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The COVID-Induced Recession and the Migrant Labor

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The COVID-induced recession has been responsible for exodus of unemployed unskilled immigrants from different regions to their origin in search of family and network support. The skilled migrant workers retained jobs and stayed at the destination, mostly. This paper argues that the migration of different skill types is a response to how regional economic prospects including provision of infrastructure have emerged in a country. The skilled workers do not return to the source despite recession owing to infrastructure deficiency. The unskilled immigrants end up unemployed at destination. We offer some conjectures on generation of skill and return to unskilled worker as an outcome of the negative economic shock.

Keywords: COVID, Recession, Skill, Infrastructure, Insurance

JEL Classifications: H54, J24, P25

1. Introduction

Sometime in early March 2020, the hugely disruptive and deadly COVID-19 virus arrived in India. It had already spread to a number of countries at that point and, admittedly despite early warnings sent by the World Health Organization on January 31, 2020 the government had neither paid attention to nor realized the health and economic implications of what this pandemic could unleash without informed and cautious measures. While it is true that many other governments and several head of states publicly undermined the harm this virus can cause and thereby brought about significant damages to various quarters, the Indian government resorted to nationwide lockdown as a first response, but without attending to the critical livelihood concerns of millions of migrant workers in the country. It is well known that India is the source of millions of migrant workers

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dispersed globally (about 17.5 million, UN-DESA, 2019), in addition to approximately 450 million individuals (MoSPI; Census of India, 2011) categorized as internal migrants. According to De (2019), in India, as in most countries, since there are generally no restrictions on internal movements, between 2001 and 2011 the internal migration witnessed an unhindered increase of 45%. This far exceeds the population growth rate of 18% between the same periods. Indeed, internal migrants as percentage of population increased from 30% in 2001 to 37% in 2011. It should be pointed out clearly that while internal migrants in India constitute a small percentage of the working population in the country as compared to the United States for example, where 10% of all workers stay and work in a location different from their place of origin (Brookings, 2019), in terms of absolute numbers it is 1.5 times the population of USA. Evidently, any natural or economic shock leading to closure of activities and imposition of restrictions on mobility in the country is expected to severely disrupt the conditions of living for a large number of individuals. The Government of India has almost no long-term policy measure in place to address the welfare concerns of this large pool of workers. Factors influencing the exodus capture the mainstay of the present paper, which in future should be able to offer advanced results subject to availability of recent statistics on regional migration of labor.

It is useful to remind that despite the significant increase in internal migration in India, bulk of the movement (62%) is within the same district, while about 26% is between districts but within the same state. The data suggests that only 12% of movements is inter-state, where both seasonal and long-run migration from Uttar Pradesh, Madhya Pradesh, Bihar, Jharkhand, Rajasthan, Gujarat, Odisha, Assam, North Eastern states, West Bengal, to states like Karnataka, Tamil Nadu, Kerala, Punjab, Jammu and Kashmir, Maharashtra, Delhi, etc. dominate the pattern. In recent times the exodus of relatively unskilled migrants from their work-related destinations back to the origin has however been largely inter-state in nature.

Like all other countries, labor migration in India varies by origin and destination, as also by skill types, occupation and gender. Rural to urban, rural to rural, urban to urban and even urban to rural migration are reported in multiple rounds of survey conducted by the National Sample Survey Organisation (NSSO) to display the extent of mobility of approximately 2% of the working population within the country. A substantive share of such workers is relatively unskilled, and belongs to the large population of unorganized and informal workforce in India making them most vulnerable to unfavorable economic conditions. Indeed, the internationally reported plight of migrant workers on foot, following the onset

of country-wide lock down in India epitomizes the poor conditions of work and livelihood for a large section of the unskilled labor in the country.

Section 2 offers further explanations along this line and section 3 develops a short model. The model purports to show that infrastructure deficits drives out workers from source regions, especially when skill and infrastructure are complementary factor inputs for the production of services in specific regions. Section 4 concludes.

2. Further Explanations and Related Literature

The states of India being rather dissimilar language-wise, custom, food habits and in general culture-wise, internal migration often reflects features observed under international migration of labor and may have similar impact on the source via multiple transmission mechanisms. The brief literature survey on the subject of internal migration, and to some extent return migration, shall therefore have much in common with international migration especially in the absence of survey data not made available beyond 2007-08 restricting contemporary impact analysis in the country to last drawn samples and to the Census of 2011.

Notably, internal migration in India often takes the form of seasonal or circular movements between rural and urban areas. This opens up the possibility of transmission of human, social and financial capital from urban to rural areas. Similarly, when migrants are forced to return to the source, the occupational choice of return migrants and future prospects might offer multiple implications for the subject of regional economics. The extant literature on international migration duly studies related issues as far as mobility of workers of varying skill types is concerned. For example, when labor returns to the source with international experience of work (see Martin and Radu, 2012; Wahba and Zenou, 2012; Piracha and Vadean, 2010; etc) the benefits from employing such workers exceed the standard benefits associated with remittances and externalities. Among the few studies that focused on internal migration, Fafchamps and Shilpi (2013) studied the destination choice of migrants in Nepal and Demurger and Xu (2011) studied the self-employment decision of return migrants in China. However, the present conditions are not expected to deliver the benefits associated with voluntary movement of workers because of the negative implications of both local and global economic downturn following closure of activities during the continuing health crisis.

The subject of what happens to migrant workers often remains subdued even when a country in question suffers from a deep recession as in the current context. There seems no easy answer to this question as conflicting views prevail economically and politically. In an earlier study (Martin, 2009) the tension which migrants are exposed to during economic downturns has been elegantly discussed; but every crisis has its own features that are distinct from the previous ones. The present pandemic is the source of an economic crisis that has not been analyzed in recent times. The absence of similar case studies is generally substituted by predictive analyses of the effect of recession on labor market outcomes for immigrants. Some of the related studies dealing with international migration showed that in the United States (Papademetriou and Terrazas, 2009; McCabe and Meissner, 2010) the onset of recession immediately saw the retrenchment of workers of foreign origin, and elsewhere the recession seemed to have little impact on immigrant jobs and might have actually favored immigrants disproportionately compared to natives (for UK see Flanders, 2010). This is an issue which gathered significant momentum in the last election debates in the UK and seems far from over. If recessionary pressure in a country leads to job losses in large numbers, it may become a political issue as to who goes first – the immigrants or the natives. And, this may not be a trivial matter because the share of immigrants in the workforce of many OECD countries is reasonably high (OECD, 2009). Consequently, a country that has traditionally produced large number of international and internal migrants might have to offer rescue packages to workers stranded in far-off locations without jobs. According to reports, while the Government of India initiated such rescue missions for skilled and unskilled workers of Indian origin stranded in foreign countries, it has shown poor response to internal migrants trying to return to the source. The recorded public policy raises a plethora of interesting questions regarding the political economy of damage control as practiced by federal and state governments. Presently, we will model a situation whereby the skilled migrants will not return at all despite the negative economic shocks at the destination, while the unskilled shall return only temporarily. The availability of infrastructure remains a critical factor in driving these outcomes. Consequently, conceiving of an unemployment insurance scheme could improve welfare for millions of workers under distress.

Migration of skilled and unskilled workers is to a large extent dependent on networks. A recent study tracking telephone records shows that social distancing measures adopted in the US in the wake of the pandemic prevented further migration by Mexican workers, as many workers who are already in the US have communicated to the prospective workers in Mexico against attempts to migrate

(see, Tian *et al*. 2020). The outcome is reminiscent of Papademetriou and Terrazas (2009) using preliminary evidence on migration stocks and flow in the United States suggest that immigrant inflow – legal and illegal – both have slowed down since USA went into the economic crisis. The migration pattern also underwent compositional changes in terms of sectoral employment. McCabe and Meissner (2010) attested to this possibility around the time, since the sectors like construction, manufacturing, leisure and hospitality, support and personal services, etc. which employ more immigrants have been worst affected. It is also the case under the present crisis. Tourism being among the worst affected industries globally, millions of workers in the sector have suffered from the downturn already. As far as internal migrants in India, China, Brazil, Russia and United States are concerned, a significant contingent works in the hotels and restaurants in different parts. The growth of tourism in a state is usually influenced by the growth of infrastructure, of which availability of hotels and means of travel are most important. Clearly, all constituent states in the country do not have equal tourist attractiveness, but even if they do, the revenue generating potential at the state level is often constrained by lack of infrastructure as well as paucity of dedicated funds for promotion of tourism (see Dutta and Kar, 2018). Therefore, it is only natural that workers engaged in the hospitality industries may undergo relocation for longer run. The tourism-led outcomes certainly show significant divergence even if the tourist attractions are uniformly distributed, which is of course unrealistic to assume. In addition, the states display varying levels of quality of governance and provision of infrastructure that could accentuate such divergence. This is also applicable to the migrant question: returning to the origin with insufficient capacity and opportunities is unlikely to be a sustainable choice.

Earlier, the economic crisis of 2008 rendered Hispanics from Mexico and Central America jobless, disproportionately.[1] However, they may not have necessarily returned home, since younger immigrants are more footloose compared to natives and not sticky to particular job types. Nevertheless, the job openings in these occupations have undoubtedly shrunk.

Compared to these, Wadsworth (2010) using data from the Labour Force Survey

[1] Historically also, Hispanics suffered more during 1994 recession in the US (see, Boisjoly and Duncan, 1994).

(LFS, UK)[2] show that although the flow dampened between 2006 and 2009, the stock still rose. Barrett and Kelly (2010) showed high job losses among immigrants in Ireland during 2008-09. Moreover, there is also anecdotal evidence that some Central and Eastern European migrants (see Krings *et al*, 2009 for Polish return migration from Ireland) have returned home. These are the most direct implications of divergent outcomes for migrants and natives -- the impact on internal migration however remains much less understood under similar contexts.

Like earlier recessions, the present crisis also created conditions under which loss to one sector, predominantly traditional manufacturing is compensated by prospects in another sector, computational services for example. Unless the labor is free to move between sectors and easily switch occupations, which is most unlikely for unskilled immigrants in the country of all people, because the larger share of such workers gets absorbed as agricultural labor, construction workers, etc. the ongoing recession shall not offer in-built insurance options. Kar (2013) explore this possibility driven by changes in the terms of trade with respect to tradable goods produced in two different sectors. It suggests that recession may bring about a perceptible change in immigrant composition for various sectors.

The predominance of unskilled workers moving about in search of jobs is not exclusive for India. In the UK for example, despite the fact that the newer immigrants are younger and relatively more educated than comparable natives, nearly 50% are engaged in less-skilled activities (Table 3, Wadsworth, 2010). Therefore, fall in demand for skilled and unskilled goods and services may affect immigrants in different ways making the relationship between recession and immigration quite complex.

Kar (2013) dealt with recession as a manifestation of falling commodity prices owing to exogenous decline in the aggregate demand. If prices fall for both export goods and import goods, the paper showed that the employment level of immigrants vis-à-vis natives crucially depend on the commodity terms-of-trade (TOT) movements. Interestingly, even during recession a commodity terms-of-trade improvement is possible. This is true for many developed countries including UK that (MacCoilee *et al*, 2009 charts 2 and 4; and Dury *et al*, 2003, chart 7 for UK to non-EU countries) the commodity terms-of-trade has improved

[2] Also Flanders (2010, BBC) using Office for National Statistics (ONS) data in the UK shows that non-UK born individuals took 81% of all jobs created over the last decade and this includes the period when recession was high in the UK.

from less than 1 to more than 1 in the recent years. This has been possible despite falling prices of both exports and imports – the export prices fell less than the import prices (Dury *et al*, 2003, chart 5, p. 166). The paper argued that this may generate more jobs for immigrants in the presence of minimum wage[3] in the relatively unskilled sector, where more immigrants work.

A direct derivative of the imminent job losses facing migrants is one of wage gaps between skilled and unskilled workers rising during this period. Earlier, Marjit, Beladi and Chakraborti (2004) have discussed the possibility of a drop in relative unskilled wage when TOT improves for a developing country. Acharyya (2011) also discussed the TOT movements and global wage inequality when specific trade policies are adopted, while Marjit, Kar and Chaudhuri (2011) discussed the effects of recession in the skilled sector on unskilled wages. The magnanimity of the current situation might necessitate deeper attention to some of these issues in future.

3. A Model

Consider a developing country with j regions indexed in a continuum $[0,1]$. Each region of the country has the potential to produce two goods: a traditional industrial product $X_j(L_j), X_j' > 0, X_j'' < 0$, where L_j is the availability of unskilled labor in region j. The country also produces a modern service sector output Y_j, which uses S as the input of skilled labor and infrastructure (I)[4]. Unlike the region-specific endowment of unskilled labor, the supply of skilled labor depends on the availability of infrastructure in region j. Let us define w_{Sj} as the skilled wage determined in region j; w_j is the unskilled wage determined in region j and k_j is the price per unit of infrastructure in region j. The autarkic (no regional trade) prices of commodity X and Y are given by (P_X, P_Y) obtained at the equilibrium from the supply of the two commodities and respective demands.

The following set of equations depicts this economy closely:

$$X_j = (L_j^S)^{\beta} \qquad 0 < \beta < 1, \qquad X_j' > 0, X_j'' < 0 \qquad (1)$$

$$Y_j = \left(S_j^S\right)^{\alpha} \left(\tilde{I}_j\right)^{1-\alpha} \qquad 0 < \alpha < 1 \qquad (2)$$

[3] According to Her Majesty's Revenue and Customs Office in UK (http://www.hmrc.gov.uk/nmw/), most adult workers working legally are eligible for the minimum wage. Comparable laws apply in other OECD countries.

[4] See Grubel (1987) arguing the importance of human capital in service trade.

$$S_j^s = [(1-\varphi)\tilde{L}_j . I_j^S]^{\sigma+1} \qquad 0 \le \sigma, \varphi < 1,\ S_j^{s\prime} > 0, S_j^{s\prime\prime} > 0 \qquad (3)$$

$$L_j^s = (\varphi \tilde{L}_j) \qquad (4)$$

$$I_j^s + \tilde{I}_j \le \bar{I}_j \qquad (5)$$

The utility function for the representative consumer in this economy (also see Giannetti, 2002) is given by:

$$U_i(X,Y) = X_i^{\theta} Y_i^{1-\theta} \qquad 0 < \theta < 1 \qquad (6)$$

It is useful to indicate that (a) skill is acquired and therefore its region-specific availability is endogenously determined; and (b) the available infrastructure goes both into skill acquisition and generating services leading to direct as well as indirect use of infrastructure in the service sector. In equation (3) the inner product for generation of skill has been used in order to exploit the characteristics of this functional form. Importantly, by its characteristic it is suggested that no amount of skill can be produced unless some amount of infrastructure is made available, which by construction is non-negative in supply for any region *j*, but varies according to endowments. The exponent on the non-negative inner product should be considered as the externality from human capital, which influences inter-regional mobility of skill (with a provision of no spillover as well as per the restrictions).[5]

Under these assumptions, the budget constraint of a representative consumer in region *j* is given by $P_X X + P_Y Y = w_j^* L^* + w_{Sj}^* S_j^*$. We assume homothetic preferences such that only total income and the relative prices of the two goods are relevant for determining aggregate demand. The autarkic equilibrium prices are derived from the supply and demand schedules directly.

Equations (1) and (2) are production functions for *X* and *Y* respectively, determining the output levels of the two commodities based on the exogenously given (φ) portion of the endowments of unskilled labor ($\tilde{L}_j$) in (4) and the supply

[5] A function from f:V x V $\rightarrow$ F (for every ordered pair (*x,y*) of vectors, we denote *f* (*x, y*) by (*x, y*)) is an **inner product** on *V* if: (i) (*x, y*) = (*y, x*) (Conjugate symmetry, or commutative); (ii) ($\alpha x+\beta y, z$) = α (*x, z*) +β (*y, z*),$\forall \alpha, \beta \in F, \forall\ x, y, z \in V$ (Linearity); and (iii) (*x, x*) $\geq$ 0, with '=' 0 *iff x* = 0 (Non-negativity). In addition, it is possible to order the constituent vectors, but in the absence of any further implications to be used, it has been avoided.

of skilled labor (S_j^s) generated with the help of infrastructure support (availability for skill generation in region *j* is given in equation 5) and a section (net of share assigned to skill generation) of the unskilled workers $(1-\varphi)$ according to the production relation in equation (3). Production of *S* follows the properties of *inner product* with respect to its inputs, (φ) being a scalar. Equation (6) is the source of demand for commodities *X* and *Y* subject to maximization of the utility functions for each skill type, *i* = *S*, *L*. The demand is assumed homogeneous across skill types. $\bar{I}$ is an index of infrastructure for region *j*. It is a combination of electricity, internet services, railway services, road network, ports, etc fetching a price per unit of service generated.

The determination of five unknown variables from five equations in equilibrium begins with an autarkic situation with varying prices of the commodities being produced across regions. First, the profit maximizing choice of output in *X* determines L_j^S in equation (1), which in turn determines the distribution ($\varphi < 1$) of unskilled workers between production and skill acquisition. If the region requires more (or less) unskilled labor than its endowment, immigration (or emigration) takes place as a response to variations in price under autarky. Subsequently, equations (2), (3) and (5) determine $(S_j^S, \tilde{I}_j, I_j^S)$. The endowment of infrastructure is binding unlike unskilled labor. The mobility of skill is also restricted by availability of infrastructure, because skill does not move to places deficient in infrastructure. Finally, the aggregate demand is the total amount of *X* and *Y* for *S* and *L* based on exogenous commodity prices in the country.

We begin by solving the equilibrium employment levels of L_j and S_j. From (1) and (4) starting with some w_j as the unskilled wage rate in region *j* we maximize output in *X* by choosing optimal employment of unskilled labor. That is,

$$\max_{L_j} \pi_{Xj} = P_X L_j^{\beta} - w_j L_j$$

yields the optimal employment of unskilled labor in region *j*:

$$L_j^d = \left(\frac{w_j}{\beta P_X} \right)^{-\frac{1}{1-\beta}}, \text{ such that, } \frac{\delta L_j^d}{\delta w_j} < 0 \qquad (7)$$

If full employment prevails in region *j*, the equilibrium unskilled wage is such that,

$$L_j^d = \left(\frac{w_j}{\beta P_X} \right)^{\frac{1}{\beta-1}} = \varphi \tilde{L}_j$$

or, $$w_j^* = \left(\varphi \tilde{L}_j \right)^{-(1-\beta)} \beta P_X \qquad (8)$$

Obviously, if opportunities are low in region *j*, such that $L_j^d < \tilde{L}_j$ then the equilibrium wage is also lower leading to outmigration of unskilled workers in search of jobs as well as higher wages in another region.

Relation (8) also shows that as the endowment of unskilled labor rises in the j^{th} region the equilibrium wage falls, whereas the rise in price of commodity *X* raises the same. Since $(1-\varphi)$ share of unskilled workers are used in skill generation, the remaining are freely mobile across all regions of the country since commodity *X* is produced everywhere. This further implies that for regions where w_j^* is low owing to larger stock of unskilled workers and/or poor skill turnout, will both send workers out to regions where w_j^* is higher. The free mobility may not bring about migration equilibrium in the country where deficits and surplus adjusts itself leading to a common wage, because regions shall have different endowments of infrastructure leading to differential skill turnout and flow into skill formation. If production of *X* requires use of infrastructure along with unskilled labor as shown for commodity *Y* subsequently, then the mobility will be further restricted by the availability of region-specific endowments and shall not bring about a uniform wage. This closely reflects the experiences of a large country like India, where the unskilled wages differ between states despite free mobility.

The case for skilled workers is therefore, different. Endowment of infrastructure varies by region and this has to be factored in for determining the optimal employment of skilled workers in region *j*. Let the unit cost of producing Y_j be given by $C = w_{Sj} S_j^S + k_j \tilde{I}_j$, where w_{Sj} is the skilled wage and k_j is the price per unit of infrastructure available for production of *Y* in region *j*. Thus, constrained profit maximization for production of Y_j is written as:

$$\max_{S_j, I_j} \pi_{Yj} = P_{Yj} \left(S_j^S \right)^{\alpha} \left(\tilde{I}_j \right)^{1-\alpha} - w_{Sj} S_j^S - k_j \tilde{I}_j + \lambda_S (S_j - m_S^2 - S_j^s) + \lambda_I (\bar{I}_j - m_I^2 - \tilde{I}_j) \qquad (9)$$

which derives from the well-known general structure: $g_j(T) \geq b_j \Rightarrow g_j(T) - m = b_j$; m_S and m_I are slack variables (squared) defining

the distance between the constraint and the amount used; λ_S and λ_I are Lagrange multipliers for the two constraints used in the production of Y_j. The availability of infrastructure and skilled labor for a region *j* are derived from (3) and (5) respectively. Non-zero values of λ_S and λ_I would imply that the constraints are binding. Solving (9) with respect to $S_j, I_j, \lambda_S, \lambda_I, m_S, m_I$, and by obtaining standard first order conditions, we get,

$$S_j^{S*} = \left[\frac{w_{Sj} - \lambda_S}{\alpha P_{Yj} \left(I_j^S \right)^{1-\alpha}} \right]^{-\frac{1}{(1-\alpha)}} \tag{10}$$

and $$\tilde{I}_j^* = \left[\frac{k_j - \lambda_I}{(1-\alpha) P_{Yj} S_j^{\alpha}} \right]^{-\frac{1}{\alpha}} \tag{11}$$

Further, $$m_S^2 = -S_j^s + \left[\frac{w_{Sj} - \lambda_S}{\alpha P_{Yj} \left(I_j^S \right)^{1-\alpha}} \right]^{-\frac{1}{(1-\alpha)}} \neq 0 \tag{12a}$$

$$m_I^2 = -\tilde{I}_j + \left[\frac{k_j - \lambda_I}{(1-\alpha) P_{Yj} S_j^{\alpha}} \right]^{\frac{1}{\alpha}} \neq 0 \tag{12b}$$

The complementary slackness conditions show that the slack variables being non-zero, the Lagrangian multipliers must be zero from $\frac{\delta \pi_{yj}}{\delta m_S} = 0$ and $\frac{\delta \pi_{yj}}{\delta m_I} = 0$. Thus, $\lambda_S = 0 = \lambda_I$ can be substituted back in (10)-(12b) to generate the final set of solutions. Thus, regions that fall short of the available infrastructure cannot draw in skilled workers to productive use, even though the solution for the unconstrained version of equation (9) shows that the wage offered in equilibrium must be higher.

In other words, if equation (9) is maximized without the constraints, then,

$$\max_{S_j, I_j} \pi_{Y_j} = P_{Yj} \left(S_j^S \right)^{\alpha} \left(\tilde{I}_j \right)^{1-\alpha} - w_{Sj} S_j^S - k_j \left(\tilde{I}_j \right) \tag{13}$$

The optimal solutions are obtained jointly in terms of product and factor prices, from:

$$\tilde{I}_j^* = \frac{k_j}{P_{Yj}} \frac{1}{(1-\alpha)\left(S_j^{S*}\right)^{\alpha}} \qquad (14a)$$

and $$S_j^{S*} = \frac{w_{Sj}}{P_{Yj}} \frac{1}{\alpha\left(\tilde{I}_j^*\right)^{1-\alpha}} \qquad (14b)$$

The optimal infrastructure allocation to skill generation in region *j* is also obtained from the above relations.

Under the constrained case, however, the optimal demand for infrastructure falls short of the available endowment especially when the price per unit of service is high: $\tilde{I}_j^* + I_j^{S*} > \bar{I}$. This implies that the skilled wage in equilibrium, $w'_{Sj} > w^*_{Sj}$, where w'_{Sj} is the constrained wage. Despite such potential wage differences prevailing across regions, mobility of skilled workers will not take place towards the constrained region because infrastructure cannot be transferred along with skilled workers. The regional wage differential may therefore prevail even when factors are free to move.

Regional Trade and Economic Shock

Let us introduce regional trade in this model, which is driven by the endowment effects across regions leading to specialization of goods or services, as assumed in this structure. Equation (10) shows that with a rise in the equilibrium wage the optimal employment of *S* falls ($0<\alpha<1$), but with a rise in the price of Y_j, the same rises. The second result is particularly interesting. Given that so far we have dealt with localized production and consumption, introduction of regional trade in goods should raise the price of the exportable of region *j*. In other words, as the region opens up to trade P_{Yj} rises. Consequently,

$$\frac{\delta S_j^*}{\delta P_{Yj}} = \frac{1}{1-\alpha}\left[\frac{w_{Sj}}{\alpha P_{Yj} I_j^{1-\alpha}}\right]^{-\frac{2-\alpha}{1-\alpha}}\left[\frac{\alpha I_j^{1-\alpha}}{\left(\alpha P_{Yj} I_j^{1-\alpha}\right)^2}\right] > 0 \qquad (15)$$

This means that the optimal skill requirement in region *j* rises with trade. Thus, all regions that possess higher endowments of skill before trade as determined by the higher endowments of infrastructure shall be the ones that supply Y_j. The regional concentration of the service facility is therefore an outcome of higher returns to the sector, but supported only by adequate availability of infrastructure. Such regions also enjoy the comparative advantage in cost as we derived in the

model. This seems consistent with the flow of skilled workers to the more prosperous regions in the country, because these have the adequate infrastructure to attract the skilled workers. The source region would be generating skill as well as surplus unskilled workers and exporting to the other regions. The coexistence of skilled workers and infrastructure is a pre-requisite for this pattern of regional concentration of activities despite higher per unit returns to skill in source regions that do not have the support of infrastructure facilities.

Subsequently, an economic shock may lead to a series of outcomes. The COVID-19 related lockdown can give rise to multiple conditions as captured within the scope of this construct:

1. P_X is the price of the commodity produced by the unskilled labor and it may temporarily rise as regional lockdown happens. This may raise wage in the short run although the real wage of unskilled might fall. This is directly observable from equation (8) above.
2. Once the local production stops and there is no trade, w_j^* goes to zero and workers seek to return home although the demand price might be very high under the circumstances.
3. The time span during which the supply remains positive even without regional trade depends on the j^{th} region's size of the economy and other factors like infrastructure.
4. Since the services produced by skilled workers will have higher demand under the circumstances, from equation (12) it implies a rise in the price of per unit services, it would not only raise the wages of the skilled workers, but would also retain them at the destination.
5. In case of strong family networks and availability of social capital, the results may be different.
6. From equation (6), the skilled and unskilled workers will have divergent outcomes in terms of real income and utility associated with consumption of the two commodities. The wage gap should undoubtedly increase owing to the crisis, until the production and trade of X and mobility of unskilled workers resume.

As a policy response, it has been argued above that unemployment benefits offered to workers in distress could address some of the vexing issues with mobility of workers at the time of the economic slowdown brought about by COVID-induced recession. From equation (7) above if the equilibrium wage rises owing to unemployment benefit, it reduces demand for labor in a continuous time model. However, a discrete time multi-period model as in Mitman and Rabinovich (2020) allows institutional provision of unemployment benefit which

pays off during economic crisis and prevents mobility of unskilled unemployed workers back to the source region in search of family and network support. Presently, equation (7) shows that a price subsidy to producers of the commodity shall sustain production and employment of unskilled labor and help to minimize the adverse effects of lock down on economic outcomes of a large number of marginal workers in the country.

4. Concluding Remarks

Skill turnout and its regional distribution are often affected by availability of infrastructure in specific regions. Since most developing countries have surplus unskilled workers, the economic closure due to spread of the pandemic is expected to bring about differential impact according to skill types. This paper considers infrastructure at the regional level as an important determinant of skill generation and for production of services. We have shown that the migration of unskilled and subsequently, skilled workers is a response to how much economic activity is pursued in a given region - a region that is deficient in workers will allow in-migration from other regions, or conversely for regions with surplus workers. The skilled workers continue to stay and work in a given region if the infrastructure is adequate, or else they move to regions with better infrastructure support. The ensuing economic crisis as an outcome of COVID-induced lock downs in most regions in India witnessed a mass return migration of unskilled workers, while skilled workers mostly remain at their destinations being part of the service sector facilities in the country. This may be true of other countries in the world, except that the exodus of unskilled workers that drew global attention regarding the lack of social security available to poor workers is in stark contrast for India.

The brief model described in this paper shows that the skill requirement rises for a region which has comparative advantage in the production of the services when the demand for services go up owing to the effects of lock down. The skilled workers therefore may not find the current recession to be a threat to job losses presently, although the skilled wage may once again lend itself to regional variation due to restrictions on mobility from infrastructure deficient locations to those with adequate support for skill to be productive and gainfully employed. However, given the health crisis brought about by COVID-19 through human-to-human transmission, services have to be more technology-intensive and (partially) replace many physical interfaces thereby switching resources and output away from the low-skill dependent sector. In the context of this model,

this may mean that the service sector will need to use more infrastructure per skilled worker, lowering the allocation of flexible infrastructure to skill generation making it costlier (for example, digital platforms for education, while making the physical infrastructure partly redundant) under the circumstances. Since, a large contingent of infrastructure is not easily convertible into alternative use, it might lower supply of skill in the short to medium run and raise skill premium. These issues require future attention.

The return migration of the unskilled should similarly raise the wages in the labor deficient locations and reduce that in the surplus regions, except that with closure of many activities where such workers find jobs, the wage implications may not have much salience. Since these changes are expected to affect consumption demand significantly, a prior provision and institutionalization of unemployment benefits to unskilled workers could have addressed associated concerns effectively.

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