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Changes in the Supply of Public Intermediate Goods, Fixed Wage, and the Relative Price in the Harris-Todaro Model

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Abstract: Since the Harris-Todaro model was proposed in 1970, it has played a crucial role in analyzing various environmental and trade issues in developing countries. This paper analyzes the effects of the amount of public intermediate goods provided by the government, the increase in the fixed wage rate in the urban sector, and the changes in the relative international prices of agricultural and manufacturing goods on labor employment, unemployment, and the economic welfare in the context of a small open economy. It also proposes relevant policies to reduce the unemployment rate while improving national welfare.

Keywords: International trade; Public intermediate good; Economic welfare; Harris-Todaro model

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1. Introduction

The Harris-Todaro model was proposed by John R. Harris and Michael P. Todaro in 1970 to analyze urban-rural migration and employment in developing countries [1]. The model revealed the underlying causes of the urban-rural income gap and urban unemployment in developing countries and continues to provide an important perspective for economic development and related policymaking in developing countries.

This paper, based on the original Harris-Todaro model, examines the impact of changes in the relative prices of public intermediate goods, fixed wages, and secondary output on the rural and urban sectors, unemployment, and economic welfare, without taking into account changes in factor endowments.

2. The model

Assume a small open country, consisting of two sectors. The urban sector employs labor L_M and capital $\overline{K}$ to produce the manufacturing goods. Rural sector employs labor L_A and land $\overline{T}$ to produce agricultural goods [2]. Furthermore, we assume that the production procedures of two goods also depend on the supply of the public intermediate goods R by the government [5]. The public intermediate goods in this paper are a pure public goods and serve the production of two goods.

The production functions of the two goods are, respectively:

$$A = g_A(R)G(L_A, T), \text{ where } \frac{\partial G}{\partial L_A} > 0,\ \frac{\partial^2 G}{\partial L_A^2} < 0, \text{ and } g_A'(R) > 0 \tag{1}$$

$$M = g_M(R)F(L_M, \bar{K}), \text{ where } \frac{\partial F}{\partial L_M} > 0,\ \frac{\partial^2 F}{\partial L_M^2} < 0, \text{ and } g_M'(R) > 0 \tag{2}$$

The production equilibrium conditions for agricultural goods are

$$p^A g_A(R)\frac{\partial G}{\partial L_A} = w_A \tag{3}$$

$$p^A g_A(R)\frac{\partial G}{\partial \bar{T}} = r_A \tag{4}$$

The production equilibrium conditions for the manufactured goods are

$$p^M g_M(R)\frac{\partial F}{\partial L_M} = \bar{w} \tag{5}$$

$$p^M g_M(R)\frac{\partial F}{\partial \bar{K}} = r_M \tag{6}$$

In international trade, the relative price of domestic agricultural goods $p^A/p^M = p$ and manufacturing goods in the country. And p^M is chosen as a numeraire, $p^M = 1$.

Rewrite **Equation (5)** and **Equation (6)**,

$$g_M(R)\frac{\partial F}{\partial L_M} = \bar{w} \tag{5a}$$

$$g_M(R)\frac{\partial F}{\partial \bar{K}} = r_M \tag{6a}$$

The public intermediate good is assumed to be initially given. And the production function of the public intermediate good is given as follows:

$$R = L_R \tag{7}$$

Labors will move freely between two sectors in pursuit of higher expected wages, and in equilibrium, labor allocation is determined such that expected wage rates across sectors are equal. Here we assume that wages are higher in the urban sector than in the rural sector. And in the urban sector, we further assume that there is a minimum wage $\bar{w}$ is fixed by legislation. The arbitrage condition of labor movement from rural to urban is:

$$\frac{L_M + L_R}{L - L_A}\bar{w} = w_A \text{ i.e. } \frac{L_M + R}{L - L_A}\bar{w} = w_A \tag{8}$$

It is assumed that the country has a labor population of size L and this is shared among the rural, urban, public input and the unemployed as L_A, L_M, L_R, L_U. These distribute the total labor population such that

$$L_A + L_M + L_R + L_U = L \text{ i.e. } L_A + L_M + R + L_U = L \tag{9}$$

From **Equation (1)** and **Equation (8)**, we have

$$p^A g_A(R)\frac{\partial G}{\partial L_A} - \frac{L_M + R}{L - L_A}\bar{w} = 0 \tag{10}$$

Differentiating **Equation (5a)**, **Equation (9)** and **Equation (10)**,

$$g_M(R)\frac{\partial^2 F}{\partial L_M^2}dL_M = d\overline{w} - \frac{\partial F}{\partial L_M}g_M^{'}dR \tag{5a'}$$

$$dL_A + dL_M + dL_U = dL - dR \tag{9'}$$

$$\left[p^A g_A(R)\frac{\partial^2 G}{\partial L_A^2} - \frac{(L_M+R)}{(L-L_A)^2}\overline{w}\right]dL_A - \frac{\overline{w}}{L-L_A}dL_M = -p^A g_A^{'}\frac{\partial G}{\partial L_A}dR + \frac{L_M+R}{L-L_A}d\overline{w} - g_A(R)\frac{\partial G}{\partial L_A}dp^A \tag{10'}$$

According to the above three equations, L_A, L_M and L_U are endogenous variables, while R, p^A, $\overline{w}$ are exogenous variables determined externally. We will perform a comparative static analysis in the next section.

3. Comparative static analysis

Organizing the above three **Equation (5a')**, **Equation (9')**, and **Equation (10')**, we have

$$\begin{bmatrix} g_M(R)\frac{\partial^2 F}{\partial L_M^2} & 0 & 0 \\ 1 & 1 & 1 \\ -\frac{\overline{w}}{L-L_A} & A & 0 \end{bmatrix}\begin{bmatrix} dL_M \\ dL_A \\ dL_U \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ \frac{L_M+R}{L-L_A} \end{bmatrix}d\overline{w} + \begin{bmatrix} -\frac{\partial F}{\partial L_M}g_M^{'} \\ -1 \\ -p^A g_A^{'}\frac{\partial G}{\partial L_A} \end{bmatrix}dR + \begin{bmatrix} 0 \\ 0 \\ -g_A(R)\frac{\partial G}{\partial L_A} \end{bmatrix}dp^A \tag{11}$$

where $A \equiv p^A g_A(R)\frac{\partial^2 G}{\partial L_A^2} - \frac{(L_M+R)}{(L-L_A)^2}\overline{w} < 0$.

So the determinant coefficient of **Equation (11)** is $|J| \equiv -g_M(R)\frac{\partial^2 F}{\partial L_M^2}A < 0$.

Next, we look at the effect of changes in the exogenous variable R in **Equation (11)** on the amount of employment in the urban sector L_M, the amount of employment in the rural sector L_A and the number of unemployed in the urban sector L_U in **Equation (11)**. We have:

$$\frac{dL_M}{dR} = \frac{A}{|J|}\frac{\partial F}{\partial L_M}g_M^{'} > 0$$

$$\frac{dL_A}{dR} = \frac{1}{|J|}[g_M(R)\frac{\partial^2 F}{\partial L_M^2}p^A g_A^{'}\frac{\partial G}{\partial L_A} + \frac{\partial F}{\partial L_M}g_M^{'}\frac{\overline{w}}{L-L_A}] = \gtrless 0$$

if $g_M(R)\frac{\partial^2 F}{\partial L_M^2}p^A g_A^{'}\frac{\partial G}{\partial L_A} > \frac{\partial F}{\partial L_M}g_M^{'}\frac{\overline{w}}{L-L_A}$, $\frac{dL_A}{dR} > 0$;

or else $g_M(R)\frac{\partial^2 F}{\partial L_M^2}p^A g_A^{'}\frac{\partial G}{\partial L_A} < \frac{\partial F}{\partial L_M}g_M^{'}\frac{\overline{w}}{L-L_A}$, $\frac{dL_A}{dR} < 0$.

$$\frac{dL_U}{dR} = \frac{1}{|J|}[g_M(R)\frac{\partial^2 F}{\partial L_M^2}(A - p^A g_A^{'}\frac{\partial G}{\partial L_A}) - \frac{\partial F}{\partial L_M}g_M^{'}(A + \frac{\overline{w}}{L-L_A})] \gtrless 0$$

when $\frac{\overline{w}}{L-L_A} > A$ and $\frac{\partial F}{\partial L_M}g_M^{'}(A + \frac{\overline{w}}{L-L_A}) > g_M(R)\frac{\partial^2 F}{\partial L_M^2}(A - p^A g_A^{'}\frac{\partial G}{\partial L_A})$, $\frac{dL_U}{dR} < 0$;

or $\frac{dL_U}{dR} > 0$.

Similarly, we look at the effect of changes in the exogenous variable $\overline{w}$ on L_M, L_A and L_U.

$$\frac{dL_M}{d\overline{w}} = -\frac{A}{|J|} < 0$$

$$\frac{dL_A}{d\overline{w}} = \frac{-1}{|J|}[g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A} + \frac{\overline{w}}{L-L_A}] \gtrless 0$$

if $\left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A}\right| < \frac{\overline{w}}{L-L_A}$, $\frac{dL_A}{d\overline{w}} > 0$;

or else $\left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A}\right| > \frac{\overline{w}}{L-L_A}$, $\frac{dL_A}{d\overline{w}} < 0$.

$$\frac{dL_U}{d\overline{w}} = \frac{1}{|J|}\left[g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M + R}{L - L_A} + A + \frac{\overline{w}}{L - L_A}\right] \gtrless 0$$

if $\left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A} + A\right| > \frac{\overline{w}}{L-L_A}$, $\frac{dL_U}{d\overline{w}} > 0$; or $\left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A} + A\right| < \frac{\overline{w}}{L-L_A}$, $\frac{dL_U}{d\overline{w}} < 0$.

And finally, we look at the effect of changes in the exogenous variable p^A on L_M, L_A and L_U.

$$\frac{dL_M}{dp^A} = 0$$

$$\frac{dL_A}{dp^A} = \frac{1}{|J|} g_M(R)\frac{\partial^2 F}{\partial L_M^2} g_A(R)\frac{\partial G}{\partial L_A} > 0$$

$$\frac{dL_U}{dp^A} = \frac{-1}{|J|} g_M(R)\frac{\partial^2 F}{\partial L_M^2} g_A(R)\frac{\partial G}{\partial L_A} < 0$$

The results of the above calculations can be summarized as Proposition 1.

Proposition 1:

(1) The effects of changes in public intermediate goods on the labor employment in two sectors and the unemployment rate as follows:

$\frac{dL_M}{dR} > 0$;

$\frac{dL_A}{dR} < 0 \Leftrightarrow g_M(R)\frac{\partial^2 F}{\partial L_M^2} p^A g_A^{'} \frac{\partial G}{\partial L_A} < \frac{\partial F}{\partial L_M} g_M^{'} \frac{\overline{w}}{L-L_A}$,

or $\frac{dL_A}{dR} > 0 \Leftrightarrow g_M(R)\frac{\partial^2 F}{\partial L_M^2} p^A g_A^{'} \frac{\partial G}{\partial L_A} > \frac{\partial F}{\partial L_M} g_M^{'} \frac{\overline{w}}{L-L_A}$;

$\frac{dL_U}{dR} < 0 \Leftrightarrow \frac{\overline{w}}{L-L_A} > A$ and $\frac{\partial F}{\partial L_M} g_M^{'}(A + \frac{\overline{w}}{L-L_A}) > g_M(R)\frac{\partial^2 F}{\partial L_M^2}(A - p^A g_A^{'} \frac{\partial G}{\partial L_A})$ or

$\frac{dL_U}{dR} > 0$.

(2) The effects of changes in the fixed-wage on the labor employment in two sectors and the unemployment rate as follows:

$\frac{dL_A}{d\overline{w}} < 0$;

$\frac{dL_A}{d\overline{w}} < 0 \Leftrightarrow \left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A}\right| > \frac{\overline{w}}{L-L_A}$, $\frac{dL_A}{d\overline{w}} < 0$, or

$\frac{dL_A}{d\overline{w}} > 0 \Leftrightarrow \left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A}\right| < \frac{\overline{w}}{L-L_A}$;

$\frac{dL_U}{d\overline{w}} < 0 \Leftrightarrow \left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A} + A\right| < \frac{\overline{w}}{L-L_A}$ or

$\frac{dL_U}{d\overline{w}} > 0 \Leftrightarrow \left|g_M(R)\frac{\partial^2 F}{\partial L_M^2}\frac{L_M+R}{L-L_A} + A\right| > \frac{\overline{w}}{L-L_A}$.

(3) The effects of changes in the relative price of two sectors on the labor employment in two sectors and the unemployment rate as follows:

$$\frac{dL_M}{dp^A} = 0\ ;$$

$$\frac{dL_M}{dp^A} > 0\ ;$$

$$\frac{dL_U}{dp^A} > 0\ .$$

4. Economic welfare

The utility of this country is given that $U = U(D_A, D_M)$, where D_A is the worker's total A goods consumption, and D_M is the worker's total M goods consumption; i.e. demand volumes. And $U = U(D_A, D_M)$ is linearly, and homogenous. The level of economic welfare in the country is represented by this utility function. Consider the aggregate utility function of this country, each of which is the social welfare function of this country.

The production of public intermediate goods shall be provided by the government. Therefore, the government shall finance the cost of production of public intermediate goods by taxing labor income. If the ad valorem tax on labor wages is t, the tax revenue is $t(w_A L_A + \overline{w} L_M)$ and if it is taken to cover $\overline{w}R$ which is the cost of production of public intermediate goods, then we have $t(w_A L_A + \overline{w} L_M) = \overline{w}R$.

The national income of the country is expressed as $w_A L_A + \overline{w} L_M + r_A \overline{T} + r_M \overline{K} = I$.

And this income is equal to the gross national product of the entire country. The country's gross national product is $p^A A + M$. So we have the gross national product = the gross national expenditure. That is, $p^A A + M = p^A D_A + D_M$.

If $A = g_A(R)G(L_A, \overline{T})$ and $M = g_M(R)F(L_M, \overline{K})$ are homogeneous, then by Euler's theorem, the production functions of the two sectors have

$$A = g_A(R)\frac{\partial G}{\partial L_A}L_A + g_A(R)\frac{\partial G}{\partial \overline{T}}\overline{T}$$

$$M = g_M(R)\frac{\partial F}{\partial L_M}L_M + g_M(R)\frac{\partial F}{\partial \overline{K}}\overline{K}$$

therefore

$$(1-t)p^A A = (1-t)p^A g_A(R)\frac{\partial G}{\partial L_A}L_A + (1-t)p^A g_A(R)\frac{\partial G}{\partial \overline{T}}\overline{T}$$

$$p^A A = w_A L_A + r_A \overline{T}$$

Similarly,

$$M = \overline{w} L_M + r_M \overline{K}$$

That is, $p^A A + M = I = p^A D_A + D_M$ is to be the principle of three-sided equivalence.

So we're going to address the problem as follows:

Max $u = U(D_A + D_M)$

sub to $p^A A + M = I = p^A D_A + D_M$(12)

Define a Lagrange function as

$\mathcal{L} = U(D_A + D_M) - \lambda(p^A D_A + D_M - I)$

FOCs:

$$\frac{\partial \mathcal{L}}{\partial D_A} = \frac{\partial U}{\partial D_A} - \lambda p^A = 0 \tag{13}$$

$$\frac{\partial \mathcal{L}}{\partial D_M} = \frac{\partial U}{\partial D_M} - \lambda = 0 \tag{14}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda} = p^A D_A + D_M - I = 0 \tag{15}$$

from **Equation (13)** and **Equation (14)**

$$\frac{\partial \mathcal{L}}{\partial D_A} \Big/ \frac{\partial \mathcal{L}}{\partial D_M} = p^A \text{ i.e } MRS = p^A \tag{16}$$

Using **Equation (16)** and $I = p^A D_A + D_M$,

$$D_A = C_A(p^A, I) \tag{17}$$

$$D_M = C_M(p^A, I) \tag{18}$$

Let v be the utility that the consumer is getting, which is obtained by substituting the quantity demanded at that time into the utility function,

$$v = U(C_A(p^A, I)) \text{ i.e } v = V(p^A, I) \tag{19}$$

where V is the indirect utility function.

When consumers minimize expenditure subject to a constant level of utility U, the ratio of marginal utilities equals the ratio of relative prices. In this case, expenditure is minimized, and the compensated demand functions for the two goods are as follows:

$$D_A = C^u{}_A(p^A, U);\ D_M = C^u{}_M(p^A, U) \tag{20}$$

The minimum cost required to achieve utility level is

$$p^A(C^u{}_A, U) + C^u{}_M(p^A, U) = E(p^A, U) \tag{21}$$

E represents the consumer's expenditure function, where $E(p^A, U) = p^A D_A + D_M = p^A A + M$. Next, we will examine how the supply of public intermediate goods and the minimum wage affect the economic welfare of a nation.

Using **Equation (21)**,

$$E(p^A, U) = p^A G(L_A, \overline{T}) + F(L_M, \overline{K}) \tag{22}$$

$$\frac{\partial E}{\partial U}\frac{dU}{dR} = p^A \frac{\partial G}{\partial L_A}\frac{dL_A}{dR} + \frac{\partial F}{\partial L_M}\frac{dL_M}{dR} \tag{23}$$

$$= \frac{1}{|J|}[(p^A)^2 g_M(R) \frac{\partial^2 F}{\partial L_M^2} g_A^{'} \frac{\partial G}{\partial L_A} + g_M^{'} (\frac{\partial F}{\partial L_M})^2 g_A^{'} \frac{\partial G}{\partial L_A} + g_M^{'} (\frac{\partial F}{\partial L_M})^2 p^A g_A(R) \frac{\partial^2 G}{\partial L_A^2} > 0$$

Therefore, since $\frac{\partial E}{\partial U} > 0$ we obtain $\frac{dU}{dR} > 0$.

Similarly,

$$\frac{\partial E}{\partial U}\frac{dU}{d\overline{w}} = p^A \frac{\partial G}{\partial L_A}\frac{dL_A}{d\overline{w}} + \frac{\partial F}{\partial L_M}\frac{dL_M}{d\overline{w}} \tag{24}$$

$$= \frac{-1}{|J|}[p^A \frac{\partial G}{\partial L_A} g_M(R) \frac{\partial^2 F}{\partial L_M^2} \frac{L_M + R}{L - L_A} + \frac{\partial F}{\partial L_M} p^A g_A(R) \frac{\partial^2 G}{\partial L_A^2}] < 0$$

Therefore, since $\frac{\partial E}{\partial U} > 0$ we obtain $\frac{dU}{d\overline{w}} < 0$.

Finally, we will examine the impact of changes in the international relative price $p^I = p^I{}_A/p^I{}_M$ ($p^I{}_M = 1$) of the two goods on economic welfare. Since we are considering a small open economy, here p^A is p^I.

From (22), we have

$$\frac{\partial E}{\partial U}\frac{dU}{dp^I} = p^I\frac{\partial G}{\partial L_A}\frac{dL_A}{dp^I} + \frac{\partial F}{\partial L_M}\frac{dL_M}{dp^I} + \left(G - \frac{\partial E}{\partial p^I}\right) = \frac{1}{|J|}p^I g_M(R)\frac{\partial^2 F}{\partial L_M^2}g_A\frac{\partial G}{\partial L_A}\frac{\partial G}{\partial L_A} + \left(G - \frac{\partial E}{\partial p^I}\right) \gtrless 0 \tag{25}$$

where $\frac{\partial E}{\partial p^I} = D_A$ and D_A is the domestic demand for agricultural products in this country. If this country exports agricultural products, then $G - \frac{\partial E}{\partial p^I} > 0$. According to Proposition 1 (3), $\frac{1}{|J|}p^I g_M(R)\frac{\partial^2 F}{\partial L_M^2}g_A\frac{\partial G}{\partial L_A}\frac{\partial G}{\partial L_A} > 0$, $\frac{\partial E}{\partial U}\frac{dU}{dp^I} > 0$.

If this country imports agricultural products, then $G - \frac{\partial E}{\partial p^I} < 0$. But when the value of $\left|\frac{1}{|J|}p^I g_M(R)\frac{\partial^2 F}{\partial L_M^2}g_A\frac{\partial G}{\partial L_A}\frac{\partial G}{\partial L_A}\right|$ is greater than $\left|G - \frac{\partial E}{\partial p^I}\right|$, then $\frac{\partial E}{\partial U}\frac{dU}{dp^I} > 0$. When the value of $\left|\frac{1}{|J|}p^I g_M(R)\frac{\partial^2 F}{\partial L_M^2}g_A\frac{\partial G}{\partial L_A}\frac{\partial G}{\partial L_A}\right|$ is less than the absolute value of $\left|G - \frac{\partial E}{\partial p^I}\right|$, then $\frac{\partial E}{\partial U}\frac{dU}{dp^I} < 0$.

Let's summarize the above results in Proposition 2.

Proposition 2:

(1) When the government supplies a greater quantity of public intermediate goods, the economic welfare of the country increases.

(2) An increase in the fixed wage level in the urban sector decreases the economic welfare of this country.

(3) The impact of changes in the international relative prices of the products of two sectors on the economic welfare of the country is as follows:

If the country's exports of agricultural products are non-negative, the economic welfare of the country increases.

If this country's exports of agricultural products are negative, the economic welfare of the country depends on the magnitude of the absolute values of $\frac{1}{|J|}p^I g_M(R)\frac{\partial^2 F}{\partial L_M^2}g_A\frac{\partial G}{\partial L_A}\frac{\partial G}{\partial L_A}$ and $G - \frac{\partial E}{\partial p^I}$.

If $\left|\frac{1}{|J|}p^I g_M(R)\frac{\partial^2 F}{\partial L_M^2}g_A\frac{\partial G}{\partial L_A}\frac{\partial G}{\partial L_A}\right| > \left|G - \frac{\partial E}{\partial p^I}\right|$, the economic welfare of the country increases; or $\left|\frac{1}{|J|}p^I g_M(R)\frac{\partial^2 F}{\partial L_M^2}g_A\frac{\partial G}{\partial L_A}\frac{\partial G}{\partial L_A}\right| < \left|G - \frac{\partial E}{\partial p^I}\right|$, the economic welfare of the country decreases.

5. Conclusion

The results obtained from the calculations in this paper are mainly summarized into Proposition 1 and Proposition 2. Proposition 1 discusses the impact of public intermediate goods, fixed wage, and the relative price of two sectors on the level of labor employment. If more public intermediate goods are provided in the urban sector, it may lead to an increase in labor employment in the urban sector because the construction of public intermediate goods could create more urban job opportunities. In the rural sector, the construction of more public intermediate goods may increase labor employment but it could also potentially reduce job opportunities. If the construction involves public infrastructure such as roads, and communication facilities, which increases the demand for rural sector's goods, then firms would likely hire more labor. However, if it involves irrigation facilities, agricultural technology improvements, and mechanization, it may reduce the demand for labor as machines can replace manual labor. Consequently, the unemployment rate may either decrease or increase due to the increase in public intermediate goods.

In Proposition 2, we focus on the impact of public intermediate goods, fixed wage, and the relative price of products from two sectors on economic welfare. If the government sector provides more public intermediate goods, it will increase the economic welfare of the country. Similarly, an increase in the relative international prices of products from the two sectors will also increase the economic welfare of this country. However, an increase in fixed wages in the urban sector will decrease the economic welfare of the country.

To reduce unemployment rates while simultaneously increasing the economic welfare of the country, we have considered the following win-win policies:

(1) Increasing the supply of public intermediate goods in the rural sector: For example, through measures such as improving and disseminating agricultural technologies, productivity, and living standards in the rural sector can be enhanced, enabling the rural population to stay and thrive in rural areas. When living standards can be maintained at a basic level comparable to urban areas, some individuals may be less inclined to migrate, reducing the pressure for rural residents to seek jobs in urban areas.

(2) Encouraging entrepreneurship and business development in rural areas: The government can encourage entrepreneurship and business development in rural areas through policies such as financial support, tax incentives, and provide technical guidance. This can create more employment opportunities and attract urban residents to return to or remain in rural areas for employment.

(3) Given the trend of the aging population in rural areas and the preference of younger people for urban employment, efforts are made to encourage young people, including graduates, to work in rural areas.

(4) Furthermore, local government departments are appropriately placing young people so that they can bring in new ideas and perspectives. Young people can lead other young people and revitalize the local economy.

This paper builds upon the original Harris-Todaro model without considering changes in factor endowments. Instead, it primarily examines the effects of changes in public intermediate goods, fixed wages, and relative prices of products from two sectors on the urban sector, rural sector, unemployment rates, and economic welfare. This paper analyzes under the conditions of a small open economy, whereas the original Harris-Todaro model discusses a closed economy. Therefore, to directly compare the analysis results with the original Harris-Todaro model, it is necessary to conduct the above analysis under the conditions of a closed economy. Additionally, to reduce unemployment rates, policies such as subsidies or insurance can be implemented to ensure the livelihood of the unemployed. These issues can be discussed as future topics of research.

Disclosure statement

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