Urban unemployment, privatization policy, and a differentiated mixed oligopoly

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Tohru Naito
(The University of Tokushima)

Outline

1. Motivation
2. Previous literature
3. Model
   - Household
   - Rural Sector
   - Urban Sector
4. Migration and unemployment
5. Conclusion

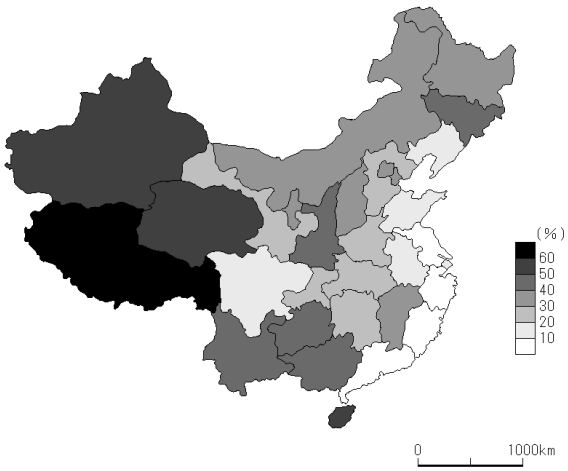
Motivation(1)

1. Recently some public firms have been privatized in many countries.
2. Since it is possible that the privatization of public firm affects the various kinds of market in the economy; Labor, goods, capital, and so on.
3. Particularly, the change of labor market in urban area affects the migration between rural area and urban area.
4. Since it is not desirable that the urban unemployment increases in the economy, we need consider the privatization of public firm more carefully.
5. Though the traditional dualistic models analyze the relationship between unemployment in urban area and labor migration, most of setting does not necessarily express reality.

Motivation(2)

5. The 1st purpose of this paper is to construct the model to analyze the relationship between urban unemployment and the privatization of public firm.
6. The 2nd purpose of it is to analyze the effect of public firm of privatization on labor demand, urban unemployment, and social welfare.

The share of public firm in regions of China (2003)



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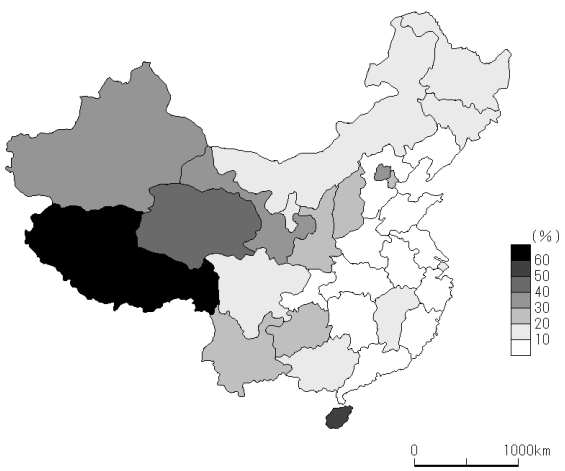
The share of public firm in regions of China (2009)



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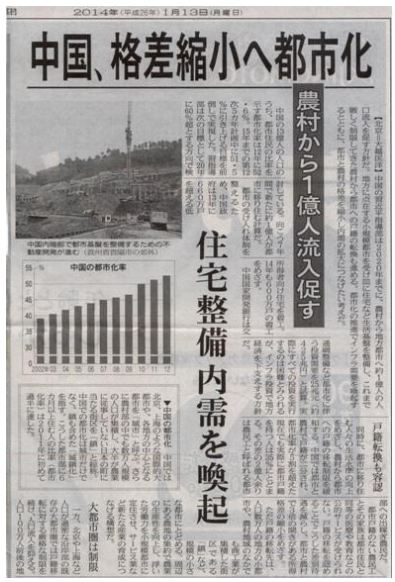


2014年（平成26年）1月13日（月曜日）

中国、格差縮小へ都市化

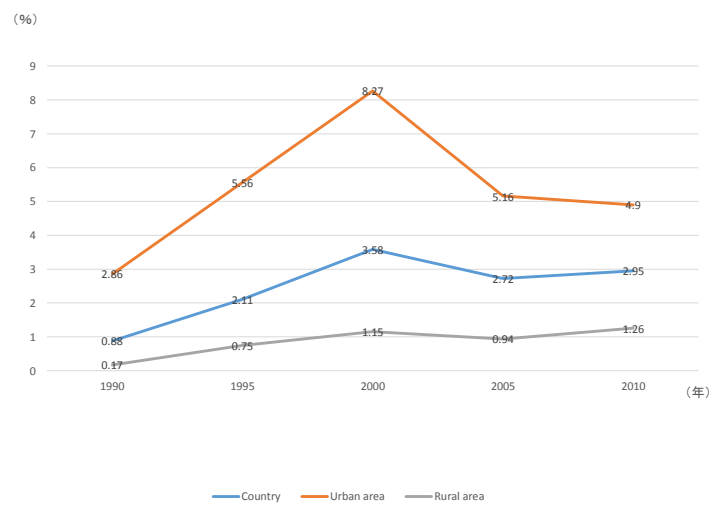
農村から1億人流入促す

住宅整備 内需を喚起

中国の都市化率

Jan. 13th 2014 from “The Nikkei”

Unemployment in China



Dualistic economy model

1. Harris and Todaro (1970) conceived a mechanism by which unemployment occurred endogenously in the framework of a dualistic economy in development economics.
2. Corden and Findlay (1975) relax this assumption, and analyze a model with free mobility of capital between the urban area and the rural area.
3. (1998) considers the partial privatization and shows that partial privatization is optimal in a mixed duopoly when a public firm is as productive as its private competitor.
4. Matsumura and Kanda (2005) generalize Matsumura (1998) to a mixed oligopoly setting with more than two private firms and show that at least partial privatization is socially preferable in the short run.
5. Fujiwara (2007) considers the differentiated goods in the mixed oligopoly and investigate the effect of goods differentiation on optimal privatization of public goods in short-run and long-run

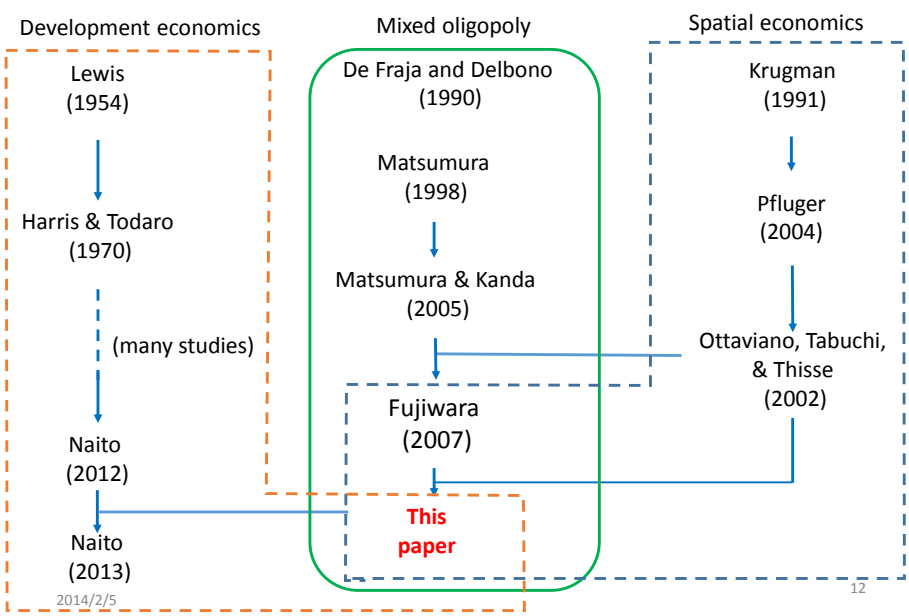
Mixed oligopoly model

1. De Fraja and Delbono (1989) show that when public firms compete with many private firms, they should maximize profits rather than welfare in order to improve overall social welfare.
2. Matsumura (1998) considers the partial privatization and shows that partial privatization is optimal in a mixed duopoly when a public firm is as productive as its private competitor.
3. Matsumura and Kanda (2005) generalize Matsumura (1998) to a mixed oligopoly setting with more than two private firms and show that at least partial privatization is socially preferable in the short run.
4. Fujiwara (2007) considers the differentiated goods in the mixed oligopoly and investigate the effect of goods differentiation on optimal privatization of public goods in short-run and long-run

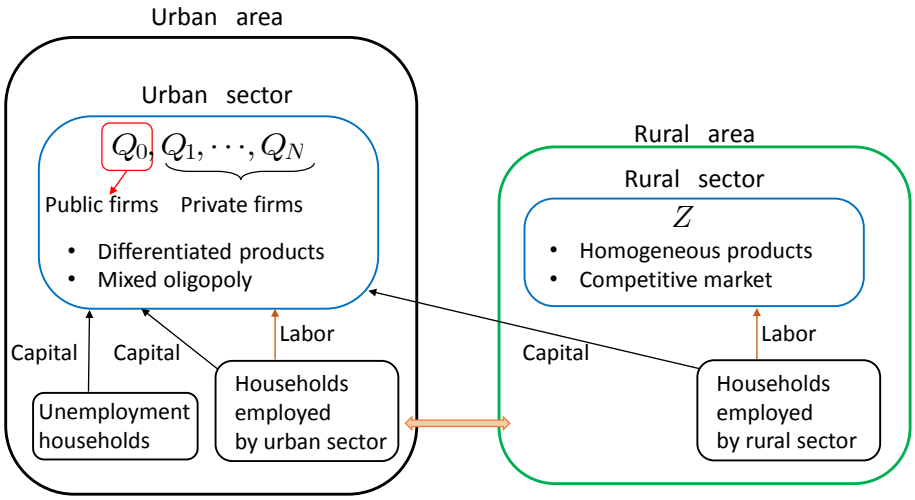
Spatial economics model

1. The monopolistic competition model by Dixit and Stiglitz (1977) has been applied to many regional science and urban studies. A salient study by Krugman (1991) is the pioneering work in core-periphery models.
2. Pfluger (2004) substitutes quasi-linear utility function with logarithmic sub utility for Dixit and Stiglitz type utility function to solve the model analytically.
3. Ottaviano, Tabuchi, and Thisse (2002) introduce the competition effect into the Core-periphery model and construct the Core-periphery which is solved analytically.

Previous works



The model



Households (1)

Utility function

- The quasi-linear utility function as well as Ottaviano, Tabuchi, and Thisse (2002)
- Differentiated manufactured goods
- All households in an economy have common preference

$$U_l = \alpha\left(q_{0l} + \sum_{i=1}^{N} q_{il}\right) - \frac{\beta-\gamma}{2}\left([q_{0l}]^2 + \sum_{i=1}^{N}[q_{il}]^2\right) - \frac{\gamma}{2}\left[q_{0l} + \sum_{i=1}^{N} q_{il}\right]^2 + z$$

$$(l = c, r, u)$$

- q_{0l} : consumption of goods produced by public firm
- q_{il} : consumption of goods produced by *i* –th private firm
- z : consumption of agricultural goods
- N : the number of private manufactured goods

Households (2)

Budget constraint

$$w_l + r\bar{k} = p_0 q_{0l} + \sum_{i=1}^{N} p_i q_{il} + z \qquad (l = c, r, u)$$

- w_l : the wage rate of household *l*
- p_i : price of goods produced by *i* –th private firm
- p_0 : price of goods produced by public firm
- $\bar{k}$: endowment capital
- r : capital rent

Urban minimum wage rate ⇨ $w_c = \bar{w}$

Unemployment households ⇨ $w_u = 0$

Households (3)

Utility maximization problem

$$\max_{q_{0l},\cdots,q_{Nl}} \alpha\left(q_{0l} + \sum_{i=1}^{N} q_{il}\right) - \frac{\beta-\gamma}{2}\left([q_{0l}]^2 + \sum_{i=1}^{N}[q_{il}]^2\right) - \frac{\gamma}{2}\left[q_{0l} + \sum_{i=1}^{N} q_{il}\right]^2 + z$$

subject to $w_l + r\bar{k} = p_0 q_{0l} + \sum_{i=1}^{N} p_i q_{il} + z \qquad (l = c, r, u)$

the first order condition of q_{0l} and q_{il}

$$\alpha - (\beta-\gamma)q_{0l} - \gamma\left[q_{0l} + \sum_{i=1}^{N} q_{il}\right] - p_0 = 0$$

$$\alpha - (\beta-\gamma)q_{il} - \gamma\left[q_{0l} + \sum_{i=1}^{N} q_{il}\right] - p_i = 0 \qquad (i = 1, \cdots, N)$$

Households (4)

Demand function

$$q_{0l}^* = a - [b + c(N+1)]p_0 + cP$$
$$q_{il}^* = a - [b + c(N+1)]p_i + cP \qquad (l = c, r, u)$$
$$a = \frac{\alpha}{[\beta+\gamma N]}, b = \frac{1}{[\beta+\gamma N]}, c = \frac{\gamma}{(\beta-\gamma)[\beta+\gamma N]}$$

- w_l : the wage rate of household *l*
- p_i : price of goods produced by *i* –th private firm
- p_0 : price of goods produced by public firm
- $\bar{k}$: endowment capital
- r : capital rent

Households (5)

Price index manufactured goods

$$P \equiv \left[p_0 + \sum_{i=1}^{N} p_i \right]$$

Indirect utility function of household *i*

$$v_l = \alpha \left(q_{0l}^* + \sum_{i=1}^{N} q_{il}^* \right) - \frac{\beta-\gamma}{2} \left([q_{0l}^*]^2 + \sum_{i=1}^{N} [q_{il}^*]^2 \right) - \frac{\gamma}{2} \left[q_{0l}^* + \sum_{i=1}^{N} q_{il}^* \right]^2$$
$$- p_0 q_{0l}^* - \sum_{i=1}^{N} p_i q_{il}^* + w_l + r\bar{k}$$
$$= \frac{a^2(N+1)}{2b} - a \left(p_0 + \sum_{i=1}^{N} p_i \right) + \frac{b+c(N+1)}{2} \left([p_0]^2 + \sum_{i=1}^{N} [p_i]^2 \right)$$
$$- \frac{c}{2} \left[p_0 + \sum_{i=1}^{N} p_i \right]^2 + w_l + r\bar{k}$$

Migration between urban area and rural area

Urban unemployment

$$\lambda \equiv \frac{L_u}{L_c+L_u}$$

Population constraint

$$L_c + L_u + L_r = 1$$

Substituting λ into population constraint,

$$L_c + (1-\lambda)L_r = 1 - \lambda$$

Production (1)

Agricultural goods sector

- competitive
- only labor input
- numeraire

Production function of agricultural goods

$$Z = (L_r)^{\sigma}, \quad \sigma \in (0,1) \qquad L_r : \text{Labor input}$$

Wage in rural area

$$w_r = \sigma(L_r)^{\sigma-1}$$

Production (2)

Manufactured goods sector

- mixed oligopoly (One public firm and N private firms)
- The large number of private firm
- labor input and (fixed) capital input

Total demand of manufactured goods in a economy

$$Q_0 = (L_c + L_u + L_r)(q_{0c} + q_{0u} + q_{0r})$$
$$= a - [b + c(N+1)]p_0 + cP$$
$$Q_i = (L_c + L_u + L_r)(q_{ic} + q_{iu} + q_{ir})$$
$$= a - [b + c(N+1)]p_i + cP, \quad (i = 1, \cdots, N)$$

Production function of manufactured goods

$$Q_j = \frac{L_c^j}{m} \quad (j = 0, \cdots, N)$$

Production (3)

Cost function of manufactured goods sector

$$C(Q_0) = m\bar{w}Q_0 - r$$
$$C_i(Q_i) = m\bar{w}Q_i - r \quad (i = 1, \cdots, N)$$

Profit function of public firm and private firms in a economy

$$\pi_0 = (a - [b + c(N+1)]p_0 + cP)(p_0 - m\bar{w}) - r$$
$$\pi_i = (a - [b + c(N+1)]p_i + cP)(p_i - m\bar{w}) - r \quad (i = 1, \cdots, N)$$

Social welfare function

$$W = \frac{a^2(N+1)}{2b} - a\left(p_0 + \sum_{i=1}^{N} p_i\right) + \frac{b+c(N+1)}{2}\left([p_0]^2 + \sum_{i=1}^{N}[p_i]^2\right)$$
$$-\frac{c}{2}\left[p_0 + \sum_{i=1}^{N} p_i\right]^2 + \pi_0 + \sum_{i=1}^{N}\pi_i + \bar{w}(L_c^0 + \sum_{i=1}^{N} L_c^i) + \pi_r + w_r L_r + (N+1)r$$

Production (4)

Maximize the weighted average of social welfare and its profit

$$
\begin{aligned}
V(\theta) &\equiv \pi_0 + (1-\theta)W \\
&= (a-[b+c(N+1)]p_0 + cP)(p_0 - m\bar{w}) - r \\
&+ (1-\theta)\left[\tfrac{a^2(N+1)}{2b} - a\left(p_0 + \sum_{i=1}^{N} p_i\right) + \tfrac{b+c(N+1)}{2}\right. \\
&+ \left.\left([p_0]^2 + \sum_{i=1}^{N}[p_i]^2\right) - \tfrac{c}{2}\left[p_0 + \sum_{i=1}^{N} p_i\right]^2 + \sum_{i=1}^{N}\pi_i + \bar{w}(L_c^0 + \sum_{i=1}^{N} L_c^i) w_r L_r + r(N+1)\right]
\end{aligned}
$$

The first order condition for the objective function of public firm

$$
\begin{aligned}
\frac{\partial V(\theta)}{\partial p_0} &= \frac{\partial \pi_0}{\partial p_0} + (1-\theta)\left\{\frac{\partial CS}{\partial p_0} + \sum_{i=1}^{N}\frac{\partial \pi_i}{\partial p_0} + \bar{w}\frac{\partial L_c^0}{\partial p_0}\right\} \\
&= a - (1+\theta)[b+c(N+1)]p_0 + cP + \theta m\bar{w}[b+c(N+1)] = 0
\end{aligned}
$$

(*)The behavior of each firm does not affect price index of manufactured goods.

$$\frac{\partial P}{\partial p_j} = 0 \quad (j = 0, \cdots, N)$$

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Production (5)

Assuming the symmetry of private firms,

$$p \equiv p_1 = \cdots = p_N$$

The equilibrium price of manufactured goods produced by public firm

$$p_0 = \frac{a}{(1+\theta)[b+c(N+1)]} + \frac{c}{(1+\theta)[b+c(N+1)]}P + \left(\frac{\theta}{1+\theta}\right) m\bar{w}$$

The equilibrium price of manufactured goods produced by private firm

$$p = \frac{a}{2[b+c(N+1)]} + \frac{c}{2[b+c(N+1)]}P + \frac{m\bar{w}}{2}$$

Inserting p_0 and p into P, the following equation is hold.

$$
\begin{aligned}
P &= p_0 + Np \\
&= \left(\frac{2+(1+\theta)}{2(1+\theta)[b+c(N+1)]}\right) a + \left(\frac{2+(1+\theta)}{2(1+\theta)[b+c(N+1)]}\right) cP + \left(\frac{2\theta+(1+N)\theta}{2(1+\theta)}\right) m\bar{w}
\end{aligned}
$$

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Production (6)

Solving this equation with respect to price index P, P* is given by

$$P^* = \left(\frac{2+(1+\theta)}{2(1+\theta)b+[2\theta+(1+\theta)N]c}\right)a + \left(\frac{2[2\theta+(1+\theta)]}{2(1+\theta)b+[2\theta+(1+\theta)N]c}\right)m\bar{w}.$$

the equilibrium price of each firm

$$p_0^* = \left(\frac{2b+(N+3)c}{(b+(N+1)c)(2(1+\theta)b+[(1+\theta)N+2\theta]c)}\right)a + \left[\frac{c}{(1+\theta)(b+c(N+1))}\left(\frac{2(2\theta+(1+\theta))}{2(1+\theta)b+(2\theta+(1+\theta)N)c}\right)+\frac{\theta}{1+\theta}\right]m\bar{w}$$

$$p^* = \frac{(\theta+1)a}{2(1+\theta)b+c[N+(N+2)\theta]} + \left[\frac{c}{2[b+c(N+1)]}\left(\frac{4\theta+2(1+\theta)N}{2(1+\theta)b+(2\theta+(1+\theta)N)c}\right)+\frac{1}{2}\right]m\bar{w}$$

the market clear condition of capital market

$$N+1=\bar{k}$$

Migration between urban area and rural area (1)

$\bar{Q}$: the total production of manufactured goods

$$\bar{Q} = \left[(N+1) - b\left(\frac{3+\theta}{2(1+\theta)+(2\theta+(1+\theta)N)c}\right)\right]a - b\left(\frac{2(1+3\theta)}{2(1+\theta)+(2\theta+(1+\theta)N)c}\right)m\bar{w}$$

Comparative statics

$$\frac{\partial\bar{Q}}{\partial m}<0,\ \ \frac{\partial\bar{Q}}{\partial\bar{w}}<0$$

The productivity of manufactured goods sector (m) ↑ → $\bar{Q}$ ↓

The minimum wage in urban area $(\bar{w})$ ↑ → $\bar{Q}$ ↓

Migration between urban area and rural area (2)

The labor demand of manufactured goods sector

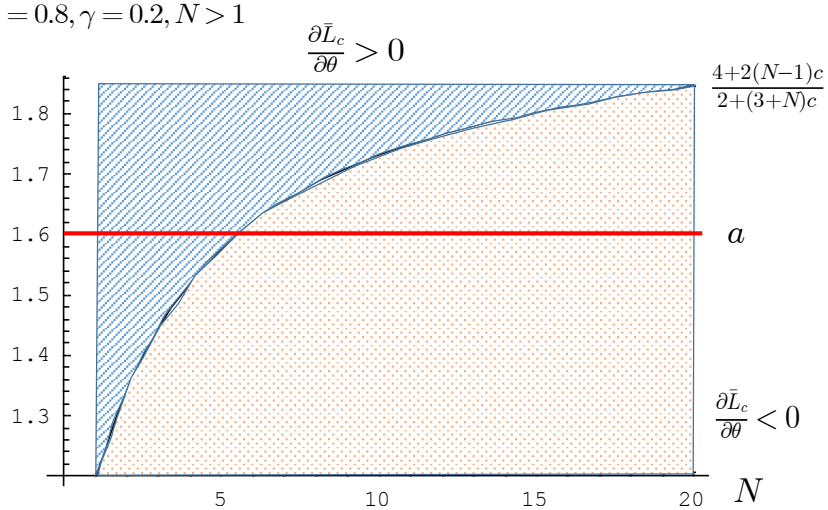
$$\bar{L}_c = m\bar{Q} = \left[(N+1) - b\left(\frac{3+\theta}{2(1+\theta)+(2\theta+(1+\theta)N)c}\right)\right] am - b\left(\frac{2(1+3\theta)}{2(1+\theta)+(2\theta+(1+\theta)N)c}\right) m^2\bar{w}$$

Comparative statics
(the effect of privatization of public firm on labor demand of manufactured goods sector)

$$\frac{\partial \bar{L}_c}{\partial \theta} = \frac{[2+(3+N)c]a-2[2+(N-1)c]}{(2\theta+2c\theta+Nc+Nc\theta+2)^2} \gtreqless 0$$

Migration between urban area and rural area (3)

$\beta = 0.8, \gamma = 0.2, N > 1$



Lemma 1

When the intensity of preference for differentiated manufactured goods is large relatively and a is larger Than $[4+2(N-1)c]/[2+(3+N)c]$, progress of privatization leads to increase the labor demand of manufactured goods sector

Migration between urban area and rural area (4)

The labor demand of agricultural goods

$$L_r = (1-\lambda)^{\frac{1}{\sigma-1}}\left(\frac{\bar{w}}{\sigma}\right)^{\frac{1}{\sigma-1}}$$

The revised population constraint in an economy

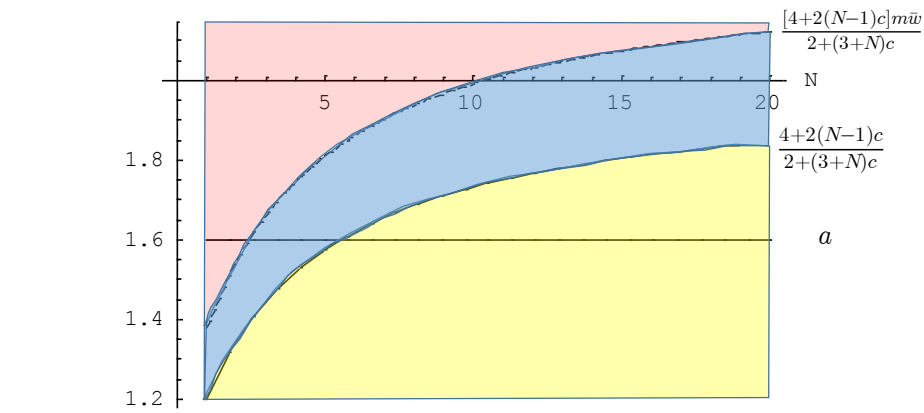
$$\left[(N+1)-b\left(\frac{3+\theta}{2(1+\theta)+(2\theta+(1+\theta)N)c}\right)\right]am-b\left(\frac{2(1+3\theta)}{2(1+\theta)+(2\theta+(1+\theta)N)c}\right)m^2\overline{w}+(1-\lambda)^{\frac{\sigma}{\sigma-1}}\left(\frac{\bar{w}}{\sigma}\right)^{\frac{1}{\sigma-1}}=1-\lambda$$

From implicit function theorem

$$\frac{d\lambda}{d\theta}=-\frac{2bm([2+(N+3)c]a-2[2+(N-1)c]m\bar{w})}{[(2+(2+N)c)\theta+(2+cN)]^2\left[\left(\frac{\overline{w}}{\sigma}\right)^{\frac{1}{\sigma-1}}\left(\frac{\sigma}{1-\sigma}\right)(1-\lambda)^{\frac{1}{\sigma-1}}+1\right]}\gtrless 0$$

Migration between urban area and rural area (5)

$\beta = 0.8, \gamma = 0.2, N > 1, m\bar{w} = 1.5$



$\frac{\partial \bar{L}_c}{\partial \theta} > 0, \frac{\partial \lambda}{\partial \theta} < 0$ $\frac{\partial \bar{L}_c}{\partial \theta} > 0, \frac{\partial \lambda}{\partial \theta} > 0$ $\frac{\partial \bar{L}_c}{\partial \theta} < 0, \frac{\partial \lambda}{\partial \theta} > 0$

Proposition 1

When the intensity of preference for differentiated manufactured goods is large (small) relatively and a and is larger(smaller) than $[4+2c(N-1)]m\bar{w}/[c(N+3)+2]$, the progress of public firm's privatization improves (makes a worse) urban unemployment.

The effect of privatization on social welfare (1)

W^* : the equilibrium social welfare

$$W^* = \frac{a^2(N+1)}{2b} - \frac{b+c(N+1)}{2}\left(\left[p_0^*\right]^2 + N[p^*]^2\right) + \frac{c}{2}[P^*]^2 + (L_r)^\sigma$$

The effect of privatization of public firm on social welfare

$$\frac{\partial W^*}{\partial \theta} = -[b+c(N+1)]\left(p_0^*\frac{\partial p_0^*}{\partial \theta} + Np^*\frac{\partial p^*}{\partial \theta}\right) + cP^*\frac{\partial P^*}{\partial \theta} + \frac{\partial}{\partial \theta}((L_r)^\sigma)$$

Price effect | Price Index effect | Migration effect

Proposition 2

a is large enough and the price effect and the employment effect exceed the price index effect, the progress of privatization of public firm improves the social welfare.

Concluding remarks

- This paper considers the model to analyze the relationship between urban unemployment and the privatization of public firm.
- We apply the dualistic economy model to differentiated mixed oligopoly by combining Harris and Todaro (1970) with Fujiwara (2007).
- The effect of privatization of public firm on labor demand depends on the intensity of preference for differentiated manufactured goods.
- When the intensity of preference for differentiated manufactured goods is large relatively and some condition is held, the progress of public firm's privatization improves (makes a worse) urban unemployment.

Concluding remarks

- The large enough and the price effect and the employment effect exceed the price index effect, the progress of privatization of public firm improves the social welfare.