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Abstract

We reconsider the effect of economic development on urban unemployment by introducing households with non-homothetic preferences into a sector-specific capital version of the Harris-Todaro model. Contrary to previous studies, this work shows that, while urban development reduces urban unemployment, rural development expands it. As for labor growth, it normally increases urban unemployment.

Keywords: sector-specific capital, Harris-Todaro model, economic development, non-homothetic preference, urban unemployment

JEL codes: J60, O10, O15

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1. Introduction

Since the seminal analysis of the rural-urban migration and urban unemployment by Harris and Todaro (1970), many economists have examined the effects of economic development on migration, urban unemployment, and social welfare by using the Harris-Todaro model (e.g., Corden and Findlay, 1975). Some studies, based on the Harris-Todaro model with sector-specific factors under small open economies, have revealed that rural development decreases urban unemployment, both in terms of absolute numbers and rates. However, urban development reduces the urban unemployment rate, while its effect on the number of unemployed is ambiguous. As for labor growth in the economy, it increases urban unemployment (Corden and Findlay, 1975; Temple, 2005; Choi and Yu, 2007). Thus, rural development is seemingly regarded as an effective prescription for urban unemployment.

The above studies assume a small open economy where the relative price is exogenously given, and thus they neglect the demand-side effect on urban unemployment. However, recent studies of economic growth acknowledge the importance of the demand side in economic development: households' non-homothetic preferences play a significant role in development and industrialization by changing the demand structure in accordance with income growth (see Echevarria, 1995; Kongsamut, Rebelo, and Xie, 2001; Matsuyama, 2007).

This work reconsiders the effect of economic development on urban unemployment by treating the demand side explicitly. We construct a sector-specific capital version of the Harris-Todaro model in a closed economy by introducing households with non-homothetic preferences and examine how urban unemployment is affected by rural development, urban development, and labor growth.

2. The model

The economy consists of two sectors: one produces an agricultural good (Y_A) in a rural area and the other produces a manufactured good (Y_M) in an urban area. Each sector produces the commodity by using labor (L_i) and sector-specific capital ($\overline{K}_i$), where $i = A$ or M . The production functions of the sectors are

$$Y_A = AF^A\left(L_A, \overline{K}_A\right) \qquad (1)$$

$$\text{and } Y_M = MF^M\left(L_M, \overline{K}_M\right) \qquad (2)$$

where A and M denote the technology level of each sector. Both production functions are assumed to be constant returns to scale, increasing in each factor and concave: $F_j^i > 0$, $F_{jj}^i < 0$, and $F_{jl}^i > 0$, where F_j^i is the first derivative of F^i with respect to factor j ($= K$ or L) and F_{jl}^i is the second derivative of F^i .

In the rural area, the wage rate is flexible and labor is fully employed. We assume that the rural wage rate (w_A) is equal to the average value of the product:

$$w_A = \frac{pY_A}{L_A} = \frac{pAF^A\left(L_A, \overline{K}_A\right)}{L_A} \qquad (3)$$

where p denotes the relative price of agricultural goods. Eq. (3) implies that laborers in the rural area own the specific capital for agricultural production and share the income from agricultural sales equally.[1] In the urban area, on the other hand, the real wage rate is rigid, and unemployment exists. Labor allocation in the urban area is determined by marginal productivity pricing:

$$\overline{w}_M = MF_L^M\left(L_M, K\right) \qquad (4)$$

where $\overline{w}_M$ denotes the rigid urban wage.

All households are assumed to be identical and have non-homothetic preferences, with the income elasticity of demand for agricultural goods being less than one. The utility function is given by

$$U = (c_A - \gamma)^{\alpha} c_M{}^{\beta} \qquad \gamma > 0, \alpha + \beta = 1,$$

where c_i is the consumption level of commodity i ($i = A, M$) and γ implies the minimum quantity of agricultural goods required for subsistence. With households maximizing utility, the demand for the two goods satisfies $\alpha c_M = \beta p(c_A - \gamma)$. Summing up this relation over all households yields

$$\alpha C_M = \beta p\{C_A - \gamma(L + L_K)\} \qquad (5)$$

where C_i ($i = A, M$) is the aggregate consumption for each sector's goods. L and L_K denote the numbers of laborers and non-laborers, respectively—the latter earning only from capital income in the urban area. Thus, the total number of households in the economy equals $(L + L_K)$.

A seminal feature of the Harris-Todaro model is that rural-to-urban migration occurs until the rural wage equals the expected wage in the urban area. In our model, the urban unemployed, who do not earn any income, cannot survive because $\gamma > 0$. To avoid this, we assume that the government provides an unemployment benefit so the unemployed can purchase the exact amount of agricultural goods they need for subsistence: $p\gamma$. The government finances the unemployment benefit from a capital tax levied in the urban area. Therefore, the Harris-Todaro migration condition in our model is shown as

$$w_A = \overline{w}_M \frac{L_M}{L_M + L_U} + p\gamma \frac{L_U}{L_M + L_U}. \quad (6)$$

where L_U denotes the number of urban unemployed and the probability of obtaining a job in the urban area is assumed to be equal to $L_M / (L_M + L_U)$.

Finally, the market clearing conditions for a production factor and commodities are as follows:

$$L_A + L_M + L_U = L, \quad (7)$$

$$Y_A = C_A \qquad (8)$$

and $Y_M = C_M$. $\qquad (9)$

3. Analysis

In this section, we examine how urban unemployment is affected by economic development, embodied by an increment in endowments or technology levels. First, we reduce the model to a system of five equations. Eq. (6) can be rearranged as

$$\left(L_M + L_U\right)w_A - \overline{w}_M L_M - p\gamma L_U = 0 . \qquad (10)$$

Substituting Eqs. (8) and (9) into (5) yields

$$\alpha MF^M\left(L_M, \overline{K}_M\right) = \beta\left\{AF^A\left(L_A, \overline{K}_A\right) - p\gamma\left(L + L_K\right)\right\}. \quad (11)$$

Eqs. (3), (4), (7), (10), and (11) contain five endogenous variables (L_A, L_M, L_U, w_A, p) and five parameters related to economic development (A, $\overline{K}_A$, M, $\overline{K}_M$, L).

To determine the effect on L_U of a change in each parameter, we totally differentiate these equations and obtain

$$\begin{pmatrix} pAF_L^A - w_A & 0 & 0 & -L_A & AF^A \\ 0 & MF_{LL}^M & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & w_A - \overline{w}_M & w_A - p\gamma & L_M + L_U & -\gamma L_U \\ \beta pAF_L^A & -\alpha MF_L^M & 0 & 0 & \beta\left\{AF^A - \gamma\left(L + L_K\right)\right\} \end{pmatrix} \begin{pmatrix} dL_A \\ dL_M \\ dL_U \\ dw_A \\ dp \end{pmatrix} =$$

.

$$\begin{pmatrix} -pF^A dA - pAF_K^A d\overline{K}_A \\ -F_L^M dM - MF_{LK}^M d\overline{K}_M \\ dL \\ 0 \\ -\beta pF^A dA - \beta pAF_K^A d\overline{K}_A + \alpha F^M dM + MF_K^M d\overline{K}_M + \beta p\gamma dL \end{pmatrix}$$

Here, we assume the following two conditions:

$$\bar{w}_M \geq w_A \geq p\gamma$$

$$\text{and } AF^A - \gamma\left(L + L_K\right) > 0.$$

The first condition ensures that each sector employs a positive amount of labor. The second one implies this economy produces a sufficient amount of agricultural goods for subsistence.[2] From these assumptions, the determinant of the coefficient matrix is proved to be positive:

$$|A| \equiv \beta M F_{LL}^M \left[\begin{array}{l} pAF_L^A \left\{ \gamma L_A L_U - AF^A \left(L_M + L_U \right) \right\} \\ + \left\{ AF^A - \gamma \left(L + L_K \right) \right\} \left\{ \left(pAF_L^A - w_A \right) \left(L_M + L_U \right) - \left(w_A - p\gamma \right) L_A \right\} \end{array} \right] > 0.$$

Now, we investigate the effect of rural development on the number of unemployed. Calculating $\partial L_U / \partial A$ and $\partial L_U / \partial \overline{K}_A$ yields

$$\frac{\partial L_U}{\partial A} = \frac{1}{|A|} \beta M F_{LL}^M pF^A \gamma \left\{ L_A L_U - \left(L + L_K \right) \left(L_M + L_U \right) \right\} > 0$$

$$\text{and } \frac{\partial L_U}{\partial \overline{K}_A} = \frac{1}{|A|} \beta M F_{LL}^M pAF_K^A \gamma \left\{ L_A L_U - \left(L + L_K \right) \left(L_M + L_U \right) \right\} > 0.$$

Thus, the following proposition is derived.

Proposition 1

In the Harris-Todaro model with sector-specific capital under non-homothetic preferences, urban unemployment increases with technological progress or capital accumulation in the rural area.

In our model, urban unemployment increases with rural development, which is therefore harmful for the economy. However, according to the previous studies introduced in Section 1, with an increase in rural wages induced by rural development, wage differentials between regions decrease and urban unemployment reduces. This

inconsistency arises from household preferences. With rural development, the real wage in rural areas and agricultural production increase. In our model, these increases are accompanied by a huge decline in agricultural prices since the income elasticity of demand for agricultural goods is less than one. This decline in p is larger than the increase in real wages in the rural area, which eventually leads to a fall in the nominal wage there.[3] Therefore, rural development expands wage differentials between regions and increases urban unemployment.

Next, we consider the effect of urban development in terms of increments in M or $\overline{K}_M$. The effect of technological progress in the urban area is given by

$$\frac{\partial L_U}{\partial M}=\frac{1}{|A|}\frac{\alpha M F^M F_L^M L_A}{p}\left[\begin{array}{r} MF_{LL}^M L_M\left(1-\theta_{ML}\right)\left\{\dfrac{1}{1-\theta_{ML}}-\varepsilon_{M\overline{w}_M}\right\} \\ -\left(w_A-pAF_L^A\right)\dfrac{L_M+L_U}{L_A}-w_A-\dfrac{\beta}{\alpha}pAF_L^A\theta_{ML}\end{array}\right].$$

where $\varepsilon_{M\overline{w}_M}$ and θ_{ML} denote the wage elasticity of labor demand and the labor share in the urban area, respectively. Thus, we obtain the following proposition.

Proposition 2

In the Harris-Todaro model with sector-specific capital under non-homothetic preferences, urban unemployment decreases with technological progress in the urban area if $\varepsilon_{M\overline{w}_M}\le 1/\left(1-\theta_{ML}\right)$.

Hereafter, we assume that the condition $\varepsilon_{M\overline{w}_M}\le 1/\left(1-\theta_{ML}\right)$ is satisfied. The effect of capital accumulation in the urban area is calculated as

$$\frac{\partial L_U}{\partial \overline{K}_M}=\frac{1}{|A|}\beta MF_{LK}^M\left[pAF_L^A\gamma\left\{L_AL_U-\left(L+L_K\right)\left(L_M+L_U\right)\right\}-w_AL\left\{AF^A-\gamma\left(L+L_K\right)\right\}\right]<0,$$

and the following proposition is derived.

Proposition 3

In the Harris-Todaro model with sector-specific capital under non-homothetic preferences, urban unemployment decreases with capital accumulation in the urban area.

Propositions 2 and 3 contradict the ambiguous effects on urban unemployment in previous studies. In our model, urban development affects unemployment through two channels: expanding labor demand in the urban area and an increase in relative prices. The first channel figures in previous studies as well. An expanding labor demand in the urban area increases the probability of obtaining jobs there. This causes migration from the rural to the urban area and increases urban unemployment. Meanwhile, this migration increases the rural wage, which in turn helps decrease the urban unemployment. Therefore, the net effect of an expansion of labor demand on unemployment is ambiguous—hence the ambiguity in previous studies. However, the second channel, which is unique to our model, outweighs the first and removes the ambiguity. Since manufactured products increase with urban development, the relative price of agriculture rises. It raises the nominal wage in the rural area and reduces wage differentials between regions.[4] This causes outmigration from the urban area, which contributes to decreasing urban unemployment. Summing up the effects working through the above two channels, we can show that the urban unemployment decreases with urban development, which is therefore beneficial to the economy.[5] However, we need one sufficient condition to derive the definite effect of M .

Finally, we calculate the effect of labor growth as follows:

$$\frac{\partial L_U}{\partial L} = \frac{1}{|A|}\beta M F_{LL}^{M}\left[\begin{array}{r}\left(pAF_L^A - w_A\right)\left(L_M + L_U\right)\left\{AF^A - \gamma\left(L + L_K\right)\right\} \\ + p\left(AF_L^A - \gamma\right)\left\{\gamma L_A L_U - AF^A\left(L_M + L_U\right)\right\}\end{array}\right].$$

This gives the following proposition.

Proposition 4

In the Harris-Todaro model with sector-specific capital under non-homothetic preferences, urban unemployment increases with an economy-wide labor growth if $AF_L^A \geq \gamma$.

If the marginal productivity of labor in the rural area is larger than γ, urban unemployment increases with labor growth. However, once the condition is violated ($AF_L^A < \gamma$), the possibility of a non-intuitive result arises—that is, a drop in the number of unemployed as a result of labor growth. When the marginal productivity of labor in the rural area is below γ, the additional labor there cannot produce enough of agricultural goods to sustain the new-born labor. This raises the agricultural price. If this increase is sufficiently large, the nominal wage in the rural area rises, and the outmigration from the urban area exceeds the additional labor supply in the whole economy. Therefore, the number of urban unemployed may decrease.

4. Conclusions

By introducing households with non-homothetic preferences into a sector-specific capital version of the Harris-Todaro model, we show that, while urban development reduces urban unemployment, rural development expands it. This finding is quite opposite to previous studies. We also show that the demand side has an important role

in the formulation of the propositions discussed in the paper. These results suggest that policy makers should be conscious of the demand factor while implementing development policy.

Our model can be extended to the mobile capital version of the Harris-Todaro model. Reconsidering the model through the demand side complements its fruitful suggestions and provides useful clues to the framing of development policies.

Notes

1. In the rural area, we assume average product pricing, often observed in the rural areas of developing countries as an income-sharing mechanism. If we assume marginal product pricing as in most of previous studies, we still obtain almost the same results, but with some additional conditions.
2. These conditions also guarantee the existence and uniqueness of the equilibrium.
3. Indeed, $\partial w_A / \partial A$ and $\partial w_A / \partial \overline{K}_A$ show negative signs. All results of comparative statics are available on request.
4. $\partial w_A / \partial M$ and $\partial w_A / \partial \overline{K}_M$ are always shown to be positive.
5. From Eq. (4) as well as propositions 2 and 3, it is noteworthy that the urban unemployment rate also decreases as a result of urban development, as in previous studies.

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