Job-search and foreign capital inflow - a three sector general equilibrium analysis

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JOB-SEARCH AND FOREIGN CAPITAL INFLOW ----A THREE SECTOR GENERAL EQUILIBRIUM ANALYSIS

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Abstract: The purpose of this paper is to extend the Fields' (1989) multi sector job-search model in a three sector general equilibrium framework by introducing international trade and an input, capital. The three sectors are the rural sector, the urban informal sector and the urban formal sector. The rural sector and the urban informal sector use one type of mobile capital while the urban formal sector uses sector-specific another type of capital. We find that the effects of the inflow of foreign capital in the urban formal sector on unemployment and social welfare crucially hinge on the relative factor intensities of the rural and the urban informal sectors. We show that there is a possibility of a trade-off between the government's twin objectives of improvement in social welfare and mitigation of the urban unemployment problem. These results are extremely crucial from the view of policymaking in an unemployment plagued, low-income developing economy.

Keywords: Job search, foreign capital, unemployment, ex-post labour, ex-ante labour, general equilibrium.

JEL classification: F10, I28, J10, J13.

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1. Introduction

Job search is an integral part of the labour market in all economies irrespective of whether developing or developed. Originally, the search theory was formulated to analyse unemployment and later, it was extended to enlighten many things like unemployment duration, on the job search etc. The idea of job search has been incorporated in the models of McCall (1970), Fields (1975, 1989), Majumder (1975), Stark (1982), Adam and Cletus (1995), Postel-Vinay and Robin (2002), Dolado et al. (2009), Hussey (2005), Sheng and Xu (2007), Flinn and Mabli (2008), Arseneau and Chugh (2009), Macit (2010) etc.

McCall (1970) used the job search theory as a standard tool for analyzing the decision making process of a jobseeker. Fields (1975) considers three types of job search: job search from the agricultural sector, Job search from the urban informal sector and full-time job search. Fields (1989) extends his earlier model to distinguish between ex-ante job search and ex-post employment. Majumder (1975) shows that the 'graduation theory'[1] theory fails if the urban formal sector directly recruits from the rural sector.

Stark (1982) explains job search in a two period planning horizon where search technologies are not sector independent. Adam and Cletus (1995) present a simple model of job-search where an unemployed worker receives job offer, but he takes decision on whether to accept this offer based on a set of criteria. Postel-Vinay and Robin (2002) explain wage increase in terms of job search and bargaining theory. Dolado et al. (2003) consider a matching model with heterogeneous jobs and workers which allows for on-the-job search by mismatched workers. Hussey (2005) develops a general equilibrium business cycle model with on-the-job search and wage rigidity arising from long term labour contract.

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[1] According to the 'graduation theory' it is beneficial to remain in the urban informal sector and search part time for a highly paid job in the urban formal sector.

Sheng and Xu (2007) develop a simple two sector search model to examine the impact of the terms of trade (TOT) shocks on unemployment and they show that an improvement of TOT reduces unemployment. Flinn and Mabli (2008) analyse the impact of binding minimum wage on labour market outcomes and welfare in a partial equilibrium model of matching and bargaining in the presence of on-the-job search. Arseneau and Chugh (2009) introduce general equilibrium efficiency in the standard labour search and matching framework. Macit (2010) develops a New Keynesian model in search and matching structure with firing costs and shows how labour market institutions affect the wage and inflation dynamics.

It is worth noting that the theoretical literature on search unemployment has not been adequately dealt with liberalized economic policies and their consequences on the developing economies. A notable exception is Bandopadhyay and Chaudhuri (2011) that has examined the effects of foreign capital inflows on unemployment and welfare in a developing economy by extending the search unemployment model of Fields (1989) to include international trade and capital as a separate input of production. But this is a two sector general equilibrium model that includes a rural sector and an urban formal sector only. However, it is beyond any doubt that the informal sector plays a very significant role in employment in developing countries constituting at least 70 per cent of total employment of the working population (Agenor 1996) and that in most cases the informal sector mainly produces non-traded intermediate goods for the formal sector on a sub-contract basis.[2] The ongoing process of economic reforms has increased significantly the role played by the informal sector in determining the pattern of employment in the developing countries. Reformatory policies contract the formal manufacturing sector and drive workers out to the informal segment of the labour market. Empirical studies e.g. Bhalotra (2002), Dev (2000), ILO (2006) and Leite (2006) have reported that the size of the informal sector in the developing countries has increased considerably in the post-reform period. But the expanding informal sector has not been able to absorb the huge number of retrenched workers from the formal sector. The consequence has been a steep rise in the level of open unemployment in many of the developing economies.

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[2] See Papola (1981), Romatet (1983) and Bose (1978) among others.

Keeping in view the importance of the urban informal sector the present paper develops a three-sector general equilibrium model in the line of Fields' (1989) analysis of search unemployment where the urban informal sector produces a non-traded input for the urban formal sector. In the line of Fields (1989) we distinguish between ex-ante and ex-post allocation of the labour force. However, unlike Fields (1989), we assume a flexible and market determined rural sector wage. The rural sector (sector 1) and the urban informal sector (sector 2) use capital of type 1 while the urban formal sector (sector 3) uses capital of type 2. So, capital of type 1 is perfectly mobile between the first two sectors while capital of type 2 is specific to sector 3. We also assume two concepts of factor intensity: ex-ante factor intensity and ex-post factor intensity. We examine the impact of an inflow of foreign capital on unemployment and social welfare. Our analysis finds that inflows of foreign capital may lower the urban unemployment level but worsens social welfare when the urban informal sector is more capital-intensive relative to the rural sector. Quite interestingly in the case when the rural sector is capital-intensive we may obtain exactly the opposite results on urban unemployment and national welfare. Our analysis, therefore, suggests the possibility of a trade-off between the government's twin objectives of growth with foreign capital and mitigation of the urban unemployment problem. These results are extremely important from the view of policymaking in an unemployment plagued, low-income developing economy.

2. The model

The paper builds up a three-sector job-search model for a small open economy. The three sectors are the rural sector (Sector1), the urban informal sector (Sector 2) and the urban formal sector (Sector3). X_1 is the export good which is produced in Sector 1. X_2 is the non-traded good which is produced in Sector 2 and is used as input in Sector3. Both sector 1 and sector 2 uses labour and capital of type 1 as their inputs. Finally, sector 3 produces the import good, X_3 by means of labour, capital 2 and the non-traded input produced by sector 2. The assumption of small open economy gives constant product prices for the two internationally traded goods, whereas the price of the non-traded good is determined in the domestic market.

We make a simplifying assumption that capital of type 2 is entirely owned by foreign capitalists although this can be enormously relaxed to include both domestic and foreign capital if these two types of capital are perfect substitutes.[3] The production function of all the sectors are subject to the Law of constant return to scale and diminishing marginal productivity to each input. All the markets except the urban formal labour market are competitive and in the long run equilibrium, product price is matched exactly by the unit cost of production in each sector. So according to our assumption, foreign capital is specific to the formal sector. However, capital of type 1 is perfectly mobile between the rural sector and the urban informal sector. So, we have different rentals on the two types of capital in the economy. As both sector 1 and sector 2 use the same two inputs they together form a Heckscher-Ohlin subsystem (HOSS) and can therefore be classified in terms of factor intensities in value sense.[4] However, at this stage we do not want to make any specific factor intensity classification. We would rather consider both the cases one by one and see how our results change depending on different factor intensity conditions.

The urban formal sector's wage rate is institutionally given.[5] Urban unemployment exists in our stylized economy as urban job seekers devote full time for searching urban jobs and all of them do not get high paid urban jobs. The unsuccessful urban job seekers stay in the urban sector being unemployed.

The following notations are used in the model:

X_i =level of output produced in the i th where $i = 1,2,3$: a_{ji} = amount of the jth input required to produce one unit of the ith commodity; L^k = ex-ante amount of labour in the k -th job-search strategy, $k = 1, 2, 3$; L_i =ex-post level of employment in i -th sector; P_1 =1(commodity 1 is the

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[3] See Papola (1981), Romatet (1983), Chaudhuri et al. (2006) and Chaudhuri and Mukhopadhyay (2009) among other.

[4] This is due to the fact that the wage rates in the rural sector and the urban informal sector differ.

[5] The workers in the urban formal sector are unionized and are able to wrest a higher unionized wage which may be determined as a Nash bargaining game between the representative labour union and the representative firm. See in this context, Chaudhuri (2003) and Chaudhuri and Mukhopadhyay (2009).

numeraire); P_2 = price of commodity 2; $P_3^* = (1+t)P_3$ = tariff-inclusive domestic price of commodity 3; t = ad-valorem rate of tariff on the import of commodity 3; W_1 = rural wage rate; W_2 = urban informal sector wage rate; W_3^* = the exogenously given wage in the unionized sector 3; R_1 = rate of return on capital of type 1; R_2 = return on capital of type 2; ρ = probability of getting urban jobs; φ_1 = job search efficiency in the rural sector; φ_2 = job search efficiency in the urban informal sector; L =total labour endowment in the economy; K_1 = stock of capital of type 1 in the economy; K_2 = amount of foreign capital in the economy; U = level of urban unemployment; D_i = domestic demand for the goods produced in the i th sector 1, for $i = 1,3$; M = volume of import of good 3; Y = national income at domestic prices; $^\wedge$ = proportional change; θ_{ji} = distributive share of the j th factor in i th sector with $j = L, K, 2$; and, $i = 1, 2, 3$; λ_{ji} = allocative share of the j th factor in i th sector; σ_i = elasticity of factor substitution in the i th sector.

The general equilibrium structure of the model is as follows:

The competitive profit conditions are given by the following three price- unit cost equalities.

$$W_1 a_{L1} + R_1 a_{K1} = 1 \tag{1}$$

$$W_2 a_{L2} + R_1 a_{K2} = P_2 \tag{2}$$

$$W_3^* a_{L2} + R_2 a_{K2} + P_2 a_{23} = (1+t)P_3 = P_3^* \tag{3}$$

The probability of getting urban formal sector job is

$$\rho = a_{L3} X_3 / (\varphi_1 L^1 + \varphi_2 L^2 + L^3) \tag{4}$$

where $(\varphi_1 L^1 + \varphi_2 L^2 + L^3)$ is the total number of job seekers.

Each search strategy has expected income. In equilibrium, the expected income from the three strategies would be equal. Thus, the allocation of labour force among the three strategies is given by

$$\rho W_3^* = \varphi_1 \rho W_3^* + (1 - \varphi_1 \rho) W_1 = \varphi_2 \rho W_3^* + \left(1 - \varphi_2 \rho\right) W_2 \qquad (5, 6)^{[6]}$$

The number of people searching urban formal sector jobs from the rural sector is L^1. Out of L^1, $\varphi_1 \rho L^1$ people get employment in the urban formal sector. Thus, the ex-post number of workers in the rural sector is

$$a_{L1} X_1 = L^1 (1 - \varphi_1 \rho) \qquad (7)$$

The ex-post number of workers in the urban informal sector (non-traded sector) is

$$a_{L2} X_2 = L^2 (1 - \varphi_2 \rho) \qquad (8)$$

The fixed amount of total labour force in the economy is not fully employed. The ex-ante and the ex-post endowments of labour are given by the following equations

$$L^1 + L^2 + L^3 = L \qquad (9)$$

$$a_{L1} X_1 + a_{L2} X_2 + a_{L3} X_3 + U = L \qquad (10)$$

The endowments of capital are fixed and fully employed. The full employment of domestic as well as foreign capital is given by

$$a_{K3} X_3 = K_2 \qquad (11)$$

$$a_{K1} X_1 + a_{K2} X_2 = K_1 \qquad (12)$$

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[6] Following Fields (1975, 1989) it is assumed that rural job-seekers are less efficient than those in the informal sector. This means, $\varphi_1 < \varphi_2$.

The output of the informal sector, X_2, is used entirely in sector 3 as input. The supply of X_2 is circumscribed by its total demand by sector 3. The demand-supply equality condition is given by

$$X_2 = a_{23} X_3 \tag{13}$$

The per-unit requirement of the intermediate input is assumed to be technologically fixed in sector 3.[7] This implies that to produce one unit of formal sector's product a_{23} units of the non-traded input are required.

The country exports commodity 1 and imports commodity 3. The trade balance condition requires that

$$X_1 - D_1 = P_3 \left(D_3 - X_3 \right) + R_2 K_F$$

or,

$$D_1 + P_3^* D_3 = X_1 + P_3^* X_3 + t P_3 M - R_2 K_2 \tag{14}$$

where $P_3^* = (1+t) P_3$ is the tariff- inclusive domestic price of commodity 3 and $M = \left(D_3 - X_3 \right)$ is the volume of import of good 3; and, $R_2 K_F$ is the repatriated income of foreign capital. .

The welfare of this small open economy is given by national income at domestic prices, Y. As foreign capital income is completely repatriated the expression for national income at domestic prices is given by

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[7] It rules out the possibility of substitution between the non-traded intermediate good and other factors of production in sector 3. Although this is a simplifying assumption, it is not totally unrealistic. In industries like shoe making and garments, large formal sector firms farm out their production to the small informal sector firms under the system of subcontracting. So the production is done in the informal sector firms while labeling, packaging and marketing are done by the formal sector firms. One pair of shoes produced in the informal sector does not change in quantity when it is marketed by the formal sector as a final commodity. Thus there remains a fixed proportion between the use of the intermediary and the quantity of the final commodity produced and marketed by the formal sector. It may be noted that several works like Gupta (1994), Chaudhuri (2003), Chaudhuri et al. (2006), Chaudhuri and Mukhopadhyay (2009) have used this assumption for different purposes.

$$Y = X_1 + P_3^* X_3 + tP_3 M - R_2 K_2 \tag{15}$$

It may be noted that tP_3M is the amount of tariff revenue of the government from the import of commodity 3 which is completely transferred to the consumers as lump-sum payments.

The aggregate demand for commodity 3 is written as follows.

$$D_3 = D_3(P_3^*, Y)$$
$$(-)(+) \tag{16}$$

Finally, the volume of import of commodity 3 is given by

$$M = D_3(P_3^*, Y) - X_3 \tag{17}$$

We can determine W_1, W_2, R_1, ρ from Equations (1), (2), (5) and (6) in terms of P_2, given $W_3^*, \varphi_1, \varphi_2$. Equation (3) determines R_2 in terms of P_2, given W_3^*, P_3 and t. Thus, we get a_{K1}, a_{K2}, a_{K3} in terms of P_2. Then, Equation (11) yields X_3 in terms of P_2, given K_F. Now, using Equations (7), (8) and (9) into (4) we get,

$$W_1 a_{L1} X_1 + W_2 a_{L2} X_2 = \rho W_3^* L - W_3^* a_{L3} X_3 \tag{4.1}$$

Solving Equations (4.1) and (12) we get, X_1, X_2 as functions of P_2, given K_F, W_3^*. Then; we get P_2 from Equation (13). L^1 is obtained from Equation (7) and L^2 from Equation (8) and L^3 from Equation (9). U is obtained from Equation (10), given L. Then Y is obtained from Equation (15) Finally, D_3 is obtained from Equation (16).

3. Comparative statics:

We are now going to examine the effects of foreign capital inflow on urban unemployment and national welfare in our small open economy.

Totally differentiating Equations (1), (2),(3), (4.1), (5), (6), (10),(12), (13) and using the static stability condition in a market for commodity 2 and simplifying we can prove[8] the following proposition:

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Proposition 1: In the case when the urban informal sector is more capital-intensive relative to the rural sector an inflow of foreign capital lowers urban unemployment if (i) $(\frac{\lambda_{L1} + \lambda_{L2}}{\rho}) \geq (\frac{W_3 *}{W_1})$; (ii) $(\frac{\lambda_{L2} + \lambda_{L3}}{\lambda_{L1}}) \geq (\frac{\lambda_{K2}}{\lambda_{K1}})$; and, (iii) $\sigma_3 \cong 0$. However, when the rural sector is capital-intensive the urban unemployment problem is likely to aggravate under reasonable conditions.

We may explain **Proposition 1** as follows. An inflow of foreign capital in the formal sector (sector 3) affects both the factor prices and the output composition of the economy. As capital of type 2 is specific to sector 3, it expands and demands more labour and the non-traded input produced by sector 2 (the informal sector). Consequently, sector 2 also expands and sector 1 has to contract as it has to release capital of type 1 to the expanding sector 2. As the price of non-traded input, P_2, rises and sector 2 is intensive in the use of capital of type 1, the return to this type of capital, R_1 rises and the wage rates in these two sectors, W_1 and W_2 decrease (it becomes clear if one looks into the two zero-profit conditions of sector 1 and sector 2, i.e., .equations 1 and 2). The producers in the first two sectors substitute capital of type 1 by labour as the relative prices of labour in both sectors have decreased. This raises a_{L1} and a_{L2} and lowers a_{K1} and a_{K2}. As sector 2 has expanded the employment level in that sector expands. However, the effect on employment level in sector 1 is ambiguous as a_{L1} rises but X_1 falls. On the other hand, the employment level in sector 2 i.e. $a_{L3}X_3$ rises as the degree of substitutability between labour and capital of type 2 in that sector (σ_3) is very low and that sector 3 has expanded, the employment level in sector 3 rises. The net effect of all these three effects would be an increase in the aggregate employment in the three sectors of the economy under the sufficient conditions

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[8]. Interested readers may check these results or can obtain proofs from the authors on request..

as provided in proposition 1. Consequently, the urban unemployment level in the economy, decreases. On the contrary, when sector 2 is more labour-intensive relative to sector 1 with respect to capital of type 1, R_1 falls and the two wage rates, W_1 and W_2 increase. Producers in the two sectors now substitute labour by capital leading to decrease in both a_{L1} and a_{L2}. Employment in sector 1 unambiguously decreases while that in sector 2 may decrease subject to a few sufficient conditions. The level of employment in sector 3, of course, increases unambiguously as σ_3 is significantly low. The net outcome of all these effects would be a decrease in aggregate employment and hence an increase in the urban unemployment level under the sufficient conditions as stated in the proposition.

For examining the welfare consequence of inflows of foreign capital after totally differentiating Equation (15), using Equations (4.1), (5), (13) and (16) and simplifying we can prove[9] the following proposition.

Proposition2: An inflow of foreign capital unambiguously lowers social welfare if the informal sector is capital-intensive vis-à-vis the rural sector. However, in the opposite case, social welfare may improve under reasonable conditions.

Proposition 2 can be intuitively discussed in the following fashion. An inflow of foreign capital in the presence of a tariff and with full repatriation of income on foreign capital affects national income in two ways. First, there occurs a reallocation of labour in the different sectors of the economy, offering different wages, following a change in the output composition. This we call the labour reallocation effect which may have positive or negative effect on national income in the two different situations. Second, as the tariff-protected import-competing sector expands, the volume of import falls. This lowers the tariff revenue which is transferred to the consumers in a lump-sum fashion. This may be called the tariff revenue effect which unambiguously produces unfavourable effect on social welfare. In the situation where the urban informal sector is more capital-intensive vis-à-vis the rural sector 1 contracts while the other two sectors expand. The

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[9]. Interested readers may check these results or can obtain proofs from the authors on request..

aggregate wage income changes as the three sectors offer three different wages, with $W_3^* > W_1 > W_2$. Our analysis shows that the change in aggregate wage income is unambiguously negative.[10] This is the negative labour reallocation effect which also exerts a downward pressure on national welfare. Therefore, social welfare measured in terms of national income at domestic prices worsens unequivocally. On the contrary, in the case where the rural sector is capital-intensive, the labour reallocation effect is positive[11]. So there are two opposite effects on welfare. In the absence of any tariff i.e. $t = 0$, there does not exist any negative tariff revenue effect and welfare definitely improves owing to the positive labour reallocation effect. Despite the presence of a tariff, social welfare may still improve if the positive labour reallocation effect dominates over the negative tariff revenue effect.

5. Concluding remarks

The paper aims to contribute to the literature on rural-urban migration and labour force allocation across sectors, in analyzing the dynamics of unemployment and social welfare. The present paper extends the Fields' (1989) model by introducing capital and international trade into the Fields' (1989) framework and examines the effects of inflow of foreign capital on unemployment and social welfare. In this model the urban informal sector produces a non-traded input for the urban formal sector where the workers receive the highest wage. Our analysis shows that the results of an inflow of foreign capital on urban unemployment and social welfare hinge crucially on the factor intensity rankings of the rural and urban informal sector. If urban informal sector is capital intensive relative to the rural sector, an inflow of foreign capital may reduce unemployment but unambiguously lower social welfare. On the contrary, when the rural sector is more capital intensive than the informal sector we may obtain exactly the opposite results. Foreign capital inflow may raise urban unemployment but improve social welfare. Thus, in both the cases it is obvious that there is a trade-off between reduction of unemployment and achieving growth with foreign capital which deserves the attention of the policy makers to design proper development policy for a small open economy.

[10] Interested readers may check these results or can obtain proofs from the authors on request.

[11] Interested readers may check these results or can obtain proofs from the authors on request.

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