Production Subsidy/tax Policy on Foreign Direct Investment in the Presence of Urban Unemployment and Labor Migration*

Masayuki Okawa†
Ritsumeikan University

Abstract

We set up a simple two sector, two factor Harris-Todaro model in which home and foreign duopolists compete in a Cournot-Nash way in the urban sector, while the rural sector is perfectly competitive. We introduce a cost asymmetry between home and foreign firms and a spillover of production technology from the foreign firm to the home firm. We then study the effects of the production subsidy/tax policy of the government for the duopolists on the urban unemployment, migration between urban and rural sectors and the welfare of the host country.

JEL Classification: F11, F12, F16

Key words: Cournot-Nash equilibrium, Harris-Todaro model, foreign direct investment, technology spillover

1. Introduction

Since 1990s, many developing countries have liberalized and opened their capital markets as well as goods and service markets for their trading partners. They are strategically competing to attract foreign direct investments (FDIs). The developing countries provide various types of investment incentives, favored treatment of taxes with regulations for FDIs. The examples include Special Economic Zone (SEZ), Export Processing Zone (EPZ) and so forth. The merits of attracting FDI for the host country are, for example, (i) the employment creation effect by foreign firms, (ii) pro-competition effect, and (iii) the spillover of superior technology and/or management know-how from the foreign firms to the domestic firms. The cost of the policy may be the loss of the profits of domestic rival firms and the financial expenditure of the government for the foreign firms. These policies are attracted widespread attention in the literature in international trade and development economics.1) Many of the

---

* This paper is partly based on my the Kojima Kiyoshi Prize Lecture at the 69th annual meeting of the Japan Society of International Economics held at Osaka University, October 16–17, 2010. The author is grateful to Professor Kemp for his helpful comment. Also he appreciates to the attendants of the seminar at Aichi University for their comments on the earlier version of the paper.
† Corresponding Author: Department of Economics, Ritsumeikan University, 1-1-1 Noji-higashi, Kusatsu, 525-8577, Japan. Email: mokawa@ec.ritsumei.ac.jp

1) Young (1992) and Miyagiwa (1993), among others, examined the effects of forming EPZs and/or free-trade zones in a perfectly competitive Harris-Todaro type economy.
theoretical analyses are conducted in the context of strategic trade policy settings and are based on partial equilibrium frameworks. Brander and Spencer (1981, 1984) examined the optimal tariff policy of a country importing from a foreign monopoly firm. Brander and Spencer (1987) also examined the tariff and tax policies of a country which imports goods and receives FDI and showed that under some circumstances, the country sets a lower tax rate than a tariff rate to attract FDI. Lahiri and Ono (2004) introduced unemployment of labor and studied the effects of restriction on the outputs of foreign firms and showed that if marginal cost of foreign firm is sufficiently small, there exists a restriction level under which the restriction raises the welfare of the host country.

On the other hand, Harris and Todaro (1970) set up a two sector general equilibrium model of a developing economy characterized as the “dual economy.” In the model the economy consists of perfectly competitive two sectors: one is an industrialized urban sector with high rigid minimum wage and unemployment of labor and another is a traditional rural sector with low wage laborers. The Harris-Todaro model has been extended by many researchers. Chao and E. Yu (1994, 1997), among others, introduced an oligopolistic urban sector in a Harris-Todaro setting. In their setting, all oligopoly firms are identical domestic firms.

The purpose of this paper is to examine the effects of the production subsidy/tax policies of a developing country for both domestic and foreign firms under imperfect competition in a simple Harris-Todaro setting. We set up a simple two sector, two factor model with urban unemployment and labor migration in which domestic and foreign duopoly firms compete in a Cournot-Nash way in the urban sector while the rural sector is perfectly competitive. We introduce a cost asymmetry between two duopolists and a spillover of production technology from the foreign firm to the home firm. We then study the effects of the production subsidy/tax policy of the government on the urban unemployment, labor migration between urban and rural sectors and welfare of the host country.

2. The model

We consider a Harris-Todaro type dual economy which consists of two sectors: an urban sector and a rural sector. In the urban sector, duopoly firms, one is a local firm $h$ and the other is a foreign firm $f$, produce good $M$. On the other hand, in the rural sector, good $A$ is produced with constant returns to scale technology in a perfectly competitive market.

Good $M$ is produced by using labor only. The production function of each firm is

\[
x_h = \theta_h l_h
\]  \hspace{1cm} (1)

\[
x_f = \theta_f l_f
\]  \hspace{1cm} (2)

where $x_j$ ($j = h, f$) is the firm $j$’s output of good $M$, $\theta_j$ is the firm $j$’s marginal productivity

---

2) Beladi and Yabuuchi (2010), for example, examine the effects of equity control of multinational firms on resource allocation and national welfare in a model with rural-urban migration and urban unemployment.

3) Chao and E. Yu (1994) showed that, in the long run, an additional foreign capital inflow always improve the welfare of the country. Chao and E. Yu (1997) showed that partial trade liberalization through relaxation of quota improves welfare of the country.
(or average productivity) of labor and \( l_j \) is the amount of labor employed by firm \( j \). The variable with subscript \( h \) (resp., \( f \)) denotes that of home (resp., foreign) firm. The fixed labor input for the production of each firm is, without loss, assumed away. We suppose that the production technology of firm \( f \) is initially superior to that of firm \( h \) (i.e., \( \theta_f > \theta_h = 1 \)), and that there exists a technology spillover from firm \( f \) to firm \( h \). Thus the relationship between \( \theta_f \) and \( \theta_h \) can be given by

\[
\theta_h = 1 + \delta (\theta_f - 1)
\]

where \( \delta \in [0,1] \) is an exogenous parameter which denotes the degree of the technological spillover from firm \( f \) to firm \( h \). If the technology of firm \( f \) is completely spilt over to firm \( h \) (i.e., \( \delta = 1 \)) then \( \theta_h \) becomes equal to \( \theta_f \). Conversely if there exists no spillover of the technology from firm \( f \) to firm \( h \) (i.e., \( \delta = 0 \)), then the marginal productivity of labor of firm \( h \) is equal to 1. It is assumed that firm \( h \) can costlessly absorb the foreign firm’s technology.

We assume that the government of the host country provides production subsidy (or imposes production tax) to both duopolists. Thus the profit of each firm can be written as:

\[
\pi_j = [(p + s_j) \theta_j - w_m]l_j
\]

where \( p \) is the price of good \( M \), \( s_j \) is the specific production subsidy to firm \( j \) and \( w_m \) is the wage rate of labor in the urban sector, which is exogenously fixed at an institutionally given level. We assume that both firms compete in a Cournot–Nash fashion for a given production subsidy/tax.

In the rural sector, good \( A \) is produced by using labor and a specific factor (say, land) under constant returns to scale technology in a perfectly competitive market. We assume the production function of good \( A \) is of a Cobb-Douglas type:

\[
x_a = \ell_a^\alpha T^{1-\alpha}, \quad \alpha \in (0,1)
\]

where \( x_a \) is the output of good \( A \), \( \ell_a \) is the amount of labor employed in the rural sector, \( T \) is the constant endowment of the specific factor. Thus the first-order condition for profit-maximization in the sector is

\[
w_a = \alpha (T/\ell_a)^{1-\alpha}
\]

where \( w_a \) is the wage rate in the rural sector. We take good \( A \) as the numeraire and the price of good \( A \) is normalized to 1.

Let us now turn to the labor market of the economy. The labor market of the dual economy is assumed to be of a traditional Harris-Todaro type. We assume that there exists urban unemployment and labor migration from the rural sector to the urban sector. The equilibrium condition for the migration of labor between two sectors is

\[
w_m = (1 + \lambda)w_a
\]

where \( \lambda \equiv \ell_u/(\ell_h + \ell_f) \) and \( \ell_u \) is the amount of the unemployed labor in the urban sector. The
equation (7) denotes that, in equilibrium, the expected wage rate in the urban sector must be equalized to the rural wage rate. The equilibrium condition for labor market is

\[ \ell_h + \ell_f + \ell_a = \bar{\ell} \tag{8} \]

where \( \bar{\ell} \) is the constant total endowment of labor in the economy.

We finally turn to the demand side of the economy. We assume that the utility function of the economy is of a simple quadratic form:

\[ u(D_a, D_m) = D_a + bD_m - \frac{1}{2}(D_m)^2 \tag{9} \]

where \( D_i \) \((i = a, m)\) is the consumption of good \( i \). The derived inverse demand function for good \( M \) is written as \( p = b - D_m = b - (x_h + x_f) \). Our model is of a two stage game. In stage 1, the government sets the production subsidy/tax on the two firms and, in stage 2, the duopolists determine their outputs in a Cournot-Nash way.

3. The effects of the production subsidy/tax policy for duopoly firms

The first-order condition for the profit maximization of duopoly firm \( j \) \((j = h, f)\) can be written as

\[ (p + s_j) \theta_j - (\theta_j)^2 \ell_j = w_m \tag{10} \]

Differentiating two first-order conditions in (10) with respect to \( s_h \) and \( s_f \), we find that

\[ \frac{\partial \ell_h}{\partial s_h} = \frac{2}{3} \theta_h > 0, \quad \frac{\partial \ell_f}{\partial s_h} = -\frac{1}{3} \theta_f < 0, \]

\[ \frac{\partial \ell_h}{\partial s_f} = -\frac{1}{3} \theta_h < 0, \quad \frac{\partial \ell_f}{\partial s_f} = \frac{2}{3} \theta_f > 0 \tag{11} \]

\[ \frac{\partial (\ell_h + \ell_f)}{\partial s_h} = (2 \theta_f - \theta_h) > 0, \quad \frac{\partial (x_h + x_f)}{\partial s_h} = \frac{1}{3} > 0, \tag{12-1} \]

\[ \frac{\partial (\ell_h + \ell_f)}{\partial s_f} = (2 \theta_h - \theta_f) / 3 \theta_h \theta_f \frac{\geq 0}{\leq 0} \quad \Rightarrow \quad \delta \geq \frac{(\theta_f / 2) - 1}{\theta_f - 1}, \tag{12-2} \]

\[ \frac{\partial (x_h + x_f)}{\partial s_f} = \frac{1}{3} > 0 \tag{12-3} \]

In (11) and (12-1), we obtain the results on the effects of the production subsidies to the duopoly firms, which one would normally expect, that (i) the production subsidy to each firm raises the output of the firm and reduces that of rival firm, (ii) the production subsidy to firm \( h \) raises both the total employment of urban labor and the total outputs of duopoly firms.

On the other hand, we see from (12-2) that whether the production subsidy to firm \( f \) raises the total employment of urban labor depends on (i) the degree of the technological gap
between two firms and (ii) the degree of spill over of the technology from firm $f$ to firm $h$. Since $\theta_f > 1$ and $\delta \in [0, 1]$, we find in (12-2) that (i) if $1 < \theta_f \leq 2$, then whatever the value of $\delta$, the production subsidy to firm $f$ raises the total employment of labor in the urban sector, (ii) If $\theta_f > 2$ and $\delta > [(\theta_f/2) - 1]/(\theta_f - 1)$, that is even when the degree of the technology gap is larger than the critical value, 2, and the degree of the spillover of the technology to firm $h$ is large, then the production subsidy to firm $f$ also raises the total employment in the urban sector, and (iii) if $\theta_f > 2$ and $\delta < [(\theta_f/2) - 1]/(\theta_f - 1)$, then the production subsidy to firm $f$ reduces the total employment of labor in the urban sector. Therefore whether the production subsidy to firm $f$ raises or reduces the total employment in the urban sector depends on two factors: the degree of technology gap between two firms and the degree of spill over of the superior foreign technology to the domestic firm. We can summarize the results in Proposition 1.

Proposition 1

1. The production subsidy to firm $h$ raises the total urban employment of labor and the total output of good M, and reduces the price of good M.
2. Suppose that (i) $1 < \theta_f \leq 2$ or (ii) $\theta_f > 2$ and $\delta > [(\theta_f/2) - 1]/(\theta_f - 1)$, then an increase in $s_f$ raises the urban employment and the total output of good M, and reduces the price of good M.
3. Suppose that $\theta_f > 2$ and $\delta < [(\theta_f/2) - 1]/(\theta_f - 1)$, then the production subsidy to firm $f$ reduces the total employment of labor and the total output of good M in the urban sector, and raises the price of good M.

Let us now turn to the effects of the production subsidy on the labor migration between two sectors and the urban unemployment. Differentiating equations (6)–(8), we find that

\[
\left(-1 + \lambda(1 - \alpha) \frac{w_a}{(\ell_h + \ell_f)}\right) \frac{d\ell_a}{d(\ell_h + \ell_f)} = \left(\frac{\lambda w_a}{(1 + \lambda)}\right) \left(\frac{d\ell_h + d\ell_f}{d\ell_a}\right) - \left(\frac{d\ell_h + d\ell_f}{d\ell_a}\right)
\]

(13)

Solving (13), we find that

\[
\frac{d\ell_a}{d(\ell_h + \ell_f)} = \frac{w_m}{E(\ell_h + \ell_f)} < 0
\]

(14)

\[
\frac{d\ell_u}{d(\ell_h + \ell_f)} = \frac{w_m}{E(\ell_h + \ell_f)} \left[-\frac{\lambda}{(1 + \lambda)} + \gamma(1 - \alpha)\right] \geq 0 \Leftrightarrow \frac{\lambda}{\gamma(1 + \lambda)} \geq 1 - \alpha
\]

(15)

where $E \equiv -[(1 - \alpha)w_m\ell_a^{-1} + w_a(\ell_h + \ell_f)^{-1}] < 0$ and $\gamma \equiv (\ell_h + \ell_f)/\ell_a$.

As for the relationship between the employment of labor in the rural sector and that in the urban sector, we obtain a normal result that an increase (resp., decrease) in the urban labor employment reduces (resp., raises) the rural employment of labor.
On the other hand, the relationship between the urban unemployment of labor and the total labor employment in the urban sector is conditional: The urban unemployment of labor will increase (resp., decrease) as the total labor employment in the sector increases, if \( \hat{\lambda}((1+\lambda)\gamma)^{-1} > 1 - \alpha \) (resp., \( \hat{\lambda}((1+\lambda)\gamma)^{-1} < 1 - \alpha \)). Noting that \( \hat{\lambda}((1+\lambda)\gamma)^{-1} = (\ell_o^2/(\ell_h^2 + \ell_f^2 + \ell_u^2) \lambda (\ell_h^2 + \ell_f^2)) \) and \( 0 < (1-\alpha) = -(\ell_o \partial w_o/\partial \ell_o) < 1 \), then we see that if the rural population \( (\ell_o) \) is larger than the urban population \( (\ell_h^2 + \ell_f^2 + \ell_u^2) \) and thus \( \hat{\lambda}((1+\lambda)\gamma)^{-1} > (1-\alpha) \), then an increase in the urban employment raises the urban unemployment. Even when the rural population is smaller than the urban population, if the response of rural wage rate \( (w_o) \) to a change in the rural labor population is very small, an increase in the urban employment will raise the urban unemployment. In these cases, an increase in the urban employment raises the expected wage rate in the sector and attracts more labor than an increase in the employment in the urban sector. Thus the urban unemployment increases. On the other hand, suppose that the rural population is smaller than the urban population and that the response of rural wage rate \( (w_o) \) to a change in the rural population is very large. Then an increase in the urban employment attracts labor from the rural sector. The amount of migration of labor from rural sector to the urban sector is, however, smaller than the increase in the urban employment. Thus the unemployment of labor in the urban sector decreases.

From (12-1), (12-2), (14) and (15), we obtain the effects of production subsidy on the labor migration and urban unemployment:

\[
\frac{\partial \ell_a}{\partial s_h} = \frac{w_a (2\theta_f - \theta_h)}{3E (\ell_h + \ell_f) \theta_h \theta_f} < 0 \tag{16}
\]

\[
\frac{\partial \ell_u}{\partial s_h} = \frac{w_a (2\theta_f - \theta_h)}{3E (\ell_h + \ell_f) \theta_h \theta_f} \left[ -\frac{\lambda}{1+\lambda} + \gamma (1-\alpha) \right] > 0 \quad \Leftrightarrow \quad \hat{\lambda}((1+\lambda)\gamma)^{-1} > (1-\alpha) \tag{17}
\]

\[
\frac{\partial \ell_f}{\partial s_f} = \frac{w_a (2\theta_h - \theta_f)}{3E (\ell_h + \ell_f) \theta_h \theta_f} > 0 \quad \Leftrightarrow \quad \delta > \left( \frac{\theta_f}{\theta_f - 1} \right)^{-1} \tag{18}
\]

\[
\frac{\partial \ell_u}{\partial s_f} = \frac{w_a (2\theta_h - \theta_f)}{3E (\ell_h + \ell_f) \theta_h \theta_f} \left[ -\frac{\lambda}{1+\lambda} + \gamma (1-\alpha) \right] > 0 \tag{19}
\]

We find that production subsidy to firm \( h \) reduces rural employment and raises both urban expected wage rate and rural wage rate. On the other hand, whether the production subsidy to firm \( f \) raises or reduces urban unemployment depends on two factors, (i) the allocation share of labor between two sectors and (ii) the distribution share of labor in the rural sector (or the degree of response of rural wage rate on a change in the rural employment).

We see again that whether the production subsidy to firm \( f \) raises or reduces the rural employment depends on (i) the degree of technology gap between two firms and (ii) the degree of technology spillover. For example, when the technology gap between two firms

\[\text{M. Okawa}\]
is large and the degree of spillover is relatively small, then the production subsidy to firm \( f \) reduces the employment of firm \( h \) and the total urban employment. This reduction in the urban employment reduces the expected urban wage rate and raises the rural employment by making labor move from the urban to the rural sector, which in turn reduces the rural wage rate.

We see that the effects of the production subsidy to firm \( f \) on the urban unemployment of labor (\( l_u \)) depends on the composite effects of: (i) the relationship between the magnitude of the technology gap between two firms and the degree of the technology spillover, and (ii) the relative allocation share of the labor between the two sectors. The first effect is captured by the sign of \( \{ \delta - [(\theta_f/2) - 1][\theta_f - 1]^{-1} \} \) and the second one is by the sign of \( \{ \lambda[(1 + \lambda)\gamma]^{-1} - (1 - \alpha) \} \). We summarize the results in Proposition 2.

**Proposition 2**

1. The production subsidy to firm \( h \) reduces the rural labor employment and reduces (resp., raises) the urban unemployment of labor if \( \lambda[(1 + \lambda)\gamma]^{-1} > (1 - \alpha) \) (resp., \( \lambda[(1 + \lambda)\gamma]^{-1} < (1 - \alpha) \)).

2. (i) The production subsidy to the foreign firm (i) reduces (resp., raises) the rural labor employment if \( \delta > [(\theta_f/2) - 1][\theta_f - 1]^{-1} \) (resp., \( \delta < [(\theta_f/2) - 1][\theta_f - 1]^{-1} \)), and (ii) reduces (resp., raises) the urban unemployment if the sign of \( \{ \delta - [(\theta_f/2) - 1][\theta_f - 1]^{-1} \} \) \( \lambda[(1 + \lambda)\gamma]^{-1} - (1 - \alpha) \) is positive (resp., negative).

### 4. Welfare effects of production subsidies/taxes

We finally turn to the welfare effects of production subsidy to home and foreign firms. The change in the utility level in (9) can be written as

\[
\text{du} = dI - (x_h + x_f) \, dp
\]

(9)'

where \( I \) is national income of the country and consists of the sum of the profit of the home firm and the total factor income minus the total payments for production subsidies, and can be written as

\[
I \equiv \pi_h + w_m(\ell_h + \ell_f) + x_a - S
\]

(20)

where \( S \equiv s_hx_h + s_f x_f \) is the total subsidy payments of the government. Totally differentiating (20), we obtain

\[
dI = -\theta_f x_h \, d\ell_f + x_h \, ds_h - \frac{w_m^2 (1 - \alpha) \gamma}{(\ell_h + \ell_f)} E(d\ell_h + d\ell_f) - dS
\]

(20)'

We first consider the welfare effect of the production subsidy to firm \( f \). Setting \( s_h = 0 \), and recalling (11) and (12-1)–(12-3), we find that
\[
\frac{\partial u}{\partial s_f}|_{s_f=0} = \frac{1}{3} \left[ -\frac{w'_m(1-\alpha)\gamma}{(\ell_f + \ell_f)E} \left( 2\theta_f - \theta_f \right) - 2x_f \right]
\]

(21)

It follows that (i) if \( \delta > [(\theta_f/2) - 1] [\theta_f - 1]^{-1} \) [i.e., \( 2\theta_f - \theta_f > 0 \)] and the first term in the right hand side is larger than \( 2x_f \), then \( \frac{\partial u}{\partial s_f} > 0 \) and the production subsidy to firm \( f \) the welfare of the country. Thus it is necessary for the production subsidy to firm \( f \) to be welfare enhancing that the technology gap between the two firms is not so large and/or the degree of spillover of the technology to the home firm is relatively large. (ii) If \( \delta < [(\theta_f/2) - 1] [\theta_f - 1]^{-1} \) [i.e., \( 2\theta_f - \theta_f < 0 \)], then \( \frac{\partial u}{\partial s_f} < 0 \), and the production subsidy to firm \( f \) reduces the welfare of the country. Thus in this case, the government should impose a production tax on firm \( f \) to shift the rent of firm \( f \). We next study the welfare effects of the production subsidy to the home firm. Setting \( s_h = s_f = 0 \) initially, we find that

\[
\frac{\partial u}{\partial s_h}|_{s_h=0} = \frac{1}{3} \left[ (2x_h + x_f) - \frac{w'_m(1-\alpha)\gamma}{(\ell_h + \ell_f)E} \left( 2\theta_f - \theta_h \right) \right] > 0
\]

(22)

The production subsidy to the home firm raises the welfare of the country. We also obtain the optimal subsidy rate to the home firm:

\[
s_h^* = \frac{1}{2} \left[ 2x_h + x_f - \frac{w'_m(1-\alpha)(2\theta_f - \theta_h)\gamma}{(\ell_h + \ell_f)\ell_fE} \right] > 0
\]

(23)

The results can be summarized in Proposition 3.

**Proposition 3**

1. The production subsidy to the home firm always raises the welfare of the country. The optimal subsidy rate is provided in eq. (23). 4)

2. If the technology gap between the two firms is large and/or the degree of the spillover is relatively small, then the production subsidy to the foreign firm reduces the welfare of the host country. (Thus the optimal policy is a production tax to the foreign firm.) On the other hand, (i) if the technology gap is relatively small and/or the degree of technology spillover is large, and (ii) if the positive effects of the production subsidy outweigh the negative effects, then the production subsidy to the foreign firm will raise the welfare of the host country.

---

4) Lahiri and Ono (1988) argued that a production subsidy to a minor firm with high marginal cost may reduce the welfare of the country. It is caused by an inefficient allocation of the production from the high productivity to low productivity firms. However, in our setting, even when a domestic firm is less productive than a foreign firm, a production subsidy to the domestic firm raises the welfare of the country by shifting oligopoly rent from the foreign firm to the domestic firm.
5. Concluding remarks

In this paper we set up a simple Harris-Todaro model of an economy in which home and foreign duopoly firms operate in the urban sector, and have examined the effects of production subsidy and/or tax to the home and foreign firms on the urban unemployment, labor migration between two sectors and welfare of the country. It is shown that the degree of technology gap between domestic and foreign firms and the degree of technological spillover from the superior foreign firm to the domestic firm play crucial role to the effects of the production subsidy/tax policies of the host country. Though our setting is a static one, the concepts like “technology spillover” and “labor migration between industries” might be more appropriate for a more dynamic treatment.

In the model, the urban wage rate is assumed to be exogenously fixed. Though the assumption is common in many literatures which work on Harris-Todaro model, we can relax the assumption and set up a model in which the urban wage rate is endogenously determined.5) Also in this paper, we assume that the foreign firm is located in the urban sector and the location choice problem by the foreign firm whether it should locate in the urban sector or the rural sector is assumed away. An extension to incorporate this endogenous location choice problem by the firm would be a future research.

References

Beladi, H. and Yabuuchi, S. (2010), “Equity Control of Multinational firms: Effects on Resource Allocation and National Welfare,” Review of Development Economics 14, 93–102.
Brander, J. A. and Spencer, B. J. (1981), “Tariffs and the Extraction of Foreign Monopoly Rents under Potential Entry,” Canadian Journal of Economics 16, 289–299.
Brander, J. A. and Spencer, B. J. (1984), “Trade Welfare: Tariffs and Cartels,” Journal of International Economics 16, 227–242.
Brander, J. A. and Spencer, B. J. (1987), “Foreign Direct Investment with Unemployment and Endogenous Taxes and Tariffs,” Journal of International Economics 22, 257–279.
Calvo, G. A. (1978), “Urban Unemployment and Wage Determination in LDCs: Trade Unions in the Harris-Todaro Model,” International Economic Review 19, 65–81.
Chi-Chur Chao and Eden S. H. Yu (1994), “Foreign capital inflows and welfare in an economy with imperfect competition,” Journal of Development Economics 45, 141–154.
Chi-Chur Chao and Eden S. H. Yu (1997), “Trade Liberalization in Oligopolistic competition with unemployment: a general equilibrium analysis,” Canadian Journal of Economics 30, 479–496.
Harris, J. R. and Todaro, M. (1970), “Migration, unemployment and development: A two-sector analysis,” American Economic Review 60, 126–142.
Lahiri, S. and Ono, Y. (1988), “Helping minor firms reduces welfare,” Economic Journal 98, 1199–1202.
Lahiri, S. and Ono, Y. (2004), “Foreign penetration in the presence of unemployment,” in: Lahiri, S. and Ono, Y., Trade and Industrial Policy under International Oligopoly, Cambridge, 82–94.
Miyagiwa, K. (1993), “The locational choice for free-trade zones: Rural versus urban options,” Journal of Development Economics 40, 187–203.
Young L. (1992), “Unemployment and the optimal export-processing zone,” Journal of Development Economics 37, 369–385.

5) Calvo (1978), among others, introduced a labor union in the urban sector and a Harris-Todaro type model under perfect competition in which the urban wage rate is endogenously determined.