review of urban & regional development studies

RURDS 2013 doi: 10.1111/rurd.12009

PRIVATIZATION OF PUBLIC FIRMS AND URBAN UNEMPLOYMENT IN AN INTEGRATED ECONOMY

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This paper presents analysis of the effect on urban employment of public firm privatization in separate countries. We consider an economy consisting of two goods and two countries, and take account of a mixed duopoly in the manufacturing goods sector in the urban area of each country. We extend the Harris and Todaro model by introducing a mixed oligopoly model. Results of this analysis show that the privatization of public firms in the home country engenders improvement of urban unemployment in the home country. However, the progressive privatization of public firms in the foreign country can worsen urban unemployment in the home country.

1. Introduction

As economic integration in the EU shows, economic boundaries are disappearing as rapidly as the Iron Curtain, another political boundary in Europe, did many years ago. After ratification of the Maastricht Treaty, the EU has encouraged economic integration in Europe. However, although the loss of economic boundaries has brought benefits from the free movement of people and goods among countries, the economy in each country now depends on the economic policies or economic conditions of other countries. When each country was economically independent, the impact of an economic policy in a particular country did not strongly affect another country's economy. Firms in one country have begun to compete with those in other countries since the economic integration of countries with different industrial structures because of political heterogeneity. For example, after the fall of the Berlin Wall, East Germany and West Germany were integrated economically and politically and their economic integration resulted in unemployment, technology gaps, and so on in both countries. Particularly, some developing countries are suffering from high unemployment rates that have persisted since economic integration.

Public firms and private firms are competing in various categories of activities. This situation has been called a mixed oligopoly. Recently, the mixed oligopoly has been widely researched. In a mixed oligopoly model, a public firm determines production to maximize social welfare, although private firms plan their production to maximize their own profit. De Fraja and Delbono (1989) reported a pioneering study in this category. They compared a mixed oligopoly, which includes one public firm and some private firms, with a pure oligopoly, which includes all private firms. Han and Ogawa (2009) extend the mixed duopoly model to a

two-country model and analyze the level of privatization in equilibrium, but they do not account for a dualistic economy.

This paper presents analysis of the effect of privatization of public firms in urban areas on unemployment in a dualistic economy. Privatization of public firms can be expected to affect any economy, not only in Europe but also in China. China, differs from other socialist countries in its transformation to a market economy, maintaining public ownership of domestic capital. China's shift to a market economy has succeeded, presenting an established growth rate higher than 10 per cent per year in the 21st century. China's shift to a market economy has been more gradual than that of Russia, and has allowed privatization of the public sector slowly. The shortfall in labor supply in urban areas is met by a cheap labor supply from rural areas, which is a factor supporting the progress of the Chinese economy. The labor supply from rural areas has been appropriated to meet labor demand in urban areas, necessitated by the remarkable economic growth in China.

Although low-wage labor is one factor supporting the progress of the Chinese economy, it has exacerbated the agglomeration in east coast areas such as Shanghai, and has increased inequality between the east coast areas and inland areas. Many industries, including manufacturing, are located in cities on the east coast that are the destinations of labor migration from rural areas. Labor demand in the agricultural goods sector has also increased, but surplus labor no longer exists in rural areas because the demand for agricultural goods has increased at a pace exceeding productivity in the agricultural goods sector from 1978–1991. Surplus labor in rural areas has flowed to non-agricultural production or it has migrated to other regions. Labor allocated to production of agricultural goods has not grown since 1992.

Moreover, some studies have estimated latent unemployment in Chinese public firms using a production function model to clarify the actual unemployment situation. Results show that laid-off employees have become more numerous since the end of the 1990s.[1] Although many researchers have estimated the unemployment rate in China, those estimates are not conclusive. It is possible that unemployment-related difficulties are more serious than the data suggests.

Many researchers have sought to investigate dualistic economy problems since Lewis (1954) first referred to it. Harris and Todaro's (1970) contribution in this category is well known. It clarifies the endogenous mechanism causing unemployment in a dualistic economy. The Harris and Todaro model has been extended from various perspectives (Chao et al., 2000; Fukuyama and Naito, 2007). However, most papers that have addressed the Harris and Todaro model assume a competitive market in both sectors. Few papers describe studies using a dualistic economy model that is extended by introducing a mixed oligopoly model.

In many cases, governments in economically developed countries own the main productive sectors of the economy under the pretext of protecting infant industries. Many studies have examined this privatization of public firm in developing countries. De Fraja and Delbono's (1989) pioneering study analyzed the mixed oligopoly market, in which the public firm competes with private firms in the same market. In the mixed oligopoly market, a public firm maximizes social welfare, but private firms pursue profits. Matsumura (1998) extended the mixed oligopoly model to partial privatization. An important argument arising from partial privatization analysis is that neither full privatization nor full nationalization is optimal. Beladi

[1] Because the unemployment rate announced officially in China is the unemployment rate among households with family registration, who have right of residence in urban areas, that number is not always the value which accords with the actual unemployment situation.

and Chao (2006) introduced mixed ownership into the Harris and Todaro model and analyze the effect of privatization on urban employment. This paper resembles that of Beladi and Chao (2006) in that respect.

The paper proceeds as follows. The next section outlines the basic model. Section 3 shows the effect of public firm privatization on the equilibrium. Then section 4 presents our concluding remarks.

2. The model

2.1. Household

We consider an economy that consists of two countries: a home country and a foreign country. It has markets for goods of two kinds: manufacturing goods and agricultural goods. Manufacturing goods and agricultural goods are produced in both countries. Populations in respective countries are normalized to one and both countries have urban areas and rural areas. The manufacturing goods produced in respective countries are homogeneous and are traded in integrated markets of both countries. Consequently, all households face a common demand function in spite of their residential country. However, we deal with agricultural goods as numéraire, so the price of agricultural goods is one.

We assume that the households are mobile between urban and rural areas in their country, but they are immobile between their residential country and any other. Because we specifically address the effects of public firm's privatization in each country on unemployment in the home country in this paper, we follow Harris and Todaro (1970), who describe unemployment in an urban area. Let L_c and L_r respectively represent the numbers of labor employed in the manufacturing goods sector and labor employed in the agricultural goods sector. Moreover, let L_u represent the number of households that are unemployed in both sectors. Because we assume that the total number of households in each country is one, the sum of L_c, L_r, and L_u is unity. The manufacturing goods are produced in the urban area of each country and are supplied by public firms and private firms in both countries. Following Harris and Todaro (1970), we assume that the wage in the urban area of the home country (w_c) is higher than the wage in the agricultural sector (w_r) because of the minimum wage constraint or labor union activity.[2] Moreover, we designate unemployed labor by the index u. Presuming that the preferences of households in both countries are homogeneous, they have a common utility function. Therefore, we specify the utility of households in the home country as shown below.

$$U_i(x_i, z_i) = ax_i - x_i^2 + z_i \ (i = c, r, u). \tag{1}$$

In that equation, c, r, and u respectively denote households employed in the manufacturing goods sector, those employed in the agricultural goods sector, and those which reside in the urban area and are not employed in the manufacturing goods sector. We describe the budget constraint of households in the home country as follows.

[2] Here we assume that the agricultural goods market is competitive. Consequently, the wage in the agricultural goods sector is equal to the marginal product of its goods.

$$w_i + I = px_i + z_i \ (i = c, r, u), \tag{2}$$

where p and I respectively denote the prices of manufacturing goods and the redistribution by the government in the home country.[3] Maximizing utility function (1) subject to the budget constraint (2) with respect to the consumption of manufacturing goods and agricultural goods, the demand function of manufacturing goods of each household in the home country is given as

$$x_c = x_r = x_u = \frac{1}{2}(a - p). \tag{3}$$

Letting X represent the total demand of manufacturing goods in the home country, then the total demand of manufacturing goods in the home country can be derived as follows.

$$X = \frac{(L_x + L_r + L_u)(a - p)}{2} = \frac{a - p}{2} \tag{4}$$

Moreover, substituting (3) into (2), the demand of agricultural goods of each household in the home country is the following.

$$z_i = w_i + I - p\left(\frac{a - p}{2}\right) \tag{5}$$

Substituting (3) and (5) into (1), the following indirect utility function of each household in the home country is given as follows.

$$v_i = \frac{(a - p)^2}{4} + w_i + I, \qquad (i = c, r, u) \tag{6}$$

Next we consider the behavior of households in the foreign country. To simplify our analysis, we do not assume a dualistic economy in the foreign country. Let X^* represent the total demand of manufacturing goods in the foreign country.[4] Because the preference of households in both countries is homogeneous, the demand of manufacturing goods of households in the foreign country is given as

$$X^* = \frac{a - p}{2}. \tag{7}$$

Similar to derivation of (5) and (6), the demand function of agricultural goods and indirect utility function of each household in the foreign country are derived as shown below.

$$z^* = w^* + I^* - p\left(\frac{a - p}{2}\right) \tag{8}$$

$$v^* = \frac{(a - p)^2}{4} + w^* + I^* \tag{9}$$

[3] Here we assume that w_u is zero and that I is a redistribution of profits in the agricultural goods sector.

[4] Subsequently, we add an asterisk to each variable in the foreign country.

We have clarified the consumption behavior of households in respective countries. Here we formulate the behavior between urban and rural residents of the home country, in which a dual economy has formed. As we described earlier, the wage for the manufacturing goods sector in the urban area (w_c) has downward rigidity. Consequently, we assume that this wage is higher than the wage rate in rural areas w_r. Here, we define the unemployment rate of urban areas in the home country as follows.

$$\lambda \equiv \frac{L_u}{L_c + L_u} \tag{10}$$

Similar to Harris and Todaro (1970), the household compares the expected utility in the urban area with the utility in the rural area to determine the behavior of its residents. Consequently, the migration equilibrium between urban and rural areas must satisfy the following condition.

$$(1 - \lambda)v_c + \lambda v_u = v_r \tag{11}$$

Combining (6) with (11), we derive the following equation.

$$(1 - \lambda)w_c = w_r \tag{12}$$

Moreover, because the population in the home country is normalized to one, the following population constraint is given as

$$L_c + L_r + L_u = 1. \tag{13}$$

Considering (10) and (13), the population constraint in the home country is revised as shown below.

$$L_c + (1 - \lambda)L_r = 1 - \lambda \tag{14}$$

2.2. Production

In the previous section, we formulated the behavior of consumer in each country and migration of households between urban and rural area in the home country. We consider the production of manufacturing goods or agricultural goods in this section, with the assumption that the required input factors of manufacturing goods are labor and fixed sector specific capital. However, land and labor are both necessary to produce agricultural goods. Moreover, we assume that land is owned by absentee land owners and that the government aggregates the profit of the agricultural sector and redistributes it for each household.

2.2.1. Agricultural goods sector

Because the input factors of agricultural goods are labor and land, we specify the production function of this sector as

$$Y = S^{1-\sigma}(L_r)^{\sigma},\ \sigma \in (0,1) \tag{15}$$

where S is the input of land. Presuming that the input of land is fixed and normalized to one for simplification, the production function of the agricultural goods sector is revised as follows.

$$Y = (L_r)^{\sigma},\ \sigma \in (0,1) \tag{16}$$

Differentiating (16) with respect to labor, the first-order condition to maximize the profit of agricultural goods sector in the home country is given as

$$w_r = \sigma(L_r)^{\sigma-1}. \tag{17}$$

However, we consider the production of the agricultural goods sector in the foreign country. Because we assume no unemployment in the foreign country and because we denote the wage rate there by w^*, the first-order condition to maximize the profit of the agricultural goods sector in the foreign country is also given as

$$w^* = \sigma(L_r^*)^{\sigma-1}. \tag{18}$$

2.2.2. Manufacturing goods sector

We assume that the manufacturing goods sector consists of public firms and private firms in both countries. Consequently, the public firms and private firms in both countries supply manufacturing goods for the integrated economy. Because we have derived (4) and (7) as the demand functions of manufacturing goods in respective countries, the demand function of manufacturing goods in the economy, $\bar{X}$, is the following.

$$\bar{X} = a - p \tag{19}$$

Here let q_0 and q_1 respectively represent the production of public firm and private firm in the home country. Furthermore, we designate q_0^* and q_1^* as the production of public firm and private firm in the foreign country. Then the market clearing condition of manufacturing goods in the economy is the following.

$$\bar{X} = X + X^* = q_0 + q_1 + q_0^* + q_1^* \tag{20}$$

Consequently, the following inverse demand function is derived from (19) and (20).

$$p = a - (q_0 + q_1 + q_0^* + q_1^*) \tag{21}$$

Here we specify the production function of manufacturing goods and assume that the production technologies of manufacturing goods in both countries are symmetric. Because we assume that labor and capital are the required factors to produce manufacturing goods, we specify the production function of manufacturing goods similarly to the method presented by Daitoh (2010) or Naito (2011) as follows.

$$q_i = \frac{L_c^i}{m} \ (i = 0, 1, \ m > 0), \tag{22}$$

where L_c^0 and L_c^1 respectively denote the labor input of public and private firms of the manufacturing goods sector in the home country. Moreover, presuming that all firms manufacturing goods in both countries have common production technology, we specify it in the foreign country as follows.

$$q_i^* = \frac{L_c^{*i}}{m} \ (i = 0, 1), \tag{23}$$

where m denotes the productivity of the manufacturing goods sector, which depends on fixed sector specific capital. Public firms and private firms in each country have capital as an initial endowment and use it as production. We specify the productivity function m as follows. Here we assume the productivity function m, which depends on capital owned by each firm.

$$m = \frac{1}{k_i} = \frac{1}{k_i^*}, \ (i = 0, 1) \tag{24}$$

As for capital ownership, the private firms in the economy own their capital. However, the ownership of capital of public firms is mixed, consisting of the government and firm. The government in each country owns a share θ and θ^* of initial endowment capital of public firms in each country, respectively.[5]

Consequently, the profit function of public and private firms in the home country is given as shown below.

$$\pi_i = (a - q_0 - q_1 - q_0^* - q_1^*)q_i - mw_c q_i \ (i = 0, 1) \tag{25}$$

As for the profit of public and private firms, we can derive it for both the foreign country and the home country.

$$\pi_i^* = (a - q_0 - q_1 - q_0^* - q_1^*)q_i^* - mw^* q_i^* \tag{26}$$

The private firms in each country determine q_1 and q_1^* to maximize their profit. Consequently, the first-order conditions are given as

$$\frac{\partial \pi_1}{\partial q_1} = a - q_0^* - q_1^* - q_0 - 2q_1 - mw_c = 0 \tag{27}$$

and

$$\frac{\partial \pi^*}{\partial q_1^*} = a - q_0^* - 2q_1^* - q_0 - q_1 - mw^* = 0. \tag{28}$$

[5] Hereafter, for simplification, we normalize those fixed sector specific capital inputs to one. Here we assume that all firms in the economy have the same quantity of capital. Therefore the productivity of the manufacturing goods sector in both countries is common.

Although the private firm determines production to maximize profit, the public firm determines it to maximize the social welfare in its country. We define the sum of consumer surplus, the profits of public firm and private firm, wage income of labor employed by the manufacturing goods and agricultural goods sectors, the profit of the agricultural goods sector and land rent revenue as social welfare. We denote W as social welfare in the home country.

$$W \equiv CS + \pi_0 + \pi_1 + w_c\bar{L}_c + w_rL_r + I + R, \tag{29}$$

where $\bar{L}_c$ and R, respectively denote the total employed labor in the manufacturing goods sector and the land rent revenue of absentee landowner in the home country. We define the social welfare function in the foreign country as well as in the home country.[6]

$$W^* \equiv CS^* + \pi_0^* + \pi_1^* + w^*\bar{L}_*^c + w^*L_r^* + I^* + R^*, \tag{30}$$

where I^* and R^* denote the redistribution and the land rent revenue of absentee landowners in the foreign country. Because the demand function of manufacturing goods is given as (19) and because we assume that the production technology is common among firms, the consumer surplus of manufacturing goods production in each country is the following.

$$CS = CS^* = \frac{1}{4}\bar{X}^2 \tag{31}$$

Moreover, we consider that the government owns a share $\theta \in (0, 1)$ of the public firms, as assumed also by Matsumura (1998). Consequently, the purpose of the public firm (firm 0) is to maximize the weighted average of social welfare and its profit in each country, which are defined respectively as $V(\theta)$ and $V(\theta^*)$. It is possible to take account of partial privatization to an optimal privatization level. Therefore, we describe $V(\theta)$ and $V(\theta^*)$ as follows.

$$V(\theta) = \theta\pi_0 + (1 - \theta)W \tag{32}$$

and

$$V^*(\theta^*) = \theta^*\pi_0^* + (1 - \theta^*)W^* \tag{33}$$

Because the public firm in the home country determines q_0 to maximize (32), the first-order condition is the following.[7]

$$\frac{\partial V(\theta)}{\partial q_0} = -\frac{1}{2}(\theta + 3)q_0 + \frac{1}{2}(\theta - 3)q_1 - \frac{1}{2}(\theta + 1)q_0^* - \frac{1}{2}(\theta + 1)q_1^* + a - m\theta w_c = 0 \tag{34}$$

Similar to the calculation presented above, the public firm in the foreign country determines its own production to maximize (33). Consequently, the first-order condition of the public firm in the foreign country is the following.

[6] Redistribution I is equal to the profit of the agricultural goods sector.

[7] Here, the public firm does not recognize the effect of its own production on the labor market in the agricultural goods sector.

$$\frac{\partial V^*(\theta^*)}{\partial q_0^*} = -\frac{1}{2}(\theta^*+1)q_0 - \frac{1}{2}(\theta^*+1)q_1 - \frac{1}{2}(\theta^*+3)q_0^* + \frac{1}{2}(\theta^*-3)q_1^* + a - m\theta^* w^* = 0 \tag{35}$$

Considering (27), (28), (34), and (35), we describe the system in our model by the following matrix.

$$\begin{pmatrix} 1 & 2 & 1 & 1 \\ \theta+3 & -\theta+3 & \theta+1 & \theta+1 \\ 1 & 1 & 1 & 2 \\ \theta^*+1 & \theta^*+1 & \theta^*+3 & -\theta^*+3 \end{pmatrix} \begin{pmatrix} q_0 \\ q_1 \\ q_0^* \\ q_1^* \end{pmatrix} = \begin{pmatrix} a - mw_c \\ 2a + 2m\theta w_c \\ a - mw^* \\ 2a - 2m\theta^* w^* \end{pmatrix} \tag{36}$$

Here we define Δ as follows.

$$\Delta \equiv 2(3\theta + 3\theta^* + 4). \tag{37}$$

Using Cramer's formula to (36) and (37), $\hat{q}_0$, $\hat{q}_1$, $\hat{q}_*^0$, and $\hat{q}_*^1$ are derived as follows.

$$\hat{q}_0 = \frac{2(2+\theta^*-\theta)a + 2(3(1-2\theta)\theta^* + (4-7\theta))mw_c + 4(3\theta-1)\theta^* mw^*}{\Delta} \tag{38}$$

$$\hat{q}_1 = \frac{2(\theta+\theta^*)a + 2(\theta-4-3\theta^*)mw_c + 8m\theta^* w^*}{\Delta} \tag{39}$$

$$\hat{q}_*^0 = \frac{2(2+\theta-\theta^*)a + 4(3\theta^*-1)\theta mw_c + 2((3\theta+4) - (6\theta+7)\theta^*)mw^*}{\Delta} \tag{40}$$

$$\hat{q}_*^1 = \frac{2(\theta+\theta^*)a + 8m\theta w_c - 2(4+3\theta-\theta^*)mw^*}{\Delta} \tag{41}$$

Here (38)–(41) are positive because we assume the interior solutions in equilibrium. Therefore, we assume that the numerators of (38)–(41) are positive. Substituting (38)–(41) into (21), we derive the equilibrium price of manufacturing goods as follows.

$$\hat{p} = \frac{2[(\theta+\theta^*)a + 4m\theta w_c + 4m\theta^* w^*]}{\Delta} \tag{42}$$

From (38) and (41), the total production of manufacturing goods in each country is derived as follows. Consequently, let Q and Q^* represent the total amount of manufacturing goods production in each country, respectively as shown below.

$$Q = \frac{4(\theta^*+1)a - 12(\theta^*+1)\theta mw_c + 4(3\theta+1)\theta^* mw^*}{\Delta} \tag{43}$$

$$Q^* = \frac{4(\theta+1)a + 4(3\theta^*+1)m\theta w_c - 12(\theta+1)m\theta^* w^*}{\Delta} \tag{44}$$

Substituting (43) and (44) into (22) and (23), respectively, the number of laborers employed by manufacturing goods sector in each country is given as

$$\bar{L}_c = \frac{4m[(\theta^* + 1)a - 3(\theta^* + 1)\theta m w_c + (3\theta + 1)\theta^* m w^*]}{\Delta} \tag{45}$$

and

$$\bar{L}_*^c = \frac{4m[(\theta + 1)a + (3\theta^* + 1)m\theta w_c - 3(\theta + 1)m\theta^* w^*]}{\Delta}. \tag{46}$$

As inferred from (45) and (46), the number of labor employed by the manufacturing goods sector in each country is described by the function of the production effectiveness of the manufacturing goods sector in each country (m), the demand scale of manufacturing goods (a), wage in each country, (w_c, w^*), and the privatization level of public firm in each country, (θ) and (θ^*).

3. Migration and urban unemployment

In the previous section, we considered the behavior of households or the production sector in each country and showed that the privatization of public firms in each country affects employment in the manufacturing goods sector in each country. In this section, we consider the equilibrium in the labor market in each country based on results derived in the previous section.

Because we assume that households are mobile between urban and rural areas within the same country and that unemployment does not exist in the foreign country, the wage in the urban area is equal to that in the rural area in the migration equilibrium. Letting w^* represent the equilibrium wage in the foreign country and recognizing that because we normalized the number of households in each country to one, the following equation must hold because of population constraints.

$$\frac{2m[(\theta + 1)a + (3\theta^* + 1)m\theta w_c - 3(\theta + 1)m\theta^* w^*]}{3\theta + 3\theta^* + 4} + \left(\frac{w^*}{\sigma}\right)^{\frac{1}{\sigma - 1}} = 1 \tag{47}$$

Applying the implicit function theorem to (47), we analyze the effect of privatization of a public firm in the home country on wages in the other country. Considering that the amount of production is non-negative, the effect of privatization of public firms in the home country on wages in the foreign country is the following.

$$\frac{dw^*}{d\theta} = \frac{(3\theta^* + 1)(a + (4 + 3\theta^*)m w_c - 3m\theta^* w^*)}{3m\theta^*(\theta + 1)(3\theta + 3\theta^* + 4)} > 0 \tag{48}$$

From (48), we know that promoting the privatization of public firms in the home country engenders an increase of the wage in the foreign country when the demand scale of manufacturing goods is large. The labor demand of the manufacturing goods sector in the foreign country is increased by the increase of manufacturing goods production in this country

because promoting the privatization of public firms in the home country decreases the production of manufacturing goods in the home country.

Moreover, using the implicit function theorem to (47), we show the effect of privatization of a public firm in the foreign country on wage rates there as follows.

$$\frac{dw^*}{d\theta^*} = -\frac{\dfrac{-6m(\theta+1)(a-3m\theta w_c+(4+3\theta)mw^*)}{(3\theta+3\theta^*+4)^2}}{\dfrac{1}{w^*(\sigma-1)}\left(\dfrac{w^*}{\sigma}\right)^{\frac{1}{\sigma-1}}-\dfrac{6m^2\theta^*(\theta+1)}{(3\theta+3\theta^*+4)}} \tag{49}$$

Presuming that the demand scale of manufacturing goods is large, the sign of the numerator of (48) is negative. Consequently if privatization of the public firm in the foreign country progresses, then the wage in the foreign country decreases.

We can advance the following economic interpretation. The progressing privatization of public firms in the foreign country engenders a decrease in the employment of manufacturing goods there. Because we assume that unemployment does not exist in the foreign country, the surplus of labor is employed by the agricultural goods sector in the rural area. The wage rate in the agricultural goods sector is equal to the marginal product because of the production function of agricultural goods. Consequently, the wage in the foreign country decreases in equilibrium.

Regarding the wage of the manufacturing goods sector in the home country, the equilibrium migration condition between urban and rural areas (Harris and Todaro condition) holds as follows.

$$(1-\lambda)w_c = \sigma(L_r)^{\sigma-1} \tag{50}$$

Total employment in the manufacturing goods sector in the home country is given as (45). Combining (11) and (17) with (14), the following relation must be satisfied in equilibrium.

$$\frac{2m[(\theta+1)a+(3\theta^*+1)m\theta w_c-3(\theta+1)m\theta^* w^*]}{3\theta+3\theta^*+4}+(1-\lambda)^{\frac{\sigma}{\sigma-1}}\left(\frac{w_c}{\sigma}\right)^{\frac{1}{\sigma-1}}=1-\lambda \tag{51}$$

Here we analyze the effect of privatization of public firms in the home or foreign country on the unemployment rate in the home country with (51). Applying the implicit function theorem to (51), we can derive the relation between the unemployment rate and privatization in the home country as follows.

$$\begin{aligned}\frac{\partial\lambda}{\partial\theta} = &\frac{2m}{(3\theta+3\theta^*+4)^2\left[\left(\dfrac{\sigma}{\sigma-1}\right)(1-\lambda)^{\frac{\sigma}{\sigma-1}}\left(\dfrac{w_c}{\sigma}\right)^{\frac{1}{\sigma-1}}-1\right]}\\ &\times[(3\theta^*+1)a+(3\theta^*+4)(3\theta^*+1)mw_c-3(3\theta+4)(3\theta+1)mw^*\\ &-3(\theta+1)(3\theta+3\theta^*+4)m\theta^*\frac{\partial w^*}{\partial\theta}]\geq(<)0\end{aligned} \tag{52}$$

Although the numerator of (52) is positive when the demand scale of manufacturing goods is so large, the sign of (52) is negative because the sign of the denominator is negative.

The sign of (52) is negative when the demand scale of manufacturing goods is sufficiently large. Therefore, urban unemployment is improved in the home country when the government proceeds with public firm privatization in the home country.

This result is not similar to that presented by Naito (2011), but the present model includes two countries. Moreover, we consider the effects of progressing privatization of public firms in the foreign country on urban unemployment in the home country. Applying the implicit function theorem to (51), we can derive the following equation.

$$\begin{aligned}\frac{\partial\lambda}{\partial\theta^*} = &\frac{2m}{(3\theta+3\theta^*+4)^2\left[\left(\frac{\sigma}{\sigma-1}\right)(1-\lambda)^{\frac{\sigma}{\sigma-1}}\left(\frac{w_c}{\sigma}\right)^{\frac{1}{\sigma-1}}-1\right]}\\ &\times[-3(\theta+1)a+3(3\theta+1)m\theta w_c-3(\theta+1)(3\theta^*+1)mw^*\\ &-3(\theta+1)(3\theta+3\theta^*+4)\theta^*\frac{\partial w^*}{\partial\theta^*}]\geq(<)0\end{aligned} \tag{53}$$

As (53) shows, the sign of (53) is not determined uniquely. The public firm privatization in the foreign country worsens the unemployment rate in the home country if the demand scale of manufacturing goods is large and if the effect of progressive privatization of public firms in the foreign country on wages there is small. The progress of privatization of public firms in the foreign country decreases employment in the manufacturing goods sector there. Moreover, the decrease of employment in the manufacturing goods sector increases employment in the agricultural goods sector in the foreign country. Thus, the wage in the foreign country decreases.

These comparative statics show that the effect of progressive privatization of public firms in the foreign country on unemployment in the home country depends on the relation between those effects. We derive the following proposition.

Proposition 1. *When the demand scale of manufacturing goods in the economy is large, the progressive privatization of public firms in the home country improves the unemployment rate in the home country. However, if the demand scale of manufacturing goods in the economy is large and the effect of progressive privatization of public firms in the foreign country on wage rates there is small, then it is possible that the progressive privatization of public firms in the foreign country worsens the unemployment rate in the home country.*

4. Concluding remarks

We examined a two-good and two-country model representing an integrated economy, and analyzed the impact of privatization policies in each country on unemployment. In recent years, economic boundaries are disintegrating through progressive economic integration, as exemplified by the EU. Through economic integration, the local economy in each country is affected not only by its own regional economic policy but also by economic policies in other countries.

To analyze these problems, we sought to extend the Harris and Todaro model by combining it with a mixed oligopoly model. As we described, in a mixed oligopoly model, the public firm determines production to maximize social welfare in the country, but private firms

do it to maximize profit. Although the Harris and Todaro model explains the occurrence of urban unemployment endogenously, it assumes that both the urban and rural sectors are perfectly competitive markets. As a result, the model is insufficient to explain the effect of privatization of public firms on urban employment. Although the privatization of public firms in East Germany before and after the fall of the Berlin wall progressed rapidly in the short term, the unemployment rate in East Germany worsened from 10.3 percent in 1991 to 17.0 percent in 1994 because of the privatization of public enterprises was promoted more in West Germany.[8] This conforms with the conclusion obtained from the analysis of our model.

Naito (2011) extended the model by introducing the Harris and Todaro model into a mixed duopoly model and subsequently analyzed the effect of privatization of public firms on urban unemployment. However, that study included the assumption of a one country model. It did not examine an integrated economy comprising two countries.

This paper specifically examines points that not analyzed in the prior literature. We analyzed the effects of public firm privatization in an integrated economy on urban unemployment. Results show that if the demand scale of manufacturing goods is sufficiently large, then it is possible that the privatization of public firms in the home country can improve the urban unemployment of its own country. However, we show that the privatization of public firms in the foreign country can improve urban unemployment in the home country. Consequently, these results show that it is necessary to take account of the behavior of countries other than the home country when local governments considers privatization of public firms. For simplification of our analysis, a mixed oligopoly is assumed, consisting of a private firm and public firm in each country. This assumption must be relaxed to make the model more realistic. Thus, those points are our future subjects.

Acknowledgements

The previous version of this paper was presented at 9th World Congress of Regional Science Association International, 2nd Asian Seminar in Regional Science, 2012 Japan Association of Applied Economics spring meeting, Economics Seminar in Doshisha University. The author is grateful to two anonymous referees, as well as Tadahisa Ohno, Akio Kawasaki, Koji Kitaura, Hiroshige Tanaka, Hikaru Ogawa, Kazutoshi Miyazawa, Tadashi Yagi, Yoshiaki Azuma, Yoshinori Wada, and Shin-Kun Peng for their helpful comments and suggestions. This study is supported by Grant-in-Aid for Scientific Research B (22330095) from Japan Society of the Promotion of Science.

Submitted 5 November 2012.
Final version received 20 April 2013.

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[8] For privatization of public firms and unemployment in East Germany, see Hayashi (1997).

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