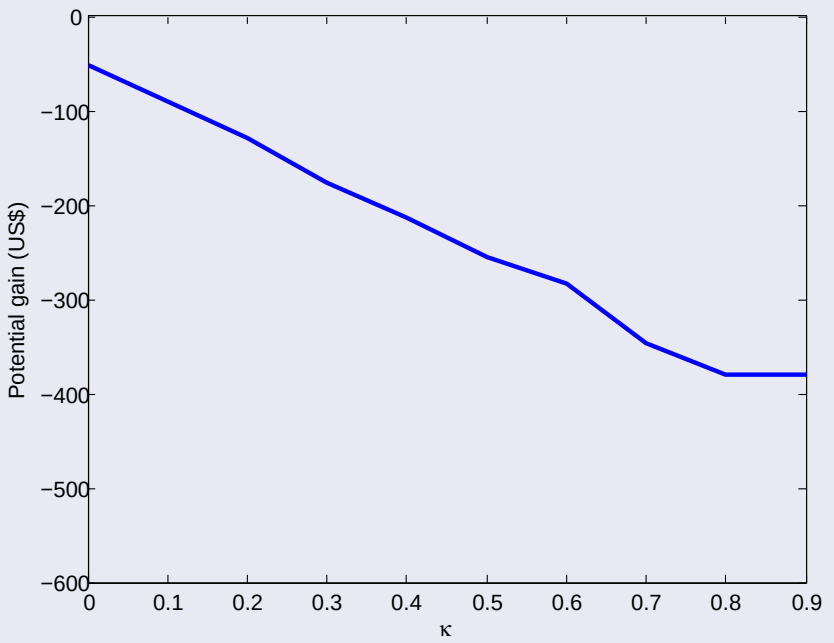
Spillover and welfare in a head-tax world, MA in Indonesia



- As the spillover increases, the potential lost of decentralization also increases.
- The impact of spillover is more moderate than in US case
- Relatively insignificant impact on welfare gain when the spillover level is relatively low ($0 \leq \kappa \leq 0.3$)
- It resonates Oates' decentralization theorem (1972).

Results: Property Tax

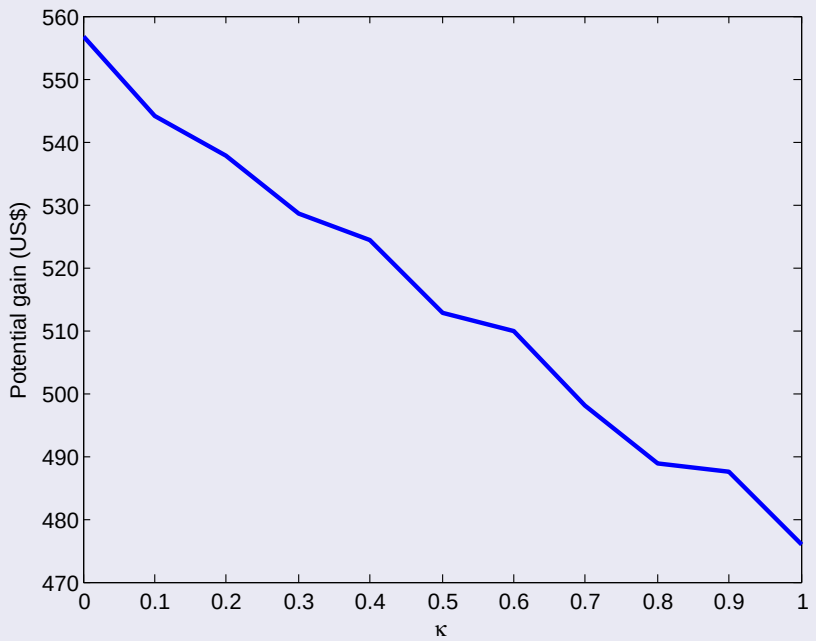
Spillover and welfare in a property-tax world, MA in US



- As the spillover increases, the potential lost of decentralization also increases.
- It resonates Oates' decentralization theorem (1972).

Results: Property Tax

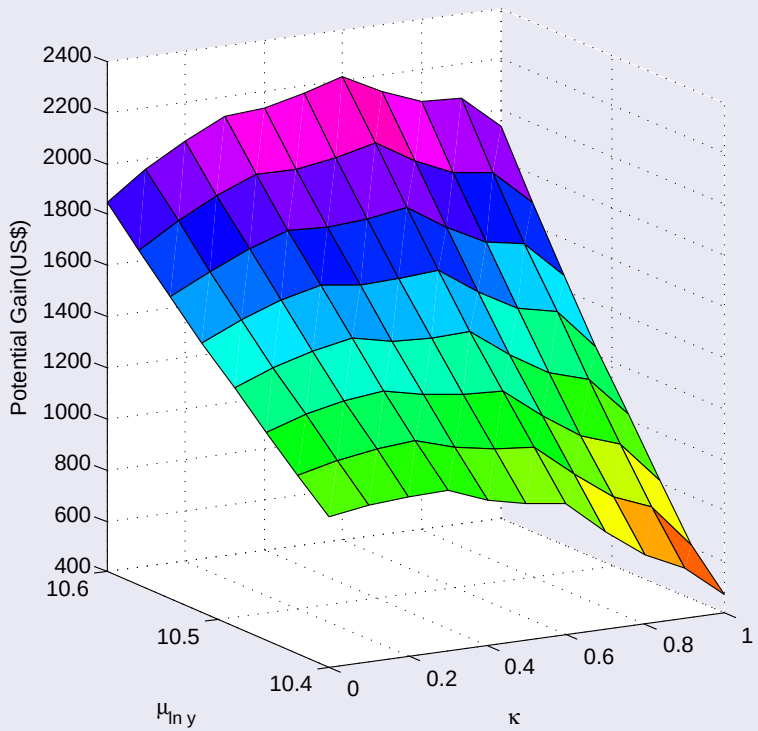
Spillover and welfare in a property-tax world, MA in Indonesia



- As the spillover increases, the potential lost of decentralization also increases.
- Decentralization is more favorable when there is no spillover or when spillover is low
- This result substantiates the idea of Oates' decentralization theorem (1972).

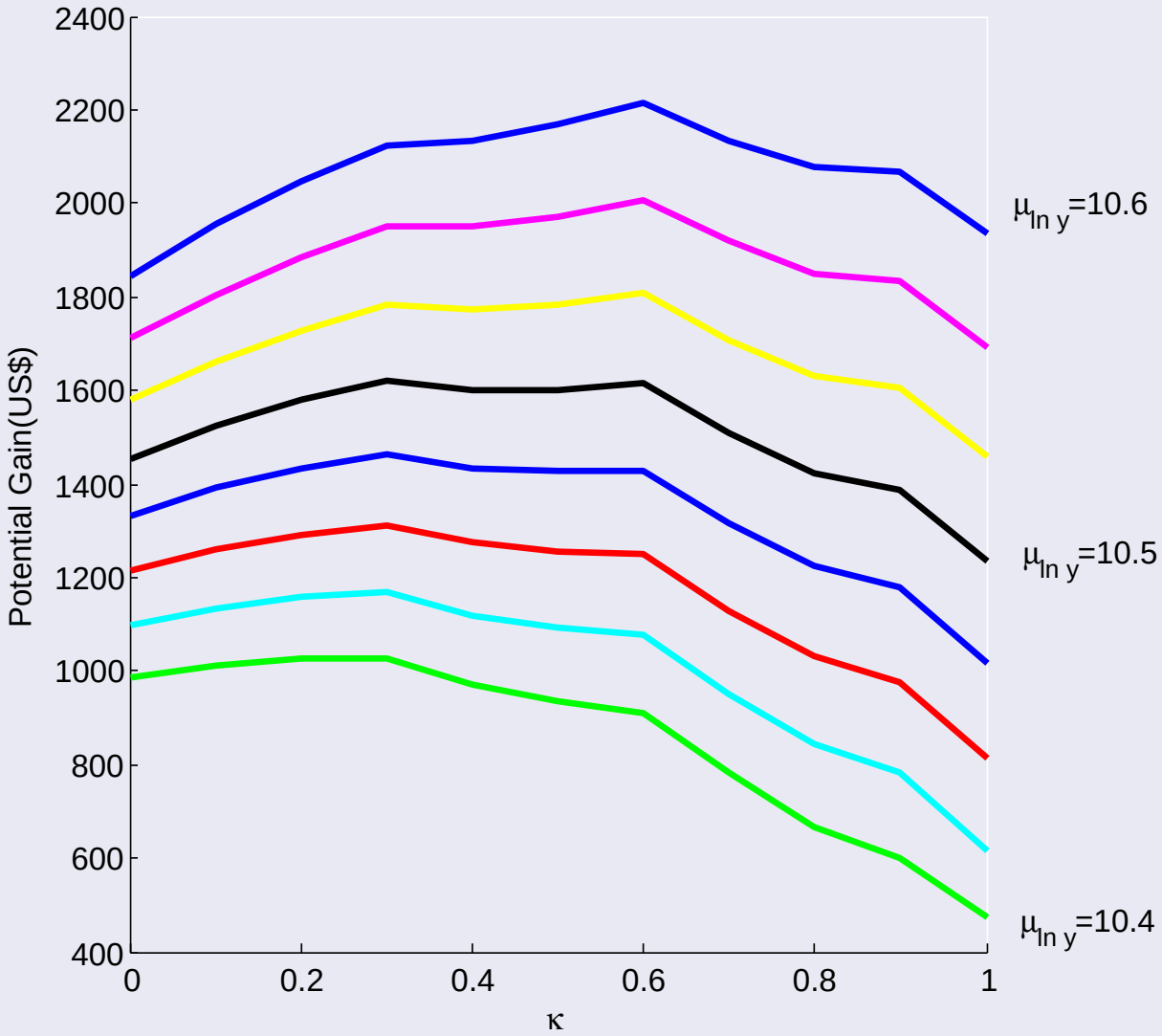
Results: For different income levels

Income level and welfare change at various degrees of spillover,US



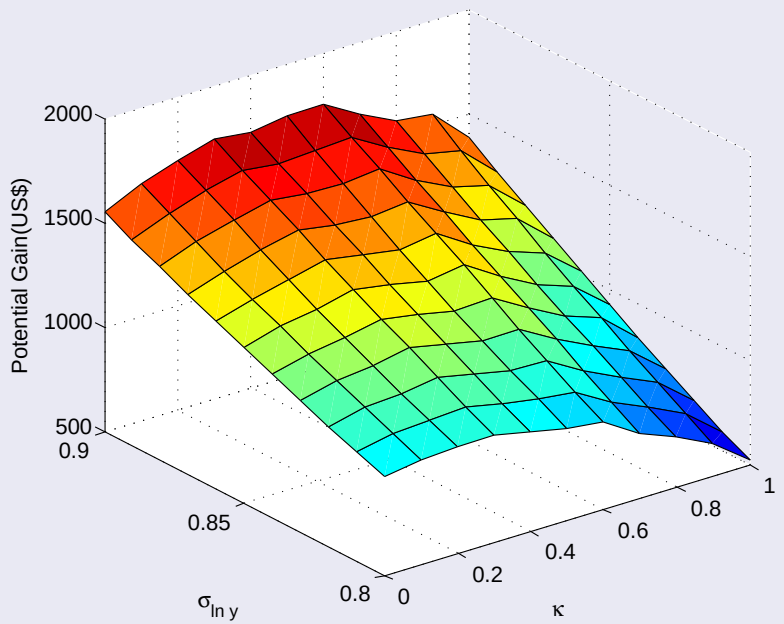
- When the mean income is relatively low, a higher spillover level will decrease the benefit from decentralization
- When the mean income is relatively high, a higher spillover level will increase the benefit from decentralization
- There is an indication that an economy with higher mean income will gain more benefit from decentralized tax policy at various level of spillover level, ceteris paribus.

Income level and welfare change at various degrees of spillover



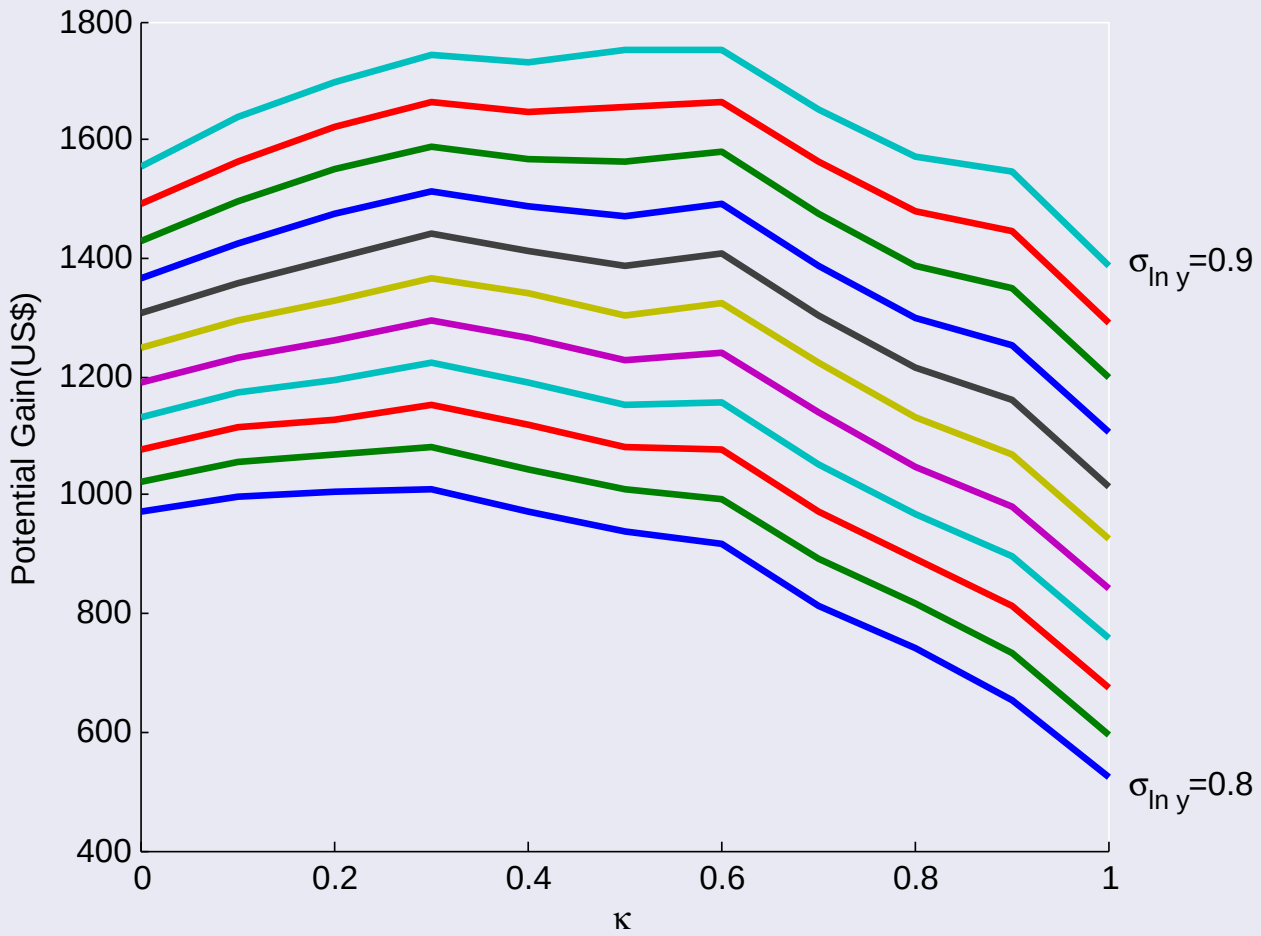
Results: For different inequality

Inequality and welfare change at various degrees of spillover



- As inequality increases, the potential gain of decentralization is linearly higher.
- When the inequality is high, the impact of spillover on the benefit from decentralization become more inconclusive (depends on the spillover).
- Urban decentralization tends to be accompanied by significant increases in income inequality (Wheeler, 2006).
- Rich countries benefit from decentralization with regard to a more equal regional income distribution but stimulate higher inequality in developing countries (Lesmann, 2011).

Income level and welfare change at various degrees of spillover



Conclusions

- Spillover level does affect the potential gain of decentralization.
- In the case of efficient taxation, the impacts of spillover are ambiguous:
  - Relatively low level of spillover has a positive impact on the potential gain of decentralization.
  - Relatively high level of spillover has a negative impact on the potential gain of decentralization in both developed and developing countries.
- In property-tax case, any degree of spillover has negative impact on the potential gain from decentralization.

- In general, the results substantiate Oates' decentralization theorem
- However, the impact of spillover level on the potential gain of decentralization varies across different level of income vis-à-vis income inequality.
  - Spillover hurts MA with lower income more than MA with higher income.
  - a higher level of inequality amplifies the benefit of decentralization, which illustrates that developed countries—that generally have higher income inequality—potentially gain more benefits from decentralization.

Policy implications

- Policy makers should be aware that decentralization may generate loss to the society.
- The results suggest that some taxes might be better to remain under centralized policy.
- As the consequence of spillover, coordination among jurisdictions is very important to minimize the cost of spillover in the metropolitan area. Consolidating the resources and coordination in choosing the type and level of public good provision are potentially beneficial to all jurisdictions in the metropolitan area and will minimize the cost of spillover and potential costs of duplication.

APPENDIX

Fiscal Decentralization

- Fiscal federalism is a general normative framework for assignment of functions to the different levels of government and appropriate fiscal instruments for carrying out these functions (Oates, 1999)

- Fiscal decentralization is the devolution by the central government to local governments (states, regions, municipalities) of specific functions with the administrative authority and fiscal revenue to perform those functions (Kee, 2003)

Back

Standardized value of joint distribution

To calculate community populations and incomes, we use the result from Epple (1999) to get the standardized value of the joint distribution $(\ln y, \ln \alpha)$, Z, by utilizing 24:

$$Z_{ij}(y) = \frac{\ln\left[\frac{(y-r_j)^\rho \Phi(p_j) - (y-r_i)^\rho \Phi(p_i)}{g_i^\rho - g_j^\rho + \kappa(g_j^\rho - g_i^\rho)}\right] - \mu_{\ln \alpha} - \lambda \sigma_{\ln \alpha} \frac{\ln y - \mu_{\ln y}}{\sigma_{lny}}}{\sigma_{\ln \alpha}\sqrt{1-\lambda^2}} \tag{19}$$

Pareto optimum characterization

$$S \equiv [\alpha, \bar{\alpha}] \times [y, \bar{y}] \subset R^2_+$$

$$h = h_d(p_i, g_i, \kappa g_{-i}, y, \alpha) \text{ for all } i \text{ and } (y, \alpha) \tag{20}$$

$$H_s = H_s\left(\frac{p_i}{1 + t_i}\right). \tag{21}$$

The household's utility in city i is maximized over housing demand

$$\begin{aligned} & V^e(p_i, g_i, \kappa g_{-i}, y + r(y, \alpha) - T_i, \alpha) \\ & \quad \equiv \max_h U(y + r(y, \alpha) - T_i - p_i h, h, g_i, \kappa g_{-i}; \alpha) \end{aligned} \tag{22}$$

$h_d(p_i, y + r(y, \alpha) - T_i, g_i, \kappa g_{-i}, \alpha)$

Back

The boundary locus between jurisdiction i and j

$$\tilde{V}_i(p_i, g_i, \kappa g_j) = \tilde{V}_j(p_j, g_j, \kappa g_i)$$

$$\Rightarrow \alpha = \frac{(y - r_j)^\rho \Phi(p_j) - (y - r_i)^\rho \Phi(p_i)}{g_i^\rho - g_j^\rho + \kappa(g_j^\rho - g_i^\rho)} \tag{23}$$

$$\Rightarrow \ln \alpha_{ij}(y) = \ln \left[\frac{(y - r_j)^\rho \Phi(p_j) - (y - r_i)^\rho \Phi(p_i)}{g_i^\rho - g_j^\rho + \kappa(g_j^\rho - g_i^\rho)} \right] \tag{24}$$

Back

$U_j = U(x_j, h_j, g_j, g_{-j}; \alpha, \kappa)$

Stage 3

Determining local public good level (g_j) and gross housing price (p_j) that satisfy:

$$p_j = (1 + t_j)p_s^j \tag{1}$$

$$g_j \int_S f_j(y, \alpha) dy \, d\alpha = t_j p_s^j H_s^j(p_s^j) \tag{2}$$

$$x_j = y - (1 + t_j)p_s^j h_j(y, \alpha) \tag{3}$$

Stage 2

Households maximize $V(.)$ where (p_j, g_j) satisfy equation (1) and (2) taking as given $(f_j(y, \alpha), h_j(y, \alpha), p_s^j)$.

Substituting (1) to (3) and (3) to utility function, we obtain:

$$V(p_j, g_j, \kappa g_{-j}, y, \alpha) = U(y - p_j h_j(y, \alpha), h_j(y, \alpha), g_j, \kappa g_{-j}; \alpha)$$

Stage 1

HHs choose jurisdictions and housing consumption:

$h = h_d(p_i, y + r(y, \alpha) - T_i, g_i, \kappa g_{-i}, \alpha)$, $\forall\ j$ and (y, α)

Housing market clearance:

$\int_S h_d(.) f_j(y, \alpha) dy\, d\alpha = H_s^j(p_s^j)$

HHs maximize

$\tilde{V}(p_j, g_j, \kappa g_{-j}, y, \alpha) = U(y - p_j h_d(.), h_d(.), g_j, g_{-j}; \alpha, \kappa)$

Back