

Trade Liberalization and Unemployment in Unionized General Oligopolistic Equilibrium

Keita Kamei*

Abstract

The paper investigates how trade liberalization affects the unemployment rate of low-skilled workers. I construct a general oligopolistic equilibrium model in which all of the firms in the low-tech sectors must (at the least) pay the union wage that is set by the sectoral trade unions. The model has two labor markets: high-skilled workers and low-skilled workers. The sectoral trade unions determine the union wage based on the number of employment and unemployment compensations, which is endogenously determined by the equilibrium wage in each sector. I investigate the effects of trade liberalization and compare two open economies: 1) a partially open economy and 2) a fully open economy. In the partially open economy, all of the low-tech sectors are shielded and all of the high-tech sectors are tradable. In this case, trade liberalization increases the unemployment rate of the low-skilled workers and decreases welfare. In the fully open economy all of the sectors are tradable. In this case, trade liberalization reduces the unemployment rate of low skilled workers and improves welfare.

Keywords: Unemployment; Trade Union; Wage inequality; Oligopoly

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*Faculty of Literature and Social Sciences, Yamagata University. 1-4-12 Kojirakawa-machi, Yamagata 990-8560, Japan. E-mail: kamei@human.kj.yamagata-u.ac.jp

Trade unions, politicians and media bodies frequently assert that trade liberalization promotes the destruction of low-skilled jobs. Therefore, some trade unions are opposed to tariff elimination, because maintaining tariffs can protect the low-skilled workers from further global competition. This situation is illustrated in the automobile industry in the United States (US), and in some agricultural sectors in the European Union (EU) and in Japan. Despite such examples, little is known about the relationship between global competition and the unemployment rate of low-skilled workers. This paper reveals that global competition can increase the unemployment rate of low-skilled workers.

The framework that I use is based on a model of general oligopolistic equilibrium (GOLE) by Neary (2016) that includes trade unions and shielded sectors. The model features the assumption that each firm employs either high-skilled workers or low-skilled workers. I assume that there are no trade unions in the high-skilled sectors. The firms in the low-tech sectors use only low-skilled workers to produce their goods. The trade unions only exists in the low-skilled sectors, because the paper assumes that the wages for low-skilled workers are lower than the wages for high-skilled workers. Additionally, the government provides unemployment compensation that is dependent on the discounted average wage. The utility of the sectoral trade unions is composed of the employment level in the sector, and the wage premium between the union wage and the unemployment compensation.

This paper investigates how trade liberalization affects the unemployment of low-tech workers. I reveal that, if all of the low-tech sectors are shielded and all of the high-tech sectors are non-tradable, then trade liberalization increases the unemployment of the low-skilled workers and decreases welfare. However, if all of the sectors are tradable, then trade liberalization decreases the unemployment of the low-skilled workers and increases welfare. These outcomes arise because trade liberalization is decomposed into two effects: the pro-competitive effect and the wage premium effect. The pro-competitive effect means that trade liberalization promotes further competition with foreign firms. This reduces the market power of each firm and hence increases the labor demand. The wage premium effect means that when trade liberalization increases the wages of the high-skilled workers, then the government increases the level

of the unemployment compensation. This level is based on the macro variables that compose the average wage for all of the sectoral wages. When the level of the unemployment compensation increases, then the trade union weakens the employment claims to maintain the wage premium. Finally, I consider how to increase the employment of low-skilled workers through trade liberalization. My proposition is simple: the government should drastically reduce, or eliminate, the prohibitive tariff that is imposed on some low-tech sectors. This should enhance the pro-competitive effect.

Some studies analyze the relationship between trade unions and international trade in some partial equilibrium approaches with oligopoly competition; for example, Mezzetti and Dinopoulos (1991), Huizinga (1993), Sorensen (1993), Naylor (1998; 1999) and Lommerud et al. (2003). These approaches show that trade liberalization promotes ongoing global competition and increases the labor demand, meaning an increase in the employment levels. However, these partial equilibrium frameworks do not explicitly consider the interaction between the labor market and oligopolistic competition.

Bastos and Kreickmeier (2009) incorporate sectoral trade unions into the GOLE framework by Neary (2016). Their model includes unionized sectors and competitive sectors, therefore the competitive wage and the union wages in each unionized sector are determined in the equilibrium. Hence, if the workers who are not employed in the unionized sectors are completely absorbed in the competitive sectors so that there is no unemployment, then trade liberalization reduces the price distortion between the unionized sector and the non-unionized sectors and hence improves welfare in each country. However, Bastos and Kreickmeier (2009) do not explain the relationship between trade liberalization and the unemployment.

Egger and Etzel (2012) look at how trade liberalization affects unemployment under the GOLE framework to reconstruct the trade unions. They assume that the trade unions obtain their utility from the number of employees, and the wage premium between the union wage with the unemployment compensation. In this case, an increase in the unemployment compensation increases the union wage to maintain the wage premium. Hence, an increase in the level of unemployment compensation decreases employment. Moreover, trade liberalization

decreases the unemployment rate in the economy, because trade liberalization increases the labor demands through promoting further competition in the global markets and hence encouraging union wage improvements. The trade unions put employment before the wage premium and therefore unemployment decreases. However, Egger and Etzel's (2012) results depend on the assumptions that all of the workers are identical.

Moreover, Egger and Etzel's (2012) results are dependent on the assumption that all workers are identical. However, many high-tech sectors use more high-skilled workers than low-skilled workers. For example, the software, electronics, automotive and pharmaceutical industries are known to heavily use high-skilled workers. Hence, I introduce high-skilled workers into the unionized GOLE and reveal how trade liberalization affects the employment rate of the low-skilled workers.

Some studies on imperfect labor markets show that trade liberalization reduces the unemployment rate under imperfect product competition among symmetric firms (Hoon, 1994; Matusz, 1996; Egger and Etzel, 2012, 2014). Those results are consistent with some cross-country empirical studies (Dutt et al., 2009; Felbermayr et al., 2011). In contrast, other studies are based on the firm selection of Melitz (2003). That model reveals that trade liberalization both increases and decreases employment because of firm exits (Egger and Kreickemeier, 2009, 2012; Helpman and Itzhoki, 2010; Davis and Harrigan, 2011). However, these models do not focus on how trade liberalization affects the unemployment level of low-skilled workers.

The remainder of this paper is structured as follows. Section 1 constructs a basic model in autarky. Section 2 considers a partially open economy where all of the low-skilled sectors are shielded. First, I investigate a fully open economy case where all of the low-tech sectors are shielded. This implies that the domestic government prohibits the low-skilled sectors from importing goods produced by low-skilled workers from foreign countries. Next, I consider a case where all of the sectors are tradable. Then I show that trade liberalization improves the unemployment level of low-skilled workers. Section 3 introduces some policy considerations, and Section 4 concludes the paper.

1 BASIC MODEL

1.1 Setup

1.1.1 Preferences

In country 1, there is a sector continuum from 0 to 1. I consider the representative agent who consumes the goods from each sector. The preference of the representative agent is defined as an additively separable utility function and the sub-utility functions are assumed to be quadratic. Hence, the utility maximization of the representative agent in country 1 is described as

$$u_1\{x_1(z)\} = \int_0^1 \left[ax_1(z) - \frac{1}{2}bx_1(z)^2 \right] dz, \quad a > 0, \quad b > 0, \quad (1)$$

subject to the budget constraint:

$$\int_0^1 p_1(z)x_1(z)dz \leq I_1, \quad (2)$$

where, $p_1(z)$ and $x_1(z)$ are the price and the output of consumption good z , respectively. $I_1 \geq 0$ denotes the income of the representative agent in country 1. I focus on the valid range of parameters whereby the representative agent consumes every good from 0 to 1, but does not saturate himself or herself with each good.

Using equations (1) and (2), I get the following inverse demand function:

$$p_1(z) = \frac{1}{\lambda_1} [a - bx_1(z)], \quad (3)$$

where I normalize the Lagrange multiplier (the marginal utility of income) to one: $\lambda_1 = 1$. The normalization is often adopted into GOLE frameworks for simplifying the analysis. Substituting equation (3) into equation (1), I obtain the indirect utility $\tilde{u}_1 = \int_0^1 \left[\frac{a^2 - p_1(z)^2}{2b} \right] dz$.

1.1.2 Production and technology

The sector continuum is divided into high-tech sectors, $z \in [0, \bar{z}]$, and low-tech sectors, $z \in [\bar{z}, 1]$. Firm productivity is assumed to be 1 in every sector. The firms in the high-tech sectors $z \in [0, \bar{z}]$ employ the high skilled workers to produce their goods, and the firms cannot produce the high-tech goods using low-skilled workers. In reality, it is essential for some industries to employ high-skilled workers to produce their goods; e.g., the medical, pharmaceutical, information and communication, and electronic industries. For simplicity, I assume that the firms in the high-tech sectors use only high-skilled workers.

Additionally, firm j in the sectors $z \in [\bar{z}, 1]$ uses both high-skilled and low-skilled workers to produce goods. The firms have the same productivity, even if the firms use high skilled workers or low skilled workers. For simplicity, I focus on the case $w_h \geq w_l$, in other words where the high skilled wage is higher than the low-skilled wage. Then firms only employ low-skilled workers.

Hence the firms in the high-tech (low-tech) sector only employ the high-skilled (low-skilled) workers to produce each final good: $y_1^i = l_1^i$, ($i = h, l$). Their profits are represented as

$$\pi_1^l(z) = p_1^l(z)y_1^l(z) - w_1^l(z)y_1^l(z), \quad (4)$$

$$\pi_1^h(z) = p_1^h(z)y_1^h(z) - w_1^h(z)y_1^h(z), \quad (5)$$

where $p_1^l(z)$ ($p_1^h(z)$) is the price in the low-tech (high-tech) sector in country 1, and w_1^i is the wages, which are discussed in the next subsection.

Following Neary (2016), in each sector, there are $n \geq 1$ oligopolistic firms that undertake Cournot competition. From the assumption of a continuum of sectors, each firm rationally ignores the impact to the economy-wide variables, such as λ and I because there is a continuum sector from 0 to 1.

1.1.3 Trade unions

The trade unions are organized at the sectoral level: they uniformly set the sector-level union wage in each sector. I assume that trade unions are organized in the low-tech sectors only. The trade unions monopolistically determine the union wage in their relevant sector before the firms produce goods.

First, I consider the sectoral trade unions that maximize the following objective function:

$$V_1(z) = (w_1^l(z) - \bar{w}_1) Y_1(z), \quad (6)$$

where $Y_1(z)$ represents the number of union member employees in sector z , and $w_1^l(z)$ is the union wage of each low-tech sector. Following Egger and Etzel (2012, 2014), equation (6) is interpreted as a utilitarian objective function in the case of a closed shop which means that the number of union member is predetermined and trade union prevents the entry of outsiders. The setup contains a continuum of sectors, meaning that each trade union is infinitesimally small in the overall economy. Hence the trade unions rationally ignore the unemployment compensation \bar{w} that is determined by the government, and is discussed in the next subsection.

When equation (6) and the assumption of a closed-shop are satisfied, then the utility maximization of the trade union is consistent with the maximization of the expected wage of the union members. Therefore, if the competitive wage in each labor market is higher than the union wage, then there is no need to organize trade unions and the worker receives a competitive wage. Section 1.2 discusses this point.

1.1.4 Unemployment compensations and income tax

We assume that the government provides an unemployment compensation for the workers who lose their jobs, which is a constant fraction of $0 < \theta < 1$ of the weighted average value \tilde{w} :

$$\bar{w} = \theta \tilde{w}(w^l(z), w^h(z)) = \theta \left[\int_{\tilde{z}}^1 w^l(z) dz + \int_0^{\tilde{z}} w^h(z) dz \right]. \quad (7)$$

The government refers to the \tilde{w} value for determining the unemployment compensations \bar{w} .

Equation (7) means that \tilde{w} is interpreted as the expected average wage of a worker who loses a job when the worker has an equal opportunity for getting the job in each sector.

To finance its unemployment compensations, the government imposes a proportional tax on all of the revenue of individuals: low-skilled workers, high-skilled workers and the firm owners who receive the firms' profits. The proportional (income) tax does not affect the profit maximization behavior of the firm owners and, therefore, it does not affect trade unions. Similar to Egger and Etzel (2012, 2014), I abbreviate the income tax discussion in the following sections because of space limitations and to simplify the analysis.

1.1.5 Labor markets

I now consider the labor market clearing conditions. This paper focuses on analyzing the unemployment rate of low-skilled workers, hence I assume that the total number of high-skilled workers is very low, and therefore the competitive wage is higher than the union wage in all of the high-skilled sectors. Accordingly, there is no need to organize the trade unions in the high-skilled sectors and hence, all of the high-skilled workers receive a competitive wage.

In the high-skilled labor market, there are $H > 0$ high-skilled workers and all of the high-skilled workers are used for production in the high-tech sectors $z \in [0, \bar{z}]$ only. Hence, the total employment of the high-skilled workers, H_1^e , is described as

$$H = H_1^e = \int_0^{\bar{z}} ny_1^h(z) dz. \quad (8)$$

All of the low-skilled workers are union members of sectoral unions. The total employment of low skilled workers is described as $L_1^e \geq 0$:

$$L \geq L_1^e = \int_{\bar{z}}^1 ny_1^l(z) dz, \quad (9)$$

where the low-skilled workers are used by the low-tech sectors $z \in [\bar{z}, 1]$ only.

1.2 Autarkic equilibrium

Next, I derive the equilibrium outcome in autarky. I first discuss the competitive wage of the high-skilled labor market before explaining how the low-skilled wage is determined. Finally, I derive the total employment of the low-tech sectors.

1.2.1 Wages for high-skilled workers

When the labor market is competitive, the high-skilled workers receive a competitive wage. From equation (5), the profit maximization conditions of the firms in the high-tech sectors are derived as follows:

$$y_1^h(z) = \frac{a - w_1^h}{b(n+1)}, \quad z \in [0, \bar{z}]. \quad (10)$$

Using equations (8) and (10), I derive the equilibrium wage of high skilled workers in autarky as follows:

$$(w_1^h)^A = a - \frac{bH(n+1)}{\bar{z}n} \quad (11)$$

Equation (11) shows that an increase in the total number of high-skilled workers, and a decrease in the number of high-skilled sectors, reduces the high-skilled wage rate.

1.2.2 Cournot competition in the low-tech sectors at stage 2

Considering a two-stage Cournot model, in the low-tech sectors, the trade unions determine the union wage at stage one, and the firms determine the output and the employment at stage two. Using backward induction, I solve the two-stage game and derive the economy-wide variables in equilibrium in autarky.

Under Cournot competition, the low tech-firms set quantities and they determine output and employment at stage two. From equation (4), the profit maximizing conditions of each firm are

derived as follows:

$$y_1^l(z) = \frac{a - w_1^l(z)}{b(n+1)}, \quad z \in [\tilde{z}, 1]. \quad (12)$$

The above first order condition shows that when the low-skilled wage increases $w_1^l(z)$ and/or the number of firms n increases, then the low-tech firms reduce their own output in the low-skilled sector, $y_1^l(z)$.

1.2.3 Wage setting in low-tech sectors at stage 1

I now consider the utility maximization problems of the trade unions. Here, I substitute equation (12) into equation (6) and obtain the first-order condition of $V_1(z)$:

$$\frac{dV_1(z)}{dw_1^l(z)} = 0 \Rightarrow w^l(z) = \frac{a + \bar{w}_1}{2} \quad (13)$$

where the union wages of the low-skilled sectors do not depend on z and, therefore can be abbreviated as $w_1^l(z) = w_1^l$. The union wage w_1^l depends on the unemployment compensation \bar{w}_1 .

1.2.4 Unemployment and wages in the low-skilled workers

From equations (7), (11) and (13), I obtain the equilibrium union wages in the low-skilled sectors under autarky:

$$(w_1^l)^A = \frac{an(1 + \tilde{z}\theta) - \theta bH(n+1)}{n(2 - \theta(1 - \tilde{z}))}. \quad (14)$$

Equation (14) reveals that an increase in the number of high-skilled workers decreases the union wages in the low-skilled sectors. However, the total number of low-skilled workers does not affect the union wages.

I focus on the equilibrium $w^h > w^l$. From equations (11) and (14) the autarkic equilibrium

must satisfy the following condition:

$$(w_1^h)^A - (w_1^l)^A > 0 \Leftrightarrow \frac{a(1-\tilde{z})(1-\theta)}{b(2-\theta)(n+1)} > H. \quad (15)$$

From the above result, when H is low enough, the high-skilled workers are employed in the high-tech sectors only. In this section, I suppose that the condition is satisfied.

Under the equilibrium in autarky, the total output in each low-tech sector, $(ny_1^l)^A$, and the total employment in the low-tech sectors, $(L_1^e)^A$, are derived as follows, respectively:

$$(ny_1^l)^A = \frac{na(1-\theta) + \theta bH(n+1)}{b(n+1)(2-\theta(1-\tilde{z}))}, \quad (16)$$

$$(L_1^e)^A = \int_{\tilde{z}}^1 (ny_1^l)^A dz = (1-\tilde{z}) \cdot \frac{na(1-\theta) + \theta bH(n+1)}{b(n+1)(2-\theta(1-\tilde{z}))}. \quad (17)$$

Hence, the total unemployment in the low-tech sectors $U_1^A = L - (L_1^e)^A$ is derived as follows:

$$U_1^A = L - \frac{(1-\tilde{z})}{b(2-\theta(1-\tilde{z}))} \left[\frac{an(1-\theta)}{n+1} + \theta bH \right], \quad (18)$$

where $L > U_1 > 0$.

I obtain the following proposition:

Proposition 1. *An increase in the total number of high-skilled workers decreases the unemployment rate.*

Proof. From equation (18) and the definition of unemployment, I obtain

$$\frac{dU_1^A}{dH} = -\frac{(1-\tilde{z})\theta b}{b(2-\theta(1-\tilde{z}))} < 0 \quad (19)$$

■

The interpretation of proposition 1 is that, if H increases, then the government sets a lower unemployment compensation than previously. A reduction in the unemployment compensation level directly decreases the union wage and the unemployment of the low-skilled workers. This

result differs to that of Egger and Etzel (2012, 2014), which states that unemployment does not depend on the total labor supply. The difference arises because Egger and Etzel (2012, 2014) assume that all of the workers are identical.

2 OPEN ECONOMY

Consider an open economy where the world is divided into two symmetric countries: home and foreign. There is no trade cost in the world. Neither the workers nor the firms in the economy move from one country to the other. I focus on analyzing the home country in this two-country scenario. I first investigate the partially open economy where all of the low-tech sectors are shielded, and all of the high-tech sectors are non-shielded. I then analyze the fully open economy where all of the sectors are non-shielded.

2.1 The partially open economy

Following Kreickemeier and Meland (2013), I introduce shielded sectors to the model and investigate how trade liberalization affects the unemployment of low-skilled workers if all of the low-skilled sectors are shielded. I assume that all of the high-tech sectors $z \in [0, \bar{z}]$ are non-shielded sectors, and that all of the low-tech sectors $z \in [\bar{z}, 1]$ are shielded. This implies that the governments impose a prohibitive tariff on the foreign low-tech sectors, $z \in [\bar{z}, 1]$. The firms' profits in each sector are defined as follows:

$$\pi_1^l(z) = p_1^l(z)y_1^l(z) - w_1^l(z)y_1^l(z), \quad (20)$$

$$\pi_1^h(z) = [p_1^h(z)y_{11}^h(z) - w_1^h y_{11}^h(z)] + [p_2^h(z)y_{12}^h - w_1^h y_{12}^h(z)], \quad (21)$$

where y_{ij}^h implies the exports of the firms in country i to the market of country j , and hence $y_{11}^h(z) + y_{12}^h(z)$ is the total output of every high-tech firm. The firms in the low-skilled sectors do not export their goods because the goods in the low-skilled sectors are non-tradable.

The profit maximizing condition of each firm is derived as follows:

$$y_1^l(z) = \frac{a - w_1^l(z)}{(n+1)b}, \quad z \in [\tilde{z}, 1], \quad (22)$$

$$y_{11}^h(z) = \frac{a - w_1^h}{(2n+1)b}, \quad z \in [0, \tilde{z}]. \quad (23)$$

For equation (23) and assuming a competitive high-skilled labor market, I obtain the high-skilled wage in the partially open economy, $(w_1^h)^{PO}$, as follows:

$$H = n \int_0^{\tilde{z}} (y_{11}^h(z) + y_{12}^h(z)) dz \quad (24)$$

$$\Leftrightarrow (w_1^h)^{PO} = a - \frac{(2n+1)Hb}{2n\tilde{z}}. \quad (25)$$

Next, the trade unions determine the union wage. From equations (7), (13) and (25), I obtain the equilibrium wage for the low-skilled workers:

$$(w_1^l(z))^{PO} = \frac{a(1+\theta)}{2} - \frac{(2n+1)\theta Hb}{4n\tilde{z}}. \quad (26)$$

Hence, from equation (26), the total unemployment of low-skilled workers is derived as follows:

$$U_1^{PO} = L - \int_{\tilde{z}}^1 n y_1^l(z) dz \quad (27)$$

$$= L - \frac{(1-\tilde{z})}{b(2-\theta(1-\tilde{z}))} \cdot \left[\frac{an(1-\theta)}{(n+1)} + \underbrace{\frac{(2n+1)}{2n} \frac{n}{n+1}}_{<1} \theta b H \right]. \quad (28)$$

Hence, I reach the following proposition:

Proposition 2. *If all of the low-tech sectors are shielded and all of the high-tech sectors are non-shielded, then trade liberalization improves the unemployment of low-skilled workers.*

Proof. From equations (18) and (27):

$$U_1^{PO} - U_1^A = \frac{(1 - \tilde{z})}{b(2 - \theta(1 - \tilde{z}))} \left[\frac{n}{2n(n + 1)} \right] > 0. \quad (29)$$

■

The intuition for Proposition 2 is that, in the partially open economy, trade liberalization promotes further competition in the high-tech sectors only, which improves the wages of the high-skilled workers. Hence, the government increases the unemployment compensation level and the trade unions decrease employment to maintain the union wage premium. This increases the unemployment of low-skilled workers. We call this effect wage premium effect.

2.2 The fully open economy

The open economy here has no shielded sectors. Each firm competes with domestic and foreign rivals in the world market. Hence, each firm gains a profit from the home market and from the foreign market, which is defined as follows:

$$\pi_1^l(z) = [p_1^l(z)y_{11}^l(z) - w_1^l(z)y_{11}^l(z)] + [p_2^l(z)y_{12}^l - w_1^l(z)y_{12}^l(z)], \quad (30)$$

$$\pi_1^h(z) = [p_1^h(z)y_{11}^h(z) - w_1^h(z)y_{11}^h(z)] + [p_2^h(z)y_{12}^h - w_1^h(z)y_{12}^h(z)], \quad (31)$$

where, y_{11}^l and y_{12}^l imply that a firm in the low-tech sectors z in country 1 sells its output to country 1 and exports its output to country 2, respectively. Moreover, $p_1^l(z)$ and $p_2^l(z)$ represent the price of the low-skilled sector z in country 1 and that in country 2, respectively.

Hence, the output of each firm in the fully open economy is derived as follows:

$$y_{11}^i(z) + y_{12}^i(z) = \frac{2[a + nw_2^i - (n + 1)w_1^i]}{b(2n + 1)}, \quad i = h, l. \quad (32)$$

The high-skilled labor markets are assumed to be competitive, and hence I obtain $(w_1^h)^{FO} = (w_1^h)^{PO}$.

Therefore, using equations (11) and (25), I derive

$$(w_1^h)^{FO} - (w_1^h)^A = \frac{bH}{2n\bar{z}} > 0 \quad (33)$$

Therefore, I know that the wages of the high-skilled workers in an open economy are higher than those in autarky.

The union wage in an open economy is determined as follows:

$$\frac{dV_1^l(z)}{dw_1^l(z)} = 0 \Rightarrow w_1^l(z) = \frac{a + (n+1)\bar{w}}{n+2} \quad (34)$$

The union wage in the low-skilled sectors in country 1 is derived in an open economy as follows:

$$(w_1^l(z))^{FO} = \frac{2na[1 + (n+1)\theta\bar{z}] - \theta bH(n+1)(2n+1)}{2n[(n+2) - (n+1)\theta(1-\bar{z})]} \quad (35)$$

Substituting equation (35) into equation (32), I obtain the total employment in the low skilled sectors:

$$(L_1^e)^{FO} = \int_{\bar{z}}^1 n(y_{11}^l(z) + y_{12}^l(z))dz \quad (36)$$

$$= \frac{(1-\bar{z})(n+1)}{b(2n+1)} \left[\frac{2n(1-\theta) + \theta bH(n+1)(2n+1)}{(n+2) - (n+1)\theta(1-\bar{z})} \right]. \quad (37)$$

Moreover, I obtain the unemployment in the low-skilled sectors, $U_1^{FO} = L - (L_1^e)^{FO}$.

When all of the sectors are tradable, how does trade liberalization affect the welfare and the unemployment of the low-skilled workers? From equation (18) and (37), I obtain the following proposition:

Proposition 3. *In the fully open economy, trade liberalization improves the unemployment of low-skilled workers.*

Proof. Using equations (18) and (37), I obtain

$$U_1^A - U_1^{FT} = a(1 - \theta)n[2n^2 + 3n + 2 - (n + 1)\theta(1 - \bar{z})] + \theta bH[2n^3 + 3n^2 + n] > 0$$

■

The trade liberalization effect is decomposed into the pro-competitive effect and the wage premium effect. The pro-competitive effect, which is showed by Egger and Etzel (2012), implies that trade liberalization promotes further competition. This means that each firm increases its labor demand, and the total employment rate increases. Hence, the pro-competitive effect decreases the unemployment rate of low-skilled workers. I next consider the wage premium effect, which is shown in proposition 2. The unemployment compensations in the open economy are higher than those in autarky, and the trade unions accordingly decrease the employment level to maintain the wage premium. This is known as the wage premium effect. From Proposition 2, trade liberalization improves welfare, because the pro-competitive effect dominates the high-skilled sectors effect in the fully open economy. In the partially open economy, trade liberalization increases the unemployment rate of low-skilled workers, because the pro-competitive effects vanishes.

Next, I investigate how trade liberalization affects welfare. I have shown that trade liberalization improves the unemployment rate of low-skilled workers, $(L_1^e)^{FO} > (L_1^e)^A$. Such new jobs produce an additional output in the economy, which implies an increase in the total consumption of low-tech goods in both countries. Therefore, trade liberalization improves welfare in each country.

3 POLICY IMPLICATION

The results show that trade liberalization can decrease the total employment of low-skilled workers and can worsen welfare. However, it is possible for governments to counter these scenarios. If there are a sufficient number of low-skilled sectors that have a prohibitive tariff from

the government, then trade liberalization can increase the employment of low-skilled workers and can improve welfare. In this case, the government should eliminate the prohibitive tariff and promote the global competition of the firms in the shielded low-skilled sectors. Certainly, some of the unemployment in the model is derived from the unemployment compensations and the rent seeking activity of the trade unions. However, it is difficult for the government to abolish either the unemployment compensation or the trade unions from a social justice perspective. As an alternative proposal for improving the welfare and the unemployment level, I propose the reduction, or the elimination, of the prohibitive tariff that is imposed on all of the low-skilled sectors.

Proposition 4. *When the number of the shielded low-tech sectors is sufficiently large and most of the high-tech sectors are open, then trade liberalization can increase the unemployment rate of the low-skilled workers. If the government drastically eliminates the prohibitive tariff rate for the shielded low-tech sectors, then trade liberalization can improve both the unemployment rate and welfare.*

4 CONCLUSION

I construct an oligopolistic general equilibrium with two types of labor market and with sectoral trade unions. The government provides unemployment compensation that depends on the wages of low-skilled and high-skilled workers. I investigate how trade liberalization between two symmetric countries affects the unemployment rate of low-skilled workers. I can decompose the effect of trade liberalization into two: the pro-competitive effect and the wage premium effect. The pro-competitive effect implies that trade liberalization increases labor demand through global competition, which means an increase in the employment rate. The wage premium effect implies that trade liberalization increases the wages of the workers in the non-shielded sectors. This means an increase in the unemployment compensation level and hence employment decreases.

I first analyze the partially open economy, where the government prohibits international trade in the low-tech sectors to protect the country from further global competition: all of the

low-tech sectors are shielded and all of the high-tech sectors are non-shielded. This means that the pro-competitive effect with regard to the low-tech sectors vanishes, and trade liberalization only increases the unemployment compensation level. This results in an increase in the unemployment rate and a decrease in welfare: in other words, the wage premium effect dominates the pro-competitive effect in the partially open economy. I next investigate the fully open economy where all of the sectors are non-shielded. If all of the sectors are tradable, then the pro-competitive effect dominates the wage premium effect, and hence trade liberalization decreases the unemployment rate and improves welfare.

While the model reveals the relationship between trade liberalization and the unemployment rate of low-skilled workers, it contains some weaknesses. First, the results are based on symmetric countries, implying that the home country is completely identical to the foreign country. However, for example, the EU and Japan have different labor market structures: the EU has many sectoral trade unions, but there are very few in Japan. Second, the model focuses on the equilibrium where the high-skilled labor markets are completely competitive. However, if the high-tech sectors have trade unions, then some high-skilled workers cannot get work in the high-tech sectors, and hence, they may work in the low-tech sectors. Then, in the partially open economy, trade liberalization increases the labor demands in the high-skilled sectors. This may reduce the number of high-skilled workers in the low-skilled sectors and hence trade liberalization may improve the unemployment rate.

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