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Socio-Economic Reforms and Gender-Based Wage Disparity In A Developing Economy: A Trade-Theoretical Analysis

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ABSTRACT

A simple 4 sector general equilibrium model has been developed with both male and female labour with capital market distortions to analyse the effect of selective economic and social liberalization policies on female labour force participation and gender based disparity. This paper finds that under some reasonable conditions, economic or social liberalization policies aimed at reducing gender-based disparity may lead to counterproductive outcomes. An alternative explanation for the U-shaped hypothesis of female labour force participation is discussed and derived which reflects the dynamics of social transition with rising male's per capita income. This paper can be further extended to capture intra-household bargaining and this might contain further policy implications

Keywords: FDI; Female labour supply; Consumerism; Gender-based wage disparity.

1. INTRODUCTION

In the rising era of globalization, which seeks to integrate world market over commodities and factor inputs, there is a growing concern on various issues such as child labour, gender dimensions in the labour market etc. Over the last few decades, gender-related issues such as equal pay for equal work, female labour force participation, discrimination at workplace etc. have gained increased attention in debates over development policies. The widening gender employment participation rate evidently shows that women are still a long way from catching up with men in terms of labour market opportunities prevalent in emerging countries. Since gender empowerment opens different avenues for development, there have been effortless studies and policy proposals in this regard. Gender discrimination in economic workspace, in availability of capital from formal institutions, etc. has several impacts on the societal living standard of women, which may vary from female feticide, ranging across neglected female child rearing, and end with bride persecution. Given an equal economic opportunity it is expected that we can reduce such misconduct towards women.

Traditionally, females have been debarred from labour market participation as mostly they were considered as home keepers. As of recently, the labour force participation rate for men and women, aged 15 and above, is on a continuous decline; globally it stands at 61.8% in 2018, down by 1.4 percentage points over the last decades. However, this decline in women's participation rate has been slower than that of men resulting in a minute contraction of the gender gap.

There are prevalent conjectures about how gender wage gap is associated with the country's competitiveness in attracting FDI. The neoclassical hypothesis suggests that there is a negative relation between the two, since an increased competition due to trade liberalization h that the taste of gender-based discrimination could not be affordable (Becker, 1971). On the contrary, a number of studies reveal that low labor cost acts as a competitive advantage in

attracting FDI thus widening gender disparity. Berik, Rodgers and Zveglich (2004) shown that the residual wage gap between male and female increased from import competition which was proxied for trade openness, since with an increase in competition and lower profit women have to bear the brunt of employer's competitive cost cutting effort. Similar result was found for the Mexican economy in Artecona and Cunnigham (2002). Hoai and Bui (2018), in their analysis, finds that foreign investors are less willing to invest in countries with large gap in education between male and female.[4] Braunstein and Brenner (2007) estimated the effect of FDI in urban China and obtained that female employment in the labour-intensive export sector increased with high FDI flows, however, this relationship could not be sustained and men gained relative advantage. Other relevant papers in this line which obtained a positive relationship between FDI and male-female wage inequality includes Stephanie (2000), Chaudhuri, Roychowdhury and Chaudhuri (2019), Feenstra and Hanson (1997), Poddar and Chaudhuri (2016) among many.

The second strand of literature discusses the U-shaped relationship between income and female labour force participation. In the study of female labour force participation in Bangladesh, Rahman and Islam (2013) estimated an interesting U-shaped hypothesis relationship between economic growth and female employment. The hypothesis argues that as the economy progresses, there will be withdrawal of female laborers from the workforce due to rise in the household income. This results in the downward part of the U shape. However, after a certain stage of growth is reached, rising wages persuades the female laborers to rejoin the labor force, substituting their leisure by work and giving rise to the upward part of the U curve. The paper also highlights the fact that poorer women are more likely to participate in low paid wage employment. This finding is in line with that of Klasen

[4]Measure of gender gap in education is shown by two proxies, Ratio of female to male enrolment in secondary education and in tertiary education.

and Pieters (2012) who found that in India urban women with lower education are usually engaged in low paid wage employment. On the other hand, the non-poor engaged in self-employment like poultry and livestock farming with the help of rural microfinance support. Goldin (1994) explained the U-shaped phenomenon from the perspective of health and education. For the initial range of income level women are mostly illiterate and hence they participate in home-based activities, however, after this range of income level, the education and health status of women improves that allows them to participate productively in market-based activities. Sanghi, Srija and Vijay (2015) discuss the structural transformation of the economy that have multi-dimensional effect on female labour force participation.

Neo-classical theories states that competition shall drive out any wage differential among participating agents. However, wage differential exists and various arguments have been sought for in this context. Studies reveal that wage differential doesn't necessarily arise out of occupational segregation, but rather is a way to shelter women from "the full force of their labour productivity" due to their low physical strength and allow for maternal responsibilities. While this is one explanation, Poddar and Chaudhuri (2016) highlight a different aspect of efficiency leading to wage differentials. Their paper claims that efficiency of each worker is positively related to the calorie intake by them, and biologically given that calorie intake of male is higher than that of female, efficiency per male worker is higher than that of female and hence, the efficiency wage repatriation is higher in case of male than female. It is noteworthy from their paper that any liberalized investment policy (in form of foreign capital inflow) 'unambiguously worsens male female wage inequality'. Mukhopadhyay and Chaudhuri (2013), using a three sector general equilibrium structure using both male and female labour, shows how FDI inflow of any type worsens gender wage inequality and claims that any kind of investment spending to advance the efficiency

(investment including spending on education, health etc.) of workers improves gender wage inequality.

Our paper has multiple deviations from the existing literature in terms of the basic economic structure and its counterproductive outcomes. We deviate from Poddar and Chaudhuri (2016) in the following respects. First, while they considered exogenously fixed endowment of female labour supply, our model have endogenised the supply of female labour and have determined the supply function from the optimizing behavior of the unskilled labour families. Second, we have considered agricultural dualism in our model which is missing in most gender studies. Third, we have studied the impacts of both investment and social liberalization (consumerism) not only on the gender-based wage inequality but also on the female labour participation rate. Fourth, as opposed to the neoclassical theories as in Becker (1971) and we have shown that even in a competitive environment gender-based wage inequality may accentuate which crucially hinges on sectoral linkage, factor specificity and factor-intensity among sectors. The studies that sought to explain the U-shaped curve for female labour force participation has assumed either economic growth or aggregate real GDP as a proxy for income, however, such a large measure of income against female labour force participation is mostly criticized.[5] We depart from this major point of criticism by drawing down the relationship between household's per capita male income and female labour force participation and explained the shape of the curve as arising from social transition.

The rest of the paper is organized as follows. In section 2, we discuss the features of the stylized economy assumed in the model. In section 3, we derive the female labour supply function from the households' decision making process. In section 4, we construct a four

[5] The point of criticism can be explained as follows. Aggregate real GDP, or economic growth rate includes income of various households those are not homogenous in terms of their outlook (valuation) towards female participation in the labour force. Hence, this degree of variation in social outlook goes ignored in such aggregate measure.

sector general equilibrium model and describe the working of the system. In section 5, we carry out two comparative static exercises that analyze specifically the effect of economic and social liberalizing policies on gender-wage pay gap. Section 6 concludes the paper.

2. THE MODEL

We assume a small open developing economy with three traded sectors and a non-traded final sector. Sector 1 is the (traditional) export agriculture sector using unskilled male labour, unskilled female labour and capital. Sector 2 is the (modern) export agriculture sector that uses unskilled male labour and capital only. Sector 2 is assumed to be advanced (modern) agriculture compared to sector 1 mainly due to three distinctive features. First, the traditional agriculture sector (*sector 1*) uses unskilled female labour while in the modern agriculture sector (*sector 2)* only unskilled male labour is employed.[6] Second, the traditional agriculture sector borrows credit at a relatively higher informal interest rate from the local moneylenders that is mark up over the formal interest rate. On the other hand, the modern agriculture sector has access to the formal credit market. Lastly, the modern agriculture sector is assumed to be more capital-intensive compared to the use of male labour than the traditional agriculture sector.[7] There is also a *non-traded* unskilled female labour specific sector (*sector N)* that provides domestic services to the well-off families in the economy. Household maid services, babysitting are some services that are provided by this sector comprising of female unskilled workers belonging to the poorer strata of the society. Lastly, there exists a formal high-skilled sector (sector 3) that uses a specific factor-skilled labour; and capital. Here, male skilled

[6]Female labour in the production of commodity 2 is excluded because the percentage of female labour used in the production of these mechanized agriculture sector activities is insignificant (see Chaudhuri and Panigrahi 2013, Table 2). Moreover, owing to high technology intensity in this sector more physical work is needed, such as for driving tractors, operating harvesters etc. which is generally done by male labour.

[7]Sector 1 (the traditional agriculture) and Sector 2 (the modern agriculture) forms a miniature Sub-system with two mobile factors, unskilled male labour and capital and hence factor intensity ranking is appropriate.

labour and female skilled labour are assumed to be perfect substitute given their homogenous skill level.

Labour market is assumed to be perfect and hence, there exist no unemployment of either type of labour. However, a crucial assumption regarding wage disparity is made. In this paper, wage disparity is observed only in the unskilled labour market while in the skilled labour market no such wage disparity exists. The logic behind this can be explained as follows. In the unskilled labour market, productivity depends on physical attributes of the worker. Given the biological differences between the male and female labour, it is more likely that men are more productive than female workers in low-skilled jobs that demands more physical work. Whereas, in the jobs requiring skilled labours, productivity depends mainly on skills set, such as education, experience and training of workers. Although, in developing nations such as India, Bangladesh, Pakistan, Sri Lanka and few other countries, discrimination persist even in education and other skill-acquisition activities, however, the extent of disparities that exists in the unskilled labour market is relatively more significant and vulnerable. Therefore, we assumed away any wage disparity in the skilled specific sector. Wage gap between skilled and unskilled labour also exist that arises due to differences in education and skill level.

Capital market imperfection is assumed in the form of interest rate differential under dualistic credit market. The traditional agriculture sector (sector 1) borrows credit at a higher interest rate than the formal competitive interest rate. The informal interest rate is assumed to be a monopoly mark-up over formal interest rate. Thus, wage disparity and capital market imperfection are the two main characteristics of the developing economy assumed in the model. Technology is assumed to be CRS and diminishing marginal productivities hold for all the factors.

3. HOUSEHOLD DECISION MAKING AND SUPPLY FUNCTION OF FEMALE LABOUR

In this stylized economy there are L numbers of homogenous unskilled working families that consists of one male labour and one female labour in each family. Each household supplies 1 unit of male labour and l_F units of female labour. Each household maximizes their utility which is a positive function of their consumption level and a positive function of women's household work. The household is constrained by their family income level and takes wage rate as given that is determined from the general equilibrium system. Thus, each household's problem can be stated as follows.

$$\underset{\{x_1, x_2, x_3, l_f\}}{Max,} \; U = B{x_1}^{\alpha}{x_2}^{\delta}{x_3}^{\phi}(1 - l_F)^{\gamma} \;\; ; \; \alpha + \delta + \emptyset + \gamma = 1 \qquad (1)$$

$$with, \qquad B > 0 \;\; and \;\; \alpha, \delta, \emptyset, \gamma > 0$$

$$subject\ to, \;\; P_1x_1 + P_2x_2 + P_3x_3 = W_M + l_F W_F \qquad (2)$$

Eq. (1) represents utility function of a single decision making household and it satisfies all standard properties. $(\alpha + \delta + \emptyset)$ represents the share of physical consumption of three commodities in household's total expenditure and $'\gamma'$ represents household's valuation of female work at home. Eq. (2) is the household's budget constraint. Assuming that male labour always work and female labour devotes l_F fraction of her total time in wage earning activities, thus household's total income is given by $W_M + l_F W_F$.

The optimization exercise yields the following female labour supply by each household.[8]

$$\boldsymbol{l_F^*} = (\propto + \emptyset + \delta) - \left(\frac{\mathrm{W_M}}{\mathrm{W_F}}\right)\gamma \qquad (3)$$

[8]See Appendix A for detailed optimization exercise.

The properties of $\boldsymbol{l_F^*}$ are as follows. *First*, $\boldsymbol{l_F^*}$ varies negatively with male wage rate W_M. This can be termed as positive cross-income effect where with an increase in male wage rate (W_M) the family income increases, and thus the household chooses less female work hours in wage earning activity and allocates more of her time in household works and child rearing activities. *Second*, $\boldsymbol{l_F^*}$ varies positively with female's hourly wage rate,W_F , this is simply negative price effect net of income effect that lowers the female's household work hours and raise her labour hours. *Third*, it is pertinent to note that $\boldsymbol{l_F^*}$ varies negatively with rise in relative ratio of male wage rate to female wage rate. This has some important implication. When W_M and W_F both moves in opposite direction, then it produces an unidirectional effect on $\boldsymbol{l_F^*}$, however, if both W_M and W_F moves in uniform direction, then the net effect on $\boldsymbol{l_F^*}$ crucially hinges on the relative ratio of wage rate $\left(\frac{W_M}{W_F}\right)$**.** If the ratio rises then female labour supply falls, thus, a more unequal society restricts female labour force participation. *Lastly*, a decrease in γ raises female labour supply indicating a more liberal attitude of the families and the society.[9] This causes a rightward shift of the female labour supply curve.

Given that there are L numbers of homogenous working families, thus the aggregate female labour supply function is given by:

$$L_F = L\, \boldsymbol{l_F^*}\begin{pmatrix} \boldsymbol{W_F} & \boldsymbol{W_M} & \boldsymbol{\gamma} \\ (+)' & (-)' & (-) \end{pmatrix} \qquad (4)$$

4. THE GENERAL EQUILIBRIUM ANALYSIS

In this section, the general equilibrium system representing the stylized economy determines simultaneously, the prices of the commodities, returns to factor and the equilibrium output level of each sector. The structure is based on Jones (1965) and Jones (1971).

[9] A fall in the value of $\boldsymbol{\gamma}$also implies an increase in $(\propto +\emptyset + \delta)$ that represents a shift of household's preference more towards consumer goods, this indicates growing consumerism (see Dwibedi and Chaudhuri, 2007)

Given the assumptions of perfectly competitive economy, the zero profit conditions are given by the following set of equations.

$$W_M a_{M1} + W_F a_{F2} + R^* a_{K1} = P_1 \quad (5)$$

$$W_M a_{M2} + R a_{K2} = P_2 \quad (6)$$

$$W_F a_{FN} = P_N \quad (7)$$

$$W_S a_{S3} + R a_{K3} = P_3 \quad (8)$$

where, a_{ji}s represents j^{th} amount of input required to produce each unit of output in the i^{th} sector. $W_S, R \; and \; R^*$ represents skilled wage rate, formal return to capital and informal interest rate respectively. The capital market imperfection is given by:

$$R^* = \beta R \quad (9)$$

where, β (> 1) is the monopoly mark-up, or the degree of isolation in the credit market.[10]

The full employment conditions are given by the following equations:

$$a_{M1} X_1 + a_{M2} X_2 = \bar{L} \quad (10)$$

$$a_{F1} X_1 + a_{F_N} X_N = L_F \underset{(+),\,(-),\,(-)}{\left(\boldsymbol{W_F}, \boldsymbol{W_M}, \boldsymbol{\gamma}\right)} \quad (11)$$

$$a_{S3} X_3 = 2\bar{S} \quad (12)$$

$$a_{K1} X_1 + a_{K2} X_2 + a_{K3} X_3 = \bar{K}_D + \bar{K}_F = \bar{K} \quad (13)$$

[10]Here, it is assumed that the moneylender is involved in relending activity where he borrows certain amount of credit from formal sources at formal interest rate R and relends it to the backward agriculture sector (Sector 1) at higher interest rate, R^*, thus maximizing his monopoly surplus. A more general case would be $R^* = f(R)$, $f' > 0$, however, the qualitative result would be unaltered by assuming a linear relationship.

Here, sector N is the non-traded service sector and in order to close the model we need the market clearing condition for the non-traded commodity,X_N . Here we assume that there are $\bar{S}$ number of homogenous skilled families each consists of one skilled male memeber and one skilled female member, both supplying their entire labour hours and earning the same skilled wage rate,W_S. Each skilled family consumes the various type of traded final commodity along with the consumption of non-traded services.[11] Thus, each representative skilled household maximizes the following utility function.

$$\underset{\{x_1^1, x_2^1, x_3^1, x_n^1\}}{Max,} V = C(x_1^1)^{\beta_1}(x_2^1)^{\beta_2}(x_3^1)^{\beta_3}(x_n^1)^{\beta_n} ; [\beta_1 + \beta_2 + \beta_3 + \beta_n = 1] ; C > 0 \quad (14)$$

$$subject\ to, \quad P_1x_1^1 + P_2x_2^1 + P_3x_3^1 + P_nx_n^1 = 2W_s \quad (15)$$

The following demand function for X_N is thus obtained as:[12]

$$X_N^D = X_N^D \left(\underset{-}{P_N}, \underset{+}{W_s}\right) \quad (16)$$

At equilibrium,

$$X_N = X_N^D \quad (17)$$

The General Equilibrium system is represented by the set of Eq. (4)-Eq. (13) and Eq. (17). There are eleven endogenous variables that are to be determined from eleven equations. From Eq. (6) we get W_M as a function of R. Substituting it into Eq. (5) we get $W_F$as function of R. From Eq. (7) we get$R$ as a function of P_N. From Eq. (8) W_S can be represented as a function

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[11] It can be usually observed that unskilled women workers are employed as maid servants in urban households. The unskilled women workers' service is therefore directly consumed by urban elites. These maid services can be either provided by female workers in unregulated manner through various urban contacts/relations, or through 'Aya' centers in a more regulated manner.

[12]See Appendix B for detailed mathematical derivation.

of P_N. Thus, all factor prices can be expressed as a function of P_N. From Eq. (12) we get X_3as a function of P_N. Plugging it in Eq. (10) and Eq. (13) we can simultaneously solve for $X_1 and X_2$ as function of P_N. From Eq. (11) we get supply of X_N as a function of P_N. Finally, from demand-supply Eq. (17) we can solve for the equilibrium value of P_N. This completes the determination of equilibrium values in the model. The model does not possess decomposition property. The capital coefficient in sector 1 is taken to be technologically fixed. Here, it is assumed that the traditional sector is more male labour-intensive compared to capital than the advanced agriculture sector. This is implied by the following condition,

$$\frac{\lambda_{M1}}{\lambda_{K1}} > \frac{\lambda_{M2}}{\lambda_{K2}} \tag{18}$$

$where, \lambda_{ji} = \frac{a_{ji}X_i}{j}$ is the share of the jth factor employed in the ith sector.

5. COMPARATIVE STATICS

How economic liberalization and advancement of society does affect female labour force participation and gender-based wage gap? General wisdom suggests that with improvement in the economic performance and progress, it is more likely that growth will lead to increased employment opportunities for female workers and with a more favourable social attitude towards women, their economic position may improve. However, this may not be true under certain special conditions and different inter-sectoral factor intensity that must count as a strong determinant factor in determining female's share in the labour force.

5.1 Economic liberalization

The effect of economic liberalization is considered in terms of an increase in inflow of direct foreign capital in the economy. This escalates the aggregate capital endowment thus lowering the returns to capital, R owing to excess supply in the capital market. A fall in R leads to saving on capital cost of sector 1, sector 2 and sector 3. Since sector 2 and sector 3 employs

only two factors of production, therefore, the zero profit conditions (Eq. (6) and Eq. (8)) implies that male wage rate W_M and skilled wage rate W_S both must rise. Skilled families' income rises owing to an increase in W_S thus causing an expansion of demand for female labour specific services from sector *N*. This puts upward pressure on its price, P_N. This is the demand side effect.

Next, we consider the supply side effect. Sector 1 and sector 2 forms a *sub-system* with two inter-sectorally mobile factors: unskilled male labour and capital. The sub-system now receives higher amount of capital. Due to *Rybczynski effect,* sector 2 expands and sector 1 contracts given that sector 2 is more *capital-intensive* relative to male labour than sector 1. The contracting sector 1 releases female labour that moves to sector N and its return W_F thus falls. Sector N now expands putting downward pressure on its price P_N. Thus, two opposite forces are acting on P_N. On one hand, demand escalation leads to increase in P_N and on the other hand, expansion of supply causes P_N to fall. However, under a special sufficient condition for Walrasian stability to hold we obtain that P_N will ultimately fall.[13] The following proposition is immediate.

Proposition 1- Economic liberalization in the form of liberalization of foreign capital inflow that is utilized in both the agriculture sector and the import-competing sector, escalates the gender-based wage inequality thus widening gender disparity.

The effect on female labour supply is also imperative to analyze as it measures the female labour force participation rate. With foreign capital inflow there are two effects on the arguments of female labour supply. First, W_M rises that causes L_F to rise. Second, W_F falls causing L_F to decrease. Thus, both the effects uniformly cause L_F to fall. Therefore, the

[13] See Appendix D for stability of the model.

result strongly opposes the conventional belief that economic liberalization necessarily leads to women empowerment. Proposition 2 summarizes the result.

Proposition 2- Inflow of foreign capital due to liberalization policies leads to a decline in female labour force participation rate.

5.2 Social Liberalization (Consumerism)

Social liberalization implies all attempts to change social attitude towards women participating in various economic activities. For our present purpose it is reflected by a fall in γ. Given that L_F responds negatively to γ, this implies L_F rises since its supply curve shifts to the right given $\frac{W_M}{W_F}$ ratio. The increased female labour supply causes W_F to fall. Female labour is specific to sector 1 and sector N, thus both the sector expands in terms of output. An expansion of output in sector N causes supply of X_N to increase and P_N to fall. This is the supply side effect. Now consider the demand side effect. Since sector 1 expands it demands more male labour and capital and sector 2 contracts to release capital and labour. Given factor intensity ranking between sector 1 and 2, there arises excess supply of capital and excess demand for unskilled male labour causing W_M to rise and R to fall. Since R falls it then follows from zero profit condition in sector 3 that W_S must rise. Increase in skilled wage rate implies higher demand for female labour specific services from sector N by the skilled households, thus inflating the price of these non-traded services, P_N. Walrasian stability condition implies that supply side conditions are dominative, leading to a lower P_N. A lower P_N implies a lower female wage rate,W_F thus widening male-female wage inequality. The following proposition is immediate.

Proposition 3- With social liberalization in terms of an exogenous increase in female labour supply accentuates gender-based wage disparity.

However, the effect of increase in γ on female labour supply is interesting to note. There are two opposite forces at work. First, with a fall in γ female labour supply rises. Second, with an increase in $\frac{W_M}{W_F}$ ratio female labour supply falls. The first effect is due to direct ***social impact*** and the second effect is due to ***economic impact*** that arises as an indirect consequence of the social impact. The *first* implication is that any socially motivated policy may not directly produce the desired outcome by improving female labour force participation given that other economic forces are at work that might produce a counterproductive effect. The *second* implication is concerned with sensitiveness of female labour supply function towards γ *and* W_M, i.e. elasticity condition.

Let $|\epsilon_\gamma|$and $|\epsilon_\omega|$ denotes the absolute value of elasticity of female labour supply function with respect to γ and ω respectively , where $\omega = \frac{W_M}{W_F}$. Now, consider the following two situations. Let $|\epsilon_\gamma| > |\epsilon_\omega|$ i.e. families are more sensitive towards change in γ than change in income distribution effect ω. This implies an increase in L_F. It is observed in advanced societies with lower value of γ and higher value of W_M. Since in such societies people responds more towards progressive social changes relative to change in income distribution. For instance, unskilled working families traditionally living in conservative rural areas are less likely to respond to social policies promoted by Government such as early child marriage of girls, anti-dowry policies etc., however, those unskilled workers belonging to urban areas surrounded by more progressive masses are more likely to change their attitude towards such social intervening policies.[14] The opposite effect on L_F holds if $|\epsilon_\gamma| < |\epsilon_\omega|$. This happens in the traditional societies with higher value of γ. This results in the following proposition.

[14]It is the simple case of acquired morality as defined in Basu and Van (1998). Acquired morality varies both due to impact of policies overtime or differs over change in geography and society.

Proposition 4- Social liberalization have ambiguous effect on female labour force participation that crucially hinges on elasticity condition with respect to relative wage ratio (economic impact) and γ (social impact) .

The above proposition can be represented in a simple diagram to illustrate changing social structure, or dynamics of social transition.

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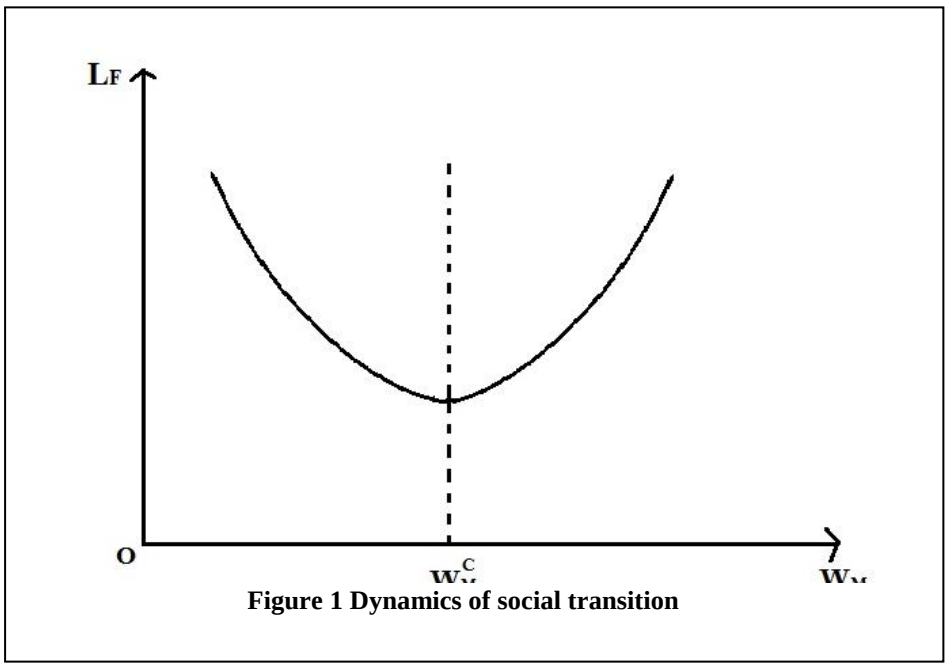

Figure 1 Dynamics of social transition

The traditional and relatively poor families earns wage rate below W_M^C i.e. below the critical level of male wage rate. Male members of those families living in modern societies earns wage rate above W_M^C . Those households with wage rate below (above) W_M^C are more (less) sensitive towards income distribution relative to sensitiveness towards change inγ, thus as society transits from higher value of γ (conservatism) to lower value γ (modernization) female labour supply falls (rises) with increase in W_M . Thus, we obtain a U-shaped female labour supply curve in the transitional stage. Hence, it implies as society transits from conservatism to consumerism implication of male wage rate changes on female labour supply decision.

6. CONCLUDING REMARKS

Gender inequality issues have been widely discussed in developing economies like India. It is considered as a prevalent issue in the labour market of these countries. Our paper attempts to analyze the basic intersection of two vast theories, namely, gender studies and international trade that is not only an emerging issue but also very much sensitive in terms of impact of international trade policies on gender based wage inequality as well as on female labour force participation. In so doing we constructed a four sector - three factor General Equilibrium model with endogenized female labour supply function and non-traded female labour specific sector. In our analysis, we linked female labour force participation not only with female wage rate, but also with wage earning of the male member and the family's attitude towards female member working in wage-earning activities. Male wage rate is inversely related to female labour supply that is because household are assumed to be altruistic towards female leisure. In poor household female participates in workforce not by choice but due to economic compulsions to support her household's consumption. Therefore, an increase in male wage rate would increase aggregate family income thus partially putting off the burden of female labour hours. Our paper obtained some counterproductive results as follows. First, it is obtained that an increase in foreign capital inflow worsens male-female wage inequality and results in decline in female labour force participation under a reasonable factor intensity condition, i.e. the traditional agriculture sector is relatively less capital-intensive than the advanced agriculture sector. It clearly opposes the conventional belief that FDI will provide the economic stimulus to increase the scope of employment for women and thus improving the living standard of female workers. Second, a social liberalization policy in terms of change in family's attitude towards women by allowing them to participate in the labour market may not fruitfully impact the female empowerment without proper government intervention. Moreover, it worsens wage inequality and may ultimately end up with lower

female labour force participation if cross income effect of male labour dominates the social impact due to gender awareness programmes. The main recommendation of the paper is that while adopting any economic or social policy to improve female labour force participation, the degree of family altruism towards their female working member must be taken into account that carries much larger weight for a country like India or its adjoining South East Asian nations where informal (unskilled) workers dominates the labour market. At the same time it must also be tracked out the implication for the destination sectors through which the new foreign capital enters into the economy and have related chain of effects on other sectors which then affects the male-female wage disparity, as it is evident from the paper that foreign capital in the agriculture sector may not lead to favourable outcomes for gender-based wage disparity problem. The paper is limited in certain scopes. First, the paper analysis only a small intersection of gender related issues that is wage disparity and labour force participation rate, however, other social disparities that coexist are not within the scope of this paper. Second, a very straightforward utility function of a unitary household is assumed which could be possibly extended to incorporate intra-household bargaining between male and female member based on certain factor and some other instrumental variables. Third, there exists scope for finding out the effect of unskilled female member accumulating skills through education or some vocational short-term training as these are the most focused area of recent Government policies aimed at empowering women and develop a more egalitarian society.

REFERENCES

Artecona, R., & Cunningham, W. (2002). Effects of Trade Liberalization on the Gender Wage Gap in Mexico. *Development Research Group, The World Bank* .

Basu, K., & Van, P. H. (1998). The Economics of Child Labour. *American Economic Association, Vol. 88 (3)* , 412-427.

Becker, G. S. (1971). *The Economics of Discrimination* (2nd Edition ed.). University of Chicago Press.

Berik, G., Rodgers, Y. v., & Zveglich, J. E. (2004). International Trade and Gender Wage Discrimination: Evidence from East Asia. *Review of Development Economics , 8* (2), 237-254.

Braunstein, E., & Brenner, M. (2017). Foreign Direct Investment And Gendered Wages In Urban China. *Feminist Economics , 13* (3-4), 213-237.

Bui, D. T., & Hoai, M. (2018). Gender Inequality and FDI: Empirical Evidence From Developing Asia-Pacific Countries. *Eurasian Economic Review* , 2-17.

Chaudhuri, B., & Panigrahi, A. K. (2013). Gender Bias in Indian Industry. *The Journal of Industrial Statistics , 2* (1), 108-127.

Chaudhuri, S., Roychowdhury, S. P., & Chaudhuri, S. (2019). Gender-based wage inequality and economic liberalism in the presence of endogenous supply of female labour. *Indian Economic Review* .

Dwibedi, J. K., & Chaudhuri, S. (2017). *Globalisation, Consumerism and Child Labour.* Retrieved 06 16, 2019, from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1226229

Feenstra, R. C., & Hanson, G. H. (1997). Foreign Direct Investment and Relative Wages: Evidence from Mexico's maquiladoras. *Journal of International Economics , 42*, 371-393.

Goldin, C. (1994). The u-shaped female labour force function ineconomic development and economic history. *Working Paper No. 4707. Cambridge, MA: National Bureau of Economic Research* .

Jones, R. W. (1965). The Structure of Simple General Equilibrium Model. *Journal of Political Economy ,* 551-572.

Jones, R. W. (1971). A three-factor model in theory, trade and history. In J. N. Bhagwati, *Trade , Balance of Payment and Growth.* North Holland Publishing Company.

Klasen, Peters, & Pieters, J (2012). Push or Pull? Drivers of Female Labour Force Participation During India's Economic Boom. *Institute of Labour Studies, Discussion Paper No. 6395*

Mukhopadhyay, U. & Chaudhuri, S. (2013). Economic Liberalization, Gender Wage Inequality and Welfare, *Journal of International Trade and Economic Development* 22(8), 1214-1239.

Poddar, S. & Chaudhuri (2016). Economic Reforms and Gender-based Wage Inequality in the Presence of Factor Market Distortions. J*ournal of Quantitative Economics*, 14(2), 301–321.

Rahman,R.I.,& Islam,R. (2013). Female labour force participation in Bangladesh: trends, drivers and barriers. *ILO Asia Pacific Working Paper, 1-16.*

Sanghi, S., Srija, A., & Vijay, S. S. (2015). Decline in Rural Female Labour Force in India: A Relook Into the Causes. *Vikalpa: The Journal for Decision Maker , 40* (3), 255-268.

Stephanie, S. (2000). Gender Inequality and Economic Growth: A Cross-Country Analysis. *World Development , 28* (7), 1211-1230.

7. MATHEMATICAL APPENDIX

7.1 Appendix A. Derivation of female labour supply function

$$Max \qquad U = Bx_1^{\alpha}x_2^{\delta}x_3^{\emptyset}(1-l_F)^{\gamma} \;\; ; \quad [\alpha+\delta+\emptyset+\gamma=1] \quad (A.1)$$

$$S.t \qquad P_1x_1 + P_2x_2 + P_3x_3 = W_M + l_FW_F \quad (A.2)$$

Setting up the Lagrangian expression-

$$L = Bx_1^{\alpha}x_2^{\delta}x_3^{\emptyset}(1-l_F)^{\gamma} + \lambda[W_M + l_FW_F - (P_1x_1 + P_2x_2 + P_3x_3)] \quad (A.3)$$

The first-order conditions for obtaining interior solutions

$$\frac{\partial L}{\partial x_1} = B\alpha x_1^{\alpha-1}x_2^{\delta}x_3^{\emptyset}(1-l_F)^{\gamma} - \lambda P_1 = 0 \ldots\ldots\ldots\ldots\ldots (A.3.1)$$

$$\frac{\partial L}{\partial x_2} = B\delta x_1^{\alpha}x_2^{\delta-1}x_3^{\emptyset}(1-l_F)^{\gamma} - \lambda P_2 = 0 \ldots\ldots\ldots\ldots\ldots (A.3.2)$$

$$\frac{\partial L}{\partial x_3} = B\emptyset x_1^{\alpha}x_2^{\delta}x_3^{\emptyset-1}(1-l_F)^{\gamma} - \lambda P_3 = 0 \ldots\ldots\ldots\ldots\ldots (A.3.3)$$

$$\frac{\partial L}{\partial l_F} = -B\gamma x_1^{\alpha}x_2^{\delta}x_3^{\emptyset}(1-l_F)^{\gamma-1} + \lambda W_F = 0 \ldots\ldots\ldots\ldots\ldots (A.3.4)$$

$$\frac{\partial L}{\partial \lambda} = W_M + l_FW_F - P_1X_1 - P_2X_2 - P_3X_3 = 0 \ldots\ldots\ldots\ldots\ldots (A.3.5)$$

$(A.3.1) \div (A.3.2)$ *we get,*

$$\frac{\alpha}{\delta}\frac{x_2}{x_1} = \frac{P_1}{P_2} => \frac{\alpha}{\delta}x_2P_2 = P_1x_1 \qquad (A.3.6)$$

$$(A.3.2) \div (A.3.3)\ we\ get,$$

$$\frac{\delta}{\emptyset}\frac{x_3}{x_2} = \frac{P_2}{P_3} => \frac{\delta}{\emptyset}x_3P_3 = P_2x_2 \qquad (A.3.7)$$

$(A.3.3) \div (A.3.4)\ we\ get$

$$\frac{\emptyset}{\gamma}\frac{(1-l_F)}{x_3} = \frac{P_3}{W_F} \Rightarrow \frac{\emptyset}{\gamma}(1-l_F)W_F = P_3X_3 \quad (A.3.8)$$

$substitute\ (A.3.6), (A.3.7)\ and\ (A.3.8) in\ (A.3.5)$

$$\frac{\alpha}{\delta}x_2P_2 + P_2x_2 + \frac{\emptyset}{\delta}P_2x_2 = W_M + l_FW_F$$

$$\Rightarrow\ x_2P_2\left[\frac{\alpha+\emptyset+\delta}{\delta}\right] = W_M + l_FW_F$$

$$\Rightarrow \frac{\emptyset}{\gamma}(1-l_F)W_F\frac{\delta}{\emptyset}\left[\frac{(\alpha+\emptyset+\delta)}{\delta}\right] = W_M + l_FW_F$$

$$\Rightarrow \quad W_F\left[\frac{\alpha+\emptyset+\delta}{\gamma}\right] - W_M = l_FW_F\left(1+\frac{\alpha+\emptyset+\delta}{\gamma}\right)$$

$$\Rightarrow \quad W_F\left[\frac{\alpha+\emptyset+\delta}{\gamma}\right] - W_M = l_FW_F\left(\frac{1}{\gamma}\right)$$

$$\Rightarrow \quad \boldsymbol{l_F^*} = (\alpha+\emptyset+\delta) - \left(\frac{\mathrm{W_M}}{\mathrm{W_F}}\right)\boldsymbol{\gamma}(A.4)$$

$$L_F = L\ l_F\begin{pmatrix}\boldsymbol{W_F} & \boldsymbol{W_M} & \boldsymbol{\gamma}\\ (+)' & (-)' & (-)\end{pmatrix}$$

7.2 Appendix B. Derivation of demand function for non-traded commodity

$$Max \quad \mathrm{V} = \mathrm{C}(\mathrm{x}_1^1)^{\beta_1}(\mathrm{x}_2^1)^{\beta_2}(\mathrm{x}_3^1)^{\beta_3}(\mathrm{x}_\mathrm{N}^1)^{\beta_\mathrm{n}} ; \quad [\beta_1 + \beta_2 + \beta_3 + \beta_\mathrm{n} = 1] \ (\mathrm{B}.1)$$

$$s.t \ P_1x_1^1 + P_2x_2^1 + P_3x_3^1 + P_Nx_N^1 = 2W_s \qquad (B.2)$$

Using Lagrangian as in appendix A.1, we get

$$x_N^{1\,*} = \beta_n\left[\frac{2W_s}{P_N}\right] \qquad (B.3)$$

Since there are "$\bar{S}$" identical households in the urban sector, thus aggregate demand is given by:

$$\bar{S}x_N^{1\,*} \equiv X_N^D = \bar{S}\beta_N\left[\frac{2W_s}{P_N}\right]$$

$$\bar{S}x_N^* \equiv X_N^D = X_N^D(W_S, P_N)$$

7.3 Appendix C. Equation of change

$$\varepsilon_{jk}^i = \frac{\partial a_{ji}}{\partial \omega_k}.\frac{\omega_k}{a_{ji}}; i = \{1,2,3,N\} ; \ j,k = \{M,F,K,S\} ; \ \omega_k = factor\ price\ of\ kth\ input$$

$$\hat{a}_{M1} = \varepsilon_{MM}^1\widehat{W}_M + \varepsilon_{MF}^1\widehat{W}_F + \varepsilon_{MK}^1\hat{R}$$

$$\hat{a}_{F1} = \varepsilon_{FM}^1\widehat{W}_M + \varepsilon_{FF}^1\widehat{W}_F + \varepsilon_{FK}^1\hat{R}$$

$$\hat{a}_{M2} = \varepsilon_{MM}^2\widehat{W}_M + \varepsilon_{MK}^2\hat{R}$$

$$\hat{a}_{K2} = \varepsilon_{KM}^2\widehat{W}_M + \varepsilon_{KK}^2\hat{R}$$

$$\hat{a}_{S3} = \varepsilon_{SS}^3\widehat{W}_S + \varepsilon_{SK}^3\hat{R}$$

$$\hat{a}_{K3} = \varepsilon_{KS}^3\widehat{W}_S + \varepsilon_{KK}^3\hat{R}$$

$$where \ \varepsilon_{jk}^i \begin{cases} > 0 \ if \ j \neq k \\ < 0 \ if \ j = k \end{cases}$$

Differentiating equation 1we get:

$$\widehat{W}_M = -\frac{\theta_{F1}}{\theta_{M1}}\widehat{W}_F - \frac{\theta_{K1}}{\theta_{M1}}\hat{R} \quad (C.1)$$

Differentiating equation 2 we get:

$$\hat{R} = \frac{\theta_{M2}\theta_{F1}}{\theta_{K2}\theta_{M1} - \theta_{K1}\theta_{M2}}\widehat{W}_F \quad (C.2)$$

Differentiating equation 3 we get:

$$\widehat{W}_F = \frac{\hat{P}_N}{\theta_{FN}} \quad (C.3)$$

Substituting (C.3) in (C.2) we get

$$\hat{R} = A_2\hat{P}_N;\ \text{Where } A_2 = \frac{\theta_{M2}\theta_{F1}}{\theta_{FN}(\theta_{K2}\theta_{M1} - \theta_{K1}\theta_{M2})};\ A_2 > 0 \quad (C.4)$$

Differentiating equation 4 we get:

$$\widehat{W}_S = A_1\hat{P}_N; \text{Where} A_1 = \frac{-\theta_{K3}\theta_{M2}\theta_{F1}}{\theta_{S3}\theta_{FN}(\theta_{K2}\theta_{M1} - \theta_{K1}\theta_{M2})}; A_1 < 0 \quad (C.5)$$

Substituting (C.3) and (C.4) in (C.1)we get:

$$\widehat{W}_M = A_5A_2\hat{P}_N\ ; \text{Where} A_5 = -\frac{\theta_{F1}}{\theta_{M1}}\left(\frac{\theta_{K2}\theta_{M1} - \theta_{K1}\theta_{M2}}{\theta_{F1}\theta_{M2}}\right) - \frac{\theta_{K1}}{\theta_{M1}};\quad A_5 < 0 \quad (C.6)$$

Total differentiating equation 8 we get:

$$\lambda_{S3}\hat{X}_3 + \lambda_{S3}\hat{a}_{S3} = 0$$

$$\hat{X}_3 = A_6\hat{P}_N; \quad (C.8)$$

Taking total differential of equation 6 and 9 respectively we get:

$$\lambda_{M1}\hat{X}_1 + \lambda_{M2}\hat{X}_2 = A_3 (C.9)$$

$$\lambda_{K1}\hat{X}_1 + \lambda_{K2}\hat{X}_2 = A_4 \qquad (C.10)$$

SolvingC.9 and C.10 simultaneously we get:

$$\hat{X}_1 = \frac{\lambda_{K2}A_3 - \lambda_{M2}A_4}{\Delta_1}; \qquad Where\ \Delta_1 = \lambda_{M1}\lambda_{K2} - \lambda_{M2}\lambda_{K1}$$

$$\hat{X}_2 = \frac{\lambda_{M1}A_4 - \lambda_{K1}A_3}{\Delta_1};$$

Substituting (C.9) and (C.10) in the above expression we get

$$\hat{X}_1 = \frac{\hat{P}_N}{\Delta_1}A_7 - \frac{\lambda_{M2}\hat{K}}{\Delta_1} (C.11)$$

$$\hat{X}_2 = \frac{\hat{P}_N}{\Delta_1}\left(A_5A_2a_4 + \frac{a_5}{\theta_{FN}} + a_6A_1 + a_7A_2 - \lambda_{M1}\lambda_{K3}A_6\right) + \frac{\lambda_{M1}\hat{K}}{\Delta_1} \qquad (C.12)$$

Taking total differential equation 7 we get:

$$\hat{X}_N = \frac{E_\gamma}{\lambda_{FN}}\hat{\gamma} + \frac{\lambda_{F1}\lambda_{M2}}{\lambda_{FN}\Delta_1}\hat{K} - \hat{P}_N A_8 \qquad (C.13)$$

At Equilibrium$X_N^D = X_N^S = X_N(W_S, P_N)$ $(C.14)$

$$\Rightarrow \qquad lnX_N^D = lnX_N$$

$$\Rightarrow \quad \frac{1}{X_N}\left[\frac{\partial X_N}{\partial W_S}\frac{dW_S}{W_S} + \frac{\partial X_N}{\partial P_N}\frac{dP_N}{P_N}\right] = \frac{1}{X_N}\,dX_N$$

$$\Rightarrow e_{W_s}\widehat{W}_S + e_{P_N}\widehat{P}_N = \frac{E_\gamma\hat{\gamma}}{\lambda_{FN}} + \frac{\lambda_{F1}\lambda_{M2}}{\lambda_{FN}\Delta_1}\widehat{K} - \widehat{P}_N A_8$$

where,$e_j = \frac{\partial X_N}{\partial j}\frac{j}{X_N}$; $j = W_S, P_N$

$$\Rightarrow \widehat{P}_N\left[e_{W_s}A_1 + e_{P_N} + A_8\right] = \frac{E_\gamma \hat{\gamma}}{\lambda_{FN}} + \frac{\lambda_{F1}\lambda_{M2}}{\lambda_{FN}\Delta_1}\widehat{K} \qquad (C.15)$$

where,

$A_6 = -(\varepsilon^3_{SS}A_1 + \varepsilon^3_{SK}A_2) < 0$

$$A_3 = -\left[A_5A_2(\lambda_{M1}\varepsilon^1_{MM} + \lambda_{M2}\varepsilon^2_{MM}) + \frac{\lambda_{M1}}{\theta_{F1}}\varepsilon^1_{MF} + A_2(\lambda_{M1}\varepsilon^1_{MK} + \lambda_{M2}\varepsilon^2_{MK})\right]\hat{P}_N$$

$$A_4 = \widehat{K} - [\lambda_{K3}A_6 + \lambda_{K2}\varepsilon^2_{KM}A_5A_2 + \lambda_{K3}\varepsilon^3_{KS}A_1 + (\lambda_{K2}\varepsilon^2_{KK} + \lambda_{K3}\varepsilon^3_{KK})A_2]\widehat{P_N}$$

$A_7 = a_1A_2A_5 + \frac{a_2}{\theta_{FN}} + a_3A_2 + \lambda_{M2}\lambda_{K3}A_6 + \lambda_{M2}\lambda_{K3}A_1\varepsilon^3_{KS} < 0$

$A_8 = \frac{\lambda_{F1}A_7}{\Delta_1} + (\lambda_{F1}\varepsilon^1_{FM} - E_M)A_5A_2 + \left(\frac{\lambda_{F1}\varepsilon^1_{FF} - E_F}{\theta_{FN}}\right) + \lambda_{F1}\varepsilon^1_{FK}A_2$

$a_1 = (-\lambda_{K2}\lambda_{M1}\varepsilon^1_{MM} + \lambda_{M2}\lambda_{K2}\varepsilon^2_{KM} - \lambda_{K2}\lambda_{M2}\varepsilon^2_{MM} > 0$

$a_2 = (-\lambda_{K2}\lambda_{M1}\varepsilon^1_{MF}) < 0$

$a_3 = (-\lambda_{K2}\lambda_{M1}\varepsilon^1_{MK} - \lambda_{K2}\lambda_{M2}\varepsilon^2_{MK} + \lambda_{M2}\lambda_{K2}\varepsilon^2_{KK} + \lambda_{M2}\lambda_{K3}\varepsilon^3_{KK}) < 0$

7.4 Appendix D. Stability conditions for equilibrium in the market for the non-traded commodity.

The value of excess demand is given by

$$ED = X_N(W_S, P_N) - X_N \qquad (D.1)$$

Differentiating with respect to P_N:

$$\frac{\partial ED}{\partial P_N} = \left[\frac{\partial X_N}{\partial P_N}\right] - \frac{\partial X_N}{\partial P_N}$$

$$=> \frac{\partial ED}{\partial P_N} = \left[\frac{\partial X_N}{\partial W_S}\frac{dW_S}{dP_N} + \frac{\partial X_N}{\partial P_N}\right] - \frac{\partial X_N}{\partial P_N}$$

$$=> \frac{\partial ED}{\partial P_N} = \frac{X_N}{P_N}\left[\frac{\partial X_N}{\partial W_S}\frac{W_S}{X_N}\frac{\widehat{W_S}}{\widehat{P_N}} + \frac{\partial X_N}{\partial P_N}\frac{P_N}{X_N}\right] - \frac{dX_N}{dP_N}$$

$$=> \frac{\partial ED}{\partial P_N} = \frac{X_N}{P_N}\left[e_{WS}\frac{\widehat{W_S}}{\widehat{P_N}} + e_{P_N} - \frac{\widehat{X_N}}{\widehat{P_N}}\right]$$

$$=> \frac{\partial ED}{\partial P_N} = \frac{X_N}{P_N}\left[e_{WS}A_1 + e_{P_N} + A_8\right] \qquad (D.2)$$

For stability of the model, we need:

$$\frac{\partial ED}{\partial P_N} < 0 \;\; if \; \left(e_{WS}A_1 + e_{P_N} + A_8\right) < 0$$

Thus the necessary condition for stability of the model is given by:

$$\left(e_{WS}A_1 + e_{P_N} + A_8\right) < 0 \qquad (D.3)$$

And the sufficient condition is given by:$A_8 \leq 0$