Time Zones, Factor Prices and Inflow of Educational Capital: Changing Sectoral Composition

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Abstract

Time Zone difference induced changes in trade and factor prices are relatively new concerns in trade literature. Here in this paper we formulate a trade model capturing the issue of Time Zone difference and communication technology revolution together to show that due to these developments skilled workers benefit. Though wage inequality between skilled and unskilled workers is widened under reasonable and, of course, sensible condition. Return to capital dwindles while educational capital gets relatively high return.These changes also attract educational capital from abroad and eventually alter the sectoral composition of the economy.

JEL classification: F12, F 16, F 21

Keywords: Time Zone Differences; Trade in Business Services; Skilled and Unskilled Labor; Day-shift and Night-shift Work, Educational Capital

I. INTRODUCTION

Vertical fragmentation or disintegration of production process has been in the literature of international trade and industrial organization for quite a long time. The underlying reasons for fragmentation date back to two significant contributions in international trade literature by Sanyal and Jones (1982) and Sanyal (1983). Drawing on these two papers a whole lot of papers were published later. However, the prime focuses of most of the papers were the effects at industry-level (not at the firm-level) and choice between vertically integrated final good production and trade in intermediate input. Till Krugman's (1979) classic publication nobody heed much attention to firm – the *black box*. A bunch of papers are also written in line of Krugman (1979). Antras (2003) and Antras and Helpman (2004) are two important latest additions into the existing stuff. However, these papers do not deal with trade in intermediate services. Though it does not matter much whether we trade in goods or services as long as the cost of production and cost of transportation are taken care of. But the issue takes an interesting turn if cost of sending and procuring either finished or unfinished services go down significantly along with the possibility of *continuity effect* (Kikuchi, 2011). *continuity effect* comes into play heavily when we think of utilizing all 24hours as working hours: somebody, somewhere must work. The entire world cannot sleep in any given time and so the whole world cannot remain idle in the night time of any given country. Some part of the world must be awake to work. Related literature comprises of Deardorf (2003), Marjit (2007), Long et al (2005), Do and Long (2008), Grossman and Rossi-Hansberg (2008), Kikuchi and Marjit (2011), Matsuoka and Fukushima (2010), Kikuchi (2011), Kikuchu, Marjit and Mandal (2013). Note that revolution in information and communication technology alone is not sufficient to capitalize on the cost difference due to drastic fall in transporting services. This phenomenon coupled with difference in Time Zones (TZ) make the story more attractive and meaningful. Two trading partners would not be able to appropriate the difference in cost of production, even if it exists, if they are located in same TZ indicating identical work-leisure time fare. Hence the success of information communication technology revolution across the globe reaches its pinnacle of gain only when we invoke the issue of TZ difference, and, this is arguably where globalization and trade touch the greatest height to exploit the advantage conferred by "*differences*" like other neo-classical trade models.[2]

Beside, following WTO negotiation impediments to goods' trade and factor movements have became weaker. Different types of trade restrictions are on the fall while degree of factor movements are on the rise. Relatively speaking capital movement from one country to another historically faces less restraint than physical movement of labor. Traditional literature talks about international movement of homogeneous capital that can be used for producing any good or service. Specific capital cannot move so smoothly though the recent trend is not such depressing. Educational capital is one which now-a-days moves from developed to developing countries as the demand for

[2] The story that we develop in this paper and the underlying issues that are going to be taken care of are discussed quite nicely in recent literature. This comprises of Deardorf (2003), Marjit (2007), Long et al (2005), Do and Long (2008), Grossman and Rossi-Hansberg (2008), Kikuchi and Marjit (2011), Matsuoka and Fukushima (2010), Kikuchi (2011), Kikuchu, Marjit and Mandal (2013),), Findlay (1978), Dixit and Grossman (1982), Sanyal (1983), Sarkar (1985), Marjit (1987), Kohler (2004a), Jones and Kierzkowski (1990), Jones and Marjit (2001, 2009), Deardorff (2001), Kohler (2004a, 2004b), Long, Riezman and Soubeyran (2005). Further this work is closely related with Antras et al (2006), Costinot et al (2012), Harms et al (2012), Dettmer (2012), Anderson (2012) Christen (2012) etc.

skilled labor naturally grows with the process of development. Scarcity of educational capital or training facility in developing part of the globe causes this phenomenon[3][4]. In addition, the existing higher-education system and allotted capital may not generate adequate skilled human resources to satisfy the much needed demand for skilled labor. The process of inflow of educational capital may help somewhat less skilled workers get trained to be suitable for more skilled sector, the demand for which is significantly high in international market (one can cite the story of remarkable growth of IT sector in India; FICCI (2007), Azam (2008)). Hence educational capital mobility is an important catalyst of sustainable development process. Related literature comprises of Lucas (2002), Barro (1997), Easterly (2001), Findaly (1995), Banerjee and Newman (1993), Galore and Zeira (1993), Ranjan (2001) etc.However, the effect of educational capital inflow on factor prices and sectoral composition are less focused in contemporary research. Findaly (1995), Beladi et al (2011, 2011a), Kar and Beladi (2004) are some notable papers in related areas though very much different from the prime concern of the current paper.

Hence we try to formulate a model to analyze the possible consequences of massive reduction in cost of information communication technology coupled with advantage of

[3] India is a major trading partner of USA in this regard due to: (a) exactly non-overlapping time zone; and (b) huge supply of educated and computer-savvy youth.

[4] Movement of educational capital towards India can be best corroborated by the following facts. India has: (a) 26,500 higher education institutes, greater than USA (7000) China (4000); (b) around 1,50,000 students go abroad in a year; (c) India needs Rs 20 lakh crore (FICCI, Ernst and Young Report) in education sector by 2020 to match the demand.

time zones differences between countries on factor prices and inflow of educational capital. In doing such exercise we would also talk about how and why an economy may move from a mix of skilled and unskilled based composition to an absolutely skill-based one.

The rest of the paper is schematized as follows. In section II we develop the environment to formulate the model for an open economy. This sections also talks about the solution of the model. In Section III the effects of communication technology revolution and time zone difference are discussed. Such effects also consist of much hyped wage-inequality question. Then we extend our analysis for inflow of educational capital and subsequent effects in Section IV. The last section provides with some concluding remarks. Nevertheless, the relevant mathematical details are relegated to the Appendix.

II. ENVIRONMENT AND THE MODEL

We start with two small open economies, Home (H) and Foreign (F), and the Rest-of the- World (ROW). Our focus would be on the economy which outsources or insources service. The idea is identical in the sense that both these countries need to bear the cost of virtual communication through high bandwidth network. It could be either Home (H) or Foreign (F). Let us assume that the economy is endowed with skilled labor (S), unskilled labor (L) and two different types of capital. One kind capital (K) is used directly for production and the other one, educational capital (E) is used for training unskilled labor to upgrade to the existing level of skill. We further assume that E is internationally mobile. All other factors are mobile across sectors. For brevity we would neither allow any kind of labor nor K to move internationally. The concerned country produces three goods viz. X, Y and Z. X is a technical sector which requires specifically trained workers or skilled labor (S) only. Specific training can easily encompass the issues such as vocational training, technical training, computer literacy, software knowledge etc. However, X requires two consecutive 12 working hours and hence two units of S in a sense.

Production function of X is $X = f(S)$

One day (24 hours) is divided into *two periods*: day-shift working hours and night-shift working hours, both of which are of 12 hours. Wage rates are determined only for 12 hrs (day-time). Markets are competitive and open every 24 hours. So the country has essentially three options: (i) Half of the product/service can be produced today and the rest half on the next day. Only day-shifts are used as productive time. In this case the commodity is ready for sale in the third day morning. But the consumers prefer to get it early. So there is a time preference[5]. (ii) Half can be produced in the day-shift and the remaining half in the night shift of the same country. But night workers wages are generally higher than day wage due to non-regular work time, some related

[5]See Marjit (2007) and Kikuchi (2011) for related issues and analysis.

medical problems etc. However, the product is ready in the next day morning[6]. (iii) Half is done in the daytime and outsource it to a country which is located in the non-overlapping time zone. Rest of the product is also finished in the daytime of other country. So the product is ready next day morning. Although it requires some cost in form of cost of communication technology, the higher wage cost for night-shift work and loss due to delayed delivery of the service are vanished. This is where TZ difference comes into play. With overlapping TZ difference between H and T option (iii) is meaningless and the underlying structure of our story breaks down. To focus on the issue of time zone we assume that out of these three options the third one is best given that skilled wages are identical in H and F[7]. We shall start from a situation where parts of the service are produced in countries which are in non-overlapping time zones but cost of communication is quite significant. This would help us focusing on the importance of time zone difference and cost of communication as communication cost does not make any sense, per se, if countries are not situated in different time zones (non-overlapping). Over-lapping time zones lead us to option (i) and (ii). So in a competitive set up with constant returns to technology and diminishing marginal productivity assumption the cost – price equality of X becomes

[6]Kikuchi, Marjit and Mandal (2013) is an important reference in this connection. Here it is discussed how and why utilization of time zone difference can induce an increase in productivity and hence skilled wage across the globe. This paper also talks about the welfare implication of such an utilization.

[7] Option-wise (i) $P_x = W_s(2+\delta)$, where δ represents time preferences (See Marjit, 2007); (ii) $P_x = W_s(2+\omega)$, where ψ reflects extra cost for night-shift work; (iii) $P_x = W_s(2+\rho)$, where ρ indicates cost of communication technology. We also assume $\delta > \omega > \rho$.

$$P_x = W_s(2+\rho) \qquad (1)$$

Two units of skilled workers are used per unit of production of X. Half is produced in, say, H and then it is sent to F at the end of "day" of H. F works for its "day" and finishes the final product/service. Half done service is sent or sent back via internet at a cost ρW_s. It does not matter whether ρ is greater or less than unity. Though sensibly we assume $0 < \rho < 1$ as communication or transportation cost per unit should not be more than labor or capital cost. Even if we assume $\rho > 1$, our story will not lose its shine and significance.

Another commodity Y is produced by S and K (capital) whereas Z uses K along with L (unskilled labor, per se). Therefore production functions for Y and Z can be respectively represented by

$$Y = f(S, K) \quad \text{and} \quad Z = f(K, L)$$

Here it must be mentioned that we also have another kind of capital in this set up. This is educational capital, E. it can only be used to upgrade L to S. return to ans supply of E are not related with K though there could be some influence through price and quantity adjustment mechanism.

All markets are assumed to be competitive and by virtue of small country assumption prices of goods are determined in the rest of the world (ROW). Following Jones ('65, '71) the full employment general equilibrium blanket ensures the subsequent cost-price equality of goods/services and factor market clearing conditions. Price equation for X is already mentioned in (1). The same for Y and Z are

$$P_y = W_s\, a_{sy} + r\, a_{ky} \tag{2}$$

$$P_z = W\, a_{lz} + r\, a_{kz} \tag{3}$$

Here P_is (i=x, y, z) represent prices, a_{ij} indicate technology of production; W_s is the return to skilled workers; W and r are the return to unskilled workers and capital, K respectively. ρ captures disutility of night shift work or communication cost or waiting decay or interest rate[8]. Y and Z are produced in 12 hrs only (day-time) while X requires two consecutive 12hr or two units of skilled labors plus the cost represented by ρ. Therefore, a_{ij} for X is 2 and it is fixed throughout the model.

Domestic endowments of skilled labor, unskilled labor, and capital, K are fixed and given by S, L and K respectively. So competitive full employment conditions guarantee the following

$$2X + a_{sy}Y = S + S_1 \tag{4}$$

$$a_{lz}Z = L - L_1 \tag{5}$$

$$a_{ky}Y + a_{kz}Z = K \tag{6}$$

S_1 is the newly trained or upgraded labor. These labors are originally L and thus assumed that some L (L_1) opted to b trained to work in either Y or X. Eventually they

[8] For further details see Marjit (2007) and Kikuchi et al (2013).

are transformed into S_1, indicating equality between L_1 and S_1. Upgrading L requires some cost as proper training can only be provided with educational capital, E which is not supplied free of cost. Per unit cost of E is given by τ and μ_{ES} the denotes the quantity requirement to upgrade one unit of L into identical unit of S. So in a sense S is produced by two factors, viz. L and E. Production function for S is represented as

$$S_1(E) = \varphi(E)L_1(E) \qquad (7)[9]$$

Here $\varphi(E)$ is essentially a quality parameter that may capture productivity of E over time. This idea goes with the literature on educational capital and human capital formation. We assume away such intricate issues to remain focused on our prime concern[10]. Therefore, we assume $\varphi(E)$ as equal to unity as one L can be transformed into one S only. Nevertheless, in efficiency terms $\varphi(E)$ can take any value greater tan unity since productivity of S has to be greater than that of L if it is properly trained. We also restrain ourselves from considering quality issue. Thus productivity of E becomes

$$\frac{1}{\mu_{ES}} = \frac{S_1(E)}{E} = \frac{\varphi(E)L_1(E)}{E} = \frac{1}{\alpha(E)} \text{ (say)} \qquad (8)$$

Equation (7) helps arriving at

$$S_1'(E) = \varphi'(E)L_1(E) + L_1'(E)\,\varphi(E)$$

[9] One can easily call it transformation or upgradation function.

[10] A careful observation of equation (7) entails that, in turn, how many L can be upgraded to S depends on E. Simultaneously, E also determines the quantity of E requires for training and upgradation purposes. Furthermore, here we do not distinguish between high and low quality S as otherwise technological requirement in X and Y would have to be different. At this juncture we cannot afford to invoke such complicated issues. However, in doing this kind of analysis we may have to think of allocating E between φ and L_1 implying a quatity-quality trade-ff.

Greater supply of E indicates more L can be upgraded to S i.e, $L_1'(E) > 0$. Even if $\varphi(E)$ is assumed as constant $S_1'(E) > 0$ as $L_1'(E) > 0$.

In what follows we have a price equation for skilled lab written as

$$W + \tau\mu_{ES} = W_s \tag{9}$$

Implications for μ_{ES} and $\alpha(E)$ are identical.

Before we enter into the focal point of the paper let us make sure that the return to E has to be identical across the globe. Even if goes up somewhere and attracts more E, it has to come down automatically. This is where the average productivity of e in upgrading unskilled workers becomes pivotal. As it is evident from previous analysis, $L_1'(E) > 0$. Average productivity of E (AP_E) represented by $\frac{1}{\alpha(E)}$ or $\frac{1}{\mu_{ES}}$ must change even when $\varphi(E)$ remains fixed by assumption. Therefore return to E denoted by τ will also adjust. Equation (9) entails that,

$$\tau = \frac{W_s - W}{\mu_{ES}} = \frac{W_s - W}{\alpha(E)}$$

Therefore, $\widehat{W}_s - \widehat{W}\theta_{ls} = \theta_{Es}(\hat{\tau} + \hat{\mu}_{ES})$ (10)

where, $\theta_{ls} = \frac{1.W}{W_s}$ and $\theta_{Es} = \frac{\alpha(E).\tau}{W_s}$

If for some reasons τ goes up, it will draw some E from abroad. And hence μ_{ES} has to fall as there had been no change in W_s and W. This indicates that AP_E has to be less than unity. Following diagram can give us some idea

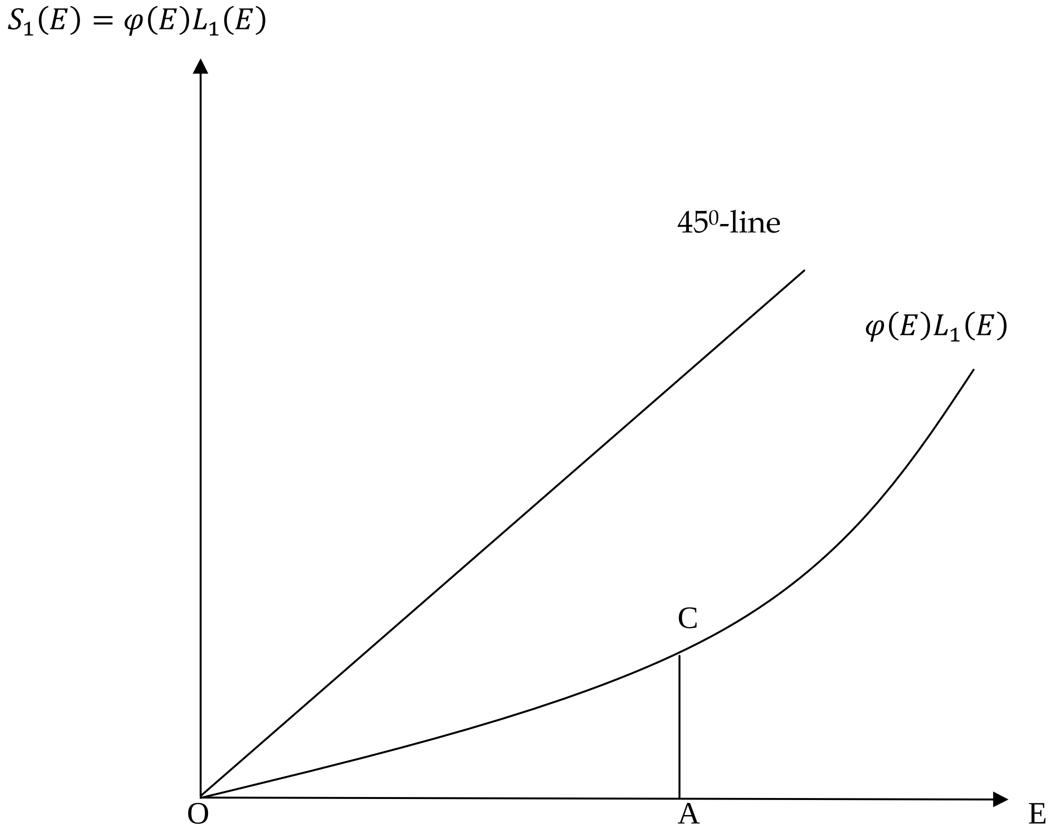

Figure-1: Average productivity of E at C is $\frac{AC}{OA} < 1$

The underlying arguments can be presented in a different way. If both τ and AP_E go up simultaneously more and more E will flow into the economy pulling up τ further. In what follows all E will flock into the economy where τ had gone up initially and the world economy would be at great imbalance. Desired movement of τ and E are shown in figure-2. Initially return to E was τ_1 given the domestic demand for and supply of E represented by D_E and S_E, respectively. Equilibrium is determined at P. When domestic demand for E goes up to D_E', τ becomes τ_3 for any given supply of E fixed at A. Consequently when supply slides up along PR, τ falls to τ_2 and equilibrium supply of E increases by AC. However, the differential between this country and the ROW attracts E

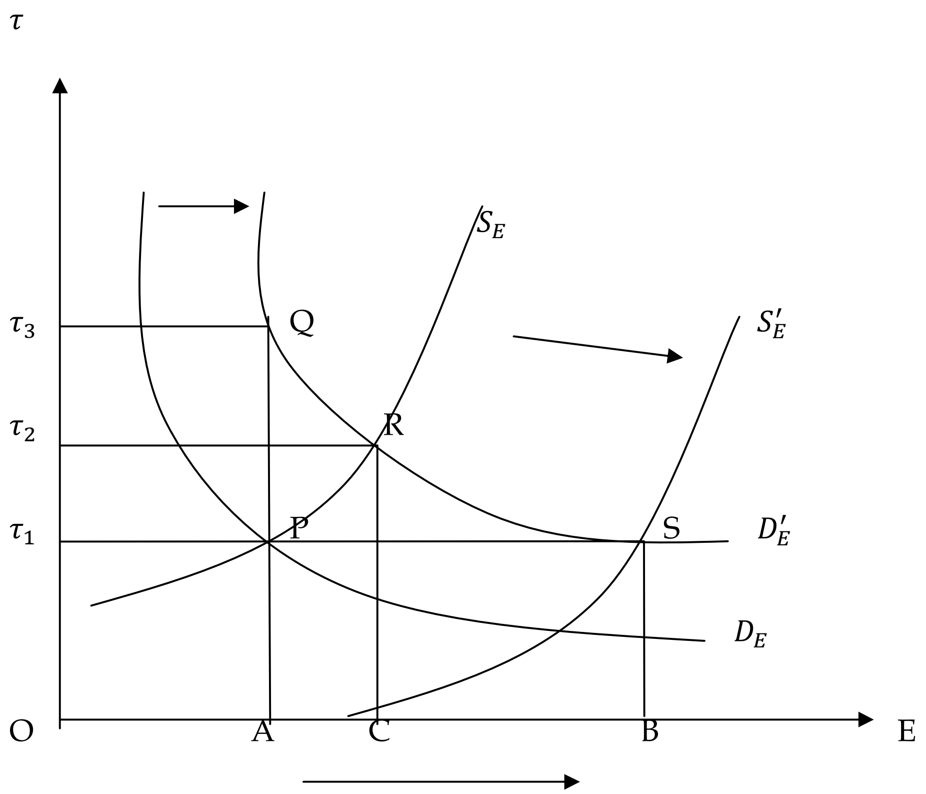

Figure-2: Return to E and equilibrium supply of E

and S_E shifts to S_E' in such a way that the new equilibrium is established at S yielding τ_1 as return to E and OB as equilibrium supply of E. And there would not be further international movement of E.

Nevertheless, if E does not change, there won't be any change in μ_{ES}, and the change in τ would be triggered and shared between W_s and W. This is shown as

$$\widehat{W}_s - \widehat{W}\theta_{ls} = \theta_{Es}\,\hat{\tau} \qquad (10A)$$

III. BASIC RESULTS

In this section we focus on the effects of TZ differences. Basically this is the effect of change or reduction in cost of communication that is made possible only through usage of high bandwith network in information technology. We relate these two aspects in the sense that high bandwith network won't be extremely useful in producing services if countries are not located in absolutely non-overlapping TZ. This is precisely why, here in this paper, we use cost of communication technology as the proxy of TZ difference.

(i) TZ and Factor Prices

Change in ρ will put its mark first on the return to other factors through standard Stolper-Samuelson arguments. A reduction in θ will promptly increase W_s since price of skilled commodity is fixed by assumption. Using conventional "hat" algebra to denote proportional change

$$\left.\begin{aligned} \widehat{W}_s &= (-)\hat{\rho}\frac{\theta_{dx}}{\theta_{sx}} \\ \hat{r} &= \hat{\rho}\frac{\theta_{dx}}{\theta_{sx}}\frac{\theta_{sy}}{\theta_{ky}} \\ \widehat{W} &= (-)\hat{\rho}\frac{\theta_{dx}}{\theta_{sx}}\frac{\theta_{sy}}{\theta_{ky}}\frac{\theta_{kz}}{\theta_{lz}} \end{aligned}\right\} \qquad (11)$$ [11]

When ρ goes down r will also fall while both types of labor gain. A fall in ρ means disutility or extra cost in form of communication cost diminishes. This helps S to

[11] Here, $\theta_{sx} = \frac{W_s(2+\rho)}{P_x}$ implies productive skilled share in X, $\theta_{dx} = \frac{W_s\rho}{P_x}$ indicates (disutility wage) or communication cost share in X, and $\theta_{ky}, \theta_{sy}, \theta_{kz}, \theta_{lz}$ have usual interpretation following Jones ('65 and '71).

capitalize some gains since product price is unchanged. When W_s increases, the complementary factor in Y must lose to absorb such gains of S. Loss to capital, K would help L to ask for higher wage, W in Z. So wage disparity may go either way.

$$\left(\widehat{W}_s - \widehat{W}\right) = (-)\hat{\rho}\,\frac{\theta_{dx}}{\theta_{sx}}\left(\frac{\theta_{sx}\theta_{ky}\theta_{lz}-\theta_{dx}\theta_{sy}\theta_{kz}}{\theta_{sx}\theta_{ky}\theta_{lz}}\right) \qquad (12)$$

Nature of wage inequality crucially hinges upon whether $\theta_{sx}\theta_{ky}\theta_{lz} \gtreqless \theta_{dx}\theta_{sy}\theta_{kz}$. Sensibly one should argue that share of disutility or communication cost must not be higher than productive skilled wage share; Y is relatively K-intensive; and the rest of the commodity, Z has to be L-intensive. Therefore, $\theta_{sx}\theta_{ky}\theta_{lz} > \theta_{dx}\theta_{sy}\theta_{kz}$.

Prposition I: *Wage inequality widens due to a fall in* ρ *if* $\theta_{sx} > \theta_{dx}, \theta_{ky} > \theta_{sy}$ *and* $\theta_{lz} > \theta_{kz}$.

Proof: See discussion above

(ii) TZ and Educational Capital

Now we move to effect on τ. This is the most important point of our analysis as E will be channelized to the economy through changes in τ. Subsequently there would be changes in sectoral output through Rybczynski effect. However, as factor prices are altered, this will trigger factor substitution and changes in output. We will, nevertheless, see later if endowment change in E augments the output effects further or weakens it.

Following arguments in Section II, change in τ without any change in endowment is shown as

$$\hat{\tau} = (-)\hat{\rho}\frac{\theta_{dx}}{\theta_{sx}}\frac{1}{\theta_{Es}}\left(\frac{\theta_{ky}\theta_{lz}-\theta_{sy}\theta_{kz}\theta_{ls}}{\theta_{ky}\theta_{lz}}\right) \quad (13)$$

Reasoning of Proposition I and the fact that $0 < \theta_{ls} < 1$ ensure an increase in τ due to a reduction in ρ. In fact, an increase in wage inequality indicates $\widehat{W}_s > \widehat{W} \Rightarrow \widehat{W}_s \gg \widehat{W}\theta_{ls}$ as $0 < \theta_{ls} < 1 \Longrightarrow \hat{\tau} > 0$ (see equation (10A)).

Prposition II: τ *will increase following a fall in* ρ *if* $(\widehat{W}_s - \widehat{W}) > 0$. ■

(iii) Sectoral Composition

Using elasticity of substitution in Z, denoted by σ_z, we arrive at

$$\left.\begin{aligned} \hat{Z} &= (-)\hat{\rho}\,\sigma_z\frac{\theta_{dx}}{\theta_{sx}}\frac{\theta_{sy}}{\theta_{ky}} > 0 \\ \hat{Y} &= \hat{\rho}\,\sigma_z\frac{\theta_{dx}}{\theta_{sx}}\frac{\theta_{sy}}{\theta_{ky}}\frac{\lambda_{kz}}{\lambda_{ky}} < 0 \\ \hat{X} &= (-)\hat{\rho}\,\sigma_z\frac{\theta_{dx}}{\theta_{sx}}\frac{\theta_{sy}}{\theta_{ky}}\frac{\lambda_{kz}}{\lambda_{ky}}\frac{\lambda_{sy}}{\lambda_{sx}} > 0 \end{aligned}\right\} \quad (14)$$

Here λs bear usual interpretation of employment share of any factor in a commodity.

L is a specific factor in Z. An increase in W leads to economizing on its usage implying an expansion of Z for any given L (insured by non-changing E). Alongside, Z shares same capital with Y. This promises a contraction of Y and outflow of S from Y simultaneously. Again as Y shares same S with X, released S will move to X and causes its expansion. Hence we find some sort of complementarity between service sector (X) and low-value L-intensive sector (Y).

Now let's go back to τ. As $\hat{\tau} > 0$, some E will come in and induce further changes in output combination. Inflow of E will immediately pull some unskilled labor out of Z. This L_1 will be trained to be employed in X and/or Z. So apparently output of Z will contract with immediate effect whereas that of X and Y will depend on factor intensity comparison between X and Y.

Again equation (7) with non-changing quality parameter, $\varphi(E)$, ensures that $\hat{S}_1(E) = \hat{L}_1(E)$. Therefore the number of unskilled workers abandoned from Z and the number of newly trained workers awaiting employment in X and Y are identical. Mathematically,

$$\left.\begin{aligned} \hat{Z} &= (-)\hat{E}\ \frac{\lambda_{l1l}}{\lambda_{lz}} < 0 \\ \hat{Y} &= \hat{E}\ \frac{\lambda_{l1l}}{\lambda_{lz}}\frac{\lambda_{kz}}{\lambda_{ky}} > 0 \\ \hat{X} &= \hat{E}\ \frac{\lambda_{S1S}\lambda_{lz} - \lambda_{l1l}\lambda_{kz}\lambda_{sy}}{\lambda_{lz}\lambda_{sx}} \end{aligned}\right\} \qquad (15)$$

Where $\lambda_{l1l} = \frac{L_1}{L}$; $\lambda_{lz} = \frac{a_{lz} Z}{L}$; $\lambda_{S1S} = \frac{S_1}{S}$ etc.

Interestingly S_1 can be used wither in X and Y. But significantly shrinkage of Z also relinquishes some K that must be employed in Y only. X does not use this. So Y must expand, and this requires some more S_1. Now the question is whether excess demand for S_1 in Y is greater or less than the newly trained S_1. This will determine the eventual effect on X. X will expand if $\lambda_{S1S}\lambda_{lz} > \lambda_{l1l}\lambda_{kz}\lambda_{sy}$. If the economy does not start with huge supply of S, λ_{S1S} is likely to be significant and λ_{l1l} cannot be so high for any economy. Therefore, $\lambda_{S1S} > \lambda_{l1l}$. On the other hand L-intensity of Z confirms $\lambda_{lz} > \lambda_{kz}$. Therefore,

$\lambda_{S1S}\lambda_{lz} > \lambda_{l1l}\lambda_{kz}\lambda_{sy}$ as $0 < \lambda_{sy} < 1$.

In what follows, both X and Y may expand simultaneously exhibiting complementarity. The economy may end up as a skill-based one due to TZ difference induced inflow of E. Notably, TZ difference creates complementarity between X and Z and, in contrast, inflow of E creates complementarity between X and Y. Though eventual effect on Z and Y is uncertain, X must expand (compare (14) and (15))

Prposition III: *Due to TZ difference induced changes in* τ *and E, X must expand if* $\lambda_{S1S}\lambda_{lz} > \lambda_{l1l}\lambda_{kz}\lambda_{sy}$. ■

So far we have not talked about the relation among ρ, τ and E in a packed in way. Before we conclude we attempt to figure out the desired channel. This would help establishing direct trajectory from ρ to E and hence outputs. Basically, $E = E(\tau)$ while return to E again depends on ρ as we have explained before i.e. $\tau = \tau(\rho)$. Therefore, $E = E(\tau(\rho)) = g(\rho)$ (say).

Tracking arguments established in the foregoing sections it is very easy to understand that $\tau'(\rho) < 0$ whereas $E'^{(\tau)} > 0$. If we take the final expression for E as $E = g(\rho)$; $g'^{(\rho)} < 0$. In words, when cost of communication is reduced, E will flow into the economy.

IV. CONCLUSION

In this paper we have developed a simple trade theoretic model to examine the effects of TZ difference of trading partners on factor prices and sectoral compositions. Starting with the assumption that outsourcing through internet is the best ossible way to get the unfinished work done early; we proceed to the effects of information communication technology revolution reflected by a reduction in cost of communication. It is shown in this set up that both skilled and unskilled workers gain due to such changes while one kind of capital lose and educational capital promises higher return. When E does not come from other countries, the concerned experiences complementarity between most skilled sector and low-value unskilled sector. Inflow of E, however, changes the complementarity structure. Eventually output of most skilled sector must expand whilst others are uncertain. Interestingly this process of transformation comes with widening wage disparity between skilled and unskilled. This paper can also corroborate some recent policy initiatives I some parts of the developing world in general and India in particular where some states have already started allowing private educational capital to promote skill development and to exploit the advantage conferred by TZ difference.

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APPENDIX