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February 2015

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*Sugata Marjit is indebted to Federal Reserve Bank St. Louis for hosting him as a visiting scholar. Biswajit Mandal acknowledges the financial support from University Grants Commission. The usual disclaimer applies.

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Abstract

This paper provides an elaborate general equilibrium framework by including informal economic activities in a model of trade, migration and unemployment. Existence of informal activities is critical in generating positive employment effects of liberal trade policies. Following a tariff cut informal wage increases and rate of unemployment goes down under reasonable conditions. Next we generalize the benchmark model to capture the phenomenon of sequential migration: from agriculture to urban informal sector, and then to urban formal sector. The paper also extends the benchmark model to include both informal intermediate and final good.

Key words: International Trade; Employment; Informal Wage; General Equilibrium.

JEL classification: F1, O17, J31, D5

1. Introduction

This paper starts with a popular saying that good news is hardly any news and bad news is all that counts. Effect of reformatory policies on development in general and employment in particular is such an issue that has been generating a never-ending debate among economists, policy makers since the time trade liberalization was initiated. Overall impact of any economic policy should be judged by its entirety which partial equilibrium analysis is incapable of. Partial effects often give us gloomy picture and create "bad news" while the overall scenario could be a better one and can create "good news if properly reported". Typically this thing happens when tariff goes down following trade liberalization and people lose jobs in the import-competing sector. On the other hand, the exportable sector may expand and the total employment may, in fact, go up. If the second outcome is not reported, good side of the story remains untold. Therefore, here we take up a general equilibrium model of trade to focus on both "good" and "bad" news to do an impartial assessment of effectiveness of any reformatory policy. In the existing, relatively recent literature, it has been demonstrated that in case of India, which initiated pro-market reforms in the early 90s, real informal wage in the unorganized manufacturing sector had gone up across all states, without exception. In this paper we focus on open urban employment, intersectoral capital mobility and alternative activities of the informal sector and argue that under reasonable conditions a cut in tariff will raise informal wage and reduce rate of unemployment.

Sarkar (1989), Beladi and Marjit (1996), Marjit and Beladi (2003), Chao & Yu (1995, 2001), and Fields (2005) etc. are some interesting papers in the existing literature that talks about possible employment effects. Sarkar (1989) argued how in a Keynesian model trade definitely leads to more unemployment if the economy suffers from effective demand constraints. Other papers used variants of H-T model to look at the effect of trade policies on open unemployment. On the other hand, in an interesting paper Gupta (1997) introduced informal sector in H-T model[1]. But the urban informal wage in such models is less than the rural wage, as expected urban wage has to be equal to the rural wage and the urban formal wage is greater than the rural wage. But casual empiricism suggests that in the developing world there is a fair bit of mobility between the urban informal sector and the rural sector. So we assume that workers get the same wage in both sectors. The urban informal sector draws labor from the rural sector and capital from the urban formal sector. Such mobility assigns a pivotal role to the informal sector. The way we set up the model allows workers to choose between working in the informal sector or going back to the rural sector and of course the choice of "waiting" in the pool of unemployed.

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[1] Two interesting papers by Banerjee and Newman (1995, 1998) need special mention. They primarily emphasized how migration, leads to development and thereby integrate different parts of the country or world through migration process.

Empirically the significance of the urban informal sector has been understood in many papers. Agenor (1996) provides an elegant survey on the size of informal sectors in developing countries. By quoting numerous studies, informal labor force accounts for more than 90% of total labor force. Segmented labor markets and implications of development policies in such a set-up have been analyzed in Agenor and Montiel (1996). Drawing on earlier papers by Agenor and Montiel (1996), Marjit (2003), Agenor (2005) and Marjit, Kar and Beladi (2007) looked at the possibility of arising informal wage and employment when laid off workers from the formal sector crowd into the informal sector[2]. Marjit and Kar (2011) is an interesting compilation of a reasonably good number of papers in this line of research. But somehow employment effect of trade policy in a standard HT structure with an informal sector is largely absent in the literature.

In our framework a decline in tariff reduces open unemployment through expansion of employment in the informal sector and an increase in the informal wage. The result is an outcome of having a labor intensive urban informal sector and allowing capital to move between the formal and the informal sector. It is more simple and general than the earlier work of Beladi and Marjit (1996) which brings in an

[2] Though recent literature on migration, informal sector and development economics has changed to a significant extent, the basic arguments of major research revolves around H-T set up. Some notable articles in such line are Fields (2009), Gerxhani (2004), Chen (2005), Gang and Gangopadhyay (1987), Stark (1991), Rauch (1991), Meng (2001), Haan (2000), Olesen (2002), Skeldon (2008), Haas (2010) etc.

intermediate input in the HT structure together employment reducing effect of protection.

The plan of the paper is as follows. Second section discusses the benchmark model and the equilibrium. This section also deals with the impact of a tariff when the informal is a traded sector. In this backdrop we also check what happens to unemployment in absence of informal sector.In section 3 we attempt to generalize the benchmark model with the notion of sequential migration where people cannot directly move from rural to urban formal sector. And hence they need to be absorbed in urban informal sector as a stop gap arrangement. But the prevailing wage rates in rural and urban informal sector are not identical, which is a conventional starting point of this kind of research.Thenext section presents an extended version of the benchmark model to focus on the role of capital mobility. In doing so we introduce two different types of capital and two informal sectors where one produces an intermediate input and the other produces a final good.The last section provides some concluding remarks. However, relevant mathematical details are provided in the Appendix.

2.The BenchmarkModel and Solutions

There are three goods X (urban formal manufacturing good), Y (urban informal good), and A (the agricultural good) produced in the neo-classical framework using three factors such as labor (L) and two types of capital (K and T). K is perfectly mobile across X and Y but T is specific to A. Labor is freely mobile between Y and Z, in the sense that workers earn the same wage, W-informal wage in both these sectors. But X offers a wage $\bar{W}$ formal wage which is determined through negotiation between producers and labor with the unions.[3] To motivate on H-T kind of migration equilibrium we further assume that there is open unemployment i.e. the workers migrating from the rural to the urban are a can either hang around unemployed waiting for a formal job which gives $\bar{W} > W$ or they can get W either in the urban informal sector or in the rural sector. So they are basically indifferent between urban informal sector and rural sector. K moves freely between the urban formal and informal sectors earning the same return, r, whereas T gets R as return.

We also assume that X is an import-competing good protected by tariff, t. On the other hand, Y, the informal manufacturing sector is assumed to produce a traded good. The agricultural good, A is an export good. The country concerned is a small one, so commodity prices are determined in the international market.

The symbols and basic equations are in consistence with Jones (1965). To build the system of equations, we use following notations:

[3]In this paper we would be using a variant of Harris-Todaro (H-T) structure with Jonesian ('65, '71) general equilibrium structures of Heckscher-Ohlin and Specific Factors model of trade.

P_i = Price of ith good, i = X, Y, A; $\bar{W}$= Return to labor in the formal sector; W= Return to labor in the informal sector; r = Return to capital, K; a_{ij}= Technological co-efficient; $\bar{K}$= Total supply of capital K; $\bar{L}$= Total supply of labor; $\bar{T}$= Total supply of capital T; U=Unemployment rate.

Competitive commodity market guarantees the following equalities:

$$\bar{W}a_{lx} + r\, a_{kx} = P_x(1+t) \tag{1}$$

$$Wa_{ly} + r\, a_{ky} = P_y \tag{2}$$

$$Wa_{la} + R\, a_{ta} = P_a \tag{3}$$

Note that, $\bar{W} > W$.

Full employment conditions ensure the following:

$$a_{ta}.A = \bar{T} \tag{4}$$

$$a_{kx}.X + a_{ky}.Y = \bar{K} \tag{5}$$

T and$K$ are inelastic supplies of land and capital.

H-T migration equilibrium condition yields

$$W = \frac{\bar{W}a_{lx}X}{\bar{L}-(a_{ly}Y + a_{la}A)} \tag{6}$$

Therefore full employment condition for L can be written as

$$\frac{\bar{W}}{W}a_{lx}X + a_{ly}Y + L_a = \bar{L} \qquad \text{(6a)}^4$$

Let us now define U as unemployment or rate of unemployment as a ratio of number of unemployed people to the number of people seeking employment in X. Therefore,

[4] $a_{la}A = L_a$

$$U = 1 - \frac{a_{lx}X}{\bar{L} - (a_{ly}Y + a_{la}A)} \tag{7}$$

Plugging (6) into (7)

$$U = 1 - \frac{W}{\bar{W}} \tag{7a}$$

This completes the structure of the model. Now let us solve for the unknown variables. Given t and small country assumption we solve r, W and R from (1), (2) and (3) respectively. All a_{ij}s are determined via CRS and DMP assumptions. Therefore A is calculated from the full employment condition of T. (5) and (6a) determine X and Y, and U is determined from (7a). Thus the model is solved.

2.A. The Basic Result

Following liberalized trade policy t goes down. This pushes down r since L is unionized and gets a pre-determined wage $\bar{W}$. The exact effect is shown as (a 'hat' over a variables represents proportional change)

$$\hat{r} = \frac{t}{\theta_{kx}}\hat{t} \tag{8}$$[5]

$\hat{r} < 0$as$\hat{t} < 0$ and θ_{kx} is the value share of K in X. In this backdrop we will consider two cases: one where urban informal sector (Y) is present in the system in contrast to the alternative situation where the economy is devoid of the informal sector.

<u>Case-I: Y exists</u>

[5] θ_{ij} is the value share of ith factor in jth commodity where i=K, L, T and j= X, Y, A

$$\widehat{W} = (-)\frac{\theta_{ky}}{\theta_{ly}}\frac{t}{\theta_{kx}}\hat{t} > 0 \tag{9}$$

Informal wage goes up following a decline in t because even when r falls P_y does not change as Y is a traded good and the country is a small one. This causes an increase in W. Again when W goes up R must fall as P_a is also given.

$$\hat{R} = \frac{\theta_{ta}}{\theta_{la}}\frac{\theta_{ky}}{\theta_{ly}}\frac{t}{\theta_{kx}}\hat{t} < 0 \tag{10}$$

When return to T falls, people uses T more intensively. Hence with a given T, A must contract. At the same time L-constraint becomes less binding and K-constraint becomes more binding as both $\left(\frac{\bar{W}}{r}\right)$ and $\left(\frac{W}{r}\right)$ go up indicating relatively less utilization of L per

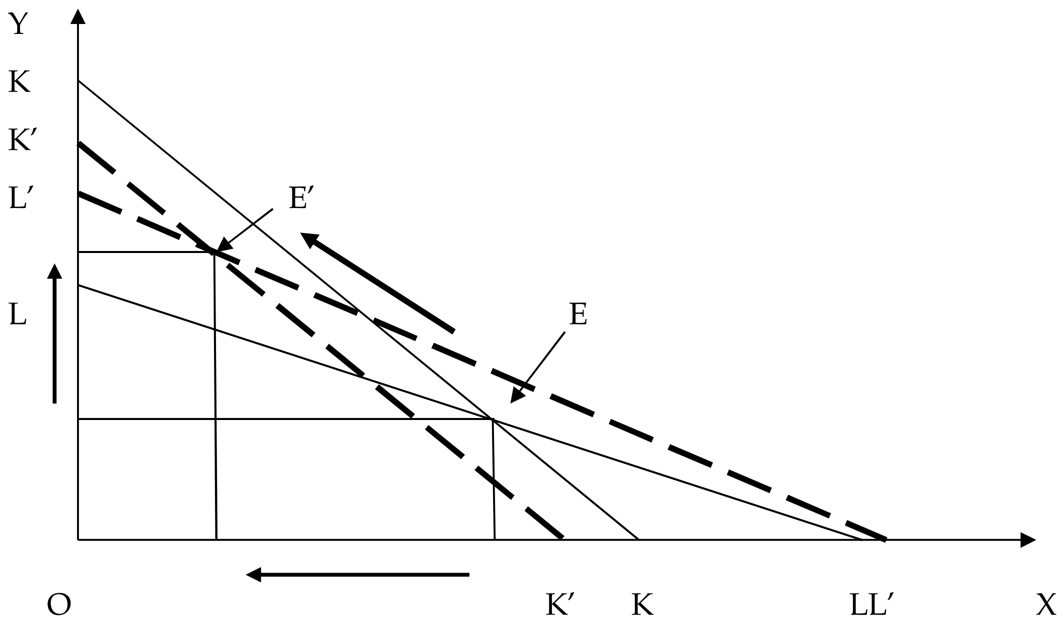

Figure-1

unit of X and Y. Therefore, depending on the factor intensity comparison between X and Y, different sectors would expand or contract. Conventionally X is K-intensive and Y is L-intensive. So X would fall and Y would inflate. This is described in the above figure (Figure-1). KK and LL are the original K-constraint and L-constraint respectively pointing at equilibrium at E. When r falls, a_{kx} and a_{ky} increase and a_{lx} and a_{ly} fall. New constraints would be K′K′ and L′L′. Even though K-constraint shifts down parallely, L-constraint would not shift up parallely as $\widehat{\left(\frac{W}{r}\right)} > \widehat{\left(\frac{\bar{W}}{r}\right)}$. It would be more like an anti-clockwise rotation. So the new equilibrium would be at E′ implying higher Y and lower X.

Algebraically,

$$\hat{A} = \sigma_a \frac{\theta_{la}}{\theta_{kx}} \frac{\theta_{ky}}{\theta_{ly}} \left(\frac{\theta_{ta} - \theta_{la}}{\theta_{la}}\right) t\hat{t} \qquad (11)^6$$

Naturally, $\theta_{ta} > \theta_{la}$; $\hat{A} < 0$ since $\hat{t} < 0$.

Differentiating (5) and (6a) and using (11) one can easily check that the value of $\hat{X}$ and $\hat{Y}$ is primarily determined by factor intensity ranking. Interested readers can find the detailed calculation in the Appendix.

$$\left.\begin{aligned} \hat{X} &= \frac{\lambda_{ky}}{|\lambda|} \frac{\theta_{ky}}{\theta_{ly}} t\hat{t} \left\{ \frac{\lambda_{lx}}{\theta_{kx}} - \sigma_a \frac{\theta_{la}}{\theta_{kx}} \frac{\lambda_{la}}{\theta_{la}} (\theta_{la} - \theta_{ta}) \right\} \\ \hat{Y} &= \frac{\lambda_{kx}}{|\lambda|} \frac{\theta_{ky}}{\theta_{ly}} t\hat{t} \left\{ \sigma_a \frac{\theta_{la}}{\theta_{kx}} \frac{\lambda_{la}}{\theta_{la}} (\theta_{la} - \theta_{ta}) - \frac{\lambda_{lx}}{\theta_{kx}} \right\} \end{aligned}\right] \qquad (12)^7$$

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[6] σ_a is the elasticity of substitution in A.

X will fall and Y will increase unambiguously if X is capital intensive which is a reasonable assumption, given that Y is considered to be the informal sector.

Now let us move to the focal point of the paper – effect on unemployment rate. Equation (7) yields

$$dU = \frac{W}{\bar{W}} \frac{t}{\theta_{kx}} \frac{\theta_{ky}}{\theta_{ly}} \hat{t} \qquad (13)$$

It is apparent from (13) that $dU < 0$ due to a tariff cut. Note that, the effect on U is independent of factor intensity assumptions of X, Y, and A.

<u>Case-II: Y does not exist</u>

A reduction in t also reduces r in this case like the situation when we had Y. Consequent upon a decrease in r, a_{kx} must go up and hence X must shrink. This will release L and they will rush to A pushing down W. Therefore, $U = 1 - \frac{W}{\bar{W}}$ will increase. Note that Y represented the urban informal sector, and it expanded. The set up that we consider in Case-II resembles a structure where capital cannot move between X and A. So it can also be conceived as a case of capital immobility[8].

Hence we propose that:

[7] $\lambda_{ij}$is the employment share of ith factor in jth commodity where i=K, L, T and j= X, Y, A. $|\lambda|$ is the factor employment share matrix for X and Y where $|\lambda| > 0$ means X is K-intensive and conversely if $|\lambda| < 0$.

[8] The capital was also immobile in Case-I. We will discuss the issue of capital immobility in a more complicated and extended structure in the next section.

PROPOSITION I: Liberal trade policy leads to a decline in the rate of unemployment irrespective of factor intensity ranking, if Y exists. ■

However, if X and A use same capital unlike the benchmark model, a fall in t induces W to rise. Hence $U = 1 - \frac{W}{\bar{W}}$ must fall. This indicates that capital mobility does not matter much if Y exists. In both cases U falls due tariff cut. But in absence of urban informal sectordU takes different value under two different capital mobility assumptions. Thus it seems that capital mobility among sectors is also very critical in determining as to what happens to unemployment rate owing to trade liberalization. Therefore, in section 4 we attempt to emphasize on the role of capital mobility in an economy characterized by unemployment and migration.

3. Generalizing the Benchmark Model with Sequential Migration

In this section we strive to reflect on more real world like phenomenon where people cannot migrate directly from agriculture (A) to urban formal sector (X). They come to urban informal sector (Y) first and then search for jobs there. So, in a sense it could be pseudo unemployment that we measure as unemployment. Though influx of L in Y pushes down W_1, and pull up W_2. We will explain the reasons later. But free mobility of L between Y and A has a tendency to equate W_1 and W_2 if there is no other compromising element. So, people migrate from A to Y, and next move is from Y to X. This behavior is termed as sequential migration since L moves sequentially. In the first phase of movement we do not have any unemployment related to migration due to bidirectional adjustment possibility in W_1. Migration related unemployment phenomenon, however, is present in the second phase as migrated people try to get employed in X where wage adjustment is not possible. Hence we get a probabilistic wage determination framework for informal as well as agricultural sector. Even if the argument seems akin to H-T set up, our model is significantly different from H-T primarily because of two reasons. H-T does not consider the presence of informal sector which remarkably absorbs unemployment problems, and migration is a two-step mechanism. Both these features are quite universal and thus our set up resembles reality better than H-T. Hence equation (1)-(3) of the benchmark model becomes:

$$\bar{W} a_{lx} + r\, a_{kx} = P_x(1+t) \tag{1}$$

$$W_1 a_{ly} + r\, a_{ky} = P_y \tag{2'}$$

$$W_2 a_{la} + R\, a_{ta} = P_a \tag{3'}$$

Again, when people move from A to Y, they do not receive wage equal to W_1. There could be various reasons for such an outcome. Unless, one has some network in the urban informal sector through kinship, friends etc. it is very difficult to find a place in Y.[9] Moving out of A, and settling in Y afresh also requires some establishment cost. On

[9] Network economics has become an integral part of migration theory. Earlier papers starting with Stark and Bloom (1985), Montgomery (1991), Neto and Mullet (1998), and then some recent contributions by Manski (2000), Munshi (2011), Mishra (2007), Pedersen et al (2008), Armengol and Jackson (2007) provide sufficient support in favor of the argument that network influences migration.

the other hand, in order to create new network, either they require some cost or need to remain work-less for the first couple of days or weeks or months when they do not earn but spend. This implies a cost that they must take into account while comparing $W_1$and W_2. Cost may also be incurred if the migrant has to commute before finding out a place of residence near to the work place. All these factors, essentially, discount the wage he receives from Y. The cost, however, is always a decreasing function of the size of the urban informal workforce through network effect. The bigger is the size of network $\left(L_y = a_{ly}Y\right)$, the chance of being employed very quickly, goes up, and thus reduces the discount value accounting for cost of migration. Hence, W_2 approaches to W_1. Therefore,

$$W_2 = q(L_y)W_1 \tag{14}$$

$q$is the discount rate or cost of migration and re-settlement. $0 < q \leq 1$and $q' > 0$. Also, $\bar{W} > W_1 > W_2$.

When $q = 1$, we will, essentially, end up with standard H-T kind of structure that clearly explained in the benchmark model. So, benchmark model is a special case of the generalized version.

Following the procedure used before,

$$W_1 = \frac{\bar{W}a_{lx}X}{\bar{L}-(L_y+L_a)} \tag{15}$$

And $U = 1 - \frac{a_{lx}X}{\bar{L}-(a_{ly}Y+a_{la}A)}$

Or, $U = 1 - \frac{W_1}{\bar{W}}$ (16)

U inversely depends only on W_1. So in our analysis, the primary variable of interest is W_1 that will inject change in U.

Full employment conditions are

$$a_{ta}.A = \bar{T} \tag{17}$$

$$a_{kx}.X + a_{ky}.Y = \bar{K} \tag{18}$$

$$\frac{\bar{W}}{W_1} a_{lx}X + a_{ly}Y + L_a = \bar{L} \tag{19}$$

Given t, r is determined from (1) and W_1 is solved from (2′). So for any given value of L_y, W_2 is derived from (14) and (3′) solves R. In what follows, A is solved from (17). Equation (18) and (19) together give X and Y. Eventually (15) solves L_a. Nevertheless, for such L_a, we need to solve for L_y, that we assumed as given while solving for W_2.

Equation (15) can be re-written as

$$(L_y + L_a) = \frac{\bar{L}W_1 - \bar{W}a_{lx}X}{W_1}$$

So, when L_a goes up, L_y must fall for any give values of X and W_1. This indicates a negative relation between $L_a$and L_y.

Again from (14), when L_y increases, $q(L_y)$ also goes up indicating an increase in the RHS of (14). To bring back equality in (14) W_2 has to rise, insisting a fall in L_a for any determined value of X. Therefore, L_a and L_y are again negatively related for equation (14). These are shown in Figure-2. Values of L_a and L_y are simultaneously solved from the intersection of AA and BB. Note that, L_y adjusts along BB, and L_a adjusts along AA.

This indicates stability of the equilibrium depicted in Figure-2. Thus the generalized model is solved for all the unknown variables.

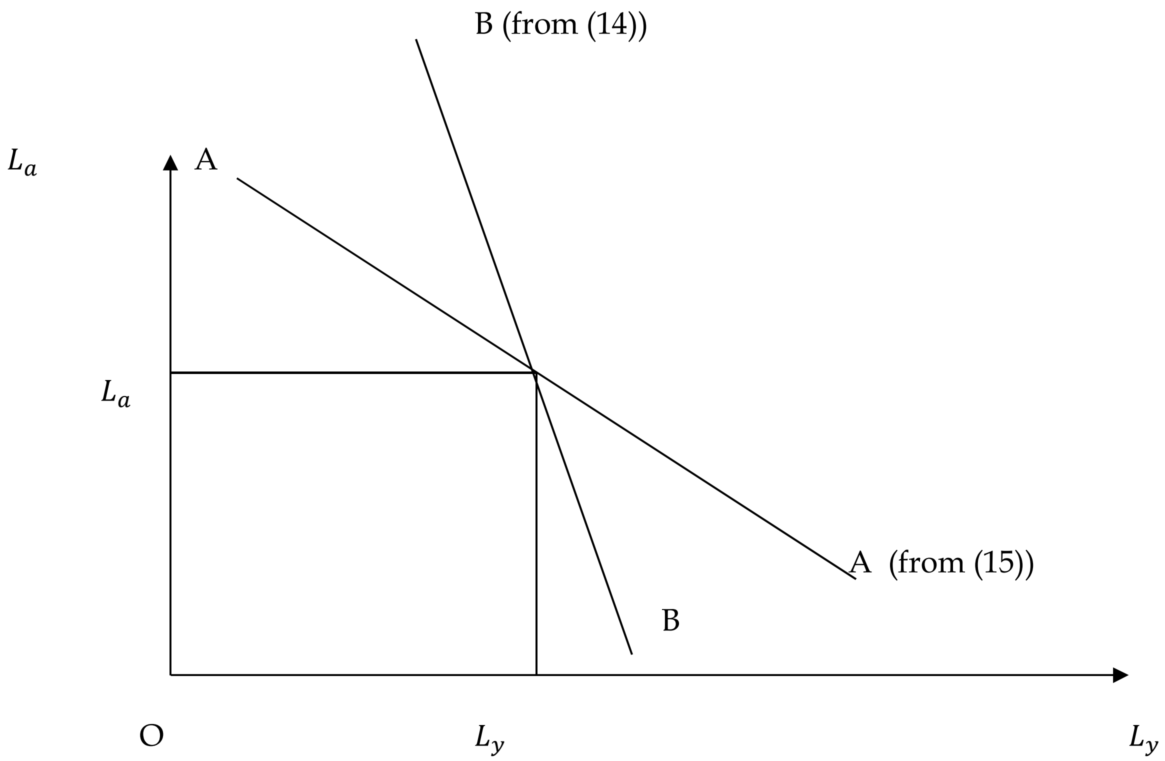

Figure-2

In this back drop, following tariff reform, return to K falls as in the benchmark model. $\hat{r} = \frac{t}{\theta_{kx}} \hat{t} < 0$. In absence of Y the notion of sequential migration does not arise at all. So, we focus only on the set up where informal sector exists. Owing to a fall in r, return to unskilled wage in Y must go up: $\widehat{W}_1 = (-)\frac{\theta_{ky}}{\theta_{ly}} \frac{t}{\theta_{kx}} \hat{t} > 0$. Therefore, it is apparent from (16) that U will decrease.

Again, $W_2 = q(L_y)W_1$ implies

$\widehat{W}_2 = \hat{q}(L_y) + \widehat{W}_1$.

For any value of $q(L_y) < 1$, our story holds the essence of sequential migration. When $q(L_y) = 1$, for any critical value of L_y such as L_y^c we have H-T framework which is explained in the benchmark model. So without any loss of generality we assume $L_y < L_y^c$, and $0 < q(L_y) < 1$. For sake of brevity we further assume q as constant. Thus,

$$\widehat{W}_2 = \widehat{W}_1$$

Hence, $dU = (-)\frac{W_1}{\bar{W}}\widehat{W}_1 = \frac{\widehat{W}_1}{\bar{W}}\frac{t}{\theta_{kx}}\frac{\theta_{ky}}{\theta_{ly}}\hat{t} < 0$. This result is identical with what we have in Proposition I of the benchmark model.

Now, we move to the output front. When r falls, X must shrink due to the fact that X and Y in isolation form Heckscher-Ohlin subset, and X is capital intensive. Consequent upon this L will move out of X and rush to either Y or A. So, $(L_a + L_y)$ must increase. This is also corroborated from (15). An increase in W_1can be equated with the RHS of (15) if the following condition holds:

$$\left|\widehat{\bar{W}a_{lx}X}\right| < \left|\bar{L} - \widehat{(L_y + L_a)}\right|$$

Thus it is insured that, $(L_a + L_y)$ has to rise. We may have three different situations in this backdrop.

(I) $\hat{L}_a = 0$ and $\hat{L}_y > 0$

(II) $\hat{L}_a > 0$ and $\hat{L}_y = 0$

(III) $\hat{L}_a > 0$ and $\hat{L}_y > 0$

However, there may be some other possibilities as well where either L_y or L_a fall and the other rises in such a fashion that $(L_a + L_y)$ rises as a whole. This argument will make the story unnecessarily complicated, so we will rule out this and try to intuitively explain the three options mentioned to argue which one is reasonable and consistent with the results derived.

Motivated by tariff cut, r drops. Reduction in r pulls up W_1. As argued before, W_2 will also increase in tandem with W_1. This pushes R down. T, being a specific factor, explains why A should fall. Hence some L will be released from A, and they have only one sector to fall back on. So, eventually L_a decreases and L_y goes up (consistent with option (I)) to ensure that only Y will expand following liberalization.

4. Extending the Benchmark Model with Capital (im)mobility

Keeping the essence of the benchmark model of the previous section intact we include an informal sector producing intermediate input (M) that is used in one of the formal segments(X_2). Besides, formal and informal segments use different types of capital vizK_1 and K_2 respectively. So we have two formal goods(X_1, X_2). , two informal goods (M, Y) and one agricultural output (A).

Extended system of equation is

$$\bar{W}a_{lx}^{1} + r_1 a_{k_1x}^{1} = P_x^1(1+t) \tag{1E}$$

$$\bar{W}a_{lx}^{2} + r_1 a_{k_1x}^{2} + P_m a_{mx}^{2} = P_x^2 \tag{2E}$$

$$Wa_{lm} + r_2 a_{k_2m} = P_m \tag{3E}$$

$$Wa_{ly} + r_2 a_{k_2y} = P_y \tag{4E}$$

$$Wa_{la} + R\, a_{ta} = P_a \tag{5E}$$

Full employment conditions are:

$$a_{ta}.A = \bar{T} \tag{6E}$$

$$a_{k_1x}^{1}.X_1 + a_{k_1x}^{2}.X_2 = \overline{K_1} \tag{7E}$$

$$a_{km}.X + a_{ky}.Y = \overline{K_2} \tag{8E}$$

$$a_{mx}.X = M \tag{9E}$$

H-Tmigration equilibriumsuggests

$$W = \frac{\bar{W}(a_{lx}^{1}.X_1 + a_{lx}^{2}.X_2)}{\bar{L} - (a_{ly}Y + a_{lm}M + a_{la}A)} \tag{10E}$$

And the unemployment rate is again defined as

$$U = 1 - \frac{W}{\bar{W}} \tag{11E}$$

Immobility of capital between formal and informal segments invokes the issue of non-identical return to capital in two segments of the economy which is quite prominent across the globe. So here we have two types of informal sectors: one produces final output Y; and other sub-section produces intermediate input, M.

Now let us look at the effect of reduction in t

$$\hat{r}_1 = \frac{t}{\theta_{k_1x}^1}\hat{t} < 0 \tag{12E}$$

Unlike the benchmark model, a fall in the return to K_1 immediately affects $P_m$as $P_x^2$is constant.

$$\hat{P}_m = (-)\frac{t}{\theta_{k_1x}^1}\frac{\theta_{k_1x}^2}{\theta_{mx}}\hat{t} > 0 \tag{13E}$$

When P_m goes up, a round of Stolper-Samuelson arguments goes around the Heckscher-Ohlin informal segments. Factor returns change following factor intensity comparison between M and Y. Simple mathematical manipulation *a la* Jones ('65, '71) gives

$$\widehat{W} = (-)\frac{1}{|\theta|}\frac{\theta_{ky}}{\theta_{k_1x}^1}\frac{\theta_{k_1x}^2}{\theta_{mx}}t\hat{t}$$ (14E)[10]

(14E) delineates that the value of $\widehat{W}$ crucially depends on $|\theta|$. So when M is labor-intensive (capital-intensive), $\widehat{W} > 0$ ($\widehat{W} < 0$). Consequently U decreases (increases). It can be insured from (11E). Thus we propose that:

PROPOSITION II: Even if there is no mobility of capital a decline in t must reduce U iff M is labor-intensive.

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[10] $|\theta|$ is the value share matrix for M and Y where $|\theta| > 0$ means M is L-intensive and conversely if $|\theta| < 0$

Proof: See discussion above.

Now think of a situation where M is used in X_1 instead of X_2. It is obvious that a decline in t under such situation would reduce P_m. In that case, U will fall iff Y is labor-intensive (unlike Proposition II).

Thus it is clear that immobility of capital is not at all critical when informal intermediates are used in final good and we have supporting intensity ranking. Note that if informal segment was totally missing, U could never go down.

5. Conclusion

In this paper we attempted to check a general apprehension if trade liberalization enhances or reduces unemployment. In the basic set up it has been proved that liberalization policy reduces unemployment if capital is mobile across sectors. We have, then, generalized the basic model to introduce more realistic pattern of migration which exhibits a sequential pattern, and validated the focal point of the benchmark model. However, in absence of informal sector capita mobility turns out to be critical in the basic set up. So in an extended model we further tested as to whether capital mobility really matters. And we showed that capital mobility is not so crucial in reducing unemployment. Rather the factor intensity ranking is a significant determinant of unemployment in the post-liberalized phase. We further proved that unemployment must go up in absence of informal segment. These arguments are valid in both the benchmark and extended model.

Appendix

Output effect in the Benchmark model

From (5) and (6a)

$$\lambda_{kx}\hat{X} + \lambda_{ky}\hat{Y} = 0$$

$$\lambda_{lx}\hat{X} + \lambda_{ly}\hat{Y} = \frac{\theta_{ky}}{\theta_{ly}} t\hat{t} \left\{ \sigma_a \frac{\theta_{la}}{\theta_{kx}} \frac{\lambda_{la}}{\theta_{la}} (\theta_{la} - \theta_{ta}) - \frac{\lambda_{lx}}{\theta_{kx}} \right\}$$

Cramer's rule helps determining the equilibrium values of $\hat{X}$ and $\hat{Y}$ as

$$\left. \begin{aligned} \hat{X} &= \frac{\lambda_{ky}}{|\lambda|} \frac{\theta_{ky}}{\theta_{ly}} t\hat{t} \left\{ \frac{\lambda_{lx}}{\theta_{kx}} - \sigma_a \frac{\theta_{la}}{\theta_{kx}} \frac{\lambda_{la}}{\theta_{la}} (\theta_{la} - \theta_{ta}) \right\} \\ \hat{Y} &= \frac{\lambda_{kx}}{|\lambda|} \frac{\theta_{ky}}{\theta_{ly}} t\hat{t} \left\{ \sigma_a \frac{\theta_{la}}{\theta_{kx}} \frac{\lambda_{la}}{\theta_{la}} (\theta_{la} - \theta_{ta}) - \frac{\lambda_{lx}}{\theta_{kx}} \right\} \end{aligned} \right]$$

Where, $|\lambda| = \begin{vmatrix} \lambda_{kx}\lambda_{ky} \\ \lambda_{lx}\lambda_{ly} \end{vmatrix}$

$|\lambda| > 0$if X is capital-intensive.

Unambiguously, $\hat{X} < 0$ and $\hat{Y} > 0$iff $\theta_{la} < \theta_{ta}$. However, even if $\theta_{la} > \theta_{ta}$ X may fall and Y may go up under certain condition. Since our focal point is not the expansion or contraction of X and Y we do not focus on such alternative conditions.

(Un)employment effect Output effect in the Benchmark model

Unemployment rate in the basic set up is defined as= $1 - \frac{W}{\bar{W}}$. Differentiating this what we get $dU = (-)\frac{dW.\bar{W}}{\bar{W}^2} = (-)\widehat{W}\,\frac{W}{\bar{W}}$.

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