FDI, RURAL-URBAN MIGRATION AND UNEMPLOYMENT: THEORY AND EMPIRICS

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Abstract

Migration is a global phenomenon characterizing human inclination towards safety and well-being. We provide a theoretical background by proposing a three-sector general equilibrium model with rural-urban migration and show the impact of various changes of exogenous variables on migration. We first propose a microeconomic framework by utility maximization to determine the behaviour of the person who decides to migrate. Next, we link the framework with a three-sector general equilibrium model. Following that, we explore the effect of FDI in the urban formal sector on unemployment and rural-urban migration. We find that both the variables increase while foreign capital in the agricultural rural sector leads to lower unemployment and rural-urban migration. We then test the propositions made in the model through time series and cross-sectional regressions.

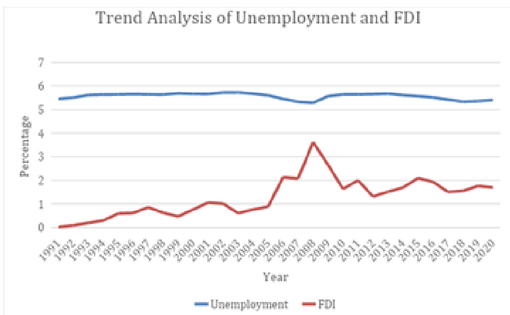
JEL Classification: R23, F21, J64, C32, C31
Keywords: Rural-urban Migration, Foreign Direct Investment, Unemployment, Time series model, Cross-sectional models, Informal sector, General equilibrium

1. INTRODUCTION

Human migration is subject to various complex factors interlinked with each other, viz. economic, environmental, social, political and demographic. Migration can be across countries or within a particular country as internal migration. While migrants highly contribute to the destination countries, in this paper, we analyse the aspects of migration in the backdrop of source countries. In reality, migration and displacement across countries may be in the form of forced migration, seeking asylum in the said countries among various other things. However, there may be major economic reasons behind migration that can be beneficial for the migrant. Foreign Direct Investment (FDI) is one of such major components. Theoretically, FDI and migration can either be complements or substitutes but empirics suggest them to complement. This is because of several reasons: by transferring knowledge and language skills across zones, migrants can significantly lower communication costs. They also possess information on market structure, consumer preferences, business ethics and commercial codes of their source and destination countries. This can encourage new business opportunities and cross-border links. It also lowers the fixed cost of undertaking FDI. The rural areas of India suffer from high unemployment due to the scarcity of FDI. As a result, they are forced to migrate to urban areas in search of a job. Thus, we build relationships between FDI and rural-urban migration through the channel of unemployment which we can use in future projections and herein lies the essence and relevance of this paper.

If we do a trend analysis of unemployment and FDI of India for the past 30 years (1990-2020), then we will find that the unemployment rate is quite high while the inflow of FDI as a percentage of GDP is quite low. Only in the year 2008, FDI inflow was highest with a magnitude of 3.62 per cent. As a result, unemployment was lowest with a value of 5.28 per cent. This is clear from the graph below:

Figure 1: *Trend of unemployment and FDI (% of GDP) in India*



Source: Authors' calculation using data from World Bank's open data

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Figure 2a: *Total migrants in India during Census 2001 and 2011*

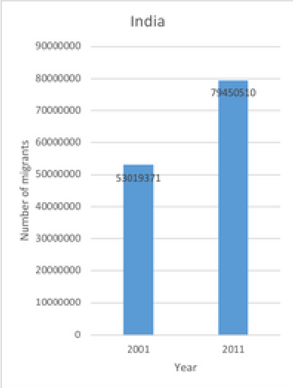
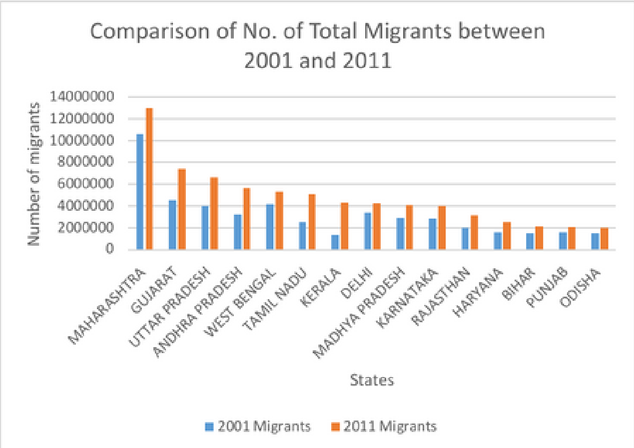


Figure 2b: *Comparison of total migrants between 2001 and 2011 in Indian States and Union Territories*



Source: Authors' calculation using data from Census of India

However, the inflow of FDI has always been rising which can be seen from the above graph. As a result, the total number of migrants from rural to urban has also increased from 2001 to 2011, not only at a national level but also for various states.

The rest of the paper is structured in the following way: Section II presents a review of the literature. Section III presents a theoretical model with comparative statistics of FDI in the urban formal sector and rural sector. Section IV presents the empirical study. Section V offers the concluding remarks along with policy suggestions.

2. REVIEW OF LITERATURE

Numerous studies and articles are devoted to finding the causes behind migration across countries. Different econometric methods have been used to assess the number of migrants for economic purposes and other issues. Theoretical models have been developed by Harris and Todaro (1970) which talk about how wage differences in rural and urban places have led to urbanisation and migration. Kundu (2009) stated that there is an increase in the inflow of people in countries with higher economic development which again looks for the economic reason. Extending the H–T framework, Fields (1975, 1989) introduced a new model in which involuntary unemployment may exist in the presence of wage flexibility in the informal sector when the migrant is lured by a higher paying formal sector job instead of an easier to find informal sector job. Consequently, they face a trade-off between informal sector employment and the search for formal sector jobs. Field's model is more general and realistic which is also supported by empirical evidence. Gupta (1993) proposes a rural-urban migration model with a special reference to the informal sector where he showed the simultaneous existence of open unemployment and informal sector. However, the model has a problem as rural wage has to be lower than the urban informal sector.

There is huge empirical literature on migration and trade, but the literature relating to the relationship between migration and FDI is much smaller. Gao (2003) finds a positive association between the FDI stock in China and the population share of ethnic Chinese in the cross-section of source countries. Aleksynska and Peri (2014) supported the fact that migrants with tertiary education encourage FDI flows. Cuadros et al (2016) also suggest a positive correlation between migration and FDI inflows into the migrant's origin country.

Lee and Vivarelli (2004) found that, although FDI is expected to positively affect employment, employment creation cannot be unambiguously assured as the employment effect can vary from country to country. Spiezia (2004) finds that the FDI has a positive impact on employment with per-capita income for a group of 49 countries, but the effect is not significant for low-income developing countries.

There is a lack of proper microeconomic foundation about the migration decision in the general equilibrium models with unemployment. Further, there is a lack of models showing the effects of FDI on migration. Therefore, we try to model the entire framework in a theoretical model with a proper microeconomic foundation.

3. THEORETICAL MODEL

3.1 Microeconomic Framework

Here we present a simple model showing the microeconomic foundation of the rural-urban migration process in basic economic modelling and how a change in these variables can lead to migration. Migration is a person's decision that is heterogeneous from person to person and region to region. Thus, attributing any single cause to migration is not fair or true. In fact, migrating to any other place is an outcome of several issues confronted by that person.

We introduce the prime variable of interest, α_i which is the migration coefficient of an individual. Here α_i denotes the variable or indicator of whether the person thinks of migrating to another place. So, α_i = 1 denotes he permanently leaves the place and α_i = 0 denotes he stays at the place.

We consider an economy with two divisions - urban and rural. We assume there are N individuals in the rural economy, living for one period who are involved in the rural sector and face an opportunity of migrating to the urban sector for a job. We consider a discrete choice framework where a representative agent decides whether to migrate or not based on the values of maximised utility functions i.e., indirect utility functions. We normalise the total labour endowment available to each agent as 1.

Thus, the individuals maximise utility $U_R = U(C_{Ri}, l_{Ri})$ subject to the budget constraint $C_{Ri} = (1 - l_{Ri})w_R$
Where C_{Ri}, l_{Ri} are the consumption and leisure of the i[th] agent in the urban sector.

In the urban sector, they face a higher wage $w_u > w_R$ but have to bear the cost of migration to travel D.

$C_{ui} = (1 - l_{ui})w_u - D$... (1)

Where C_{ui} and l_{ui} are the consumption and leisure of the i[th] agent in the urban sector, D is the cost of migration. Thus, they maximise utility $U_U = U(C_{Ui}, l_{Ui})$ subject to eqn (1).
Let $V_R = \max U_R$ and $V_U = \max U_U$ are the two indirect utility functions obtained after maximization.

The migration decision is made on the basis of the values of V_R and V_U
The agent migrates when he derives more utility from the urban sector i.e. when $V_U > V_R$.

Thus, we have $\alpha_i = \{1 \quad V_U > V_R \quad 0 \quad V_R > V_U\}$

We consider the Cobb Douglas utility function to demonstrate some results for analysis purposes.

$$U_U = {C_{ui}}^{\beta_i} {l_{ui}}^{1-\beta_i} \quad 0 < \beta_i < 1$$

$$U_R = {C_{Ri}}^{\beta_i} {l_{Ri}}^{1-\beta_i} \quad 0 < \beta_i < 1$$

The agent maximises the following utility function

$$max_{C_{ui}, l_{ui}} \; U_U = {C_{ui}}^{\beta_i} {l_{ui}}^{1-\beta_i} \text{ s.t. } C_{ui} = (1 - l_{ui})w_u - D$$

and $max_{C_{Ri}, l_{Ri}} \; U_R = {C_{Ri}}^{\beta_i} {l_{Ri}}^{1-\beta_i}$ s.t. $C_{Ri} = (1 - l_{Ri})w_R$

The optimal values of
$C_{ui} = \beta_i(w_u - D)$, $l_{ui} = (1 - \beta_i)(\frac{w_u - D}{w_u})$

and $C_{Ri} = \beta_i w_R \quad l_{Ri} = (1 - \beta_i)$

Thus, the values of the indirect utility function are

$$V_R = \frac{{\beta_i}^{\beta_i}(1-\beta_i)^{(1-\beta_i)}}{{w_R}^{(1-\beta_i)}}(w_R) \text{ and}$$

$$V_U = \frac{{\beta_i}^{\beta_i}(1-\beta_i)^{(1-\beta_i)}}{{w_u}^{(1-\beta_i)}}(w_u - D)$$

Comparing V_R and V_U we get

$$V_U - V_R > 0 \text{ when } (w_u - D) - {w_R}^{\beta_i}{w_u}^{(1-\beta_i)} > 0$$

Or, ${w_u}^{(1-\beta_i)}({w_U}^{\beta_i} - {w_R}^{\beta_i}) - D > 0$ .....(2)

When the inequality (2) is satisfied, then $\alpha_i = 1$ i.e. the agent decides to migrate.

We can interpret the inequality as when the wage difference weighted by β_i is sufficiently greater than the cost of migration, the agent will migrate. Any increase in the difference in the weighted wage rates leads to an increase in the utility derived in the urban sector relative to the rural sector and thus, an increase in migration. An increase in the cost of migration D, on the other hand, leads to a decrease in the difference of V_R and V_U . Consequently,
it leads to a fall in migration. In this case, the role of the β_i introduces heterogeneity in the model by which not all agents migrate since the weights on

migrate since the weights on wage rates are based on the preference parameter β_i . Hence, the wage rate difference $(w_U{}^{\beta_i} - w_R{}^{\beta_i})$ is different for all individuals in the economy. β_i is the elasticity of utility with respect to consumption (C_{ui}) (A higher wage rate ensures higher consumption. Thus, the wage rates are weighted by β_i In an uncertain world, could be interpret β_i as relative risk aversion which often plays a key role in migration decisions. (Dustmann et.al (2017))

We consider another case of utility functions for the agents as

$$U_U = C_{ui}{}^{\beta_i} l_{ui}{}^{1-\beta_i} \quad 0 < \beta_i < 1$$

$$U_R = C_{Ri}{}^{\beta_i} l_{Ri}{}^{1-\beta_i} \quad 0 < \beta_i < 1$$

ρ_i denotes a discounting factor applied to the migrant's utility function denoting the effect of staying in the urban sector due to network effects or other real perceived costs etc. (Brucker et.al (2011))

The agent maximises the following utility function

$max_{C_{ui},l_{ui}}\ U_U = \rho_i{}^{(1-\eta_i)} C_{ui} l_{ui}$ s.t. $C_{ui} = (1 - l_{ui})w_u - D$ and

$max_{C_{Ri},l_{Ri}}\ U_R = C_{Ri} l_{Ri}$ s.t. $C_{Ri} = (1 - l_{Ri})w_R$

The optimal values of

$$C_{ui} = \frac{(w_u - D)}{2}\ , l_{ui} = \frac{(w_u - D)}{2w_u}$$

and $C_{Ri} = \frac{w_R}{2}, l_{Ri} = 1/2$

Thus, the values of the indirect utility function are

$$V_R = \frac{w_R}{4} \text{ and } V_U = \rho_i{}^{(1-\eta_i)} \frac{(w_u - D)^2}{4w_u}$$

Comparing V_R and V_U we get $V_U > V_R$ when

$$(\rho_i{}^{(1-\eta_i)} w_u - w_R) w_u + \rho_i{}^{(1-\eta_i)} D^2 - 2 w_u \rho_i{}^{(1-\eta_i)} D > 0 \ldots.. (3)$$

When the inequality (3) is satisfied then $\alpha_i = 1$ i.e. the agent decides to migrate.

Thus, with an increase in the difference of wage rate in the urban and rural sector (where the urban wage rate is weighted by the preference parameter), the right-hand side of the inequality increases and the agent will migrate.

The decision of whether to migrate or not depends on differences in parameters of utility and differences in the discount factor for staying in the urban sector, thus depending on the values of β_i and ρ_i.

Hence, we define now the aggregate migration coefficient for the economy α, which gives the fraction of the rural people who will migrate

$$\alpha = \frac{\sum_1^N \alpha_i}{N}$$

The value of α lies between 0 and 1.

3.2 Production side of the economy – A General Equilibrium Analysis

Following Jones (1965,1971) we present a three-sector general equilibrium model. We have three sectors – one rural sector (R) producing agricultural commodities and two urban sectors – urban informal (I) and urban formal sector (M). The rural sector produces an agricultural export good. The urban informal sector produces a non-traded good which is used as an input in Sector M. Both sectors R and I use labour and capital while the land (fixed coefficient input) is specific to sector R. We also assume that sector I uses an imported input in a fixed quantity. Sector M is the import-competing sector that produces its output M using labour, capital and the non-traded input produced by sector I. Since we assume a small open economy, there are constant product prices for the two internationally traded goods, whereas the price of the non-traded good is determined in the domestic market using demand and supply forces. The wages of labour in the informal and rural sectors are assumed to be perfectly flexible while wages of formal sector labour are fixed through some bargaining process between firms and labour unions. Since capital is assumed to be perfectly mobile between the two urban sectors M and I, we have a common rate of return on capital in both sectors.

The institutional rate of return on formal capital is also the same in the urban formal sector and the rural sector.

The following symbols are used for the formal representation of the model:

a_{LR} , a_{TR} = labour and land coefficient of the rural sector R;

a_{KI} , a_{LI} = capital, labour and intermediate input coefficient in the urban informal sector;

a_{KM} , a_{LM} = capital, labour coefficient in the urban formal sector

L = Endowment of labour; **K** = Endowment of capital; **T** = Endowment of land;
w_R = Wage of labour in the rural sector;
w_I = Wage of labour in the urban formal sector;
r = Rate of return on capital; **g** = rate of return on land;
P_R, P_M = International price of commodity R and M;
P_I = Price of the non-traded product I;
p_m^* = Prices of the intermediate input used in the sector I;
$\lambda_{LR}, \lambda_{TR}$ = Proportion of labour and land employed in rural sector R;
$\lambda_{KI}, \lambda_{LI}$ = Proportion of capital, labour employed in the urban informal sector;
$\lambda_{KM}, \lambda_{LM}$ = Proportion of capital, labour employed in the urban formal sector;
θ_{LR}, θ_{TR} = Distribution share of labour and land employed in rural sector R;
θ_{KM}, θ_{Lm} = Distribution share of capital, labour employed in the urban formal sector
$\theta_{KI}, \theta_{LI}, \theta_{mI}$ = Distribution share of capital, labour employed in the urban informal sector

Given this situation, we follow Fields (1975) to model the rural-urban migration equilibrium which is a modified and general version of the Harris-Todaro equilibrium. Let us denote

J_M = job seekers in the urban formal sector;

L_M = total labour force in the rural sector;

L_I = total labour force in the informal sector;

L_R = total labour force in the formal sector;

E_M = total employed in the formal sector M;

h = job search parameter in the urban sector by urban informal sector worker; **n** = job search in the urban sector by rural sector worker migrating in the urban sector;

Given the migration coefficient α, we have the total number of job seekers in the urban formal sector as

$$J_M = L_M + hL_I + \alpha n L_R$$

Given this, we determine the probability of finding a job in the urban formal sector

$$p = \frac{E_M}{J_M} \qquad (4)$$

Then, the expected wage in the rural sector (R) is

$$E(R) = \alpha n p \underline{w} + (1 - \alpha n p) w_R$$

The expected wage in the informal sector (I) is

$$E(I) = hp\underline{w} + (1 - hp) w_I$$

The expected wage in the urban formal sector (M) is

$$E(M) = p\underline{w}$$

Now, we equate E(R) = E(M) = E(I) so that the expected wage is equal in all three search strategies.

$$\alpha n p \underline{w} + (1 - \alpha n p) w_I = p\underline{w} = hp\underline{w} + (1 - hp) w_I$$

This is the rural-urban migration equilibrium in the model.

Finally, the general equilibrium structure of the model is given as follows -

Given the assumption of perfectly competitive markets, the usual price–unit cost equality conditions relating to the three sectors of the economy are given by the following three equations, respectively:

$$a_{LR}\, w_R + a_{TR}\, g + a_{IR}\, P_I = P_R \qquad (5)$$

$$a_{KI}\, r + a_{LI}\, w_I + a_{mR}\, p_m^* = P_I \qquad (6)$$

$$a_{LM}\, \underline{w} + a_{KM}\, r = P_M \qquad (7)$$

The full employment conditions are given as follows:

$$L = L_u + a_{LM} M + a_{LI} I + a_{LR} R = L_M + L_I + L_R \qquad (8)$$

$$K = a_{KM} M + a_{KI} I \qquad (9)$$

$$T = a_{TR} R \qquad (10)$$

Also, from the above equation:

$$\alpha n p \underline{w} + (1 - \alpha n p) w_R = p\underline{w} \qquad (11)$$

$$p\underline{w} = hp\underline{w} + (1 - hp) w_I \qquad (12)$$

We can also write

$$(1 - \alpha n p) L_R = a_{LR} R \qquad (13)$$

$$(1 - hp) L_I = a_{LI} I \qquad (14)$$

Combining (4), (8), (13) and (14) we have the following the equation

$$w_R a_{LR} R + w_I a_{LI} I = (\underline{w}p) - \underline{w} a_{LM} M \qquad (15)$$

Aggregate demand of Sector I is given by total consumption demand and intermediate product demand by sector M. It is assumed that a fraction of the total wage income is spent on the produce of the informal sector. It also produces an intermediate input for the rural sector. Hence, it reflects the dual economy present in the urban economy. Thus, we have:

$$\delta(a_{LM}\ \underline{w}\ M + a_{LI}\ w_I\ I + a_{LR}\ w_R\ R) + a_{IR}\ P_R R = P_I\ I \qquad (16)$$

This completes the framework of the model.

The urban formal sector is relatively more capital intensive than the urban informal sector in both value and physical sense i.e.

$$\frac{\theta_{KM}}{\theta_{LM}} > \theta_{KI}/\theta_{LI} \text{ and } \frac{\lambda_{KM}}{\lambda_{LM}} > \frac{\lambda_{KI}}{\lambda_{LI}}$$

Working of the Model – Here we have 11 endogenous variables in the system:
w_R, w_I, g, r, R, I, M, P_I , L_u , p, α
and 11 independent equations: (3),(5)-(12),(15),(16). We obtain r from equation (7) and R from equation (10). Then, we can solve the equations (5), (6), (13) and (14) to obtain w_R, w_I, g, p in terms of P_I .

Given these values, we insert them in equation (15) and (16). Then we can obtain three equations (15), (16) and (9) to obtain the values of M, I and P_I .

With all the endogenous variables solved in terms of parameters, we can obtain α from equation (3) which given the maximized value of α, L_u is obtained from equation (8).

3.3 Comparative Statics

We show effects on the endogenous variables due to changes in the flow of capital through increases in FDI inflows, changes in foreign-owned land or changes in environmental degradation of land, changes in world prices and effects of COVID-19 pandemic. (All necessary calculations are shown in appendix 1.1)

1. Change in Foreign investment in land - This kind of change can be interpreted as an increase in the usage of land in agricultural and allied activities. Investments in the agricultural sector in rural India can transform barren or arable lands into productive lands through an increase in proper water storage facilities and other modern agricultural techniques. It may also lead to more agro-based industries which can strengthen the prospects of agri-business farming.
Thus, we have $T = T_D + T_F$
Thus, with an exogenous rise in T_F with the increase in land, we have the following effects on the economy.

We consider FDI in the agricultural sector. By FDI in agriculture, we mean expanding the land endowment. An inflow of foreign capital in the rural sector affects both the factor prices and the output composition of the economy. This immediately lowers the rate of return to land. This, in turn, should imply an increase in and from the equation. (5) This shall be seen gradually. Now being a specific factor, with an increase in land we have an increase in the output of rural sector R. With an increase in output of R we have an increase in employment of labour. With an increase in employment and wages in the rural sector, there will be less attraction for migration. With an increase in output of R (since it uses the output of sector I as intermediate input), output of sector I also increases. Since the informal sector is labour intensive, it will expand with more labour employment. With lesser availability of labour in the Heckscher Ohlin subsystem formed by both the urban sectors with eqn (5), (6), (11) and (12), M will contract to release more labour. Now the increase in the price of I, the output of the informal sector thus will be reflected in a rise in wage rate in the informal sector.

$\hat{M} < 0. \hat{R} > 0 . \hat{I} > 0$

Since the wage–rental ratios in the second sector have risen, producers of I would substitute labour by capital. Thus, we have an increase in employment in sectors I and R while employment is likely to fall in sector M. But we will find since migration has fallen so the number of job seekers in the urban formal sector has decreased. With an increase in employment in the rural and urban informal sector, this effect is likely to dominate the effect of a contraction in the urban formal sector. This is again true since the expansion of the urban informal sector (which is labour intensive) will create more employment opportunities. Thus, the overall effect of FDI in agriculture will lead to lesser migration as well as lead to lesser employment. That is, we have
$\widehat{L_U} < 0$ and $\underline{\hat{\alpha}} < 0$ if the (3.1) is satisfied which in

general will be satisfied.

($\underline{\alpha}^*$ is the average migration rate for the whole rural labour force.)

We can similarly imagine environmental degradation due to low rainfall which can wear out the productivity of the land. Less rainfall or any other adverse impact on the marginal productivity of land will lead to a fall in lower the effective endowment of land and lower land usage.

Proposition – Given the informal sector as labour intensive in our production structure, an increase in FDI in the agricultural sector will increase the output of the urban informal sector and the rural sector. This will further lessen the rate of rural-urban migration and the overall unemployment of labour.

2. Change in Capital inflows through FDI –

Within the lockdown period and after that period, India has seen a surge of FDI inflows. Such huge inflows have major implications for the output of various sectors as well as incomes of different agents in the economy for different parts of the income distribution. This may have a major impact on rural-urban migration as well. We can use the framework constructed above to analyse the changes in FDI inflows. Similarly, we have $K = K_D + K_F$.

With the increase in capital, we have sector M expanding at the expense of sector I as we assume sector M to be labour intensive in both value and terms. As sector I contracts, but also faces a fall in demand due to a fall in employment, the sign of the price of sector I output is indeterminate. If there is a decrease in price, it will be reflected in the fall in wage rates of labour in both sectors R and I from the equation. Thus, with increased FDI in the capital, we have a decrease in rural wage rates in our model satisfying condition. Now since the rural wage rates fall (and return on land rises), we must have a rise in rural-urban migration. However, the probability of getting an urban job increases this time due to the expansion of the sector M. Thus, the net effect on migration will be determined by the relative forces. Urban unemployment of labour may fall or increase as both the sectors here expand and contract simultaneously. But in general, given the nature of factor intensity as the informal sector is labour intensive, unemployment may rise as it contracts.

A Re-modification in the inputs used - This seemingly paradoxical result in our model as shown here is due to the fact of using the same type of capital in both sectors. Thus, we can easily solve the problem by considering two types of capital. K1 used in informal and suppose rural sector and K2 used in the formal sector and assume there is no land input in the model to keep it a 3×4 structure.

The only changes in the equations are

$$K_1 = a_{KI}\, I + a_{KR}\, R \quad (17) \quad K_2 = a_{KM}\, M (18)$$

Now we have an increase in K_2 due to foreign direct investment so there is an increase in output of M only. This will lead to an increase in output employment in the formal sector but the output and employment in the informal sector and the rural sector remains unchanged. However, with an increase in employment, demand for the commodity I will rise. It will be translated into a rise in the price of sector I and therefore, on the wage rates of the rural and urban informal sector.

$$\widehat{L_U} = -\lambda_{LM}\widehat{M} < 0 \text{ as } \widehat{P_I} > 0 \quad \widehat{w_R} > 0\; \widehat{\underline{\alpha}^*} < 0$$

if the (3.1) is satisfied which in general will be satisfied ($\underline{\alpha}^*$ is the average migration rate for the whole rural labour force).

But the major finding is the unambiguous fall in the unemployment rate of labour with an increase in FDI. In this case, as well with a rise in rural wage rate, there will be a lesser rate of migration.

Proposition – With an increase in FDI inflows, if the urban informal and formal sectors use the same type of capital, then it will intensify unemployment problems given the formal sector is relatively more capital intensive. If the two sectors are using different types of capital, then a flow of capital in the formal sector will lead to an increase in employment. In other words, it will decrease the unemployment rate among labourers.

3. International lockdown –

Due to COVID 19 lockdown and lack of free flow of imports, it is difficult for the informal sector to buy imported raw materials. This kind of trade restriction will lead to an increase in prices of the intermediate input or products p_m^*. Now given the trade balance and production of the exportable good R remains unchanged, such a restriction may lead to a fall in the total imported intermediate input. Consequently, there will be a fall in the output of I. As the output of I falls, capital is released in sector M and there is an increase in the equation of M. Therefore, the sector M expands absorbing some labour. However, since sector I is labour intensive, we have an increase in unemployment of labour and lesser rural-urban migration as the increase in the price of I will lead to an increase in rural wage rates. Nonetheless rural-urban sector production R remains unaffected as it is still completely determined by the land endowment. Thus, we have $\widehat{P_I} > 0$ $\widehat{w_R} > 0$ $\underline{\widehat{\alpha^*}} < 0$ and $\widehat{L_U} \geq 0$

Proposition – With international lockdown and restriction in the trade, we have an increase in unemployment of labour due to the factor intensity issue as the informal sector contracts and the urban formal sector M expands. The model also supports a reversal of rural-urban migration variables.

4. EMPIRICAL STUDIES

4.1 Time Series Regression

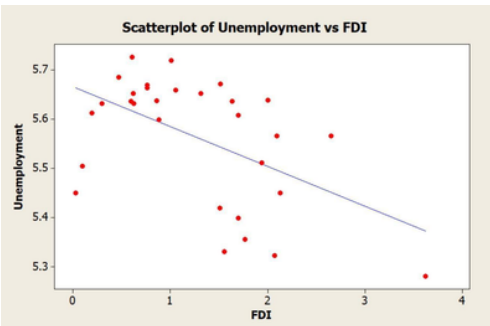
Data: Data for both FDI inflow and unemployment have been collected from World Bank Open Data. We have taken data on India for 30 years (from 1991 to 2020).

Variables:

- Our **Dependent Variable** is Unemployment as a percentage of the total labour force. It is a modelled ILO estimate.
- Our **Explanatory Variable** is net Foreign Direct Investment inflow as a percentage of GDP.

Methodology: Firstly, we try to plot Unemployment and FDI.

Figure 3: *Scatter plot of Unemployment and FDI (% of GDP)*



Source: Authors' calculations using data from World Bank's open data

The downward sloping line suggests the inverse relationship between the two variables with a high negative correlation of -0.57.

But correlation doesn't signify the entire picture. Due to the presence of significant positive autocorrelation (Durbin Watson d-statistic as 0.299), we used the Prais-Winsten method of estimating the regression using the Cochrane-Orcutt procedure to estimate the autocorrelation coefficient (rho). So, we have estimated the effects of FDI inflow on unemployment using GLS estimators with the Cochrane-Orcutt procedure in this time-series regression.

Regression Analysis: We estimate the equation as

$$(\text{Unemployment})_t = \alpha_0 + \alpha_1(\text{FDI Inflow})_t + e_t$$

Table 1: *Regression results of Unemployment and FDI inflow*

Unemployment	Coefficient	Std. Err.
FDI inflow	(-0.07698980 (0.005)***	0.0250726
constant	5.682956 (0)***	0.1004596
Number of obs	30	
F(1, 27)	9.43 (0.0048)***	
R-squared	0.2588	
Adj R-squared	0.2314	
Estimated rho	0.86	

P- values in parentheses (** p <0.05 *** p < 0.01)

Source: Authors' calculations using data from World Bank's open data

Persistent unemployment is an alarming feature of developing countries, be it skilled or unskilled. FDI in different sectors improves the situation of employment of either type of labour. The result thus proves empirically the result from our theoretical model. A negative coefficient between unemployment and FDI suggests that FDI reduces unemployment. The relation is statistically significant.

4.2 Cross-Sectional Regression

Data: Data for FDI inflow has been collected from figures released by the Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, Government of India. Data for rural to urban migration has been taken from the Census of India, 2011. We have taken data on 35

states and union territories of India for the year 2011.
Variables:

- Our **dependent variable** is the total number of migrants from rural to urban in different states. This is a quantitative proxy variable for rural-urban migration.
- Our **explanatory variable** is net inflow of Foreign Direct Investment as a percentage of GDP.

Methodology: We have estimated the effects of FDI inflow on rural-urban migration using OLS estimators in this Cross-sectional regression.
Regression Analysis: We estimate the equation as

$$(\text{Rural-urban migration})_i = \alpha_0 + \alpha_1(\text{FDI Inflow})_i + e_i$$

Table 2: *Regression Results of Rural-Urban migration and FDI inflo*

Migration	Coefficient	Std. Err.
FDI inflow	0.00366 (0.001)***	1E-05
constant	1638515 (0.001)***	454742
Number of obs	35	
F(1, 33)	12.4 (0.0013) ***	
R-squared	0.2732	
Adj R-squared	0.2511	

P- values in parentheses (** p <0.05 *** p < 0.01)

Source: Authors' calculations using Data from Census of India and DIPP

Migration and FDI inflow are complements. As FDI inflows in urban industrial zones, more job opportunities are created. This encourages rural people to migrate to cities in search of jobs. As a result, the tendency of rural to urban migration increases with an increase in FDI. The positive coefficient between FDI and total migrants, which is a proxy variable for rural to urban migration, proves this result. The relation is statistically significant as well.

5. CONCLUSION AND POLICY RECOMMENDATIONS

Given the proposition of the theoretical model, we propose the need for strong FDI in both the rural and urban formal sectors. An increase in the flow of capital in the agricultural sector in India can have a tremendous effect on the rural development and wellbeing of people. This is also desirable as it shows the lesser tendency of agents in the economy to migrate from rural to urban, leading to lesser pressure in some specific cities. With the increase in FDI in the agricultural sector, modern technology can be implemented to increase the productivity of the land as well as transfer the non-usable arable or barren land into productive usable land. This will lead to an increase in agricultural output and create more job opportunities in rural India. An increase in formal sector capital flow will mainly specify greater investment in the capital intensive service sector. This is often criticized to create jobless growth as we have shown in our basic model. Though with a slightly changed model which is closer to reality (as the type of capital can be different), we found an increase in employment. Our empirical analysis also supported the claim of such an overall fall in the unemployment rate of labour due to increased FDI inflows.

APPENDIX

Appendix A.1

$$Z = C_{ui}{}^{\beta_i} l_{ui}{}^{1-\beta_i} + \lambda(C_{ui} - (1 - l_{ui})w_u - D)$$

The FOC are:

$$\frac{\partial Z}{\partial C_{ui}} = \beta_i (C_{ui}/l_{ui})^{-\beta_i} + \lambda = 0 \ldots (1.11)$$

$$\frac{\partial Z}{\partial l_{ui}} = (1 - \beta_i)(l_{ui} /(C_{ui})^{1-\beta_i} + \lambda = 0 \ldots (1.12)$$

$$\frac{\partial Z}{\partial \lambda} = (C_{ui} - (1 - l_{ui})w_u - D) = 0 \ldots (1.13)$$

Eliminating λ from (1.11) and (1.12) and putting the value of C_{ui} in (1.13) we obtain

$l_{ui} = (1 - \beta_i)(\frac{w_u - D}{w_u})$ and then $C_{ui} = \beta_i(w_u - D)$. Similarly, we can find C_{Ri} and l_{Ri} for the rural sector.

Appendix A.2

Differentiating (5) – (7)

$$\theta_{LR}\,\hat{g} + \theta_{TR}\,\widehat{w_R} - \theta_{IR}\,\widehat{P_I} = 0$$

$$\theta_{KI}\,\hat{r} + \theta_{LI}\,\widehat{w_I} + \theta_{mI}\,\widehat{p_m^*} = \widehat{P_I}$$

$$\theta_{KM}\,\hat{r} = 0$$

Differentiating (11) and (12)

$$\hat{p} = (1\text{-}\ \alpha np)\,\widehat{w_I} = (1\text{-}\ hp)\,\widehat{w_R}$$

We get $\widehat{a_{KM}} = \widehat{a_{LM}} = 0$ as there is no change in input prices for sector 3. We assume $\widehat{a_{TR}} = \widehat{a_{LR}} = 0$

Thus, we obtain $\widehat{w_R} = \frac{\widehat{P_I}(1 - hp)}{\theta_{LI}\,(1 - \alpha np)}; \hat{g} = -\frac{\theta_{LR}\,\widehat{P_I}(1 - hp)}{\theta_{TR}\,\theta_{LI}\,(1 - \alpha np)};$

$$\widehat{w_I} = \frac{\widehat{P_I}}{\theta_{LI}}; \hat{p} = \frac{\theta_{LR}\,\widehat{P_I}(1 - hp)}{\theta_{LI}}$$

Differentiating (8) and (10)

$$\hat{T} = \lambda_{TR}\,\hat{R}$$

$$\hat{K} = \lambda_{KM}\,\widehat{M} + \lambda_{KI}\,\hat{I} + \widehat{a_{KI}}\,\lambda_{KI}$$

$$\hat{L} = \lambda_{LM}\,\widehat{M} + \lambda_{LI}\,\hat{I} + \lambda_{LR}\,\hat{R} + \lambda_U\,\widehat{L_U}$$

Given the demand equation as

$$\delta\left(a_{LM}\ \underline{w}\, M + a_{LI}\ w_I\, I + a_{LR}\ w_R\ \ R\right) + a_{IR}\ P_R R = P_I\, I$$

Differentiating it we get

$$w_R \lambda_{LR}\, \hat{R} + w_I\ \lambda_{LI}\, \hat{I} = \left(\underline{w}\hat{p} - w_R \lambda_{LR}\, \widehat{w_R} - w_I \lambda_{LI}\, (\widehat{w_I} + \widehat{a_{LI}}\ )\right) - \underline{w}\lambda_{LM}\, \widehat{M}$$

$$w_R \lambda_{LR}\, \hat{R} + w_I\ \lambda_{LI}\, \hat{I} = \left(\underline{w}\hat{p} - w_R \lambda_{LR}\, \widehat{w_R} - w_I \lambda_{LI}\, (\widehat{w_I} + \widehat{a_{LI}}\ )\right) - \underline{w}\lambda_{LM}\, \widehat{M} \quad (1)$$

$$\delta(\lambda_{LM}\ \underline{w}L\, \widehat{M} + \lambda_{LR}\ w_R L\hat{R}\ +\ \lambda_{LR}\ \widehat{w_R}L + \lambda_{LI}\ \widehat{w_I}L\,) - P_I\, I\widehat{P_I}\ =\ P_I\, I\hat{I}\ \text{-}\ \delta\lambda_{LI}\ w_I L\,\hat{I} \quad (2)$$

$$\widehat{K} = \lambda_{KM}\ \widehat{M} + \lambda_{KI}\ \hat{I} + \widehat{a_{KI}}\ \lambda_{KI}\ (3)$$

Arranging (1) (2) and (3) we have

$$\mathrm{C}\widehat{M} + \mathrm{D}\ \widehat{P_I} + \mathrm{E}\hat{I}\ =\ -w_R\widehat{T}$$

$$\mathrm{F}\widehat{M} + \mathrm{G}\ \widehat{P_I} + \mathrm{H}\ \hat{I} = \delta w_R L\widehat{T}$$

$$\lambda_{KM}\ \widehat{M} + \lambda_{KI}\ \hat{I} + \lambda_{KI}\ \sigma_2\widehat{P_I}\ \ = \widehat{K}$$

1, change in land input - $\hat{R} = \hat{T}/\lambda_{TR} > 0$

We again solve by Cramer's rule taking $\widehat{K} = 0$ and $\widehat{T} \neq 0$

$$\widehat{M} = \frac{-\delta w_R L\widehat{T}(w_I\lambda_{LI}\,\lambda_{KM}\,\lambda_{LM}\, L + \theta_{KI}\,\lambda_{KI}\, L\sigma_2 + P_I\, I\underline{w}\lambda_{KM}\,)}{J_1} < 0$$

$$\hat{I} = \frac{\delta w_R L\hat{T}(\sigma_2 w_I\lambda_{KI}\, L\delta + P_I\, I\underline{w}\lambda_{LM}\,/\delta + \underline{w}\lambda_{LM}\, L\delta + w_I\lambda_{LI}\,\lambda_{KM} - w_I\lambda_{KI}\,\underline{w}\lambda_{LM}\,/\delta\,)}{J_1} > 0$$

$$\widehat{P_I}\ = \frac{\delta w_R L\widehat{T}(\underline{w}\lambda_{KM}\, L\delta + P_I\, Iw_I\lambda_{LM}\ + \underline{w}\lambda_{LM}\, L\delta - \lambda_{KM}\,\lambda_{LI}\,\theta_{LI}\, w_I)}{J_1} > 0$$

$$J_1 = \frac{\delta}{J_2}(\underline{w}\lambda_{KM}\,\lambda_{LI}\ - w_I\lambda_{KI}\,\lambda_{LM}\ ) + P_I\, I(\frac{\theta_{KI}\,\underline{w}\lambda_{LM}}{J_2} - 1) > 0$$

$J_2 = (\theta_{LI} - \frac{\theta_{KI}\,\theta_{LM}}{\theta_{KM}}) > 0$ given the assumption of factor intensity

$\hat{L} = \lambda_{LM}\,\widehat{M} + \lambda_{LI}\,\hat{I} + \lambda_{LR}\,\hat{R} + \lambda_U\,\widehat{L_U}$

Or, $\widehat{L_U}\ =\ -\lambda_{LM}\,\widehat{M}\ - \lambda_{LI}\,\hat{I}\ - \lambda_{LR}\,\hat{R}\ < 0$ (due to labour intensive I)

as $\widehat{P_I}\ > 0\quad \widehat{w_R} > 0\ \widehat{\alpha^*} > 0$ if the (3.1) is satisfied which in general will be satisfied.

2, change in capital input - We solve by Cramer's rule taking $\hat{R} \neq 0$ and $\hat{T} = 0$ $\widehat{R}=0$

$$\hat{M} = \frac{\widehat{K}(\underline{w}^2 \lambda_{LI} L + \theta_{KI} \lambda_{KI} L\sigma_2)}{J_1} > 0$$

$$\hat{I} = -\frac{\hat{K}(\underline{w}\lambda_{LM} L\delta + P_I I\underline{w}\lambda_{LM} + \underline{w}\lambda_{LM} L\delta)}{J_1} < 0$$

$$\widehat{P_I} = \frac{\hat{K}(-\underline{w}\lambda_{LM} L\delta + P_I I\underline{w}\lambda_{LM} - \underline{w}\lambda_{LM} L\delta)}{J_1} \lesseqgtr 0$$

$J_1 = \frac{\delta}{J_2}(\underline{w}\lambda_{KI}\ \lambda_{KI} - w_I\lambda_{KI}\ \lambda_{KI}) + P_I\, I(\frac{\theta_{KI}\, w\lambda_{LM}}{J_2} - 1)$

$J_2 = (\theta_{LI} - \frac{\theta_{KI}\,\theta_{LM}}{\theta_{KM}})>0$ given the assumption of factor intensity

$\hat{L} = \lambda_{LM}\,\widehat{M} + \lambda_{LI}\,\hat{I} + \lambda_{LR}\,\hat{R} + \lambda_U\,\widehat{L_U}$

Or, $\widehat{L_U} = -\lambda_{LM}\,\widehat{M} - \lambda_{LI}\,\hat{I} > 0$ (due to labour intensive I)

Assuming $\widehat{P_I} > 0$ $\widehat{w_R} > 0$ $\hat{\alpha} > 0$ if the (3.1) is satisfied which in general will be satisfied.

With the remodification as done by (17) and (18) we have

$\hat{M} = \widehat{K_2}/\lambda_{K2M}$

$\hat{R} = \hat{T}/\lambda_{TR} = 0$ as T doesn't change. So, by differentiating (18) we have

$\lambda_{K1R}\ \hat{R} + \lambda_{K1I}\ \hat{I} = 0$. Then we have $\hat{I} = 0$

$\hat{L} = \lambda_{LM}\,\widehat{M} + \lambda_{LI}\,\hat{I} + \lambda_{LR}\,\hat{R} + \lambda_U\,\widehat{L_U}$

Or, $\widehat{L_U} = -\lambda_{LM}\,\widehat{M} < 0$

as $\widehat{P_I} > 0$ $\widehat{w_R} > 0$ $\hat{\alpha} > 0$ if the (3.1) is satisfied which in general will be satisfied.

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