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**Economic Liberalization, Gender Wage Inequality and Welfare – A Theoretical
Analysis**

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Abstract

The paper develops a 3-sector general equilibrium model appropriate for economies with female labour oriented export sector to examine the effects of economic liberalization policies on gender based wage inequality. It is assumed that there exist disparities in efficiencies between male and female labour due to skewed access to education and health, and differences in their spending patterns leading to differential effects of respective wages on their nutrition. The results indicate that tariff cut may reduce gender wage inequality, but may have detrimental effects on welfare; while foreign capital inflow may accentuate the inequality, despite improving the welfare of the economy. However, government policies to increase the provision of education and health have favourable effects on gender wage inequality but may be welfare deteriorating. Thus, the paper provides a theoretical explanation to empirical evidences of diverse effects of liberalization on gender wage inequality and explains the possibility of a trade-off between gender inequality and social welfare.

JEL classification: D50, J16, F21

Keywords: gender; wage inequality; foreign capital inflow; tariff cut

Economic Liberalization, Gender Wage Inequality and Welfare – A Theoretical Analysis

1. Introduction

Gender inequality in the labour market is a pervasive phenomenon in most countries, especially the developing ones. One of its important manifestations is the gender wage gap, generally referred to the average difference in hourly earnings of men and women. The size of the gap varies from country to country and is dependent on many variables. In many countries in Asia and the Middle East and North Africa, the gap is upwards of 40 per cent in some sectors (Corley, et al 2005). In Latin America and the Caribbean, most women earn on average only about 69 per cent of men's labour income¹. Even within the same occupations the wages and earnings of women tend to be less than those of their male counterparts.

The gender wage inequality has been significantly impinged by the ongoing trend of economic liberalisation, with an increasing number of countries embracing policies like cutback in tariff barriers and reduction or elimination of restrictions on foreign investment. Trade liberalisation brings about changes in the relative prices of goods, while foreign capital inflow alters the relative factor endowments, leading to changes in relative factor prices. Both of these induce reallocation of factors of production among sectors that use them with different intensities and therefore changes in their employment and remuneration. Therefore, liberalization policies affect the choice of employment between male and female workers and their respective wages (UNCTAD 2009).

The theoretical underpinning of the impact of trade liberalization on the gender wage gap is based on two mainstream theories, Heckscher-Ohlin/ Stolper-Samuelson (HO/SS) theory and Becker's (1957) theory of discrimination. Both predict a beneficial impact of trade openness on gender wage gap. The standard trade theory suggests that trade

¹ UNICEF. *State of the World's Children 2007*, pp. 18. Also see www.unicef.org/sowc07/docs/sowc07_tacro.pdf

liberalization in unskilled labour-abundant developing countries increases the demand for unskilled labour and pulls up their relative wage. Since most of the unskilled work is often performed by women, particularly in the export processing zones², it can be inferred that globalization causes an increase in women's wages and the diminution of the gender gap. On the other hand, Becker's (1957) theory asserts that if employers discriminate against female workers and pay them less than male workers, then under increased competitive pressures due to trade openness, the demand for underpaid female labour is expected to grow, bidding up their wage and reducing the wage gap.

Several empirical studies confirm that international trade openness have resulted in narrowing gender wage inequality (Berik 2000; Fontana and Wood 2000; Hazarika and Otero 2004; Oostendorp 2004). There also exist a plethora of evidences that document persistent and even increasing gender wage gaps as a consequence of liberalisation (Fontana 2002; Berik, Rodgers and Zveglich 2004). The issue perhaps is particularly interesting in the context of the South Asian countries like India, Bangladesh and Pakistan which have embarked on liberalization policies and are characterized by low paid female labour intensive export oriented sectors. Menon and Rodgers (2009) find that in India, policy reforms like licensing deregulation and tariff reductions have increased competitive forces in the manufacturing industries and weakened the bargaining power of women, leading to the widening of the wage gap. Chamarbagwala (2006) finds that international trade in manufactures have benefited skilled men but hurt skilled women, whereas outsourcing of services has generated a demand for both female and male college graduates. In Bangladesh, gender wage differentials in garments were found to narrow from 1983 to 1990, but increased from 1990 to 1997, mainly owing to a higher proportion of men taking up high skilled jobs and an increase in the number of temporary workers among women (Bhattacharya and Rahman 1999; Paul-Majumder and Begun 2000). Siddiqui et al (2006) in a study of export-oriented industries in Pakistan concluded

² On average 70 percent of the labour force in EPZs is female (Joekes and Weston 1994), and in some countries, such as Sri Lanka, women constitute 85% of the workforce in EPZs (See United Nations 1999; Benería 2003).

that liberalization resulted in a disproportionately higher negative impact on females. Trade liberalization through tariff reduction and fiscal adjustment through cut in government expenditure reduced the gender wage gap (Siddiqui, 2007). Vijaya and Kaltani (2007) in a study of panel data show that FDI has an adverse impact on overall wages in the manufacturing sector and this impact is more pronounced for female wages.

The diverse empirical findings on the impact of liberalization on gender wage inequality appear a little perplexing in light of the existing theories³. In reality, liberalization is a multifaceted phenomenon; it is a policy package, consisting most importantly of reduction in tariff rates accompanied by freer flow of foreign capital. Both these policies are likely to have concurrent effects on gender wage gap. But most of the empirical studies have emphasized on policies like increased foreign trade and export orientation, while only very few studies have dealt with effects of foreign capital inflow⁴. Moreover, it is also necessary to study the effects of the policies on the overall welfare of the country along with gender wage gap, since elimination of gender based wage inequality cannot be aimed at in isolation. A proper evaluation of a particular policy can be done only when gendered considerations are made alongwith its overall welfare effect on the society. However, there has been little effort to theoretically examine the effects of both tariff reduction and foreign capital inflow on gender wage gap and welfare of the economy.

³ The widening wage gap in some countries mainly due to fall in female wage is often attributed to the informalisation of labour and lowering of women's bargaining power (Seguino 2002; Carr, Chen and Tate 2000; Balakrishnan 2002). Since women concentrate in labour-intensive manufacturing firms and services, their relative bargaining power does not rise even as labour demand increases due to globalisation, due to the potential threat of relocation of firms to lower wage sites. In contrast, men working mainly in nontradables and capital-intensive industries have more bargaining power to demand higher wages. Secondly, there has been a shift of a large number of formal sector jobs in female dominated labour-intensive industries, to informal employment arrangements, like subcontracting or home worker arrangements, where women earn much less than in formal sector jobs.

⁴ Studies by Oostendorp (2004); Siegmann (2006); Braunstein and Brenner (2007) have emphasized on the impact of FDI.

The developing countries are characterized by two pertinent features: gendered inequality in access to education and health facilities, and differences in the spending patterns of men and women, both having significant implications on their relative efficiency or productivity. With widespread poverty in these countries it often becomes difficult to meet the direct costs of schooling, so that if a choice has to be made between sending a boy or a girl to school, the boy gets preference. Moreover, girls are more likely to have to work in the home, care for siblings etc. so that their opportunity cost is higher than that of boys (Herz and Sperling 2004). Lack of proper facilities and negligence to women often leads to their ill-health, low nutritional level and life expectancy (Sharma 2007; Sen and Östlin 2007). On the other hand, in these countries, the 'consumption efficiency hypothesis' (Leibenstein 1957; Bliss and Stern 1978) is of particular relevance. The hypothesis proposes that the nutritional efficiency of a worker is positively related to his consumption level at least up to a certain point. If there is a stable relationship between the consumption level of the worker and his wage income then the worker's productivity is positively linked to the wage that he receives. However, an increase in wage affects men and women differently due to differences in their spending patterns. Women are more likely than men to spend a significantly higher proportion of their income on purchase of goods and services that promote the nutrition, health, and general well being of their families (Duncan 1997; Quisumbing et al. 1998; Kurz and Welch 2000). Men tend to spend most of their income on non-food items and their personal luxury articles like alcohol and cigarettes or reinvest it in their work or businesses (Guyer 1988; Hoddinott and Haddad 1995; Anderson and Baland 2002). Hence an increase in female wage is likely to raise the nutritional standard and efficiency of both men and women in a family vis-à-vis male wages. Since liberalisation policies affect labour allocation and wages of men and women, it in turn can have different impact on their efficiencies, inducing further labour reallocation and change in wages. But this aspect has not been dealt in the literature earlier.

The present paper purports to analyze the effects of liberalized economic policies⁵ like tariff cut⁶ and foreign capital inflow on the gender based wage gap and welfare of an economy in a 3-sector general equilibrium model appropriate particularly for the female labour oriented export led developing countries of South Asia. It is assumed that the efficiency functions of male and female workers are different due to two reasons: first, gendered differences in spending patterns, with differential effects of male and female wages on their nutrition and secondly, social institutions and supply side constraints resulting in less availability of education and health facilities to women vis-à-vis men. Economic liberalization affects both male and female wages and their efficiencies, while change in public provision of social services directly affects the efficiencies of men and women, but in dissimilar ways. These in turn, alter the number of male and female workers in efficiency units and result in reallocation of factors of production among sectors using them with different intensities (in accordance with Rybczynski theorem) and changes in relative factor prices. The comparative static results show that tariff reforms alongwith increase in public provision of social services may be instrumental in lowering gender wage inequality but may have detrimental effects on the welfare of the economy. On the other hand, foreign capital inflow both into the export and import-competing sectors may accentuate wage inequality, but also raise the welfare of the economy. These results can explain the empirical evidence of dissimilar effects of economic reforms on gender wage inequality in diverse countries as they have

⁵ Liberalized economic policies are designed to remove all the impediments to free trade, which is the optimal policy for a small open economy. The liberalized investment policy in the form of an FDI into the export sector(s) may be an instrument that can lead to export-led growth and raise the output of the export sector. On the other hand, contrary to the famous Brecher and Alejandro (1977) proposition that suggests an inflow of foreign capital into the import-competing sector under certain conditions might lead to import substitution and lower the country's welfare, there are works like Marjit and Beladi (1996), Chaudhuri (2005, 2007), Marjit, Broll and Mitra (1997), Chaudhuri et al. (2006) which have shown that welfare may improve also in this case. In the present paper also we get the same result. Finally, a tariff cut leads to increase in import competition.

⁶ Although many of the export-led countries like the East Asian Newly Industrialized Countries (NICs) maintained substantial tariff protections, countries like India (Reilly and Dutta 2005), Bangladesh (Hoque 2009), Pakistan (Khan, 1999) with female oriented export industries have undertaken substantial tariff reduction.

undertaken each of the economic liberalization policies at different pace and magnitude. These also indicate that there exists a trade-off between reduction in gender wage gap and improvement in national welfare.

2. The model

We consider a small open full-employment economy consisting of three sectors. Sector 1 produces an agricultural commodity, X_1 , using male labour (M), female labour (F) and capital of type 1 (K_1). Sector 2 uses female labour and capital of type 1 to produce a manufacturing product, X_2 .⁷ Sector 3 produces a manufacturing product, X_3 , using male labour and capital of type 2 (K_2). It is assumed that sectors 1 and 2 are the export sectors; while sector 1 is the primary good exporting sector, sector 2 may be identified as the female labour oriented export-processing zone. Sector 3 is the tariff-protected import-competing sector. Male labour is mobile between sectors 1 and 3 while female labour is employed in sectors 1 and 2. Capital of type 1 is mobile between the two export sectors while capital of type 2 is specific⁸ to sector 3. All the factors of production are fully utilized.⁹ The male and female workers earn wages W_M and W_F , respectively, with $W_M > W_F$, so that there exists a gap between male and female labour wages¹⁰. Due to the

⁷ Some examples of industries intensive in female labour are: garments, tea, tobacco, food-processing.

⁸ Here K_1 requires less skill than K_2 , and therefore, can fairly be assumed to be used simultaneously in the agricultural and export manufacturing sectors.

⁹ In reality, a developing economy is plagued by the existence of involuntary unemployment of both male and female labour due to the presence of factor market distortions. As our focus in this paper is on gender wage inequality and not on unemployment, we have ignored factor market distortions and unemployment of labour. The production structure of our economy is a three-sector analogue (or a 3×4 specific factor extension) of the classic 2×3 specific factor full-employment general equilibrium model as developed by Jones (1971). As the return to each mobile factor is the same in the two sectors in which it is employed, there occurs full-employment of all the mobile factors in the different sectors of the economy.

¹⁰ The male female wage gap exists in agriculture as well. For example, in India, the wage rates paid to women workers in the agricultural sector are at least 20 to 30 per cent lower than those

assumption of a small economy, all the product prices are internationally given. Production functions exhibit constant returns to scale with diminishing marginal productivity to each factor. Commodity 1 is assumed to be the numeraire.

The following symbols will be used in the formal presentation of the model.

a_{Ki} = capital-output ratio in the i th sector, $i = 1, 2, 3$; a_{Mi} = male labour-output ratio in the i th sector, $i = 1, 3$; a_{Fi} = female labour-output ratio in the i th sector, $i = 1, 2$; P_i = world price of the i th good, $i = 1, 2, 3$; H = efficiency of the representative male worker; h = efficiency of the representative female worker; W_F = wage rate of female labour (per efficiency unit); W_M = wage rate of male labour (per efficiency unit); R = return to capital of type 1; r = return to capital of type 2; t = ad-valorem tariff rate; X_i = output level of the i th sector, $i = 1, 2, 3$; M = male population; F = female population; K_{Di} = amount of domestic capital stock of i th type, $i = 1, 2$; K_{Fi} = amount of foreign capital stock of i th type, $i = 1, 2$; K_1 = aggregate capital stock of type 1 of the economy (domestic plus foreign); K_2 = aggregate capital stock of type 2 of the economy (domestic plus foreign); E = public spending on social sector; θ_{ji} = distributive share of the j th input in the i th sector, $i = 1, 2, 3$; $j = M, F, K$; λ_{ji} = proportion of the j th input employed in the i th sector, $i = 1, 2, 3$; $j = M, F, K$; S_{jk}^i = the degree of substitution between factors j and k in the i th sector, $i = 1, 2, 3$; $\hat{\ } =$ proportionate change, for example, $\hat{X}_1 = (dX_1 / X_1)$.

The general equilibrium is represented by the following set of equations.

$$W_M a_{M1} + W_F a_{F1} + R a_{K1} = 1 \quad (1)$$

$$W_F a_{F2} + R a_{K2} = P_2 \quad (2)$$

$$W_M a_{M3} + r a_{K3} = P_3(1+t) \quad (3)$$

paid to men for the same activity. In non-agricultural activities, the difference is even more pronounced, with women being paid less than half the wages given to their male counterparts (Ramachandran 2006).

Equations (1)–(3) are the competitive industry equilibrium conditions in the three sectors. Sectors 1 and 2 together can effectively be regarded as a *Modified Heckscher-Ohlin subsystem (MHOSS)*. The modification is due to the fact that apart from two common inputs, capital of type 1 and female labour, sector 1 also uses male labour as input. We now make assumptions on relative factor intensities that we will use throughout the analysis. As sector 2 is the female labour oriented export-processing zone we assume that sector 2 is female labour-intensive vis-à-vis sector 1 with respect to capital (of type 1) in both value and physical sense. These, respectively, suggest that $\theta_{F2}\theta_{K1} > \theta_{F1}\theta_{K2}$ and $\lambda_{F2}\lambda_{K1} > \lambda_{F1}\lambda_{K2}$. It is also assumed that the male labour intensity in sector 1 is not less than the female labour intensity in sector 2 with respect to capital in value terms, which in turn implies that $(\theta_{M1}\theta_{K2} \geq \theta_{F2}\theta_{K1})$. Besides, for the sake of analytical simplicity we also consider that the capital-output ratio in sector 1 (a_{K1}) is constant¹¹.

Complete utilization of capital of types 1 and 2 can be expressed, respectively, as:

$$a_{K1}X_1 + a_{K2}X_2 = K_{D1} + K_{F1} = K_1 \quad (4)$$

$$a_{K3}X_3 = K_{D2} + K_{F2} = K_2 \quad (5)$$

Capital of either type includes both domestic capital and foreign capital. Domestic capital and foreign capital of each type are perfect substitutes. Incomes from foreign capital are completely repatriated.

¹¹ Although this is a simplifying assumption it is not completely without any basis. Agriculture requires inputs like fertilizers, pesticides, weedicides etc., which are to be used in recommended doses. Now if capital of type 1 is used to purchase those inputs, the capital (of type 1)-output ratio, a_{K1} , becomes constant technologically. However, male labour and female labour are substitutes and the production function displays the property of constant returns to scale in these two inputs. However, even if the capital (of type 1)-output ratio is not given technologically the results of the paper still hold under alternative sufficient conditions incorporating the partial elasticities of substitution between capital of type 1 and the two types of labour used in sector 1.

The efficiency of each type of worker (male and female) is assumed to depend positively on wages and the workers' access to education and health facilities.¹² However, the efficiency functions of male and female labour are different. The efficiency function of a representative male worker is given by

$$H = H(E, (W_M + W_F)); H_1, H_2 > 0 \quad (6)$$

Here E denotes the public spending on social sector like education and health, which is financed by a portion of the tariff revenue earned by the government from the import of commodity 3. It may include education subsidy and expenditure on provision and extension of health facilities. Since both higher education and better health are pivotal in raising the efficiency of a worker, an increase in E raises the efficiency of a worker.

The efficiency of a worker also depends on the family income depicted by $(W_M + W_F)$, considering that each family consists of a couple¹³. This is because higher income enhances women's decision-making power within households with substantial effects on what items are to be bought, and how it is to be distributed among household members, with important implications for welfare of all family members. In the countries for which information is available, women's income has beneficial effect on household calorie consumption (von Braun and Kennedy 1994). Therefore, a hike in wages of women leads to higher consumption and efficiency of men as well.

¹² It may be noted that in accordance with the 'consumption efficiency hypothesis' as outlined earlier, nutritional efficiencies of the workers actually depend on quantities of commodities consumed by them, which is represented by their wages. However, quantities of consumption must depend on commodity prices, which in turn suggest that commodity prices should figure in the efficiency functions. But since we consider a small open economy where the prices of all traded commodities are internationally given, the inclusion or exclusion of commodity prices into the efficiency functions does not, in fact, make any difference.

¹³ The model implicitly considers both the cases of male/female households and extended households, which are quite common in developing countries. In case of the latter, empirical results show that household consumption is strongly correlated with their own income, even after extended households' pooled income is controlled for (Altonji et al. 1992; Park 2001). However, we do not consider the single-parent household case.

Therefore, in equation (6), $H_1 = (\partial H / \partial E) > 0$ and $H_2 = (\partial H / \partial ((W_M + W_F))) > 0$ denote the responsiveness of the efficiency of male workers to changes in public spending on social sector and changes in family income respectively.

On the other hand, apart from an increase in public provision of social services, the efficiency of women workers also depend on the female wage rate. Most of the evidence shows that women working in export-oriented industries retain some control over their earnings (Kabeer 2000; Kusago and Barham 2001) and the effect of women's income is also beneficial to their own dietary intake (Bisgrove and Popkin 1996). Therefore with an increase in their wages, their consumption and efficiency is likely to increase. However, male wages are not likely to have any significant impact since men tend to spend most of their income on non-food items and their personal luxury articles, so that any change in their wage does not affect the nutrition and efficiency of women in the particular household.¹⁴

Hence, the efficiency of a representative female worker can be expressed as

$$h = h(E, W_F); \quad h_1, h_2 > 0; \quad (7)$$

In equation (7), $h_1 = (\partial h / \partial E)$ and $h_2 = (\partial h / \partial W_F)$ are the responsiveness of the efficiency of female workers to changes in public spending on social sector and changes in female wage.

However, due to social discrimination based on gender, women have access only to a portion of the public spending on social sector. Consequently, the effective impact of any change in public spending on social sector on the efficiency of a female worker is less than that of a male worker. Hence, we assume that $H_1 > h_1$.

¹⁴ It is empirically observed that men also contribute to the family although their contribution is far less than that of the women. There can be two extreme cases: (i) men do not contribute at all to family income; and (ii) they contribute their whole income to family income. For the sake of analytical simplicity, we have considered the first extreme case. The algebra of the model becomes extremely complicated if we consider the intermediate case. It may, however, be checked intuitively that even if we assume that men do contribute to family income but at a significantly lower rate than women, the qualitative results of our paper are retained.

The endowments of male and female labour in efficiency units are given by the following:

$$a_{M1}X_1 + a_{M3}X_3 = MH(E, W_M + W_F) \quad (8)$$

$$a_{F1}X_1 + a_{F2}X_2 = Fh(E, W_F) \quad (9)$$

Here M and F denote the male and female population respectively.

There are nine endogenous variables, $W_M, W_F, R, r, X_1, X_2, X_3, H$ and h that can be solved from the above nine equations. The policy parameters of the system are, K_1, K_2, t and E . This is an indecomposable system, where the factor prices cannot be solved from the price system alone. Therefore, any change in the factor endowments affect factor prices, which in turn, affect the per unit input requirements, a_{ij} s in each sector.

The demand side of the model is represented by a quasi-concave social utility function. Let U denote the social utility that depends on the consumption demands for the three commodities denoted by, D_1, D_2 and D_3 . Thus, it is shown as

$$U = U(D_1, D_2, D_3) \quad . \quad (10)$$

Now the aggregate demands for the three commodities are given by the following three equations.

$$D_1 = D_1(P_1, P_2, P_3(1+t), Y) \quad (11.1)$$

(-) (+) (+) (+)

$$D_2 = D_2(P_1, P_2, P_3(1+t), Y) \quad (11.2)$$

(+) (-) (+) (+)

and,

$$D_3 = D_3(P_1, P_2, P_3(1+t), Y) \quad (11.3)$$

(+) (+) (-) (+)

where Y is the national income at domestic prices. All commodities are normal goods with negative and positive own price and income elasticities of demand, respectively. The

cross-price elasticities are positive. So, we have $E_{P_i}^i = ((\partial D_i / \partial P_i)(P_i / D_i)) < 0$; $E_Y^i = ((\partial D_i / \partial Y)(Y / D_i)) > 0$ for $i = 1, 2, 3$; and, $E_{P_k}^i = ((\partial D_i / \partial P_k)(P_k / D_i)) > 0$ for $i \neq k$.

The foreign capital incomes of both types are fully repatriated. The balance of trade equilibrium requires that

$$P_1 D_1 + P_2 D_2 + P_3 D_3 = P_1 X_1 + P_2 X_2 + P_3 X_3 - RK_{F1} - rK_{F2} - E, \quad (12)$$

or equivalently,

$$P_1 D_1 + P_2 D_2 + P_3 * D_3 = P_1 X_1 + P_2 X_2 + P_3 * X_3 - RK_{F1} - rK_{F2} + (tP_3 M - E) \quad (12.1)$$

The volume of import is given by the following equation.

$$M = D_3(P_1, P_2, P_3(1+t), Y) - X_3 \quad (13)$$

The national income of the economy at domestic prices is given by

$$Y = P_1 X_1 + P_2 X_2 + P_3(1+t)X_3 + (tP_3 M - E) - RK_{F1} - rK_{F2} \quad (14)$$

or equivalently,

$$Y = W_M MH(.) + W_F Fh(.) + RK_{D1} + rK_{D2} + (tP_3 M - E) \quad (14.1)$$

In equation (14.1), $W_M MH(.)$ and $W_F Fh(.)$ are the total wage incomes earned by male and female workers respectively. RK_{D1} and rK_{D2} are the domestic rental incomes from two types of capital. E is the amount of government spending on health and education which is financed by a portion of the tariff revenue, $tP_3 M$, earned by the government from import of commodity 3. Finally, $(tP_3 M - E)$ is the excess tariff revenue (net of the government spending), which is handed over to the consumers in a lump-sum manner.

3. Effects of economic liberalization and government policies on gender wage inequality

In this section, we analyse (i) the effects of trade liberalization like reduction in import tariff and foreign capital inflow of both types; and, (ii) government policies like higher public provision of social services, on the gender wage inequality.¹⁵

It has been assumed that W_M and W_F represent the wage rates of male and female workers per efficiency units respectively. Now, an increase in any of the parameters is likely to affect the efficiencies of both types of workers per capita. Since wage inequality generally refers to difference in per capita wage per unit of time, the appropriate measure of wage inequality between male and female workers is

$$W_I = (W_M H - W_F h) \quad (15)$$

From (15) it is evident that the change in male-female wage inequality must depend on changes in their wages, W_M and W_F , and also on their efficiencies, H and h .¹⁶

3.1 Effects of tariff cut

To examine the effects of reduction in the tariff rate on gender wage inequality, it is assumed that $\hat{t} < 0$ while other parameters are constant. The effect on gender wage inequality is obtained as

¹⁵ The mathematical derivations of the comparative static results can be obtained from the authors on request.

¹⁶ Labour productivity improvements (via increased social spending) result only in declines in wages since the country is a price taker.

$$\begin{aligned}
W_I \hat{W}_I = & (T \hat{t} / \Delta (|\theta|)^2) [(\lambda_{K1} \lambda_{F2} - \lambda_{F1} \lambda_{K2}) (\theta_{F1} \theta_{K2} - \theta_{K1} \theta_{F2}) \lambda_{M3} S_{MK}^3 (\theta_{M3} + 1)] [W_M H_2 W_F \theta_{M1} \theta_{K2} \\
& \quad (+) \quad (+) \quad (-) \quad (+) \quad (+) \\
& - W_M (H_2 W_M + H) (\theta_{F1} \theta_{K2} - \theta_{F2} \theta_{K1}) - W_F (h_2 W_F + h) \theta_{M1} \theta_{K2}] \\
& \quad (-)
\end{aligned} \tag{16}$$

It follows from (16) that $\hat{W}_I < 0$ when $\hat{t} < 0$ under the sufficient conditions:

$$\left. \begin{array}{l}
\text{(i) } \Delta < 0 \text{ and} \\
\text{(ii) } W_M H_2 \geq (h_2 W_F + h)
\end{array} \right\} \tag{17}$$

This leads to the following proposition.

Proposition 1: *A reduction in tariff may improve the gender wage inequality.*

The economic explanation may be given as follows. The lowering of tariff rate reduces the domestic price of the output in sector 3 leading to contraction of the sector. So X_3 falls. The input demands for both male labour and capital of type 2 fall leading to decreases in their prices, W_M and r . Now as W_M falls the effective price of commodity 1 rises due to saving on cost of male labour. This produces a Stolper-Samuelson effect in the *MHOSS*. The return to capital of type 1 (R) rises and the female wage (W_F) falls as sector 1 is more (less) capital (female labour) intensive than sector 2. So both W_M and W_F plummet, which in turn lower both the efficiency of each male worker (H) and that of female worker (h) but at different rates as the forms of their efficiency functions (equation (6) and equation (7)) are different. Therefore, the direction of change in gender wage inequality must depend on rates of change in W_M , W_F , H and h . Our analysis suggests that the wage inequality improves following a tariff cut under the sufficient conditions as presented in (17).

3.2 Effects of foreign capital inflow

Let us assume that foreign capital of type 1 flows in. This implies that $\hat{K}_1 > 0$ with all other parameters remaining unchanged. The effect on gender wage inequality is obtained as

$$W_I \hat{W}_I = (\hat{K}_1 / \Delta |\theta|) \lambda_{M1} \lambda_{F2} \theta_{K3} [W_M H_2 W_F \theta_{M1} \theta_{K2} - W_M (H_2 W_M + H) (\theta_{F1} \theta_{K2} - \theta_{F2} \theta_{K1}) - W_F (h_2 W_F + h) \theta_{M1} \theta_{K2}] \quad (18)$$

(-)
(+)
(-)
(+)
(+)

It follows from (18) that $\hat{W}_I > 0$ when $\hat{K}_1 > 0$ if condition (17) holds.

Now, let us consider the case when foreign capital of type 2 flows in. This implies that $\hat{K}_2 > 0$ with other parameters remaining unaltered. The resulting wage inequality is given as

$$W_I \hat{W}_I = (\hat{K}_2 / (\Delta |\theta|)) \lambda_{M3} \theta_{K3} (\lambda_{K1} \lambda_{F2} - \lambda_{K2} \lambda_{F1}) [W_M H_2 W_F \theta_{M1} \theta_{K2} - W_M (H_2 W_M + H) (\theta_{F1} \theta_{K2} - \theta_{F2} \theta_{K1}) - W_F (h_2 W_F + h) \theta_{M1} \theta_{K2}] \quad (19)$$

(-)
(+)
(+)
(-)
(+)

It follows from (19) that $\hat{W}_I > 0$ when $\hat{K}_2 > 0$ if condition (17) holds.

These results lead to the following proposition.

Proposition 2: *Foreign capital inflow of either type may aggravate gender based wage differential.*

An inflow of foreign capital of type 1 lowers its return, R . For satisfying the zero-profit condition in sector 2, W_F must rise. Also a Rybczynski effect takes place in the MHOSS. Sector 1 expands while sector 2 contracts, as the former is more capital-intensive vis-à-vis the latter with respect to female labour. The input demands for both types of labour

increase in sector 1 leading to increases in both W_M and W_F . The additional female labour in sector 1 comes from the contracting sector 2 while male labour must come from sector 3. Consequently, sector 3 contracts. Now, owing to increases in W_M and W_F , the efficiencies of both male and female workers augment, but in different magnitudes due to differences in spending patterns. The increase in per capita wage for female workers is lower than that for the male workers, increasing the wage gap under the sufficient conditions (17).

On the other hand, an inflow of foreign capital of type 2 in the import-competing sector lowers the return to capital, r . Sector 3 must expand as this type of capital is specific to this sector. Accordingly the demand for male labour rises which in turn raises W_M . Additional male labour must come from sector 1 leading to its contraction. The contracting sector 1 releases both capital of type 1 and female labour to sector 2, which in turn expands. However, the increase in the demand for female labour in sector 2 is greater than the release of female labour by sector 1. This leads to an increase in the female wage, W_F . We may provide an alternative explanation as to why sector 1 (sector 2) contracts (expands) and W_F rises. As W_M rises, the effective price of commodity 1, net of cost on male labour, falls. This produces a Stolper-Samuelson type effect in the *MHOSS* resulting in a decrease in R and an increase in W_F as sector 1 (sector 2) is capital (female labour) intensive. This then leads to a Rybczynski type effect.¹⁷ As a result of increases in wages (per efficiency units), the efficiencies of both male and female labour (H and h) rise. But the increase in H is greater than that in h because of the reasons discussed earlier. The per capita wage inequality rises under the given sufficient conditions.

¹⁷ A Stolper-Samuelson effect is followed by a Rybczynski type effect if the production functions are of variable coefficient type.

3.3 Effects of increased public provision of education and health

Now we examine the effects of an increase in the public spending on social services, i.e.

$\hat{E} > 0$. The gender wage inequality is obtained as

$$\begin{aligned}
 W_I \hat{W}_I = & (E \hat{E} / (\Delta |\theta|)) \theta_{K3} [\{ H_1 (\lambda_{K2} \lambda_{F1} - \lambda_{K1} \lambda_{F2}) - \lambda_{M1} \lambda_{K2} h_1 (1 + \alpha) \} [W_M H_2 W_F \theta_{M1} \theta_{K2} \\
 & \quad (-) \qquad \qquad \qquad (-) \qquad \qquad \qquad (+) \\
 & - W_M (H_2 W_M + H) (\theta_{F1} \theta_{K2} - \theta_{F2} \theta_{K1}) - W_F (h_2 W_F + h) \theta_{M1} \theta_{K2}] \\
 & \quad (+) \qquad \qquad \qquad (-) \qquad \qquad \qquad (+)
 \end{aligned} \tag{20}$$

It follows from (20) that $\hat{W}_I < 0$ when $\hat{E} > 0$ if condition (17) holds.

These results lead to the following proposition.

Proposition 3: *An increase in the public spending on social services may improve the gender wage inequality.*

A boost in E augments the efficiencies and therefore endowments of both male and female labour (in efficiency units), the latter being lesser due to skewed access to social services ($H_1 > h_1$). Both W_M and W_F fall as the supply of both types of labour (in efficiency units) increase given their demands. As W_M falls, the return to capital of type 2 i.e. r rises (see equation (3)) urging the producers to substitute capital by male labour.

This lowers the capital-output ratio in sector 3 i.e. a_{K3} . As $X_2 = \frac{K_2}{a_{K3}}$ (see equation (5)),

sector 3 expands. Besides, fall in both W_M and W_F in turn generate a second round of effect, reducing the efficiencies of both male and female labour. The gap in per capita wages improves under the same sufficient conditions.

4. Effects of economic liberalization and government policies on the welfare of the economy

The comparative static results on gender wage inequality show that trade liberalization in the form of tariff cut and government policies of enhanced social services reduce the gender wage gap, while foreign capital inflow of either type enhances it. However, it is equally important to ascertain the effect of each policy change on the welfare of the economy. Therefore, we now analyze the implications of different policies on the welfare, measured by the social welfare function as given by equation (10).¹⁸

4.1 Effects of tariff cut

Reduction in tariff rate has both favourable and adverse effects on the national welfare. On one hand, both male and female wages reduce (explained in proposition 1), leading to decreases in their endowments in efficiency units so that total wage income falls. This affects social welfare adversely. On the other hand, the lowering of tariff rate leads to the contraction of sector 3 and may result in an increase in tariff revenue following an increase in import demand.¹⁹ Hence the amount of net lump-sum transfer payments to the consumers may increase and work favourably on welfare. Besides, as the tariff-distorted domestic price of commodity 3 falls, the demand side distortionary effect of tariff is reduced and consumers would be consuming more of good 3. However, national welfare may worsen if the negative wage effect dominates over the positive tariff revenue effect. This leads to the following proposition.

Proposition 4: Tariff reduction may be welfare deteriorating.

¹⁸ The mathematical derivations of the welfare analysis can be obtained from the authors on request.

¹⁹ The tariff revenue goes up unless the import demand function is price inelastic.

4.2. Effects of foreign capital inflow

An inflow of K_1 , on one hand, leads to increases in both W_M and W_F (explained in proposition 2), which in turn augment the efficiencies of both male and female workers and their endowments in efficiency units. Therefore the total wage income of male and female labour rises. On the other hand, as sector 3 contracts (already explained in proposition 2) the tariff revenue rises following a boost in import demand. This in turn raises the net transfer payments made to the consumers. Welfare of the economy improves as both aggregate wage income and net transfer payments increase.

Analogously, an inflow of foreign capital of type 2 results in hike in W_M and W_F (as explained in proposition 2) so that the male and female labour in efficiency units rise and their total wage income rises, producing a favourable effect on social welfare. On the other hand, as sector 3 expands, import demand falls that lowers the tariff revenue and hence the net transfer payments to the consumers. This affects welfare adversely. Thus, there are two opposite effects on welfare. The net outcome would be an improvement of the society's welfare if the positive wage effect outweighs the negative tariff revenue effect.

This leads to the following proposition.

Proposition 5: *An inflow of foreign capital of either type may be welfare improving.*

4.3 Effects of increased public provision of education and health

An increase in E raises the efficiencies of both male and female workers, so that given their wages, there is a favourable impact on welfare. However, the wages do not remain the same. We have seen that both the policies reduce W_M and W_F , leading to declines in the endowments of both male and female labour in efficiency units (explained in proposition 3). The net outcomes on the male and female endowment in efficiency units and total wage income depend on the relative strengths of the two opposite effects. Besides, as the tariff-protected import-competing sector (sector 3) expands, the demand for imports falls. The consequence would be a decline in the tariff revenue. The net lump-

sum transfer payments made to consumers also plummets. Social welfare worsens if the aggregate wage effect is either negative or not sufficiently positive to dominate over the negative tariff revenue effect. So the following proposition can now be established.

Proposition 6: *Increased public provision of social services may have detrimental consequences on the welfare of the economy.*

5. Concluding Remarks

In the recent decades, an increasing number of countries have been embarking on the trajectory of economic liberalization. To acquire the greatest and inclusive benefits of liberalization, it is widely argued that gender dimensions should be mainstreamed into development and trade strategies. With the wide persistence of gender based wage differential in the developing countries, it therefore becomes imperative to examine the effects of different liberalization policies on the wage gap. In this paper, we develop a 3-sector general equilibrium model to study the effects of tariff cut and foreign capital inflow on the gender wage gap and welfare of the economy. It is assumed that the efficiency functions of male and female workers are different due to (i) skewed access to education and health, and (ii) differences in their spending patterns and effects of wages on nutrition. In this scenario, it is found that tariff cut may reduce the gender wage inequality, but may also have adverse effects on welfare. On the other hand, inflow of foreign capital both into export as well as import sectors may aggravate male-female wage inequality. Nonetheless, it may have favourable consequences on the welfare of the economy. However, although increased provision of social services leads to diminution of wage inequality, it may have detrimental effects on welfare. Therefore, when tariff cut and investment liberalization policies are undertaken concomitantly, the impact on gender wage gap may differ among countries depending on the magnitude and strength of each policy. The paper on one hand, provides a theoretical explanation behind diverse empirical findings on gender wage inequality due to economic liberalization in developing countries; on the other, it shows that there exists a trade off between gender wage inequality and welfare of the economy.

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