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International Labor Standards and Southern Competition

Laixun ZHAO Kobe University

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Laixun Zhao

RIEB, Kobe University

Abstract This paper models the economic aspects of labor standards in an oligopolistic framework of three countries, incorporating labor-management negotiations in the North and monopsonic labor markets in Southern countries. Different from the literature, a higher LS not only requires a higher cost, but also benefits workers and induces them to work harder. Because of these links, Northern intervention, via import taxes or minimum LS regulation, may often have perverse effects on Southern countries. Nevertheless, such interventions may occur due to domestic unionization or pressure from global competition. Specifically, imposing a tariff against a certain Southern country to force up its LS does not work. Further, the tariff would shift production to another country. These shed light on why developing countries oppose including LS in WTO negotiations. We also find that union wages, employment and utility increase with a higher import tariff, which explains why unions are keen lobbies of raising LS in developing countries. Under minimum LS regulation in one Southern country, the LS and profits in the other Southern country and the utility of the Northern union may fall. Finally, as the empirical evidence shows, we demonstrate that multinational enterprises choose to locate in those developing countries whose LS is relatively higher rather than lower, because LS benefits workers and labor unions, and is thus productive.

Keywords: Labor Standards, Labor Unions, Oligopoly, Trade Policy, North-South Issues

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Author Address: Research Institute of Economics & Business, Kobe University, Kobe 657-8501, JAPAN;
zhao@rieb.kobe-u.ac.jp; Fax: 81-78-803-7059

1. Introduction

The issue of labor standards (LS) has generated heated debates in recent years. An example is during the WTO meeting of finance ministers in November 1999, thousands of demonstrators succeeded in bringing their talks to a halt in Seattle. Such groups demand that the WTO address international LS along with trade issues, and claim that market access in the North should be conditioned on raising LS in the South, to prevent “social dumping” or a “race to the bottom” in wages and benefits. Some even advocate a “social clause” that trade sanctions be imposed in response to violations of LS.

This point of view presumes that workers benefit from LS protection, which is novel but has not been analyzed formally in economic theory. Some economists argue that LS adds to consumer utility (Rodrik, 1996), or national welfare (Brown, Deardorff and Stern, 1995; Srinivasan, 1995). However, in these analyses, workers and firms do not benefit directly from a higher LS. On the other hand, firms must bear the cost of producing it. Thus it is no wonder that firms have no incentives to improve LS. Furthermore, an average consumer simply does not have enough information to tell whether a product is made with high or low LS, especially when it is imported from a foreign country.

In order to gain a better perspective on this issue, let us first observe some stylized facts.

(1). International labor standards are meant to be policy measures aimed at helping poor nations achieve certain minimal living standards, and workers are supposed to benefit from them. However, the demand for LS has come overwhelmingly from industrialized countries. For instance, the U.S. and France campaigned for LS and a “social clause” at WTO meetings in Singapore in 1996 and Seattle in 1999; The European Union also brought such issues to the WTO’s Doha conference in 2001. In contrast, the most consistent opposition to LS has come from developing countries--the alleged beneficiaries. Related to these, many economists such as Bhagwati (1995) and Basu (1999) argue that the recent surge in the demands for LS stems from lobbies whose true agenda is protectionism, and that the best way to improve LS in poor countries is to keep open the doors of industrialized countries so there can be greater demands for goods and services from the former countries.

(II). The concern of labor unions and social activists is that increased imports from countries with low LS will hurt the wages and working conditions in industrialized countries. However, some economists argue that LS is an issue of South vs. South rather than South vs. North. Punishment from the North against one developing country benefits not the North but some other developing country due to production shifting.¹ This is especially so in the age of globalization, where Southern production facilities are owned by Northern multinationals, whose capital can move among potentially many Southern countries.

(III). Despite allegations of a “race to the bottom” in LS, empirical studies such as those by Aggarwall (1995) and Rodrik (1996) found that multinationals tend to locate in the developing countries with relatively higher rather than lower LS.

This paper attempts to model the phenomena and arguments above. We focus on the economic aspects of LS, rather than on the humanitarian aspects such as discrimination, freedom of speech, etc. We assume that while it is costly to maintain a certain level of LS, a higher LS also increases the utility of workers and labor unions, and thus induces higher work efforts. For instance, Hunter (2003) documents that the enforcement of the Japanese Factory Act (enacted in 1911) reduced labor hours and prohibited midnight work in Japan. Subsequently, in the textile industry where women were the main work force, the health condition of workers improved and their productivity increased. In turn, product quality rose (pp202-204).

More specifically, as examples we can consider LS to exhibit in three forms. One is work safety, ventilation, clean and healthy work environment, etc., which is not embodied in the worker physically; the second is health improvement, which is embodied in the worker; the third is a reduction of child labor (i.e., replacement with adult labor) or an increase in the minimum wage, which can raise productivity indirectly. Different from the literature in which workers and firms have nothing to gain

¹ Basu (1999) documents that Iran was historically the largest exporter of hand-knotted carpets to the U.S. In the late 1980s, the U.S. placed an embargo on imports from Iran. But it did not boost any production in the U.S. or other industrialized

from LS improvements, in the present model, workers and labor unions benefit from a higher LS directly. In addition, the home government's utility can increase if foreign LS rises, as argued by some activists. These features of LS distinguish themselves from human capital or R&D investments.

Consider a structure of three countries: one developed country N, and two developing countries E and S, with consumption only in N. The Northern government also imposes an import tariff, hoping to raise foreign LS. In addition, there is a labor union in N, which negotiates with firm N over wages and employment. In contrast, labor is not organized in E and S, since in reality labor unions are very weak or nonexistent in many developing countries. Then in E and S, firms compete à la Cournot, choosing how much LS and final output to produce.

We show that since LS contributes to worker utility and induces higher work efforts, even in poor countries, maintaining a certain level of LS is beneficial to the workers, the firms and national welfare there, because the productivity increase with a higher LS brings a higher marginal revenue, leading the firm to hire more workers and produce more output.

One might ask that since LS induces higher work efforts, why poor countries do not willingly apply the same level of LS observed in developed countries. The present paper assumes that LS contributes to work effort at a decreasing rate, and the cost of producing LS increases at an increasing rate. These imply that the firm chooses the optimal level of LS to maximize profits. Depending on technology (how costly it is to produce LS) and labor market structure (e.g., whether the labor market is unionized or not), countries adopt different levels of LS. In particular, countries with an ample supply but only limited buyers of labor (e.g., China) provide low levels of LS.

Globalization in the form of increased competition may reduce the market share of some firms and consequently lower their LS. In such cases, government intervention may be called for to protect the working conditions. But increased competition also raises world total levels of outputs and LS.

Also, if country N imposes a tariff against imports from one developing country E only, hoping to force up the LS in E, then: i). E's output and consequently LS both fall, contrarily to N's original intention; ii). Output and LS in the other developing country rise, due to product substitution by Northern consumers. These two results lend support to the arguments that LS is more an issue of South vs. South rather than South vs. North, and that the best way to raise LS in the South is to keep open Northern markets; iii). In the Northern country, union wages, employment and hence utility all rise, but firm profits fall and national welfare might fall also. These shed light on why unions and other interest groups are the main lobby for raising LS in developing countries.

In addition, direct regulation in the form of a minimum LS in country E is effective in raising E's LS, but may reduce the utility of the Northern labor union. And the LS and profits in country S also decrease. Thus, precautions must be taken before any such minimum standards are set. Note that if Northern import tariffs are chosen so that they are contingent on country E's LS, then the tariffs are effective in raising LS, in a manner similar to the minimum LS regulation.

The basic model is then extended to cover the case of foreign direct investment (FDI), by assuming that firms E and S are branches of multinational firm N. We obtain identical results as in the basic model, which match the empirical findings of Aggarwall (1996) and Rodrik (1996) that multinationals produce more in those developing countries with relatively higher rather than lower LS. The reason lies in that LS benefits workers and is intrinsically productive.

In the existing literature, Srinivasan (1995) and Brown, Deardorff and Stern (1996) and Brown (2001) demonstrate that the diversity of LS between nations reflect differences in factor endowments and levels of income. Martin and Maskus (2001) show that a failure to establish and enforce LS may reduce an economy's efficiency and interfere with its comparative advantage. Bagwell and Staiger (2001) argue that efficiency can be achieved without negotiating over LS. In contrast, some other economists such as Rodrik (1996) and Elliot (2000) embrace linking LS to trade and FDI. In a recent paper, Chau and Kanbur (2006) show that whether a race to the bottom (of environmental or labor

standards) is possible or not depends on the Northern demand curve, the size of big exporters relative to each other, and the relative size of the competitive fringe of small exporters. Different from these papers which are mostly in general equilibrium with perfect competition, we analyze the problem under oligopoly in a three-country framework with asymmetric labor markets, explicitly incorporating LS that contributes to worker utility, which in turn induces higher work efforts.²

The remainder of the paper is organized as follows. Section 2 sets up the basic model and investigates its equilibrium properties. Section 3 examines the effects of an import tariff against developing countries. Section 4 looks into direct regulation on LS. Section 5 extends the model to the case of FDI. And section 6 concludes. Detailed calculations are relegated to the appendix.

2. The Model Ingredients

Consider three countries the North (N), the South (S), and the East (E), each with one firm, respectively N, S and E, located in its boundary. N is a developed country, while E and S are two developing countries. Denote each firm's output x_i , $i = N, S, E$. The final outputs are only sold in the North, and the Northern government imposes a tariff on imports.

2.1 Firms

For each firm, production of the final output requires input labor only, in the following manner:

$$L_i = [\alpha - e(\theta_i)]x_i, \quad (1)$$

² In the literature of unionization, trade and FDI, Leahy and Montagna (2000) analyze the welfare effects on the host country; Skaksen and Sorensen (2001) show that home workers may lose or gain depending on the substitutability of the multinational activities; Lommerud, Meland and Sorgard (2003) argue that trade liberalization can induce FDI because the firm uses FDI to battle with the union; and Haaland and Wooton (2002, 2003) examine how country risks related to labor markets and industry affect the decisions of multinationals in location selection.

where $\alpha > 0$ is a constant. Eq. (1) says that to produce x_i units of the final output, L_i units of labor are required. The variable $e(\cdot)$ denotes worker efforts, which is a function of firm i 's LS θ_i . In the efficiency wage literature, a higher wage induces higher work efforts (see for instance Akerlof and Yellen, 1986 and Shapiro and Stiglitz, 1984). Here we borrow this insight by assuming workers are willing to work harder with a higher LS, such that $e' > 0$, $e'' < 0$, $e(0) = 0$. Thus, without any LS ($\theta = 0$), then equation (1) collapses to $L_i = \alpha x_i$; As LS increases, the unit labor requirement to produce the good decreases, in a decreasing rate. It is also straightforward to verify that

$$\frac{\partial^2 x_i}{\partial L_i \partial \theta_i} = \frac{e'}{[\alpha - e(\theta_i)]^2} > 0, \text{ i.e., an increase in LS raises the marginal product of labor. There is no}$$

market for LS hence each firm must produce it by itself. Note that in the literature, LS does not contribute to work efforts, but rather increases the cost of production, resulting in $e(\theta_i) = 0$.

The profit functions can be written as,

$$\begin{aligned} \pi_i(x_N, x_E, x_S, \theta_i, t_j, w_i) &\equiv px_i - w_i L_i - c_i(\theta_i) - t_j x_i \\ &= px_i - w_i [\alpha - e(\theta_i)] x_i - c_i(\theta_i) - t_j x_i, \quad i, j = N, S, E, \quad i \neq j, \quad t_N = 0 \end{aligned} \quad (2)$$

where $c_i(\theta_i)$ is the cost of producing LS θ_i with $c_i' > 0$ and $c_i'' \geq 0$, t_j is an import tariff imposed by country N, w_i is the wage rate, and p is the inverse demand such that $p \equiv p(x_N + x_S + x_E)$. This setup includes two sides of LS: it is costly to produce and also, a higher LS induces higher work efforts and as a consequence reduces the unit cost of final production x_i . These two effects work against each other. The function $c_i(\theta_i)$ measures the technology in producing LS. The way LS contributes to work efforts and thus productivity is similar to R&D or human capital investment. But we focus on the impact of LS on national welfare, and the effects of the tariffs. Also, it is commonly assumed in the literature that the governments in developed countries care about LS in developing countries, but the

modeling approach has been to include the latter's LS in the former's welfare function directly. In the present paper, we model it a little differently: the Northern government imposes an import tariff to induce a higher LS from the developing countries.

2.2 *The Labor Markets*

2.2.1 *The North*

The labor market in country N is unionized, and wages, employment and LS are negotiated between the labor union and the firm. The reason for considering Northern labor unions is that they are the activists who claim that market access in the North should be conditioned on raising LS in the South, to prevent "social dumping" or a "race to the bottom" in wages and benefits. The utility of the Northern union can be represented by

$$v = w_N L_N \theta_N . \quad (3)$$

Observe that one way LS differs from R&D in the present paper is that LS benefits workers directly.

There are at least three popular models of labor management negotiations (see Booth, 1995 for an excellent survey. Other contributions include, for instance, Oswald 1985, Brander and Spencer 1988, Pemberton 1988, Mezzetti and Dinopoulos 1991 and Naylor 2003, etc.). They are (i). the monopoly union model in which the wage is determined by the union while employment is left to the firm to decide; (ii). The wage bargaining model in which wages are bargained between labor and management but employment is determined by the firm; and (iii). The efficient bargaining model in which both wages and employment are negotiated. We take the third approach and assume that wages and employment are negotiated simultaneously between the union and the firm.

Further, we assume that LS in country N, θ_N , is already above a certain threshold, and is not a major concern of either party in the bargaining game.³ This greatly simplifies the present model, as will become clear soon. It can be justified with empirical observations that most developed countries abide by ILO guidelines, and penalty for violations is high. There are of course instances of violations, mainly involving illegal immigration, which we abstract in this paper.

Given the above description, the two parties choose employment and wages to maximize the following generalized Nash product

$$\max B(w_N, L_N) \equiv v^\sigma \pi_N^{1-\sigma}. \quad (4)$$

Since $e(\theta_N)$ is determined for any given θ_N , by (1) L_i is a monotonic transformation of x_i . Thus bargaining over x_i is identical as over L_i . Therefore using (1), (2) and (3), the first order conditions (FOCs) for the bargaining problem are obtained as

$$\frac{1}{B} \frac{\partial B}{\partial w_N} = \frac{\sigma}{w_N} - \frac{(1-\sigma)}{\pi_N} [\alpha - e(\theta_N)] x_N = 0, \quad (5a)$$

$$\frac{1}{B} \frac{\partial B}{\partial x_N} = \frac{\sigma}{x_N} + \frac{(1-\sigma)}{\pi_N} \frac{\partial \pi_N}{\partial x_N} = 0, \quad (5b)$$

where $\frac{\partial \pi_N}{\partial x_N} = p_N + x_N p'_N - w_N [\alpha - e(\theta_N)] < 0$. An important note is in order. Without the union,

the firm maximizes its profit by setting $\partial \pi_N / \partial x_N = 0$ and $\partial \pi_N / \partial \theta_N = 0$. But in (5b),

$\partial \pi_N / \partial x_N < 0$, which arises because the union is able to negotiate higher levels of employment

³ In an earlier version, I allowed θ_N to be negotiated along with wages and employment. The qualitative results remain robust.

(output) than the firm would allow in the absence of the union. That is, the firm is forced to produce more than the level that can maximize profits. We shall use this condition to investigate the impacts of Northern policies on profits and welfare later.

2.2.2 *The East and the South*

In developing countries, labor unions are usually weak.⁴ To introduce some asymmetry into the model, we assume that wages, employment as well as LS in E and S are not determined through negotiations between labor and management. Instead, we assume that workers supply labor according to the following upward sloping curve:⁵

$$L_i = r_0 + r_1 w_i + r_2 \theta_i, \quad i = E, S, \quad (6)$$

where r_0 , r_1 and r_2 are positive constants, w_i and θ_i are the wage rate and LS in country i respectively. Thus, an increase in either the wage rate or LS induces workers to supply more labor. More precisely, this labor supply function can be derived from the worker's maximization of a utility function including income, leisure (i.e., total hours minus work hours) and LS as arguments. Again, since LS enters worker utility and the resulted labor supply functions, it differs from R&D in the literature.

Firms E and S are the monopsonic buyers of labor in their respective countries. This can be justified for the case of many developing countries, such as China and India, where there is an "unlimited" supply of labor. Thus, once the firm chooses the levels of employment and LS, the wage

⁴ For instance, in both Bangladesh and Pakistan, the export processing zones (EPZs) Authority Ordinance of 1980 excludes EPZs from the Industrial Relations Ordinance, denying workers there the right to join trade unions. In China, all local unions are affiliated with the government controlled All China Federation of Trade Unions, and strikes are not allowed in the so-called Special Economic Zones. Because the union is government controlled, MNEs can argue more strongly against the formation of unions. Wal-mart had 28 independent branches and 26 joint venture branches with more than 10,000 employees in China in 2003, but none was unionized.

⁵ An alternative but rougher way of modeling this is to assume an exogenous wage rate. Then workers supply labor in response to changes in LS.

rate will be determined by eq. (6). Then, firms E and S maximize profits (2) choosing Y_E and Y_S , θ_E and θ_S respectively. Using (1) and (6), the FOCs can be written as, for all $i = E, S$

$$\frac{\partial \pi_i}{\partial x_i} = p + x_i p' - t_i - w_i [\alpha - e(\theta_i)] - [\alpha - e(\theta_i)]^2 x_i / r_1 = 0, \quad (7a)$$

$$\frac{\partial \pi_i}{\partial \theta_i} = w_i x_i e'_i + x_i [\alpha - e(\theta_i)] (x_i e'_i + r_2) / r_1 - c'_i = 0, \quad (7b)$$

where $w_i = \{[\alpha - e(\theta_i)]x_i - (r_0 + r_2\theta_i)\} / r_1$ from (1) and (6). Conditions (7a) and (7b) exist for both developing countries E and S respectively, determining outputs and LS there.

2.3 Equilibrium Properties

Conditions (5a), (5b), (7a) and (7b) jointly determine the following endogenous variables: outputs in all three countries N, E and S, the union wage in N and the LS in E and S. The union employment can be obtained by substituting the Northern LS and union wage into (1). By comparing the FOCs in the three countries, we find that the differences in the equilibrium levels of LS across countries are caused by the differences in the labor market structure and LS technology. In other words, the relatively high equilibrium value of the working conditions in N is a direct consequence of the bargaining power of labor in N; and the working conditions in S and E reflect the comparative cost of improving these conditions.

To be more specific, the LS in E and S is obtained as $\theta_i(c'_i, r_1, r_2)$ in (7b), where c'_i indicates LS technologies, and r_1 and r_2 represent the characteristics of the monopsonic labor market in the developing countries. In contrast, if we were to determine Northern LS endogenously, say through negotiations between the union and management, then the Northern LS can be obtained as a function

of Northern LS technology and the labor union's bargaining power, i.e., $\theta_N(c'_N, \sigma)$. The point is, domestic unionization and how strong the union is in the North can explain why the North has higher LS than the South, and so can the LS technology difference across countries.

We now turn to the issue of “a race to the bottom” of LS. There could be a couple definitions of it. One is an *absolute* “race to the bottom” by producing zero LS. It could arise in some models in the literature, where raising LS increases only the cost but not the benefit, then $e(\theta_i) = 0$ in (1), and firm i always chooses $\theta_i = 0$ in equilibrium. However, in the present model, an *absolute* race to the bottom does not arise. This can be seen from (7b). If one drew a figure, then the marginal cost of raising LS c'_i is a positively sloped curve, while the marginal benefit can be depicted by a negatively sloped curve, i.e., expression $MR = w_i x_i e'_i + [\alpha - e(\theta_i)] x_i (x_i e'_i + r_2) / r_1 > 0$ in (7b). They would cross at a point where the profit-maximizing level of LS is positive.

Perhaps a more meaningful definition of “a race to the bottom” is to see whether increased trade and competition lower LS. To this end, suppose initially there are two firms N and S competing in the Northern market, with each observing a certain level of LS. Now let firm E enter the market. What happens to the LS in each firm and the world total LS?

Differentiation of (7a) and (7b) yields straightforwardly (see the Appendix for the expanded expressions),

$$\frac{dx_i}{d\theta_i} = -\frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} / \frac{\partial^2 \pi_i}{\partial x_i^2} > 0 \quad \text{and} \quad \frac{d\theta_i}{dx_i} = -\frac{\partial^2 \pi_i}{\partial \theta_i \partial x_i} / \frac{\partial^2 \pi_i}{\partial \theta_i^2} > 0, \quad (8)$$

which says that in order to produce more output, a higher LS is required; or equivalently, a higher LS induces a higher output. In the present standard Cournot model of three oligopolists, the entry of firm E into the Northern market lowers the outputs of both firms N and S. As a consequence, the LS in S must fall too by condition (8) (recall that the LS in N is treated as exogenous). More precisely, the firm's

market share determines its level of LS. If its market share goes down, then it can no longer afford the original higher level of costly LS.

The following proposition summarizes the main results of this section.

Proposition 1: (i). *The difference in the level of LS across countries is caused by the differences in the labor market structure and in the technology of LS production;* (ii). *An absolute race to the bottom of LS does not occur. More generally, the firm tends to produce a lower LS if its market share falls, in the absence of government regulation.*

Since LS contributes to worker utility and induces higher work effort, one might ask why in reality developing countries do not adopt the higher LS observed in developed countries. Part (i) of Proposition 1 says that the answer lies in the differences in the labor markets and LS technologies. Take China for instance, there is almost an “unlimited supply” of labor, but only limited number of buyers (firms). Our model predicts that both wages and LS are low there. Part (ii) says that a firm losing market share from foreign competition tends to lower its LS. In such a case, to maintain a certain level of working conditions, government intervention is called for. However, with increased trade and competition, the world total output increases, and in turn the world total level of LS must rise as well.

3. The Import Tariff

In this section, we investigate the impact of the import tariff, imposed by the Northern government against one developing country, hoping to force up its LS. From the Appendix, we obtain respectively,

$$\Delta \frac{dx_i}{dt_i} = \frac{\partial^2 B}{\partial w_N^2} \frac{\partial^2 \pi_N}{\partial x_N^2} \frac{\partial^2 \pi_i}{\partial \theta_i^2} < 0, \quad (9a)$$

$$\Delta \frac{d\theta_i}{dt_i} = -\frac{\partial^2 B}{\partial w_N^2} \frac{\partial^2 \pi_N}{\partial x_N^2} \frac{\partial^2 \pi_i}{\partial \theta_i \partial x_i} < 0, \quad (9b)$$

$$\Delta \frac{dx_N}{dt_i} = -\frac{\partial^2 B}{\partial w_N^2} \frac{\partial^2 \pi_N}{\partial x_N \partial x_i} \frac{\partial^2 \pi_i}{\partial \theta_i^2} > 0, \quad (9c)$$

$$\Delta \frac{dw_N}{dt_i} = \frac{\partial^2 \pi_i}{\partial \theta_i^2} \left\{ \frac{\partial^2 B}{\partial w_N \partial x_N} \frac{\partial^2 \pi_N}{\partial x_N \partial x_i} - \sigma \frac{\partial \pi_N}{\partial x_i} \frac{\partial^2 \pi_N}{\partial x_N^2} \right\}. \quad (9d)$$

Condition (9a) shows that the Northern tariff against country i reduces the imports from country i , as expected. And since x_N is a substitute for imports, condition (9c) says that Northern output rises. More interestingly, condition (9b) states that the tariff also reduces the LS in country i , which is against the original intention of the Northern government, who imposed the tariff to force country i to raise its LS. The intuition is, a higher tariff reduces firm i 's marginal profit and output, and since LS is costly to produce, this in turn forces firm i to lower its LS. On the contrary, a reduction of the Northern tariff raises the demand for imports and consequently the LS in country i . This result supports the argument that the best way to raise LS in developing countries is to keep markets open in developed countries. In other words, if the Northern government really cares about the LS in S or E, then it cannot credibly threaten to impose the import tariff.

Condition (9d) can be expanded as

$$\Delta \frac{dw_N}{dt_i} = \frac{\partial^2 \pi_i}{\partial \theta_i^2} \{ [p - (\alpha - e_N)w_N](p' + x_N p'') + (1 - \sigma)x_N^2 p' p'' + (1 - 2\sigma)x_N (p')^2 \}. \quad (9d')$$

All terms inside the braces are negative except the last one, $(1 - 2\sigma)x_N (p')^2 > 0$. Thus, a sufficient condition for (9d') to be positively signed is if the union has sufficiently strong bargaining power v.s. the firm. For instance, if $\sigma \geq 1/2$, then one clearly sees that under linear demand, (9d') is positively

signed. That is, an increase in the tariff on a developing country's imports raises the Northern union wage. It arises because (9c) says that Northern output rises, which raises union employment and allows the union to bargain for a higher wage. In addition, conditions (9c) and (9d) also imply

$$\frac{dv_N}{dt_i} > 0. \quad (10)$$

That is, the import tariff raises the union utility in the North.

Next, by total differentiation of (7a), we obtain

$$-(p' + x_i p'') \Delta \frac{dx_j}{dt_i} = \frac{\partial^2 \pi_i}{\partial x_i^2} \frac{dx_i}{dt_i} + \frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} \frac{d\theta_i}{dt_i} + \frac{\partial^2 \pi_i}{\partial x_i \partial x_N} \frac{dx_N}{dt_i} = \Delta. \quad \text{Thus,}$$

$$\frac{dx_j}{dt_i} = -\frac{1}{p' + x_j p''} > 0. \quad (11a)$$

Further, differentiation of (7b) yields

$$\frac{d\theta_j}{dt_i} = -\frac{\partial^2 \pi_i / \partial \theta_i \partial x_i}{\partial^2 \pi_i / \partial \theta_i^2} \frac{dx_i}{dt_i} > 0. \quad (11b)$$

Conditions (11a) and (11b) state that an increase in the import tariff against country i would raise the exports and LS of country j , due to consumption substitution of Northern consumers. These probably give support to the argument that LS is an issue more of "South vs. South rather than South vs. North."

Now, the impact of the tariff on the Northern firm's profit can be derived as,

$$\frac{d\pi_N}{dt_i} = \frac{\partial \pi_N}{\partial x_N} \frac{dx_N}{dt_i} + \frac{\partial \pi_N}{\partial w_N} \frac{dw_N}{dt_i} + \left(\frac{\partial \pi_N}{\partial x_i} \frac{dx_i}{dt_i} + \frac{\partial \pi_N}{\partial x_j} \frac{dx_j}{dt_i} \right), \quad (12a)$$

where $\frac{\partial \pi_N}{\partial x_j} = \frac{\partial \pi_N}{\partial x_i}$. All terms on the RHS of (12a) are negatively signed except the last one in

parentheses. Thus, a sufficient condition for (12a) to be negative is $|dx_j / dt_i| \approx |dx_i / dt_i|$, leading the Northern profit to fall. This stems from the following effects. i). If $|dx_j / dt_i| \approx |dx_i / dt_i|$ holds, then most of the output reduction in one developing country will be matched by production increases in the other developing country. As a consequence, country N does not gain much in terms of output.⁶ ii). It might seem that the Northern firm and the union should both lose or gain together. However, this is not true. There are two reasons: (1). Condition (9d) shows that the tariff increases the union wage if the union has a higher bargaining power than the firm, which in turn lowers the firm profit; (2). Labor–management negotiations already force the Northern firm to produce a higher output than optimal for profit maximization, i.e. $\partial \pi_N / \partial x_N < 0$ as shown below condition (5b). An increase in the tariff induces even higher wages and outputs in country N (see conditions (9c-9d)), reducing profits.

Analogously, we can also derive the impacts of the increase in the tariff on the profits of countries E and S. Since consumption occurs only in country N, they are identical to the effects on the national welfare of these countries.

$$\frac{d\pi_i}{dt_i} = \frac{\partial \pi_i}{\partial x_N} \frac{dx_N}{dt_i} + \frac{\partial \pi_N}{\partial x_j} \frac{dx_j}{dt_i} < 0, \quad (12b)$$

$$\frac{d\pi_j}{dt_i} = \frac{\partial \pi_j}{\partial x_N} \frac{dx_N}{dt_i} + \frac{\partial \pi_j}{\partial x_i} \frac{dx_i}{dt_i} > 0, \quad (12c)$$

where $\frac{\partial \pi_j}{\partial x_N} = \frac{\partial \pi_j}{\partial x_i}$ and the sign of (12c) can be obtained by using (9a) and (9c).

⁶ In the present structure, products are homogenous. However, it is straightforward to conclude that this effect becomes even

Finally, we examine how the import tariff impacts the Northern welfare, which can be calculated in two different ways in the present paper. The first is the standard one, which includes the sum of firm profits, consumer surplus and the tariff revenue, and can be written as:

$$\begin{aligned}\Phi_N &\equiv \pi_N + u(x_N + x_E + x_S) - (x_N + x_E + x_S)p + t_i x_i \\ &= u(x_N + x_i + x_j) - (x_i + x_j)p - [\alpha - e(\theta_N)]w_N x_N + t_i x_i, \quad i = E, j = S.\end{aligned}\quad (13)$$

Differentiation yields

$$\begin{aligned}\frac{d\Phi_N}{dt_i} &= -(\alpha - e_N)w_N \frac{dx_N}{dt_i} - (\alpha - e_N)x_N \frac{dw_N}{dt_i} + [p - (x_i + x_j)p'] \frac{d(x_N + x_i + x_j)}{\partial t_i} \\ &\quad + \{x_i + t_i \frac{dx_i}{dt_i}\} - p \left\{ \frac{dx_i}{dt_i} + \frac{dx_j}{dt_i} \right\}\end{aligned}\quad (14)$$

where $u' = p$. All terms on the RHS of (14) are negative except the second line. The term

$\{x_i + t_i dx_i / dt_i\}$ is the changes in the tariff revenue, which is positive for at least small levels of the tariff. Generally, the sign of (14) is ambiguous. However, it can be signed under some conditions.

Suppose as before $|dx_j / dt_i| \approx |dx_i / dt_i|$ holds, then (14) becomes negatively signed if x_i is relatively small, i.e., the level of imports from country i is relatively low. Under these conditions, an increase in the import tariff would reduce Northern welfare, because the decreases in both consumer surplus and firm profits more than offset the increase in tariff revenue.

The second way of calculating Northern welfare is to include union utility in the welfare function, i.e., adding v as defined in (3) to (13). If this were done, then the net impact of the tariff on national welfare becomes more obscured. But the following conclusion can be drawn: The union benefits from the import tariff with both higher wages and employment, at the expense of firm profits and consumer surplus.

We summarize the above results in:

Proposition 2: *If country N imposes a tariff against imports from one developing country E only, hoping to force up E's LS, then: i). E's output and consequently LS both fall, contrarily to N's original intention; ii). Output and LS in the other developing country rise, due to product substitution by Northern consumers; iii). Profits and welfare fall in E but rise in S; iv). In the Northern country, union wages, employment and hence utility all rise, but firm profits and national welfare fall if the level of imports from country E is relatively low.*

Note that in the present model, the Northern LS θ_N is treated as exogenous. If it were endogenized, then an increase in the import tariff would raise the Northern LS, since Northern output/employment rises.

4. Minimum LS

In this section, we investigate an alternative policy to improve LS in developing countries: direct regulation, i.e., setting a minimum LS. Even though this is a hypothetical case, we examine it to shed some light on the issue of how to raise LS in developing countries.

Certainly if a minimum LS were set, it must be abided by all countries. This can be straightforwardly analyzed in the present model. However, to incorporate more cases, we assume that the minimum LS is binding only for one developing country i , not for others. In other words, only country i 's LS is fixed by an international organization. Even though j is also a developing country, we allow it to choose LS freely in order to investigate the full impact of the regulation. And the LS in the Northern country still remains above the minimum level and exogenously given.

With the above said, the equilibrium of the model is determined by eq. (5a), (5b) and (7a). Further differentiation yields (A4) in the Appendix. It is then straightforward to derive:

$$\Delta_1 \frac{dx_i}{d\theta_i} = -\frac{\partial^2 B}{\partial w_N^2} \frac{\partial^2 \pi_N}{\partial x_N^2} \frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} < 0, \quad (15a)$$

$$\Delta_1 \frac{dx_N}{d\theta_i} = \frac{\partial^2 B}{\partial w_N^2} \frac{\partial^2 \pi_N}{\partial x_N \partial x_i} \frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} > 0, \quad (15b)$$

$$\Delta_1 \frac{dw_N}{d\theta_i} = \frac{\partial^2 \pi_i}{\partial \theta_i^2} \left\{ \frac{\partial^2 B}{\partial w_N \partial x_N} \frac{\partial^2 \pi_N}{\partial x_N \partial x_i} - \sigma \frac{\partial \pi_N}{\partial x_i} \frac{\partial^2 \pi_N}{\partial x_N^2} \right\}. \quad (15c)$$

Condition (15a) says that raising LS in country i will increase its *output* (not profit), stemming from the assumption that a higher LS raises work efforts and thus lowers the labor requirement for output production. It follows that country N 's output must be reduced as in (15b), due to substitution. In addition, the sign of (15c) can be obtained in a similar way to (9d'). It is negatively signed if the union's bargaining power is sufficiently strong. Finally, following (15b) and (15c), it is clear that the Northern union utility decreases if country i 's LS is forced up.

Differentiating (7a) now yields

$$\begin{aligned} -(p' + x_j p'') \Delta_1 \frac{dx_j}{dt_i} &= \frac{\partial^2 \pi_i}{\partial x_i^2} \frac{dx_i}{d\theta_i} + \frac{\partial^2 \pi_i}{\partial x_i \partial x_N} \frac{dx_N}{d\theta_i} \\ &= \frac{\partial^2 B}{\partial w_N^2} \frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} \left(\frac{\partial^2 \pi_i}{\partial x_i \partial x_N} \frac{\partial^2 \pi_N}{\partial x_N \partial \theta_i} - \frac{\partial^2 \pi_i}{\partial x_i^2} \frac{\partial^2 \pi_N}{\partial x_N^2} \right) > 0 \end{aligned}$$

Thus, we have

$$\frac{dx_j}{d\theta_i} < 0. \quad (16a)$$

Further, (7b) can be used to yield

$$\frac{d\theta_j}{d\theta_i} = -\frac{\partial^2 \pi_i / \partial \theta_i \partial x_i}{\partial^2 \pi_i / \partial \theta_i^2} \frac{dx_i}{d\theta_j} < 0. \quad (16b)$$

Therefore, raising country i's LS directly would lower that of country j, forcing it to reduce its output too. These effects are just the opposite of an increase in the import tariff.

Finally we examine the impact of the minimum LS on profits. Since firm i is forced to raise its LS above the optimal level, the resulted profit must be lower than optimal, even though its output is higher. Regarding firms j and N, we obtain the following,

$$\frac{d\pi_j}{d\theta_i} = \frac{\partial \pi_j}{\partial x_N} \frac{dx_N}{d\theta_i} + \frac{\partial \pi_j}{\partial x_i} \frac{dx_i}{d\theta_i} < 0, \quad (17a)$$

$$\frac{d\pi_N}{d\theta_i} = \frac{\partial \pi_N}{\partial x_N} \frac{dx_N}{d\theta_i} + \frac{\partial \pi_N}{\partial w_N} \frac{dw_N}{d\theta_i} + \left(\frac{\partial \pi_N}{\partial x_i} \frac{dx_i}{d\theta_i} + \frac{\partial \pi_N}{\partial x_j} \frac{dx_j}{d\theta_i} \right), \quad (17b)$$

where $\frac{\partial \pi_j}{\partial x_N} = \frac{\partial \pi_j}{\partial x_i}$ and $\frac{\partial \pi_N}{\partial x_j} = \frac{\partial \pi_N}{\partial x_i}$.

Condition (17a) says that the minimum LS set on country i lowers the profits of country j, which is surprising. The reason is that country i is forced to expand its output under the minimum LS, squeezing the market share of country j and lowering its profits.

All terms on the RHS of (17b) are positively signed except the last one in parentheses. Thus, if $\left| \frac{dx_j}{dt_i} \right| \approx \left| \frac{dx_i}{dt_i} \right|$, then (17b) becomes positive, and the Northern profit rises. The reason lies in the effects as explained following expression (12a), only this time the direction is reversed, since the minimum LS forces up the output of country i but lowers that of country N.

We summarize the main results of this section as:

Proposition 3: *Under a minimum LS set on country E, (i). Firm E's profits fall; (ii). Firm S loses market share and profits; (iii). Firm N's profits increase, but union wages, employment and utility all decrease.*

Proposition 3 implies that the minimum LS is effective in raising the LS in a certain developing country. However, not only this country but the other developing country and the Northern labor union may lose in terms of profits or utility. The LS in the other developing country also fall. Hence, precautions must be taken before such minimum standards are set. In addition, if Northern import tariffs are chosen so that they are contingent on country E's LS, then the tariffs are effective in raising LS, in a manner similar to the minimum LS regulation.

5. Foreign Direct Investment

There are allegations that multinationals may be attracted to locate in countries with lower LS. However, both Aggarwall (1995) and Rodrik (1996) found that the opposite is true, by testing empirically U.S. outward FDI. Their conclusion is that lower LS is a hindrance rather than an attraction for foreign investors. Our model can be readily extended to shed some light on the empirical evidence.

In order to incorporate FDI, we simplify the model by assuming that both firms E and S are foreign branches of firm N and they already exist at the beginning, i.e., any setup costs have already been incurred. Note that this assumption is made to keep the basic model as intact as possible, with which we can still analyze FDI and compare the new results with the old ones. The multinational coordinates production in the three locations. It is also reasonable to imagine that the multinational may choose to keep one or two (not all three) plants for profit maximization, such as threatening to close Northern production when negotiating with the labor union. We investigate whether firm N shifts production to country S if country E's LS is forced to increase, and what happens if the import tariff against country E rises. All other aspects of the model are kept the same as in section 2.

Firm N's total profits include the sum from all three branches: $\Pi = \sum_i \pi_i$, $i=N,E,S$. In the labor-management negotiations, the multinational firm and the union bargain over w_N and x_N to maximize the following generalized Nash product:

$$\max G(w_N, L_N) \equiv v^\sigma [\Pi - (\pi_E + \pi_S)]^{1-\sigma}, \quad (18)$$

where $(\pi_E + \pi_S)$ is the multinational's threat-point payoff if bargaining breaks down, when it obtains profits from overseas branches only. In other words, the multinational can threaten to close the Northern branch if negotiation breaks down. In contrast, the Northern union's threat-point payoff is zero, because union workers are not employed if bargaining breaks down. Thus, expressions v and $\Pi - (\pi_E + \pi_S)$ represent the net gains of the union and the multinational firm respectively from the bargaining game. Since $\Pi - (\pi_E + \pi_S) = \pi_N$, equation (18) is reduced to (4). That is, the bargaining equilibrium under FDI also satisfies FOCs (5a)--(5b).

Simultaneously, the multinational firm chooses x_j and θ_j , $j = E, S$ to maximize total profits, which satisfies the following FOCs.

$$\frac{\partial \Pi}{\partial x_i} \equiv \frac{\partial \pi_i}{\partial x_i} + (x_N + x_j)p' = 0, \quad j = E, S, \quad i \neq j \quad (19a)$$

$$\frac{\partial \Pi}{\partial \theta_i} \equiv \frac{\partial \pi_i}{\partial \theta_i} = 0, \quad (19b)$$

Again, conditions (19a) and (19b) exist for both developing countries E and S respectively, determining outputs and LS in both countries. While (19b) is identical to (7b), (19a) is different from (7a) with an extra negative term $(x_N + x_j)p'$, which lowers the firm's output because the

multinational takes into consideration the intra-marginal negative effects of one branch's output on that of another branch.

By totally differentiating FOCs (5a), (5b), (19a) and (19b), we can obtain a matrix similar to the left hand side of (A3) in the Appendix. In fact, all terms in the matrix are identical except we

replace $\frac{\partial^2 \pi_i}{\partial x_i \partial x_N}$ with $\frac{\partial^2 \Pi}{\partial x_i \partial x_N} = \frac{\partial^2 \pi_i}{\partial x_i \partial x_N} + p' + (x_N + x_j)p'' < 0$ and $\frac{\partial^2 \pi_i}{\partial x_i^2}$ with

$\frac{\partial^2 \Pi}{\partial x_i \partial x_N} = \frac{\partial^2 \pi_i}{\partial x_i \partial x_N} + (x_N + x_j)p'' < 0$. Since these changes do not affect the signs of any term in (A3),

we can establish:

Corollary 1: *Under FDI, Proposition 2 still holds valid.*

This Corollary thus implies that multinational firms produce more output in the developing countries with higher LS, which is supported by empirical studies.

6. Concluding Remarks

This paper has modeled the issue of labor standards in an oligopolistic framework of three countries, incorporating labor-management negotiations in the North and monopsonic labor markets in developing countries where labor is of ample supply. We showed that when LS contributes to worker utility, even in poor countries, maintaining a certain level of LS is beneficial to the workers, the firms and national welfare there. However, a firm may produce a lower LS if it loses market share to global competition. To protect working conditions, some type of government intervention may be called for.

More importantly, imposing tariffs against developing countries to force their LS does not work. On the contrary, reduction of Northern tariffs raises demand for the goods and consequently LS

in those countries. Further, a tariff against one country would shift production to another country. These shed light on why developing countries are against including LS in WTO negotiations. It is also shown that union wages, employment and utility increase with a higher import tariff, which explains why labor unions are keen lobbies of raising LS in developing countries. Nevertheless, firm profits and consumer surplus fall, and national welfare may fall too if imports from this developing country is not too high. In general, labor unions gain at the expense of others.

In addition, direct regulation in the form of a minimum LS in one developing country is effective in raising its LS, but may reduce the utility of the Northern labor union. And the LS and profits in the other developing country also decrease. Finally, as the empirical evidences show, the model demonstrates that multinational enterprises choose to locate in those developing countries whose LS is relatively higher rather than lower, because LS benefits workers and thus induces higher work efforts.

A very interesting extension of the model would be to allow labor turnover and migration between firms. Then LS upgraded in one firm benefits other firms. In this case, we conjecture that the equilibrium LS chosen by firms falls. Also, in a general equilibrium framework, if LS is improved in one sector and benefits workers there, it would attract workers from other sectors, expanding output and competitiveness of this sector against other countries, contrarily to conventional claims. These represent fruitful avenues for future research.

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Appendix

Conditions (5a) and (5b) can be simplified as

$$\partial B / \partial w_N \equiv \sigma \pi_N - (1 - \sigma)[\alpha - e(\theta_N)]w_N x_N = 0, \quad (\text{A1})$$

$$\partial B / \partial x_N \equiv \partial \pi_N / \partial x_N + [\alpha - e(\theta_N)]w_N = 0. \quad (\text{A2})$$

Totally differentiating the above, (7a) and (7b) yields

$$\begin{pmatrix} \frac{\partial^2 B}{\partial w_N^2} & \frac{\partial^2 B}{\partial w_N \partial x_N} & \sigma \frac{\partial \pi_N}{\partial x_i} & 0 \\ 0 & \frac{\partial^2 \pi_N}{\partial x_N^2} & \frac{\partial^2 \pi_N}{\partial x_N \partial x_i} & 0 \\ 0 & \frac{\partial^2 \pi_i}{\partial x_i \partial x_N} & \frac{\partial^2 \pi_i}{\partial x_i^2} & \frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} \\ 0 & 0 & \frac{\partial^2 \pi_i}{\partial \theta_i \partial x_i} & \frac{\partial^2 \pi_i}{\partial \theta_i^2} \end{pmatrix} \begin{pmatrix} dw_N \\ dx_N \\ dx_i \\ d\theta_i \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 1 \\ 0 \end{pmatrix} dt_i, \quad (\text{A3})$$

where $\frac{\partial^2 B}{\partial w_N^2} = \sigma \frac{\partial \pi_N}{\partial w_N} - (1 - \sigma)(\alpha - e_N)x_N < 0,$

$$\frac{\partial^2 B}{\partial w_N \partial x_N} = \sigma \frac{\partial \pi_N}{\partial x_N} - (1 - \sigma)(\alpha - e_N)w_N = \frac{\partial \pi_N}{\partial x_N} < 0,$$

$$\frac{\partial^2 B}{\partial x_N^2} = \sigma \frac{\partial \pi_N}{\partial x_N} - (1 - \sigma)(\alpha - e_N)w_N < 0,,$$

$$\frac{\partial^2 \pi_N}{\partial x_N^2} = 2p' + x_N p'' < 0,$$

$$\frac{\partial \pi_N}{\partial x_i} = x_N p' < 0,$$

$$\frac{\partial^2 \pi_N}{\partial x_N \partial x_i} = p' + x_N p'' < 0,$$

$$\frac{\partial^2 \pi_i}{\partial x_i \partial x_N} = p' + x_i p'' < 0,$$

$$\frac{\partial^2 \pi_i}{\partial x_i^2} = 2p' + x_i p'' - 2(\alpha - e_i)^2 / r_1 < 0,$$

$$\frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} = \frac{\partial^2 \pi_i}{\partial \theta_i \partial x_i} = w_i e_i' + (3x_i e_i' + r_2)(\alpha - e_i) / r_1 > 0,$$

$$\frac{\partial^2 \pi_i}{\partial \theta_i^2} = -2x_i e_i'(x_i e_i' + r_2) / r_1 + x_i e_i'' [w_i + x_i(\alpha - e_i) / r_1] < 0.$$

The determinant of the matrix on the left hand side of (A3) can be expanded as

$$\Delta = \frac{\partial^2 B}{\partial w_N^2} \left\{ \frac{\partial^2 \pi_N}{\partial x_N^2} \frac{\partial^2 \pi_i}{\partial x_i^2} \frac{\partial^2 \pi_i}{\partial \theta_i^2} - \frac{\partial^2 \pi_N}{\partial x_N^2} \left(\frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} \right)^2 - \frac{\partial^2 \pi_i}{\partial \theta_i^2} \frac{\partial^2 \pi_i}{\partial x_i \partial x_N} \frac{\partial^2 \pi_N}{\partial x_N \partial x_i} \right\} > 0,$$

provided that the direct effects (the first term in braces) dominate the indirect effects (the rest of terms in braces), which is a condition usually assumed in models of oligopoly (see Brander and Spencer, 1985; and Dixit, 1986).

Under the minimum direct regulation on country i 's LS θ_i , we obtain the following matrix.

$$\begin{pmatrix} \frac{\partial^2 B}{\partial w_N^2} & \frac{\partial^2 B}{\partial w_N \partial x_N} & \sigma \frac{\partial \pi_N}{\partial x_i} \\ 0 & \frac{\partial^2 \pi_N}{\partial x_N^2} & \frac{\partial^2 \pi_N}{\partial x_N \partial x_i} \\ 0 & \frac{\partial^2 \pi_i}{\partial x_i \partial x_N} & \frac{\partial^2 \pi_i}{\partial x_i^2} \end{pmatrix} \begin{pmatrix} dw_N \\ dx_N \\ dx_i \end{pmatrix} = -\frac{\partial^2 \pi_i}{\partial x_i \partial \theta_i} \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} d\theta_i. \quad (\text{A4})$$

The determinant of the matrix on the left hand side of (A4) is

$$\Delta_1 = \frac{\partial^2 B}{\partial w_N^2} \left\{ \frac{\partial^2 \pi_N}{\partial x_N^2} \frac{\partial^2 \pi_i}{\partial x_i^2} - \left(\frac{\partial^2 \pi_N}{\partial x_N \partial x_i} \right)^2 \right\} < 0.$$

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