Chukyo University Institute of Economics Discussion Paper Series
November 2011

No.1104

Globalization and Economic Welfare: The Presence of an Unfair Gap between Skilled Workers

Kenji Kondoh*

Abstract

By focusing on the unfair gap between skilled workers of uniform quality, where unionized older workers are employed permanently with higher wages, but younger workers fail to occupy permanent positions and are employed as uncertain temporary staff on lower wages, we investigate the effects of the two types of globalization caused by the increasing immigration of foreign unskilled workers and trade liberalization. Under certain conditions, the immigration of unskilled workers might expand the income gap between the two types of skilled workers, but it would have a positive effect on national welfare. Thus, with adequate income re-distribution policies by the government, immigration could be a welfare-improving policy. In contrast, although trade liberalization may reduce the wage gap between the two types of skilled workers, every worker may lose out, and the welfare-improving possibility of trade liberalization may be relatively small. We also suggest that every worker may gain from an increase in the legal minimum wage.

Chukyo University
School of Economics, Chukyo University, Nagoya 466-8666, Japan. E-mail: kkondo@mecl.chukyo-u.ac.jp

1. Introduction

As a result of low economic growth in the recent decades, firms in developed countries that confront uncertainty in their future tend to hesitate to employ workers on a permanent basis. Thus, it has gradually become increasingly difficult for young workers, who have just graduated from a college or a university and have sufficient potential quality to be skilled workers, to find suitable job opportunities. They aspire to be permanent employees, but many new graduates fail to find permanent positions. In such a situation, a number of young skilled workers are employed by staff agencies that supply workers to companies on a temporary basis. Usually, the wages of these temporary workers are very low and almost equal to the legal minimum wage. Moreover, these workers face the possibility of unemployment because the contract of temporary staff can be terminated easily and frequently. Therefore, by following the wage arbitrage, some skilled young workers, rather than taking up temporary assignments, choose to be employed as unskilled workers with very low competitive wages.

As the educational backgrounds of these temporary staff are the same as those of the regular staff, there is no difference in productivity between them. However, despite the fact that there is no quality difference between them, there exists a serious gap among skilled (highly educated) workers. While the younger generations suffer, the older generations not only occupy permanent positions but they are also sometimes unionized and through negotiation, they acquire a certain share of the profits by firms that are under oligopolistic competition.

The prevailing economic trend is globalization, and several kinds of ETAs and EPAs have been agreed upon between countries. Thus, there is not only free trade of goods and services but also free labor mobility between countries, which implies introducing unskilled foreign workers into the mainstream global economy. The main focus of our study is to investigate the economic effects of globalization on the existence of the unfair gap between the two types of skilled workers.

Despite the important effect of labor market imperfections on the issue of immigration, theoretical studies on the subject have been limited. Schmidt et al. (1994) and Fuest and Thum (2001) have analyzed immigration in unionized markets by focusing on skill differences. They demonstrate that immigration can be beneficial to the host country owing to the complementarity of unskilled immigrants to skilled natives. Fuest and Thum (2000) show that immigration enhances welfare if the wage elasticity of labor demand in the competitive sector is smaller than that in the unionized sectors. Our study is based on the study by Zhao and Kondoh (2007), which analyzes the economic effects of globalization under unionization. Some workers in the manufacturing industry are unionized, and they obtain a wage premium, but the other workers are non-unionized and gain only a competitive wage. By adopting a similar approach to the one taken by Harris and Todaro (1970), we extend the study of Zhao and Kondoh (2007), which does not consider the recent unfair gap between generations, the possible unemployment of temporary staff, and the outflow of skilled workers to the unskilled labor market. Our findings about the effects of globalization differ from Zhao and Kondoh (2007) in some ways (for instance, the possibility of welfare improving the situation through trade liberalization). We suggest that immigration could be acceptable with an adequate income-redistribution policy; however, in the case of a poor income re-distribution policy, trade liberalization might be better for the dissolution of the unfair gap. Moreover, we analyze the effects of an increase in the legal minimum wage and show the possibility that all the workers can gain from this facet.

In Section 2, we present our model. Section 3 is devoted to the analysis. Concluding remarks are presented in Section 4.

2. The Model

2.1 Consumers

By adopting a similar approach to the one taken by Zhao and Kondoh (2007), let us consider a host-country economy consisting of the following two sectors: service sector (x) and manufacturing sector (y), with y as the numeraire good. While perfect competition prevails in the manufacturing industry, the service sector is characterized by Cournot-Nash competition of a fixed number of n firms. We assume that a typical consumer maximizes the following homothetic utility function, $\mu = c_x^{\alpha} c_y^{1-\alpha}$, where c_x and c_y are respectively the domestic consumption of goods x and y, and α is a positive constant. Utility maximization subject to the standard budget constraint yields the following inverse demand function,

$$p(c_x, c_y) = \frac{\alpha}{(1-\alpha)} \frac{c_y}{c_x}. \tag{1}$$

By following the economy of Japan, which has a surplus of trade and deficit of service, we assume that the host country is import competing in service; that is, it imports good x and exports good y. This country is small and takes the world price as given. However, it imposes a quota, q, on foreign imports. The justification for this assumption might be that under the WTO system, while tariffs are on the decline, non-tariff barriers still exist in various forms, especially in service trade, limiting trade flows. In order to maintain a balanced trade, we must also have $c_x = x + q$, $c_y = y - p^* q$, where x and y respectively denote the total outputs of service and manufacturing produced in the host country, and p^* is the world price[1].

2.2 Manufacturing Sector

In the manufacturing sector, the production of good y uses unskilled labor and capital: $y = y(L_y, K)$, where y is output, and L_y and K are the inputs of unskilled labor and capital respectively. We assume that perfect competition prevails in this sector, such that labor is hired until the marginal product of labor is equal to the competitive wage:

$$w^* = y_1(L_y, K). \tag{2}$$

Although some exporting manufacturing industries in Japan are characterized by oligopolistic competition, such as the car industry, we here focus on small firms that are sub-contracted by large firms. Owing to the keen competition with similar domestic and foreign firms and the discounted payment usually enforced by the parent companies, the small firms in this sector cannot afford to observe the legal criteria. This is why we permit that the competitive wage of this sector w^* could be lower than the legal minimum wage $\underline{w}$ informally. Moreover, we also assume that foreign unskilled workers are employed in this sector. In reality, workers who cannot communicate with domestic people very well tend to be employed by the manufacturing industry, and such workers are not employed by the service sector.

2.3 Service Sector

We assume that the workers employed in the service sector of our model are relatively skilled workers with regard to communication skills, and they have a bachelor's degree. In Japan, almost one-third of the domestic workers are employed as temporary staff. In particular,

---

[1] Equation (1) can be expressed as $p = p(L_1, L_0, L_y, q)$ where $p_1 = \partial p/\partial L_1 = \partial p/\partial L_0 = -p/(x+q) < 0$,

$p_2 = \partial p/\partial L_2 = p y_1/(y - p^* q) > 0$, and $p_3 = \partial p/\partial q = -p[(1/x+q)+(p^*/y - p^* q)] < 0$.

2

more than 60% of the workers serving in restaurants or hotels are not permanent employees. Around 45% of the salespersons in the wholesale or retail sectors are also part time employees. Reasonable examples of the x sector, in which some unionized permanent employees and some temporary staff are both employed, are Japanese-style home security, parcel delivery, and home-moving services. The services are exported mainly to China and are widely accepted.

In accordance with Zhao and Kondoh (2007), we characterize this sector by mixed oligopoly. There are $n+m$ oligopolistically competitive firms, n of which are unionized and the rest, m, are non-unionized. In equilibrium, we seek a symmetric solution; that is, we assume that all the non-unionized firms are identical, and the same applies to all unionized firms. The number of each type of firm is exogenous. In a typical unionized firm, employment and wages are determined by negotiation. All firms behave like Cournot-Nash oligopolists and replicate the actions of their competitors. Further, the production of good (service) x uses labor only in a one-to-one ratio by a proper choice of units: $x = L_1 + L_0$, where x is the output, L_1 is the aggregate labor input of unionized firms, and L_0 is the aggregate labor input of non-unionized firms, respectively. We need to note that there is no difference in the productivity between workers.

A typical non-unionized firm employs workers who register with temporary staffing agencies. The labor contracts of such workers are renewed periodically, and whether or not the worker will continue to be employed in the next period depends on random probability. The firm pays the legal minimum wage $\underline{w}$ to the temporary staff and maximizes profits:

$$\pi_0 = (p - \underline{w})L_0. \tag{3}$$

All m non-unionized firms behave in the Cournot fashion, which results in the following FOCs:

$$\underline{w} = p + p_1 L_0. \tag{4}$$

In contrast, the profit function of a typical unionized firm is:

$$\pi_1 = (p - w)L_1, \tag{5}$$

where w is the wage paid to union members in a unionized firm, and L_1 is the union's employment. In a unionized firm, all the domestic workers join in the union. In other words, the unionized firm does not hire non-unionized domestic workers.

A typical union has a Stone-Geary type utility function (see Mezzetti and Dinopoulos, 1991):

$$u(w, L_1) = (w - \underline{w})L_1^{\beta}. \tag{6}$$

It is interested in employment as well as a union wage premium above the legal minimum wage, and β is the parameter which shows the union preference. $\beta > (<)1$ implies that unions prefer employment to wage (wage to employment). Wage and employment in unionized firms are determined through negotiations. The solution concept we adopt is Nash bargaining. The union and the firm jointly choose employment and wage to maximize the following Nash product: $G(L_u, w) = \pi_1 u^{\gamma}$, where γ denotes the negotiation power between the union and firm. $\gamma > (<)1$ implies that the power of the union (firm) dominates that of firm (union). The equilibrium satisfies the following conditions:

$$(p - w)(1 + \beta\gamma) + L_1 p_1 = 0, \tag{7a}$$

$$\gamma(p - w) - (w - \underline{w}) = 0. \tag{7b}$$

The labor contract of a worker with a non-unionized firm is temporary. Let us assume that it is renewed in each period, and whether the worker will continue to be employed in the next period or not depends on random probability. The total number of workers who register with temporary staffing agencies is the sum of workers employed by non-unionized firms, and

3

unemployed workers who are just waiting for the next opportunity to be hired. Domestic workers can move between the two sectors freely. Thus, in equilibrium, the expected income of a worker who registers with temporary staffing agencies should be equal to the income of workers in the competitive sector y:

$$w^* = \frac{L_0}{L_0 + L_u} \underline{w} , \qquad (8)$$

where L_u denotes the number of unemployed workers who register with temporary staffing agencies.

Finally, there is full employment and full mobility of labor among non-unionized firms between the two sectors:

$$L_1 + L_0 + L_u + L_y = \bar{L} , \qquad (9)$$

where $\bar{L}$ is the labor endowment.

If we substitute (1) into (4), (7a) and (7b), and substitute (2) into (8), we have five equations that determine the endogenous variables, L_y, L_0, L_1, L_u, and w. This completes the basic model set up.

3. The Analysis
3.1 International Immigration

Let us first investigate the case of international immigration. In recent times, the majority of immigrants to developed countries such as Japan are unskilled workers who have poor communication skills, and some of them are illegal immigrants. By considering this situation, we assume that immigrants cannot be employed by unionized firms in sector x. Let L_M denote the total number of immigrants. Under permanent immigration, using (8), condition (9) becomes

$$L_1 + L_0 + L_u + L_y = \bar{L} + L_M , \qquad (9')$$

where we assume $L_M < L_y$. By total differentiation, we derive the following comparative statistical results (see Appendix for detailed calculations) under the condition $\beta \gamma^2 < 1$: $dw / dL_M > 0$, $dL_1 / dL_M > 0$ (if $\beta > 1$), $dL_0 / dL_M > 0$, $dL_u / dL_M > 0$, and $dL_y / dL_M > 0$.

Both conditions, $\beta > 1$ and $\beta \gamma^2 \leq 1$, could be satisfied under the following numerical example: $(\beta, \gamma) = (2, 0.6)$, which implies that labor unions prefer employment to wage, and the negotiating power of the union is less than that of the firm. The utility of unionized workers will surely increase with international immigration because of increasing employment, L_1 and wage rate, w. In contrast, the wage rate paid to the workers in the manufacturing sector and the expected wage rate of temporary staff in the non-unionized service sector, w^*, will decrease because of increasing L_y. Therefore, regardless of the change in the relative price of two goods, p, the income gap between the two types of workers, the high-income unionized workers and the low-income workers, will increase after the introduction of foreign unskilled workers. Moreover, the income of capital owners in the manufacturing industry and the profits of unionized and non-unionized firms will also increase.

In terms of economic welfare, let us define the per-capita indirect utility function as $v \equiv v(p, I)$, where $I = px + y / \bar{L} + L_M$ is the national income. The total differentiation yields $-v_1 / v_2 = C_x / (\bar{L} + L_M)$, using (1) and the trade balance condition. Further, we derive

4

$$\frac{dv}{dL_M} = \frac{v_1 dp}{dL_M} + \frac{v_2}{\bar{L}+L_M}(\frac{C_x dp}{dL_M} + \frac{pdx}{dL_M} + \frac{dy}{dL_M}) - \frac{v_2(px+y)}{(\bar{L}+L_M)^2}$$

$$= \frac{v_2}{\bar{L}+L_M}(\frac{pdx}{dL_M} + \frac{dy}{dL_M} - I). \tag{10}$$

The sign of (10) could be positive if $\beta > 1$ and $\beta\gamma^2 \leq 1$ are held and I is sufficiently small to satisfy $pdx/dL_M + dy/dL_M > I$ or $\bar{L} > (px+y)[(pdx+dy)/dL_M]^{-1}$. Thus, we may conclude that international immigration could improve the welfare of the host country with sufficient population, $\bar{L}+L_M$. Thus, if the government adopts effective income distribution policies and compensates the wage loss of low-income workers by imposing a tax on the income of unionized workers, capital owners, and unionized firms, the residents of this country could welcome the expansion of the immigration policy.

Now, we can assert the following propositions:

Proposition 1

1) *Consider that labor unions prefer employment to wages, and the negotiation power of the union is less than that of the firm to satisfy conditions, $\beta > 1$ and $\beta\gamma^2 \leq 1$. Accordingly, an increase in immigration raises the union wage but reduces the competitive wage and the expected wage of the temporary staff. It also increases the utility of the union, the profits of the unionized and non-unionized firms, and the rental of capital owners.*

2) *Additionally, in case the labor endowment of the host country is sufficiently large to satisfy $\bar{L} > (px+y)[(pdx+dy)/dL_M]^{-1}$, immigration increases national welfare.*

3.2 Trade Liberalization

Further, we examine the effect of trade liberalization. Appendix shows that $dw/dq < 0$, $dL_1/dq < 0$, $dL_0/dq > 0$, $dL_u/dq > 0$, and $dL_y/dq > 0$ ($dw*/dq < 0$). On the basis of these factors, the union welfare will decline because of the reduced wage rate and employment. The non-unionized workers will also lose from globalization because the (expected) wage for them, $w*$, will decrease. Furthermore, on the basis of (7b), the unions and the unionized firms always share the realized profits by $\gamma:1$. It subsequently follows that an increase in q also reduces the profits of the unionized firms. Capital owners in the manufacturing sector are the only ones who gain. On the basis of (A9) in the Appendix, the total output of service, x, will possibly decrease (increase) under the condition that $\beta > 1$ and $L_1 \leq (1+\gamma)L_0$ ($\beta < 1$, $L_1 > (1+\gamma)L_0$, and γ is sufficiently small). In accordance with the former sub-section, whether economic welfare will increase or decrease depends on the change of outputs of both sectors as shown in (11).

$$\frac{dv}{dq} = \frac{v_2}{\bar{L}+L_M}(\frac{pdx+dy}{dq}). \tag{11}$$

Although the total output of the manufacturing sector increases, it is not clear whether this positive effect dominates the negative effect caused by the decreasing production of the service sector. We can only assert that in case $\beta < 1$, $L_1 > (1+\gamma)L_0$, and γ is sufficiently small, economic welfare will increase after trade liberalization (increasing quota).

The above results lead to the following proposition.

Proposition 2

1) *Trade liberalization in the form of an increase in the import quota reduces the income of every worker. Employment by the unionized firm, the union utility, and the profit of the unionized firms will also decrease.*

2) *The effects on economic welfare depend on certain parameters. The national welfare will increase in case the union prefers wage to employment, the negotiation power of the union is sufficiently small, and the number of workers employed by the unionized firms is much larger than that of those employed by non-unionized firms in the service sector.*

3.3 Increase in Legal Minimum Wage

In our model, the legal minimum wage is paid to the temporary staff, and the competitive wage of unskilled workers employed in the manufacturing sector is less than the minimum wage, because of the informal nature of the labor market. Government can only control the legal minimum wage but cannot control the competitive wage directly. If the negotiation power of the unions γ, the legal minimum wage rate $\underline{w}$, and the capital endowment K are all sufficiently small, we can then assert the possibility $dw/d\underline{w}>0$, $dL_1/d\underline{w}>0$, $dL_0/d\underline{w}<0$, $dL_u/d\underline{w}<0$, and $dL_y/d\underline{w}<0$ ($dw*/d\underline{w}>0$) [2]. These results imply that an increase in the legal minimum wage will have a positive effect on all other workers, unskilled workers in the manufacturing sector, and unionized workers. This is because unions prefer both wage gap and employment, and an increase in the legal minimum wage reduces union utility. Subsequently, the unions tend to increase their premium wage. If the unions succeed in expanding the wage gap more than earlier, the unions also tend to increase their employment. This effect may lead to a decrease in the employment of temporary staff. Accordingly, the total number of workers employed in the manufacturing sector will decrease, the wage rate of this sector will increase, and therefore, on the basis of (8), the number of unemployed temporary staff will also decrease.

The next proposition is based on the above results:

Proposition 3

Under certain conditions, an increase in the legal minimum wage rate applied to the employed temporary staff in the service sector might have a positive effect on the income of every worker.

4. Concluding Remarks

We revise the Zhao and Kondoh (2007) model by focusing on the unfair gap between the skilled workers of uniform quality, that is, between the unionized older workers employed permanently and young temporary staff with lower wages. In particular, we investigate the economic effects of the trend of globalization caused by the increasing immigration of foreign unskilled workers and trade liberalization. Under certain conditions, the immigration of unskilled workers might expand the income gap between the two types of skilled workers, but it would have a positive effect on the national welfare. Thus, with adequate income re-distribution policies by the government, everybody could benefit through the introduction of foreign unskilled workers. In contrast, trade liberalization reduces the expected wage of every worker, but the income gap between the two types of skilled workers may decrease. There exists a small possibility that trade liberalization may have a positive effect on the national welfare. Additionally, under certain conditions, an increase in the legal minimum wage may have a positive effect on every worker's income.

The above results depend on the straightforward setting of our model. The consideration of other situations, such as the opposite trade pattern, the immigration of skilled workers, and the temporary immigration of unskilled workers, are subjects for future examination.

---

[2] Detail calculation report is available upon request.

Appendix

Totally differentiating (7b), (7a), (4), (9) and (8), using inverse demand (1), yields the following matrix.

$$
\begin{bmatrix}
-(1+\gamma) & \gamma p_1 & \gamma p_1 & 0 & \gamma p_2 y_1 \\
-(1+\beta\gamma) & p_1+A & A & 0 & B \\
0 & C & p_1+C & 0 & D \\
0 & 1 & 1 & 1 & 1 \\
0 & 0 & \dfrac{L_u}{(L_0+L_u)^2} & -\dfrac{wL_0}{(L_0+L_u)^2} & -y_{11}
\end{bmatrix}
\begin{bmatrix}
dw \\
dL_1 \\
dL_0 \\
dL_u \\
dL_y
\end{bmatrix}
$$

$$
=
\begin{bmatrix}
-1 \\
0 \\
1 \\
0 \\
-\dfrac{L_0}{L_0+L_u}
\end{bmatrix}
d\underline{w}+
\begin{bmatrix}
-\gamma p_3 \\
E \\
F \\
0 \\
0
\end{bmatrix}
dq+
\begin{bmatrix}
0 \\
0 \\
0 \\
1 \\
0
\end{bmatrix}
d\bar{L}.
\tag{A1}
$$

where $A = p_{11}L_1+(1+\beta\gamma)p_1 = p[\dfrac{L_1-(1+\beta\gamma)(x+q)}{(x+q)^2}] < 0$, and

$B = y_1[p_{12}L_1+(1+\beta\gamma)p_2] = -py_1[\dfrac{L_1-(1+\beta\gamma)(x+q)}{(x+q)(y-p*q)}] > 0$,

$C = p_1+p_{11}L_0 = -p[\dfrac{(x+q-L_0)}{(x+q)^2}] < 0$, $D = y_1[p_2+p_{12}L_0] = py_1[\dfrac{(x+q-L_0)}{(x+q)(y-p*q)}] > 0$,

$E = -[p_{13}L_1+(1+\beta\gamma)p_3] = p[\dfrac{(1+\beta\gamma)(x+q)-L_1}{x+q}][\dfrac{1}{(x+q)}+\dfrac{p*}{y-p*q}] > 0$,

$F = -[p_{13}L_0+p_3] = p[\dfrac{x+q-L_0}{x+q}][\dfrac{1}{(x+q)}+\dfrac{p*}{y-p*q}] > 0$.

The determinant of the LHS matrix of (A1) is,

$$
\Delta = [\dfrac{wL_0}{(L_0+L_u)^2}-y_{11}][(\beta\gamma^2-1)p_1^2-(1+\gamma)(A+C)p_1]-\dfrac{L_u}{(L_0+L_u)^2}[(\beta\gamma^2-1)p_1D-(1+\beta\gamma)\gamma p_2 y_1 C]
$$

$$
+\dfrac{wL_0}{(L_0+L_u)^2}[(1+\gamma)p_1(B+D)-(1+\beta\gamma)\gamma p_1 p_2 y_1].
$$

The sign of Δ is negative if $\beta^2\gamma \le 1$ which exclude the unrealistic case that satisfy both the following two conditions; union does not prefer wage premium of themselves to introducing new union members and the negotiation power of unionized firm is relatively weaker than that of union.
Straightforward calculations yield:

$$
\dfrac{dw}{dL_M} = \Delta^{-1}[-\dfrac{wL_0}{(L_0+L_u)^2}\gamma py_1 p_1\{p[L_1+L_0-(2+\beta\gamma)(x+q)]
\tag{A2}
$$

$$
+py_1[L_1+L_0-(x+q)(3+\beta)]\}] > 0,
$$

$$
\dfrac{dL_1}{dL_M} = \Delta^{-1}[\dfrac{wL_0}{(L_0+L_u)^2}\{\dfrac{-p^2 y_1[(1+\beta\gamma)(x+q)-(1+\gamma)L_1]}{(x+q)^2(y-p*q)}\}] > 0 \quad if\ \beta > 1,
\tag{A3}
$$

$$\frac{dL_0}{dL_M} = \Delta^{-1} \frac{wL_0}{(L_0 + L_u)^2} (1+\gamma)p_1 D > 0 ,\tag{A4}$$

$$\frac{dL_u}{dL_M} = \Delta^{-1}\{-y_{11}[(\beta\gamma^2-1)p_1^2 - (A+C)(1+\gamma)p_1]$$

$$-\frac{L_u}{(L_0+L_u)^2}[(\beta\gamma^2-1)p_1 D - (1+\beta\gamma)\gamma p_2 y_1 C]\} > 0 \quad if\ \beta\gamma^2 \leq 1,\tag{A5}$$

$$\frac{dL_y}{dL_M} = \Delta^{-1}[\frac{wL_0}{(L_0+L_u)^2}\{p_1^2(\beta\gamma^2-1) - (1+\gamma)p_1(A+C)\}] > 0 \quad if\ \beta\gamma^2 \leq 1,\tag{A6}$$

$$\frac{dw}{dq} = \Delta^{-1}\{-\gamma p_1^2 p_3[\frac{wL_0}{(L_0+L_u)^2} - y_{11}]\} < 0 ,\tag{A7}$$

$$\frac{dL_1}{dq} = \Delta^{-1}\{-p_1 E[\frac{wL_0}{(L_0+L_u)^2} - y_{11}] - F\gamma y_1 p_{12} L_1[\frac{wL_0 + L_u}{(L_0+L_u)^2}]\} < 0 ,\tag{A8}$$

$$\frac{dL_0}{dq} = \Delta^{-1}\{(1+\gamma)p_1 F[\frac{wL_0}{(L_0+L_u)^2} - y_{11}] + F\gamma y_1 p_{12} L_1[\frac{wL_0}{(L_0+L_u)^2}]\} > 0 ,\tag{A9}$$

$$\frac{dL_1 + dL_0}{dq} = \Delta^{-1}\{-F\gamma y_1 p_{12} L_1[\frac{L_u}{(L_0+L_u)^2}]$$

$$- p_1 p[\frac{1}{x+q} + \frac{p^*}{y-p^*q}][\frac{\gamma(x+q)(1-\beta) + L_1 - (1+\gamma)L_0}{x+q}][\frac{wL_0}{(L_0+L_u)^2} - y_{11}]\},\tag{A10}$$

$$\frac{dL_y}{dq} = \Delta^{-1}\{F[(1+\gamma)p_1 + \gamma A - (1+\beta\gamma)]\frac{L_u}{(L_0+L_u)^2}$$

$$+ p_1[E + (1+\gamma)F][\frac{wL_0}{(L_0+L_u)^2}]\} > 0.\tag{A11}$$

where the sign of (A9) is negative (which implies $dx/dq < 0$) if $\beta > 1$ and $L_1 \leq (1+\gamma)L_0$. While the sign of (A9) could be positive (which implies $dx/dq > 0$) if the negotiation power of union, γ, is sufficiently small (close to null), $\beta < 1$ and $L_1 > (1+\gamma)L_0$. From (8), (A8) and (A10), we also can conclude that $dL_u/dq > 0$.

References

Boeri, T., G.H. Hanson, and B. McCormick, *Immigration Policy and the Welfare State--A Report for the Fondazione Rodolfo Debenedetti*, Oxford University Press, 2002.

Borjas, Gorge J., *Heaven's Door: Immigration Policy and the American Economy*, Princeton University Press, 1999.

Chao, C.C. and Yu, E.S.H., Immigration and Welfare for the Host Economy with Imperfect Competition, *Journal of Regional Science*. May 2002; 42(2): 327-38.

Djajic, S., International Migration, Remittances and Welfare in a Dependent Economy. *Journal of Development Economics,* 1986, 21(2): 229-34.

Ethier, W. J., International Trade and Labor Migration, *American Economic Review* 75, 1985, 691-707.

Filer, R., The effect of immigrant arrival on migratory patterns of native workers, in G. Borjas and R. Freeman, eds., *Immigration and the Work Force*, The University of Chicago Press, Chicago and London, 1992.

Fuest, C. and Thum, M., Welfare Effects of Immigration in a Dual Labor Market. *Regional Science and Urban Economics*. September 2000; 30(5): 551-63.

Fuest, C. and Thum, M., Immigration and Skill Formation in Unionised Labour. *European Journal of Political Economy*. September 2001; 17(3): 557-73.

Kondoh, K., Permanent Migrants and Cross-Border Workers: The Effects on the Host Country, *Journal of Regional Science* 38, 3, 1999, 467-78.

McCormick, B. and Wahba, J., Overseas Employment and Remittances to a Dual Economy, *Economic Journal*. April 2000; 110(463): 509-34.

Mezzetti, C. and Dinopoulos, E., Domestic Unionization and Import Competition, *Journal of International Economics* 31, 1/2, (1991), 79-100.

Quinlan, M., and Lever, T. C., From Labour Market Exclusion to Industrial Solidarity: Australian Trade Union Responses to Asian Workers, 1830-1988. *Cambridge Journal of Economics*. June 1990;14(2): 159-81.

Schmidt, C. M., Stilz, A., and Zimmermann, K. F., Mass Migration, Unions, and Government Intervention. *Journal of Public Economics*, 1994, 55(2): 185-201.

Zhao, L., Quantitative Trade Restrictions in Unionized Economies, *Review of International Economics*, 9(1), 2001, 81-93.

Zhao, L. and Kondoh, K., Temporary and Permanent Immigration under Unionization, Review of Development Economics, 11(2), 2007, 346-358.

Zimmermann, K. F., Tackling the European Migration Problems, *Journal of Economic Perspectives* 9(2), 1995, 45-62.