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On Asymmetric Migration Patterns from Developing Countries

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Abstract

This paper shows that trade and emigration of skilled workers from a poor country is complementary but that between trade and emigration of unskilled workers is a substitute. The asymmetric effect of more openness to trade on the local wages seems to be crucial in driving such results. The *asymmetric* changes in skilled and unskilled wages generate counterintuitive outcomes regardless of the policy shock that triggers such wage effect. One of the more compelling outcomes is rise in wage inequality as influenced by asymmetric emigration patterns.

Keywords: Trade, emigration, skilled labour, specific factor, remittances, tax

JEL Classification: F22, J64, O15

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1. Introduction

This paper examines pattern of emigration of skilled and unskilled workers of a small open economy which is liberalizing its commodity trade with the external world.

A number of earlier studies discussed scenarios under which trade and migration of labour are complements rather than substitutes, at least in the short run (viz. Schiff, 1994; Lopez and Schiff, 1998; Marjit and Beladi, 2002; Schiff, 2006; Narayan and Smyth, 2006; Kugler and Rapoport, 2011). This implies that trade liberalization will temporarily lead to more migration, not less, and create a short-run migration hump. The existing literature puts forward at least three plausible explanations for such a complementary relationship. First, by creating new employment in the source countries trade liberalization provides families with a means to finance international migration which they could not afford otherwise. Secondly, following trade reforms, with sectors showing specificity in factor usage there would be some economic costs involved in switching resources from one sector to another. This would cause some transitional unemployment and therefore encourage more workers to emigrate. This is particularly relevant for a source-country where absorptive capacities of manufacturing sectors (and inter-sectoral labour mobility) are often low due to labour market inflexibilities. Finally, if the most protected import-competing sector is labour intensive, which is more relevant for a developed (and richer) source country if the trade pattern of countries are endowment driven as predicted by the Heckscher-Ohlin theory, then trade liberalization renders labour unemployed and might engender migrant flow to other sectors and other countries.

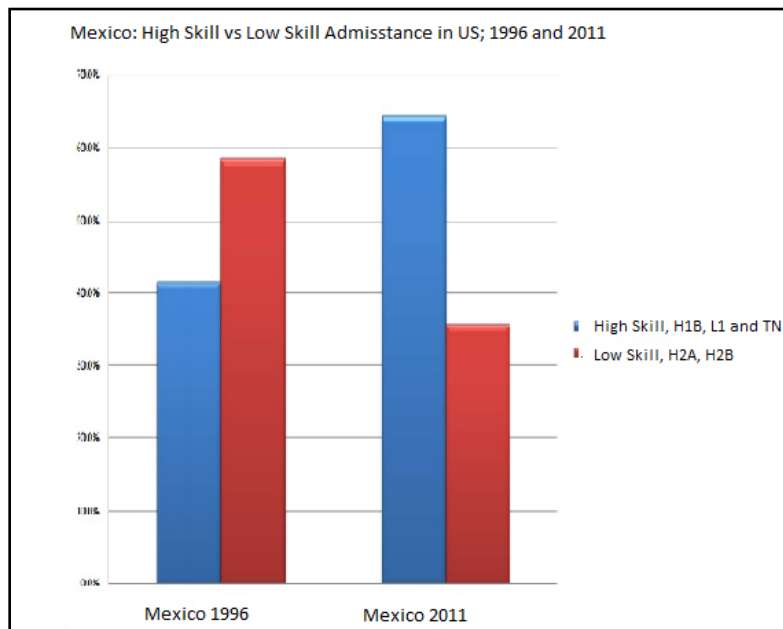
Therefore, in the aftermath of a trade reform at time zero, the short run complementarity between trade and migration will cause an increase in migration above the usual quasi-concave trend line. The available literature also suggests that the migration hump in the short run translates into net long run ‘savings’ in unwanted migration as a result of trade reforms¹. Thus, the long-run substitutability between trade and migration will cause the hump to slide down.

But, how does this general pattern shape up across skill types? Do skilled workers migrate at a higher rate (if not larger in number) than the unskilled workers? Is the complementarity or substitutability between trade and emigration symmetric across workers with different skills? Do emigration of workers with different skills inter-related? If so, does emigration of one type encourage (complement) or discourage (substitute) emigration of other types? The existing literature on trade and migration does not provide us with a very clear set of answers to these questions. Similarly, there seems to be some sporadic evidence on emigrant skill composition, but no theory to comprehend the available patterns. For example, Taylor (2007) show that couples in Britain that migrates for jobs is either a wife-following-husband model (that does not necessarily imply skill combination) or that by skilled couples with low job retention rates. As further motivation, Figure 1 shows that while more skilled (vis-à-vis unskilled) workers migrated from Mexico in 1996, the number of skilled emigrants not only declined in 2011, but also was far less than the unskilled emigrants. Thus, the skill composition of emigration from Mexico in 2011 was in sharp contrast to that in 1996. Such patterns may have been shaped by host country policies on migration, or due to shocks at the origin, including but not limited to capital inflows. In fact, it is well known

¹ See Acharyya and Kar (2014, Chapter 5) for a detailed review.

that both the host and source country factors crucially influence the nature and types of migration in various countries.²

Figure 1



Source: Miguel Jiminez, Wilson Center Comexi Scholar,
http://wilsoncenter.org/sites/default/files/miguel_jiminez_nafta.pdf

On the other hand, as illustrated in the Appendix, since 1990, migrants of relatively unskilled workers from India to Kuwait and Qatar went down; the rate of entry into Saudi Arabia dropped while that to USA and Canada went up. Since, historically, unskilled workers has been emigrating from India to the middle-east Asia in larger numbers but to America and Europe in smaller numbers relative to the skilled workers, so this

² For example, using British panel data, Rabe and Taylor (2012) show that, workers migrate on the basis of expected wage, employment opportunities and housing prices at the intended location. Individual characteristics observed (and, unobserved heterogeneity corrected for) at the source matter very little. Fafchamps and Shilpi (2013) use the Nepal Living Standard survey to show that migrants prefer less variation in terms of ethnic background of groups at the destination; prefer high density areas with more public amenities and feel comfortable in places where many speak their native languages. See also Docquier and Rapoport (2007, 2012) for elegant surveys.

destination specific change in emigration pattern may suggest an overall increase in the skill composition of Indian emigrants. The 1990s were also the years during which India initiated its major economic reforms with trade (and exchange rate) liberalization being a major component. Similar emigration pattern may also be observed for Indonesia and the Philippines: a recent decline in emigration to the middle-eastern countries that primarily employ unskilled and semi-skilled workers. This may have to do with the first Gulf-war, but the pattern did not reverse since then. It may also be an outcome of internal policy changes, where trade liberalization undertaken by these countries (and the developing countries in general which constitute major source countries for international migration) may have adversely affected the skilled workers of these source countries more than the unskilled workers, thereby inducing them to emigrate in larger numbers. Asymmetric impact of trade reforms on the pattern of emigration of skilled and unskilled workers thus may be a plausible explanation.

If that be the case, then trade-induced asymmetric changes in the emigration pattern of skilled and unskilled workers (or skill composition of emigration) has some far reaching implications for incomes (and its distribution) at present as well as in the future for those who do not migrate. At any point of time, if trade liberalization increases the skill composition of emigrants, it means emerging relative scarcity of skilled workers as a consequence of emigration and corresponding increase in the skilled wage vis-à-vis unskilled wage, and vice versa. That is, trade liberalization can increase wage inequality among skilled and unskilled workers in the source country by inducing more skilled workers than unskilled workers to emigrate.

On the other hand, the nature of changes in future incomes of those who do not emigrate depends, *ceteris paribus*, on the purpose of remittances by the emigrants. It is now documented by several authors that, the source countries receive large inward remittances (or inflow of capital) also for investments and skill formation (see, for example, Mueller and Sharif, 2011), in addition to usual enhancement in consumption of durable and non-durable goods. It is possible that the purposes of remittances originate from variations in skill types: the skilled are more likely to invest directly in the source country (*viz.* Taylor, 2006)³, whereas the relatively unskilled are more likely to remit for livelihood support of the non-migrant family.⁴

Thus, studying the impact of trade liberalization on emigration of workers with different skills is not only relevant for identifying it as a plausible explanation for the observed changes in skill composition of emigrants as mentioned above, but also for its possible role in changing the pattern of wages and incomes for those who stay back in the source country. However, these issues have not been addressed either in the literature on trade and migration, with the sole exception of Lopez and Schiff (1998), or in the literature on trade and wage inequality (see Marjit and Kar, 2005 as an exception). Lopez and Schiff (1998) considered a two-period Heckscher-Ohlin (hereafter, HO) model with heterogeneity of skills and financial constraints on migration as distinguishing elements of their analysis. The central result that they derived was that under certain conditions a

³ Notwithstanding that for unskilled households, part of the remittance receipts is spent on education and durable assets, consumption of wage goods out of remittances by relatively unskilled households and pure capital market transactions by relatively skilled emigrants are quite significant (see, for example, Acharyya and Kar, 2005, for evidence on the skill composition of Indian emigrants and remittance to non-remittance transfers).

⁴ Future income of the source country may also be adversely affected through constraints on export-led growth. Increased skill composition of emigrants implies fall in output of skill-based goods and consequently a fall in the share of such goods in the export basket of the source country. This makes its export basket less aligned with the import-bias of developed countries towards skill-based goods in the present era of globalization, and thereby constrains its export and GDP growth.

reduction of tariff on import of relatively capital-intensive good raises emigration of unskilled workers but leaves unchanged emigration of skilled workers. For two liberalizing small source economies, on the other hand, they showed that emigration of skilled workers is smaller in the more open economy. But by the assumption of skilled and unskilled labour being perfect substitutes of each other, Lopez and Schiff (1998) reduced their three-factor production structure essentially to the typical two-factor HO production structure with wages and rate of return to capital being determined solely (and uniquely) by the given set of world commodity prices. Of course, this may be purpose specific since their primary focus was to study the role of financial constraints for the decision to migrate and to what extent, and for which type of skill, a tariff reduction relaxes such constraints. But the simplification achieved through one-to-one correspondence property of their effectively HO production structure ruled out changes in wages in their small source country as a consequence of tariff-reduction induced migration and effect of such induced wage changes on the migration decision itself. That is, a tariff reduction had only the direct effect on wages in their analysis. But production structures in reality do not always display one-to-one correspondence (and thus insensitivity of wages to changes in supply of factors of production) for a variety of reasons. Imperfect substitutability of skilled and unskilled workers, and specificity of certain types of skills in production of some of the traded goods at the extreme, is one such reason. Thus, unlike the assumption of Lopez and Schiff (1998), we can expect in general that tariff-reduction induced asymmetric pattern of emigration to have a *subsequent* impact on local wages in the source country and, therefore, on the migration decision itself since local wages are the *push-factors* for migration. That is, *in general*,

migration and wages have a two-way causality meaning that in a general equilibrium setting the rate of emigration and wages (and tariff-induced changes therein) need to be solved *simultaneously*.

Moreover, since the assumption of perfect substitutability of different skills meant equi-proportionate changes in skilled and unskilled wages, it did not allow Lopez and Schiff (1998) to shed light on the effect of trade induced changes in the skill composition of emigration on the wage inequality in the source country. This unexplored aspect of their analysis is important because many researchers have found evidence of growing wage inequality or widening wage gap almost universally across the globe during the last two decades of 20th century, a period that coincides with phenomenal increase in the volume of world commodity trade (as a result of falling trade barriers), globalization of capital and international migration.⁵ The theoretical analyses motivated by these empirical observations identified channels through which trade liberalization and globalization may have caused growing wage inequality particularly in the developing countries where the import competing good is relatively skilled labour intensive and thus should have experienced a declining wage inequality or narrowing wage gap. These explanations include differences in local and global factor intensity ranking of final goods commonly produced by countries in a multi-commodity setting or intermediate goods in a vertical chain of production stages (Davis, 1996; Feenstra and Hansen, 1996; Marjit and Acharyya (2003); Zhu and Trefler, 2006); distinguishing characteristics of production and labour market structures in the developing countries like non-traded good, segmented

⁵ See Marjit and Acharyya (2003, 2006) and Acharyya (2012) for a documentation of empirical research and observations on this phenomenon. The observed universal widening of wage gap being in sharp contrast with predictions of the standard HO and Stolper-Samuelson theorems also led to a debate amongst trade theorists like Paul Krugman and Edward Leamer over technology versus trade as a plausible cause for it. See Jones and Engerman (1996).

labour markets and the like (Dogan, 2008; Ruffin, 2009; Xu, 2003); imperfectly competitive commodity market structures (Chakraborty and Sarkar, 2009; Ruffin, 2003); and rent-seeking activities under non-tariff barriers (Acharyya, 2011). While all these alternative explanations for growing wage inequality in the developing countries are important in their own merit, a relatively unexplored channel through which trade liberalization may cause such a phenomenon is by changing the skill composition of emigration from the developing countries in the present era of globalization and corresponding skill composition of the workforce available for employing in production of goods there.

This paper is concerned with these aspects and implications of emigration pattern: how does the inter-relationship between the rate of emigration and changes in wages affect the tariff reduction induced changes in migration pattern across different skills; and what implications does a tariff reduction induced changes in the skill composition of emigration have on the wage inequality in the source country. In many cases, the risk perception of the individuals becomes quite important (see Akguc, Liu, Tani and Zimmermann, 2016 for a measurement of risk aversion among rural-urban migrants in China). This is part of a much larger discussion on risk tolerance of migrants and the decision to migrate, although we do not engage with this presently.

Instead, we consider a one-period specific factor production structure of a small open economy a Jones (1971), where skilled and unskilled workers are imperfect substitutes (in contrast to Lopez and Schiff, 1998) and are specific in production of an import-competing good and an export good respectively. Physical capital, being homogeneous, is used in production of both these goods. The import competing good is initially protected

by an ad valorem tariff, and rates of emigration of skilled and unskilled workers are endogeneously determined, which depend on domestic wages relative to wages in the destination country and the cost of migration which varies with the stock of migrants in the destination country. In addition to tariff reduction, we also consider two other policy changes: emigration tax and remittance as a form of capital inflow. The specific factor production structure serves two purposes relevant for our primary concerns mentioned above. First, local wages in the source country, the push factor for emigration, depends on the relative size of the workforce and therefore on the rate of emigration. Second, skilled and unskilled wages are not tied to given world prices (and to each other), thereby creating scope for a change in the wage gap not only through changes in the tariff-inclusive price of imports, but also through tariff-induced changes in the rate of emigration.

In this structure, we establish the following set of results. First is the complementarity between trade liberalization and emigration of skilled workers but substitutability between trade liberalization and emigration of unskilled workers. The effect of trade liberalization by the fully employed source country on its domestic wages (the push factor behind emigration), however, holds the centre stage in the complementary (and substitutability) result in contrast to explanations offered in the existing literature mentioned above. Second is the substitutability between emigration of skilled and unskilled workers regardless of the policy shock that triggers such emigrations. *Asymmetric* changes in skilled and unskilled wages due to policy shocks underlie this result. Emigration of skilled workers induced by fall in their domestic wage following any policy change is shown to raise the unskilled wage and thus create

disincentive for unskilled workers to emigrate. This substitutability result, in fact, explains why trade liberalization fosters emigration of skilled workers whereas discourages emigration of unskilled workers, that is, has an asymmetric impact on the pattern of emigration of workers of different skills. For the same reason, policies like emigration tax (or a cap on immigration of workers a particular skill imposed by the destination country) is shown to have an asymmetric impact on the pattern of emigration.

Third, a reduction of tariff on skill-based imports *may* widen the wage gap in the source country by increasing the skill composition of emigration. At initial rate of emigration, a tariff reduction lowers the skilled wage and raises the unskilled wage, and, therefore, unambiguously narrows down the wage gap. Subsequently, as the skill composition of emigrants increases, the consequent relative scarcity of skilled workers in the source country raises the skilled wage and thus opens up the possibility of widening of the wage gap.

The rest of the paper is organized as follows. Section 2 develops the analytical framework model and derives how the domestic wages vary with the rates of emigration and policy shocks. In Section 3 we define the emigration decision and derive the equilibrium wages and rates of emigration. Section 4 analyses asymmetric impact of different policies on the pattern of emigration by skilled and unskilled workers. In Section 5 we discuss the implication of tariff-reduction induced migration pattern the wage inequality in our small source country. Finally, we conclude the paper in Section 6.

2. Analytical Framework

Consider a small open economy producing two goods, an export good x using unskilled

labour (L) and capital (K), and an import-competing good y using skilled labour (S) and capital, under constant returns to scale (CRS) technology.⁶ Being a small open economy it cannot influence the world prices of these goods, denoted by P_X^W and P_Y^W . The import-competing sector is, however, protected by an *ad valorem* tariff at the rate $t \in (0,1)$. Perfectly competitive markets along with flexible money wages (w and w_S) and rate of return to capital (r) ensure full employment of labour and capital. At any point of time, α proportion of skilled workers and β proportion of unskilled workers decide to emigrate.⁷ These proportions are endogenously determined through emigration decisions by workers of different skills, which depend on the wage differences across source and destination, costs of migration and public policy. We elaborate on these shortly.

The following set of equations describes this economy.

$$P_X^W = a_{LX}w + a_{KX}r \quad (1)$$

$$(1+t)P_Y^W = a_{SY}w_S + a_{KY}r \quad (2)$$

$$a_{LX} = a_{LX}(w/r), a_{SY} = a_{SY}(w_S/r), a_{Kj} = a_{Kj}(\rho_j), j = X, Y \quad (3)$$

$$(1-\alpha)\bar{S} = a_{SY}Y \quad (4)$$

$$(1-\beta)\bar{L} = a_{LX}X \quad (5)$$

$$\bar{K} = a_{KX}X + a_{KY}Y \quad (6)$$

⁶ The pattern of trade is consistent with most of the developing countries in general, with some exceptions like China, India and Mexico which also export skill-specific goods along with unskilled labour intensive goods.

⁷ In many developing countries, wages of both skilled and unskilled workers are lower than those in the developed or richer nations, owing to lower stock of capital. Thus, wage difference between source and destination continues to be important.

where, a_{LX} denotes the requirement of unskilled labour to produce one unit of the export good x ; a_{SY} denotes the requirement of skilled labour to produce one unit of the import competing good y ; a_{KX} and a_{KY} denote the requirement of capital to produce one unit of good x and one unit of good y respectively; ρ_j equals $\frac{w}{r}$ for $j = x$ and $\frac{w_s}{r}$ for $j = y$; X and Y denote the output levels of good x and good y respectively; and \bar{L} , \bar{S} and \bar{K} denote fixed endowments of unskilled labour, skilled labour and capital respectively.

Conditions (1)-(2) indicate that the domestic producers in each sector earn zero profit as perfect competition and free entry equalize price to unit cost. Set of equations in (3) gives us the least-cost input choices. Finally, (4)-(6) describe the post-emigration full-employment conditions.

For any given values of α and β , the world commodity prices and the tariff rate, the above set of nine conditions together determine three factor prices, four input choices, and two output levels. It is evident that the wages consistent with zero-profit and full-employment conditions vary with the rate of emigration and the trade policy choice as captured here by the tariff rate. That the wages are dependent on the emigration decision is not surprising. The production structure of this economy displays the properties of a *specific factor* model *a' la* Jones (1971). Thus, factor prices depend on the number of unskilled and skilled workers who stay back, or more precisely on the rates of emigration,

α and β .⁸ A higher rate of emigration of unskilled workers (β) means a smaller number of them will be available for domestic production. Similar is the case when rate of emigration of skilled workers increases. That is, emigration appears as the adverse endowment shock for this economy that changes the output level as well as wage. To fix the idea, suppose for the time being that emigration rates α and β are given exogenously. Then the above set of conditions would give us the equilibrium values of wages for such emigration rates. Exogenous changes in the emigration rates (and in the tariff rate) would change the equilibrium value of wages. The precise nature and magnitude of changes in wages due to changes in emigration and tariff rates can be worked out from the above set of conditions as (detailed calculation is provided in Appendix II):

$$\hat{w} = \frac{\theta_{KX}}{\theta_{LX}} \left[\frac{\lambda_{KX} \mu}{\gamma} \hat{\alpha} + \frac{\lambda_{KX} \psi}{\gamma} \hat{\beta} - \frac{\gamma_Y}{\gamma} \hat{T} \right] \quad (7)$$

$$\hat{w}_S = \frac{\theta_{KY}}{\theta_{SY}} \left[\frac{\lambda_{KX} \mu}{\gamma} \hat{\alpha} + \frac{\lambda_{KX} \psi}{\gamma} \hat{\beta} + \left(\frac{1 - \theta_{KY}}{\theta_{KY}} \right) \frac{\gamma_Y}{\gamma} \hat{T} \right] \quad (8)$$

Change in the rate of return to capital, on the other hand, is given by:

$$\hat{r} = -\frac{\lambda_{KX} \mu}{\gamma} \hat{\alpha} - \frac{\lambda_{KX} \psi}{\gamma} \hat{\beta} + \frac{\gamma_Y}{\gamma} \hat{T} \quad (9)$$

where, “hat” over a variable denote its proportional change (e.g., $\hat{w} = \frac{dw}{w}$); $T = (1 + t)$;

$\mu \equiv \frac{\alpha}{1 - \alpha}$; $\psi \equiv \frac{\beta}{1 - \beta}$; $\theta_{LX} \equiv \frac{a_{LX} w}{P_X^w}$ is the share of unskilled labour in unit cost of

producing good x; cost shares θ_{KX} , θ_{SY} and θ_{KY} are similarly defined; $\lambda_{KX} \equiv \frac{a_{KX} X}{K}$ is

⁸ In a standard two-good two-factor Heckscher-Ohlin-Samuelson model, the factor prices would usually have been determined solely and uniquely by the world commodity prices along with the tariff rate, independently of the factor endowments. Thus, emigration would have *no* impact on domestic wages in such a case.

the share of sector x in total employment of capital; $\gamma_Y \equiv \frac{\lambda_{KY}}{\theta_{SY}} \sigma_Y$;

$\gamma \equiv \frac{\lambda_{KY}}{\theta_{SY}} \sigma_Y + \frac{\lambda_{KX}}{\theta_{LX}} \sigma_X = \gamma_Y + \gamma_X$ and σ_j is the elasticity of factor substitution in sector- j ($j = x, y$).

What follows from the above discussion is that if emigration rates were exogenously given, the equilibrium wages would rise with the exogenous increase in *both* α and β , but would change *asymmetrically* with a reduction of the tariff rate:

$$w = w(\alpha, \beta, t), \quad w_s = w_s(\alpha, \beta, t) \quad (10)$$

+ + - + + +

The sign below each argument in (10), which indicates how the equilibrium wages change with respect to change in that particular argument, follows from (7) and (8). Note that, in defining the sign of the partial derivative with respect to the tariff rate in (10) we have used $\hat{T} = \frac{t}{1+t} \hat{t} = \hat{\phi t}$.

The intuition for these signs is simple. Consider an initial equilibrium with factor prices and output levels. When more unskilled workers emigrate so that less of them work in the domestic economy, the excess demand for unskilled labour raises its domestic wage and thus raises the unit labour cost in the export sector. Given the world price of good x , producers of good x experience losses and accordingly exit from this sector. The industry output contracts so that the demand for unskilled labour adjusts to the reduced supply due to emigration, which mitigates the initial wage increase to some extent. At the same time, contraction of output of good x releases some capital and depresses its rate of return (see (9) above), thereby making up losses for producers arising due to the rise in unit labour

cost. The exit of firms from the export sector continues till the decline in the rate of return to capital is just sufficient to make the production of the export good break even. The rise in the wage rental ratio in the export sector induces remaining producers there to adopt relatively capital-intensive techniques of production than before, which depresses the demand for labour and mitigates the initial rise in the unskilled wage further. But this subsequent technique effect is second order small and does not pull down the wage at the new equilibrium.

On the other hand, the capital released from the export sector creates scope for an expansion of production of the import-competing good y . But this requires additional skilled labour, which is a specific factor in y only. The additional demand for skilled labour also comes from the new firms that enter y , being attracted by profit opportunity consequent upon the decline in unit capital cost at the initial skilled wage. The skilled wage thus rises (see (8) above), which along with decline in the rate of return to capital makes production techniques of incumbent firms and new entrants more capital intensive. This technique effect in the import-competing sector makes available the required skilled labour for expansion of output of good y by the incumbent firms and production by the entrants. In sum, an increase in the rate of emigration of unskilled workers raises both the unskilled and the skilled wage. For analogous reasons, an increase in the rate of emigration of skilled workers raises both the unskilled and the skilled wage.

However, in this paper, emigration rates are endogenously determined. So, (10) describes functional relationships between wages *consistent with zero-profit and full-employment conditions* and the emigration rates, rather than equilibrium wages. Thus, to arrive at the

equilibrium wages in our economy, we must determine the emigration rates. We turn to this in the next section.

3. Decision to Emigrate

The decision to migrate from one country to another depends on many things. In the context of this paper, the relevant factors are the wage differentials across countries and costs of emigration. Let w^* and w_s^* denote respectively unskilled wage and skilled wage prevalent in a destination country, which do not change due to emigration. But, emigration of either type raises wages at the source, such that the wage differential for each type decreases with the rate of emigration. In other words, the incentives for emigration, captured by the wage differential, decrease with the rate of emigration itself.

There are, however, disincentives for migration, direct and indirect, modelled as the costs of emigration. One such disincentive or cost is the emigration policy of the government in the domestic or native country and immigration policy of the destination or the host country. These include visa fees and other transaction costs, emigration tax. These are usually exogenous factors but can also be conceived as endogenous, if, for example, the emigration tax rate rises with the rate of emigration. There are also costs that are typically endogenous in nature and may be both pecuniary (such as establishment cost in the host country) and non-pecuniary (such as those arising due to cultural adversity, and heterogeneity in social customs). Some of these costs may actually go down for a prospective emigrant when a sizeable number of workers of similar skill have already

migrated in to the host economy. This is a kind of network externality.⁹ Remittance at the household level is one channel through which this network functions. But, even beyond family ties, emigrant stock may help to lower information gaps and uncertainties (viz. Katz and Stark, 1987; Dequiedt and Zenou, 2011) for prospective emigrants of similar skill types and hence the cost. The costs are treated as 'discount factors' that lower the net income abroad because migrants are forced to live away from their friends, neighbourhood and culture. At the same time, some of these costs may increase with the stock of emigrants due to congestion effects. In other words, there may be both favourable and adverse effects of the stock of emigrants in a host country on the costs of emigration. However, the congestion effect gathers wind only when the stock of emigrants is too large in a host country so that as long as emigration does not push the stock of emigrants beyond a threshold level, we can expect the cost of emigration falling with the stock of emigration. Overall, one may thus expect a non-monotonic relationship (more precisely, a *U*-shaped one) between the cost and the stock of migration.¹⁰

In this static framework, to keep things simple, we assume that the stock of emigrants adjusts instantaneously with the flow of emigration. Thus, denoting the cost of emigration for a prospective skilled emigrant by δ_s and for a prospective unskilled emigrant by δ , and assuming away any cross effects (i.e., network externality and/or

⁹ This is one of the primary forces behind choice of a host country amongst the probable ones by a prospective emigrant, and fits well with the observations that Indians would like to emigrate more to UK, USA or middle-East, or even particular cities in the United States than anywhere else with similar wage differentials. See also Fafchamps and Shilpi (2013) cited earlier. Zhao (2003), Rapoport and Docquier (2006), Taylor (2006) and Beine, Docquier and Ozden (2011) have found evidences for stock of experienced migrants influencing further emigration flows from China.

¹⁰ As it will be evident later, the main results will not change *qualitatively* had there been no costs of emigration. When costs of emigration exist, whether such costs increase or decrease with the *flow* of emigration do not alter our results either.

congestion effect for emigrants of one skill type not spilling over to emigrants of other type) we define these costs as,

$$\delta_s = \delta_s(\alpha) \quad (11)$$

$$\delta = \delta(\beta) \quad (12)$$

with the following properties,

$$0 < \delta_s(0) < w_s^*, \quad 0 < \delta(0) < w^*, \quad \frac{\partial \delta_s}{\partial \alpha} = \begin{cases} < 0 & \forall \alpha < \bar{\alpha} \\ > 0 & \forall \alpha > \bar{\alpha} \end{cases}, \quad \frac{\partial \delta}{\partial \beta} = \begin{cases} < 0 & \forall \beta < \bar{\beta} \\ > 0 & \forall \beta > \bar{\beta} \end{cases} \quad (13)$$

where $\bar{\alpha} < 1$ and $\bar{\beta} < 1$ are the threshold rates of skilled and unskilled emigration respectively for which congestion effect of emigration becomes stronger, thereby raising the costs of emigration with further flow of emigration.

Given the costs of migration as defined in (11)–(13), an unskilled worker emigrates if the difference in wages, $w^* - w$, exceeds the cost of migration δ , and does not emigrate otherwise. Since, the domestic wage rises with the rate of emigration, so as more and more unskilled workers emigrate, the wage differential declines and with it the incentive for migration. Of course, for smaller initial stock of emigration, the cost of emigration may decline, but if it falls less fast than the rise in the domestic wage then for some $\beta = \tilde{\beta} < 1$, we can expect the net return from emigration to be zero. Emigration stops at that point as any further emigration will make the net return negative. Similar argument holds for emigration decision of the skilled workers. Therefore, using (10) we can write the emigration equilibrium conditions as,

$$w_s(\tilde{\alpha}, \beta, t) = w_s^* - \delta_s(\tilde{\alpha}) \quad (14)$$

$$w(\alpha, \tilde{\beta}, t) = w^* - \delta(\tilde{\beta}) \quad (15)$$

Note that, (14) and (15) are written as equalities between net gain from migration (the right hand side) and the opportunity cost of migration or domestic wages foregone (the left hand side). These migration equilibrium conditions also indicate that domestic wages and number of workers emigrating in equilibrium must be simultaneously determined. The emigration equilibria for unskilled and skilled workers are illustrated in Figure 1, using the signs of relevant partial derivatives as specified in (10). Of course, we assume that the domestic wages rise faster than the net gain from migration for stability:

$$\frac{\partial w_s}{\partial \alpha} > \left| \frac{\partial \delta_s}{\partial \alpha} \right|, \quad \frac{\partial w}{\partial \beta} > \left| \frac{\partial \delta}{\partial \beta} \right| \quad (16)$$

and also $w(\alpha, 0, t) < w^* - \delta(0)$ and $w_s(0, \beta, t) < w_s^* - \delta_s(0)$ to ensure that the migration equilibrium exists and is unique. The opportunity cost for unskilled (skilled) emigrants is drawn for any given rate of emigration of skilled (unskilled) workers and the tariff rate. Figure 2a depicts the emigration decision of the skilled workers, given the number of unskilled emigrants (β) and the tariff rate (t). Figure 2b, on the other hand, depicts the same for unskilled workers. Though we have shown the optimum migration decisions along the rising part of the net benefit from migration, it would have been inconsequential if the emigration equilibrium would have occurred along the falling part of it.

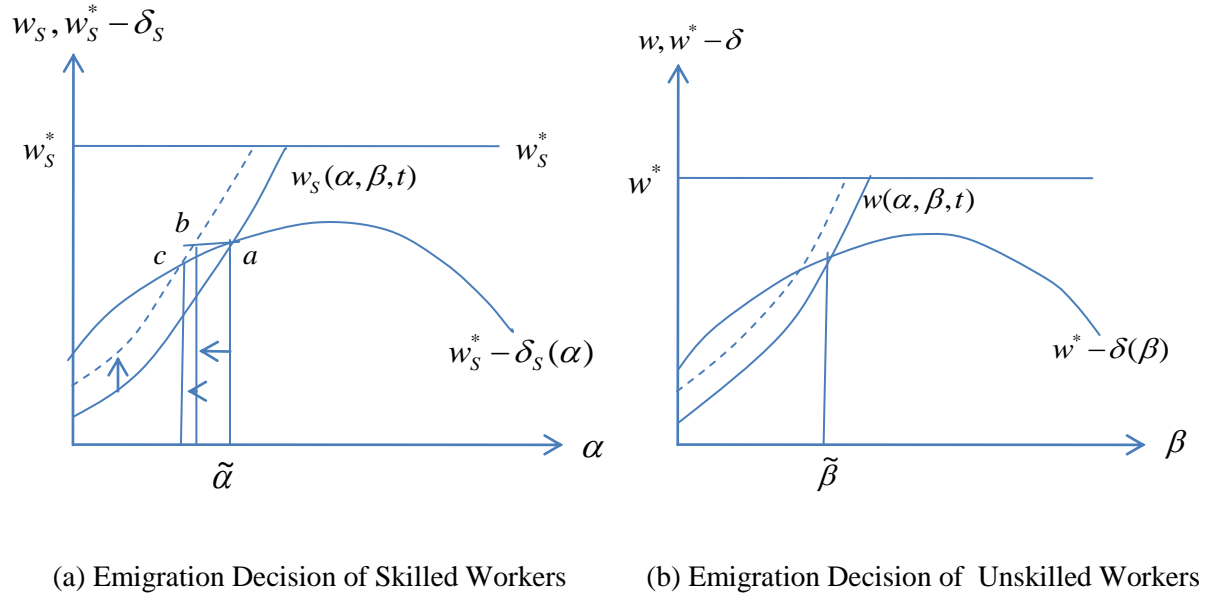


Figure 2: Emigration Decisions

It is immediate then that the optimum rates of emigration are interdependent. This is also evident from (14) and (15): $\tilde{\alpha} = \alpha(\beta, t)$ and $\tilde{\beta} = \beta(\alpha, t)$. Such interdependence arises from the fact that the workers of different skills work with a common factor of production (here, physical capital) to produce specific goods. Accordingly, the wages that they receive (which are the opportunity costs, or the push factor, for emigration) are interdependent as well for reasons spelled out above.

What emerges from the above analysis is that *the rates of emigration of skilled and unskilled workers must be determined simultaneously*, along with the domestic wages.

The following lemma specifies the precise nature of interdependence in case of joint determination:

Lemma 1: $\frac{d\tilde{\alpha}}{d\beta} < 0$, $\frac{d\tilde{\beta}}{d\alpha} < 0$.

Proof: Total differentiation of (15) yields,

$$\begin{aligned} \frac{\partial w_s}{\partial \tilde{\alpha}} d\tilde{\alpha} + \frac{\partial w_s}{\partial \beta} d\beta + \frac{\partial w_s}{\partial t} dt &= -\frac{\partial \delta_s}{\partial \alpha} d\tilde{\alpha} \\ \Rightarrow \left[\frac{\partial w_s}{\partial \tilde{\alpha}} + \frac{\partial \delta_s}{\partial \alpha} \right] d\tilde{\alpha} &= -\frac{\partial w_s}{\partial \beta} d\beta - \frac{\partial w_s}{\partial t} dt. \end{aligned}$$

For a ceteris paribus change in the emigration rates ($dt = 0$), this boils down to,

$$\frac{d\tilde{\alpha}}{d\beta} = \frac{-\frac{\partial w_s}{\partial \beta}}{\left[\frac{\partial w_s}{\partial \tilde{\alpha}} + \frac{\partial \delta_s}{\partial \alpha} \right]}$$

Since $\frac{\partial w_s}{\partial \beta} > 0$ and $\frac{\partial w_s}{\partial \alpha} > 0$ by (10), so $\frac{d\tilde{\alpha}}{d\beta} < 0$ when $\frac{\partial \delta_s}{\partial \alpha} > 0$. For $\frac{\partial \delta_s}{\partial \alpha} < 0$, on the

other hand, $\frac{d\tilde{\alpha}}{d\beta} < 0$ by (10) and (16). This completes the proof of the first part.

Total differentiation of (14) and similar reasoning as above proves the second part. \square

Note that the inverse relationship between the two rates of emigration holds regardless of whether the costs of emigration rise or fall with the flow of emigration. Thus, as mentioned above and it shall be more evident later, nature of the cost functions defined in (13) is inconsequential.

Intuitively, an increase in the rate of emigration of unskilled workers raises the skilled wage through an increase in the demand for skilled labour in the source country. This acts as a disincentive for emigration because now the opportunity cost increases, and so the rate of emigration falls. In Figure 2a, increase in β shifts up the domestic skilled wage

curve (as shown by the broken curve) and thus shifts the migration equilibrium to the left. Note that the initial decline the rate of emigration of skilled workers due to increase in the skilled wage (the push factor for emigration) affects the marginal cost of emigration (the pull factor emigration), which in turn may mitigate or reinforce the initial decline in the rate of emigration. Herein lies the role of the nature of change in the cost emigration with the flow of emigration itself. In particular, if $\frac{\partial \delta_s}{\partial \alpha} > 0$. Then the initial fall in the rate of emigration of skilled workers lowers the cost of emigration and thereby mitigates the initial decline (along with the mitigating effect of subsequent fall in the skilled wage that the fall the rate of emigration triggers). On the other hand, if $\frac{\partial \delta_s}{\partial \alpha} < 0$, then the cost of emigration rises with the initial decline in the rate of emigration, which acts as a further disincentives for emigration and reinforces the initial decline. However, the assumption in (16) ensures that the subsequent disincentive effect due to rise in emigration cost is weaker than the incentive effect of the subsequent fall in the skilled wage, and thus does not spiral down the rate of emigration to the bottom.

What emerges from this discussion is that the nature of change in emigration cost has a magnitude effect on the rate of emigration. Referring back to Figure 2a, starting from an initial position at point *a* along the upward sloping part, had the cost of emigration been insensitive to changes in the rate of emigration of skilled workers, then an increase in the rate of emigration of unskilled workers and corresponding rise in the skilled wage would have reduced the rate emigration of skilled workers to a level corresponding to point *b*. But as the cost of emigration rises with the rate of emigration of skilled workers, the

decline is to a larger level corresponding to point c . Similarly, it can be seen that starting from an initial position along the downward sloping part of the net foreign skilled wage curve, an increase in the rate of emigration of unskilled workers will reduce the rate of emigration of skilled workers by a smaller magnitude when the cost of emigration increases than when it is invariant. This can also be verified from following algebraic expression (in absolute value) used in the above lemma:

$$\left| \frac{d\tilde{\alpha}}{d\beta} \right| = \frac{\frac{\partial w_s}{\partial \beta}}{\left[\frac{\partial w_s}{\partial \tilde{\alpha}} + \frac{\partial \delta_s}{\partial \alpha} \right]} > \text{ or } < \left| \frac{d\tilde{\alpha}}{d\beta} \right|_{\bar{\delta}_s} = \frac{\frac{\partial w_s}{\partial \beta}}{\frac{\partial w_s}{\partial \tilde{\alpha}}} \text{ as } \frac{\partial \delta_s}{\partial \alpha} < \text{ or } > 0 \quad (17)$$

where, $\left. \frac{d\tilde{\alpha}}{d\beta} \right|_{\bar{\delta}_s}$ is the change in the rate of emigration of skilled workers following an increase in the rate of emigration of unskilled workers, when the cost of emigration for skilled emigrants is invariant with respect to the flow of emigration.

The decline in the rate of emigration of unskilled workers due to an increase in the rate of emigration of skilled workers can similarly be explained, and again, only the extent to which rate of emigration of unskilled workers will fall depends on whether the cost of emigration rises or falls with the rate of emigration of unskilled workers.

The above lemma indicates *substitutability* between emigration of the two types of skilled workers, which is shown in Figure 3 by the negatively sloped (bold) curves labelled $\tilde{\alpha} = \alpha(\beta, t)$ and $\tilde{\beta} = \beta(\alpha, t)$. The former is drawn steeper to ensure stability. These curves are essentially optimum emigration decisions of one type of skill given the

emigration decision of the other type. The *equilibrium* rates of emigration, $\tilde{\alpha}_e$ and $\tilde{\beta}_e$, are determined simultaneously when these optimum decisions match. These optimum values in turn determine the *equilibrium* wages in our domestic economy.

Note that since a higher rate of emigration of unskilled workers lowers the rate of emigration of skilled workers (and vice versa) by a larger extent when cost of emigration for skilled workers falls than when it rises with the rate of emigration, so $\tilde{\alpha} = \alpha(\beta, t)$ curve will be flatter in the former case compared to the latter case. For similar reason, $\tilde{\beta} = \beta(\alpha, t)$ curve will be steeper when the cost of emigration of unskilled workers falls with the rate of emigration than when it rises.

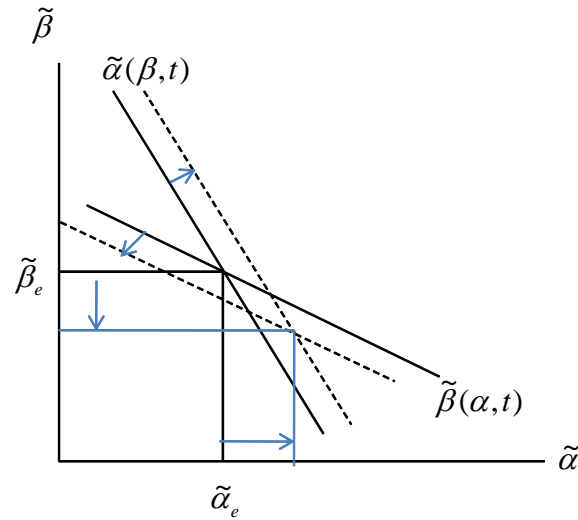


Figure 3: Equilibrium Emigration Levels

Given this equilibrium, in the next section we turn to the implication of trade liberalization and other policy changes on the emigration decisions.

4. Policy Changes and Emigration

As mentioned earlier, disincentives or cost borne by emigrants may also be in the form of emigration policy of the government at source or at destination. These may include visa fees and other transaction costs, or at the extreme, an emigration tax.¹¹ These policies act as direct disincentive policies. In section 4.3 we examine implications of such direct policies. There are also policies that are indirect in nature in the sense that they affect wages in the source country (or the push factors) and accordingly influence the emigration decision. Among such policies, we consider trade liberalization and foreign capital inflow in the form of remittances are indirect policies in sections 4.1 and 4.2 respectively.

4.1 Trade Liberalization and Asymmetric Pattern of Emigration

In order to examine the implications of a tariff reduction ($\hat{t} < 0$) on the emigration decisions, the following lemma would be useful:

Lemma 2: $\frac{d\tilde{\alpha}}{dt} < 0$, $\frac{d\tilde{\beta}}{dt} > 0$.

Proof: Differentiating (15) with respect to the tariff rate, we obtain,

$$\begin{aligned} \frac{\partial w_s}{\partial \tilde{\alpha}} \frac{d\tilde{\alpha}}{dt} + \frac{\partial w_s}{\partial t} &= - \frac{\partial \delta_s}{\partial \alpha} \frac{d\tilde{\alpha}}{dt} \\ \Rightarrow \left[\frac{\partial w_s}{\partial \tilde{\alpha}} + \frac{\partial \delta_s}{\partial \alpha} \right] \frac{d\tilde{\alpha}}{dt} &= - \frac{\partial w_s}{\partial t} \end{aligned}$$

¹¹ Following initial policy suggestions in Bhagwati and Wilson (1989), several countries experimented with emigration tax, including the Philippines that raised close to 4% of GDP by taxing emigrants. The United States also collects taxes from its citizens living abroad. In a recent paper (Desai, Kapoor and McHale, 2008) it was suggested that implementation of migrant taxes can help India improve its budgetary allocation for education, which currently stands at only 1% of GDP, much below socially desirable levels.

$$\Rightarrow \frac{d\tilde{\alpha}}{dt} = \frac{-\frac{\partial w_s}{\partial t}}{\left[\frac{\partial w_s}{\partial \tilde{\alpha}} + \frac{\partial \delta_s}{\partial \alpha} \right]}$$

Since, $\frac{\partial w_s}{\partial t} > 0$ and $\frac{\partial w_s}{\partial \alpha} > 0$ by (10), so $\frac{d\tilde{\alpha}}{dt} < 0$ when $\frac{\partial \delta_s}{\partial \alpha} > 0$. For $\frac{\partial \delta_s}{\partial \alpha} < 0$.

On the other hand, $\frac{d\tilde{\alpha}}{dt} < 0$ by (10) and (16). This completes the proof of the first part.

Total differentiation of (14) and similar reasoning as above, given $\frac{\partial w}{\partial t} < 0$, proves the second part. \square

What Lemma 2 implies is that a tariff reduction raises the incentive for emigration by the skilled workers by lowering the skilled wage for any given rate of emigration by the unskilled workers. At the same time, it *lowers* the incentive for emigration by the unskilled workers by raising their domestic wage for any given rate of emigration by the skilled workers. These are obvious. A tariff reduction contracts the import-competing sector through competition from importers. This lowers the skilled wage unambiguously. On the other hand, capital released from the contracting sector creates scope for expansion in the export sector. The fall in the rate of return to capital makes the export production more profitable, and thereby induces not only the incumbent firms to raise their respective production levels but also attracting the potential entrants. The consequent increase in the demand for unskilled workers raises the unskilled wage. Thus, a reduction in tariff has *asymmetric* (initial) effects on the skilled and unskilled wages.¹²

In Figure 3, the initial effects of tariff on the migration decisions of the two types of

¹² These are in fact the standard price magnification effects in a specific factor model: $\hat{w}_s < \hat{P}_Y < \hat{r} < 0 = \hat{P}_X^W < \hat{w}$, where P_Y is the tariff-inclusive (domestic) price of the import-competing good such that $\hat{P}_Y = \phi \hat{r} < 0$.

workers are shown by lateral rightward shift of the $\tilde{\alpha} = \alpha(\beta, t)$ curve and downward shift of the $\tilde{\beta} = \beta(\alpha, t)$ curve.

These initial *asymmetric* effects, however, are *reinforced* by induced wage effects. The initial increase in the rate of emigration of skilled workers raises the unskilled wage further (see (10)), and thereby magnifies the disincentive for unskilled workers to emigrate. On the other hand, the initial decline in the rate of emigration by the unskilled workers lowers the skilled wage and raises the incentive for emigration further for the skilled workers.

Proposition 1: *A ceteris paribus reduction of tariff rate unambiguously raises the rate of emigration of the skilled workers and lowers the rate of emigration of the unskilled workers.*

Proof: Follows from Lemma 2 and the above discussion. \square

This result is not counter intuitive. Increased competition from foreign firms as a consequence of trade liberalization squeezes the employment opportunity of skilled workers in the domestic economy. It is not surprising then that they would emigrate since the wage gap between source and destination has gone up. Note again that the above result is *regardless of whether the emigration costs rise or fall* with the flow (or the stock) of emigration, though, of course, there will be differences in the quantum of the change in the equilibrium rates of emigration for reasons spelled out earlier. Algebraically, this is evident from following expression (in absolute value) derived in Lemma 2 above:

$$\left| \frac{d\tilde{\alpha}}{dt} \right| = \frac{\frac{\partial w_s}{\partial t}}{\left[\frac{\partial w_s}{\partial \tilde{\alpha}} + \frac{\partial \delta_s}{\partial \alpha} \right]} \quad (18)$$

That is, by (16), $\frac{d\tilde{\alpha}}{dt} < 0$ even when $\frac{\partial \delta_s}{\partial \alpha} < 0$, but augmentation of the rate of emigration

of skilled workers due to tariff reduction will be lower in this case than when $\frac{\partial \delta_s}{\partial \alpha} > 0$.

There will thus be no difference in the direction of change but only a difference in the magnitude of change in the rates of emigration. This also highlights the role of push factor relative to pull factor in the migration decision.

What is interesting to note is the asymmetric pattern of emigration by skilled and unskilled workers, which provides a theoretical support to the empirical observation mentioned earlier. At the same time, this asymmetric emigration pattern may have some far reaching implications for the nature of remittances that the migrant workers send to their native country.

4.2. Remittance as a form of Capital Inflow

A significant part of earnings by the unskilled workers as emigrants to other countries is remitted to their families back home. One might wonder how such remittances may have altered the results derived above. While looking at the migration conditions (14) and (15) it may appear that as remittances lower the net earning from emigration, the emigration decision may change. Yet, remittances should not be taken as a disincentive because it is

simply a transfer of income from the individual earner to his or her family. As long as an emigrant values consumption by his family members equally as his own consumption, remittances will not alter the emigration decisions. On the other hand, remittances do increase the national income and create additional demand for the two goods considered here. But, this is inconsequential as well in the above set up, for two reasons. First, the wages in the specific factor set up do not *directly* depend on the domestic demand for goods. Second, the domestic economy being small, changes in the demand and consequent changes in trade volumes will have no impact on the world commodity prices. Hence, there will be no *indirect* effect on wages either and, therefore, on the emigration decision.

Of course, in a *large* economy that can influence the world commodity prices, remittance may affect migration decisions.¹³ Though an elaborate and technical discussion of the large country case is beyond the scope of the present paper, an informal discussion below is suggestive of how remittance may affect the migration decision.

To the extent by which remittances raise income, the domestic demand for all such goods must rise if all goods are normal. This means, exports will fall and import demand will rise at initial set of world prices. Hence, if the host country is large, world prices of both the goods should rise. But these price changes need not be proportional and the relative magnitudes should depend on two things: (a) income elasticity of domestic demand and (b) foreign price elasticities of demand and supply. For example, if all goods are unit

¹³ However, given that larger /richer countries receive negligible remittance transfers as compared to their GDP, income effects may also be negligible.

income elastic in the host country, remittances will raise their demand equally. Hence, we can expect decline in host country export supply and increase in host country import demand to be of the same magnitude. Yet, depending on the slope (and price elasticity) of world demand curve for what the host country exports and of world supply curve for what it imports, the world price changes may be non-proportional. This should change domestic (as well as foreign) wages through price magnification effect, and hence the migration decisions.

4.3. Emigration and Immigration Policies

Movement of labour is more restricted than movement of capital across nations that are not tied up through regional trade agreements like common market. Moreover, the emigration and immigration policies vary widely across nations as well as across different skill types. Most of these restrictions are physical in nature and imposed by the host country restricting the maximum number of immigrants. These are made effective mainly through grant of visas. In some countries like China and India, there are emigration checks that often vary across different skill types or education levels.¹⁴ In recent times, there has also been some discussion in India regarding taxing skilled emigrants in order to put a check on brain drain. An emigration tax acts as a disincentive for emigration and it is trivial to argue that the rate of emigration of a particular skill type will fall. But what is not obvious is the result that the emigration of workers of other type may as well be affected even though they are not taxed. This essentially follows from the

¹⁴ Countries like China and India have emigration policies restricting emigration of unskilled/skilled workers. The Ministry of External Affairs, Govt. of India practices ECNR (Emigration Check not Required) criterion to monitor exodus of unskilled workers. Only the skilled (high school graduate and above) are *exempt* from emigration check by concerned authorities. However, restriction may also come from the host country, like point-based immigration criteria limiting inflow of unskilled/skilled workers.

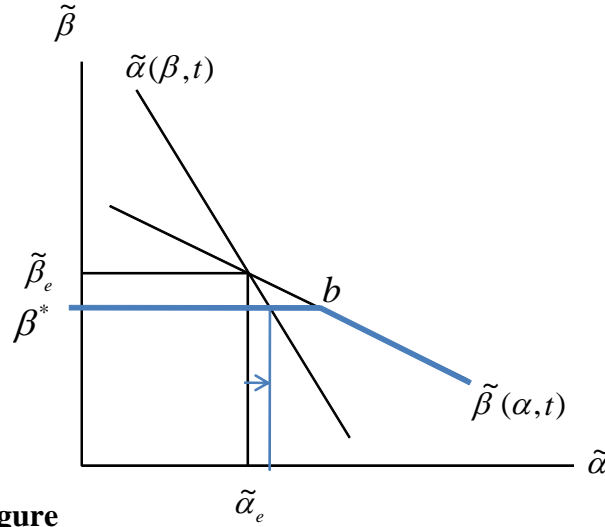
interdependence of emigration rates for the different skills as elaborated in the earlier sections. To see this, note that an imposition of an emigration tax would appear as a direct cost of emigration. Let such a tax apply only to skilled emigrants. If the rate is invariant with respect to the rate of emigration itself, then the net gain curve in Figure 1a shifts down *uniformly*. Thus, at any given rate of emigration of unskilled workers (β), a smaller number of skilled workers decide to emigrate. This means that the $\tilde{\alpha} = \alpha(\beta, t)$ curve in Figure 3 shifts to the left. Therefore, the equilibrium rate of emigration of skilled workers declines, as expected, but *the equilibrium rate of emigration of unskilled workers increases*. The reason is simple. A decline in the rate of emigration of skilled workers lowers the domestic unskilled wage and thus acts as incentive for emigration of the unskilled workers. For similar reasons, a ceteris paribus imposition of an emigration tax on the unskilled workers will encourage more skilled workers to emigrate.

Now consider an immigration policy of a host country which restricts the number of unskilled emigrants from the native country to a level below the equilibrium rate of emigration. In terms of proportions of unskilled workers emigrating, let such an upper limit be denoted by $\beta^* < \tilde{\beta}_e$. The $\tilde{\beta} = \beta(\alpha, t)$ curve now changes as in Figure 4. Clearly, such a restriction on the immigration of unskilled workers encourages more skilled workers to emigrate. Again, this is because, a binding quota on immigration of unskilled workers allowing smaller number of unskilled workers than those who would have emigrated, lowers the skilled wage in the native country and increases the incentive for more skilled workers to emigrate. Similarly, a binding restriction on the immigration of skilled workers will encourage more unskilled workers to emigrate.

The above results can be summarized in Proposition 2 below:

Proposition 2: *An emigration tax on skilled (unskilled) workers increases the emigration of unskilled (skilled) workers. The same result is obtained if there is a physical restriction on the immigration of unskilled (skilled) workers.*

Proof: Follows from the above discussion.



Figure

4: Restriction on Immigration of Unskilled Workers

It appears from Figure 4, that a restriction on the immigration of skilled workers will increase the immigration of unskilled workers more than proportionately. Consequently, the total number of immigrants, unskilled and skilled, increases. That is, if the aim of a tighter immigration policy is to restrict the total number of immigrants, then restricting immigration of only one type may backfire.

5. Emigration and Wage Inequality

Whereas policy changes appear to alter the rates of emigration of skilled and unskilled workers asymmetrically, do the skilled and unskilled wages change asymmetrically as well so that the wage inequality between skilled and unskilled workers either accentuates or declines? In the specific factor set up considered above, if there had been no factor mobility ($\alpha = 0$ and $\beta = 0$), or if there had been no change in the rates of emigration ($\hat{\alpha} = 0$ and $\hat{\beta} = 0$), a reduction of tariff on skill-based imports would lower both the skilled and the unskilled wage though the latter less than proportionately so that wage inequality would have unambiguously accentuated. This is evident from (7) and (8):

$$\hat{w}_s - \hat{w} = \frac{\gamma_Y}{\theta_{LX} \gamma} \hat{T} < 0 \quad (19)$$

But, as we have seen, the reduction of tariff raises the rate of emigration of skilled workers but lowers that of the unskilled workers, which in turn, would change skilled and unskilled wages. That is, a reduction of tariff, or any other policy changes such as those - considered above, will have a direct and a migration-induced effect on wages. Changes in wage inequality due to trade policy changes, therefore, may be different, both directionally and in magnitude, when international factor mobility (or migration) is considered than is perceived in the literature on trade and wage inequality. As evident from (7) and (8), this subsequent emigration effect of tariff reduction changes the skilled and unskilled wages in the same direction and are proportionate to each other:

$$\hat{W}_s = \frac{\theta_{KY}}{\theta_{SY}} \frac{\theta_{LX}}{\theta_{KX}} \hat{W} > 0 \quad (20)$$

As shown in the appendix, skilled and unskilled wages increase as a consequence of tariff

reduction induced changes in the rate of emigration of skilled and unskilled workers if

$$\left[\frac{B\psi}{A\mu} + 1 \right] \frac{\gamma_Y}{\gamma} \theta_{KY} < 1 \quad (21)$$

Since $\frac{\gamma_Y}{\gamma} \equiv \frac{\frac{\lambda_{KY}}{\theta_{SY}} \sigma_Y}{\frac{\lambda_{KY}}{\theta_{SY}} \sigma_Y + \frac{\lambda_{KX}}{\theta_{LX}} \sigma_X} < 1$ and $\theta_{KY} < 1$, so this condition is not unlikely to be

satisfied. Moreover, since $\frac{\gamma_Y}{\gamma} = 0$ when $\sigma_Y = 0$, and $\frac{\gamma_Y}{\gamma} = 1$ when $\sigma_Y = \infty$, so this

condition would be satisfied for very low values of factor substitution elasticity in the import competing sector (σ_Y) including the case of no-substitutability ($\sigma_Y = 0$). The intuition is simple. From (8) it is evident that a higher rate of emigration of skilled workers (as a consequence of tariff reduction) raises the skilled wage, whereas a lower rate of emigration of unskilled workers lowers it. If σ_Y is small in value, then the technological scope for substitution of scarcer and dearer skilled workers by capital is rather limited compared to the case if σ_Y is large in value, *ceteris paribus*. Accordingly, larger rate of emigration of skilled workers induced by tariff reduction would raise the skilled wage to a greater extent, and thus despite smaller rate of emigration of unskilled workers having a depressing effect on it, the skilled wage may rise.

However, even if the condition (21) holds and both wages rise, the relation between the two wages specified in (20) suggests that the migration effect of tariff reduction will lower the wage inequality, and thus reinforce the initial decline in the wage inequality (as

specified in (19) above) due to the direct effect of the tariff reduction, if $\frac{\theta_{KY}}{\theta_{SY}} < \frac{\theta_{KX}}{\theta_{LX}}$. But

when $\frac{\theta_{KY}}{\theta_{SY}} > \frac{\theta_{KX}}{\theta_{LX}}$, by the migration effect the skilled wage rises more than proportionately than the unskilled wage and consequently the wage inequality in the source country rises. Overall, the wage inequality may rise if this subsequent migration-effect on wage inequality is larger in magnitude than the initial effect of the tariff reduction. In other words, when international migration is allowed as a consequence of a tariff reduction, then *it may be possible that the wage inequality in the liberalizing small country accentuates, and the necessary condition for this is that* $\frac{\theta_{KY}}{\theta_{SY}} > \frac{\theta_{KX}}{\theta_{LX}}$.

Using $\theta_{SY} + \theta_{KY} = 1$ and $\theta_{LX} + \theta_{KX} = 1$, the above (necessary) condition boils down to $\theta_{KY} > \theta_{LX}$. That is, the unit cost share of capital in the import-competing sector must be larger than that in the export sector. The reason is simple. Migration-induced rise in wages lower the rate of return to capital. If capital cost share is larger in the import-competing sector, then the fall in the unit cost of production on this account is larger there leading to a more than proportionate increase in skilled wage than in the unskilled wage to maintain zero profit under competitive pressure.

6. Concluding Remarks

This paper showed that the stock of migrants in a developed country strongly influences the flow of migration by affecting the wages across skilled and unskilled categories for the remaining residents at a threshold level of migration. Despite a large body of evidence on skill composition of emigrants from developing countries, the literature does not offer an explanation on how the skill types will shape up when trade and other policy

changes loom large. The closest to what we derived are available in earlier papers on emigration by skill categories that showed how certain skill types will emigrate and others will not depending on information gaps across countries. This paper shows that emigration patterns can in fact display polar asymmetries not accounted for in the earlier literature. To obtain this, we discussed a general production pattern for a developing country where skilled and unskilled workers are used in export and import-competing sectors along with capital. Next, we obtained general reaction functions on how skill emigration is affected by unskilled emigration and vice versa (at the threshold level), through wage effects among remaining residents. At this point, we invoked three possible policy changes, such as trade liberalization (import being allowed in more freely), emigration tax (skilled workers exposed to a tax at the point of emigration) and remittance inflow (mainly, unskilled types sending remittances back home). We showed that a *ceteris paribus* reduction in the tariff rate unambiguously raises the rate of emigration of the skilled workers and lowers the rate of emigration of the unskilled workers.

The emigration tax or a quota on immigration applied at the source or destination, respectively, on the other hand, affects the other type in exactly the opposite manner by raising the source-destination wage gap. But, remittances sent by migrant workers do not affect emigration decision in our set up of a small source country.

Overall, the paper provides a theoretical support to the empirically observed asymmetric pattern of emigration by skilled and unskilled workers after trade reform and other policy

changes. This follows from the substitutability between emigration by the different skill-types.

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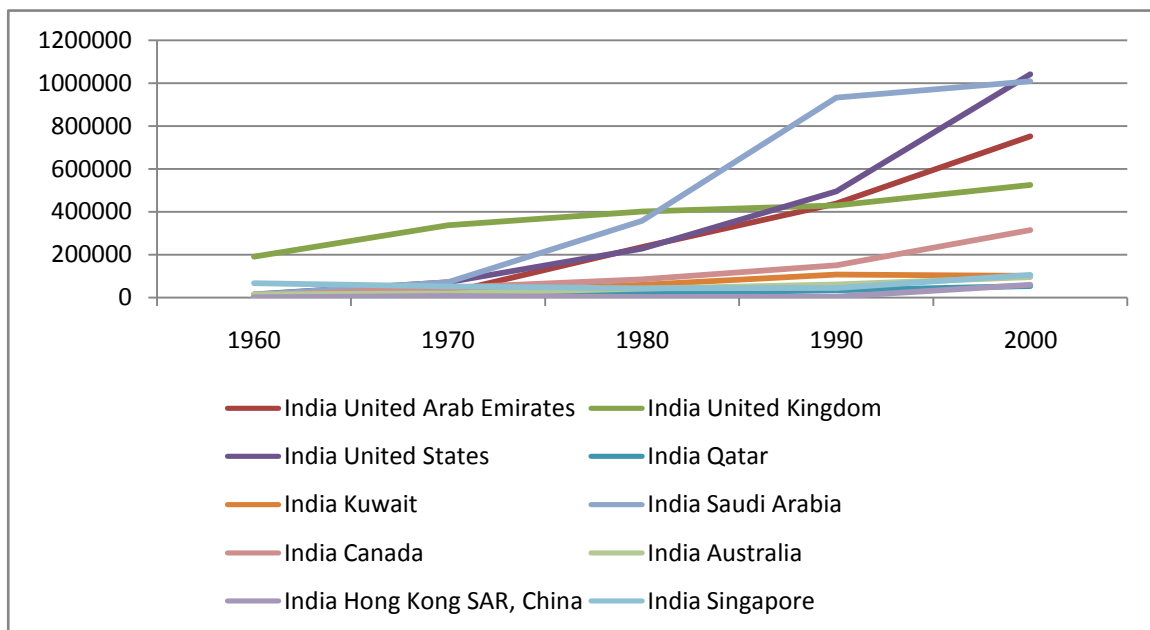
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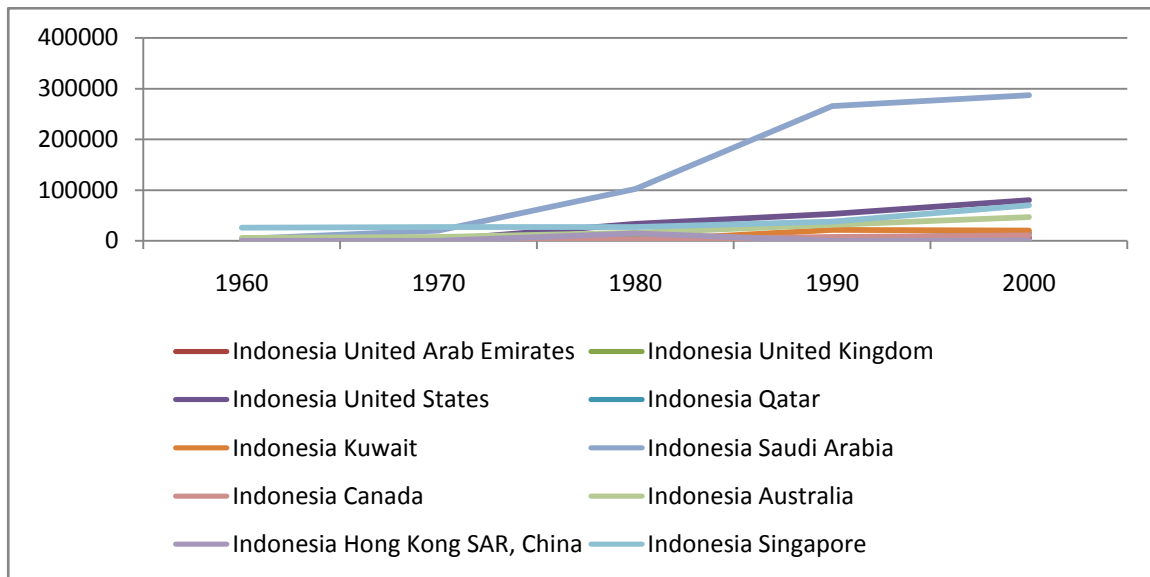
Appendix 1

Figure A1. Decadal Changes in Migration from India to select Destinations



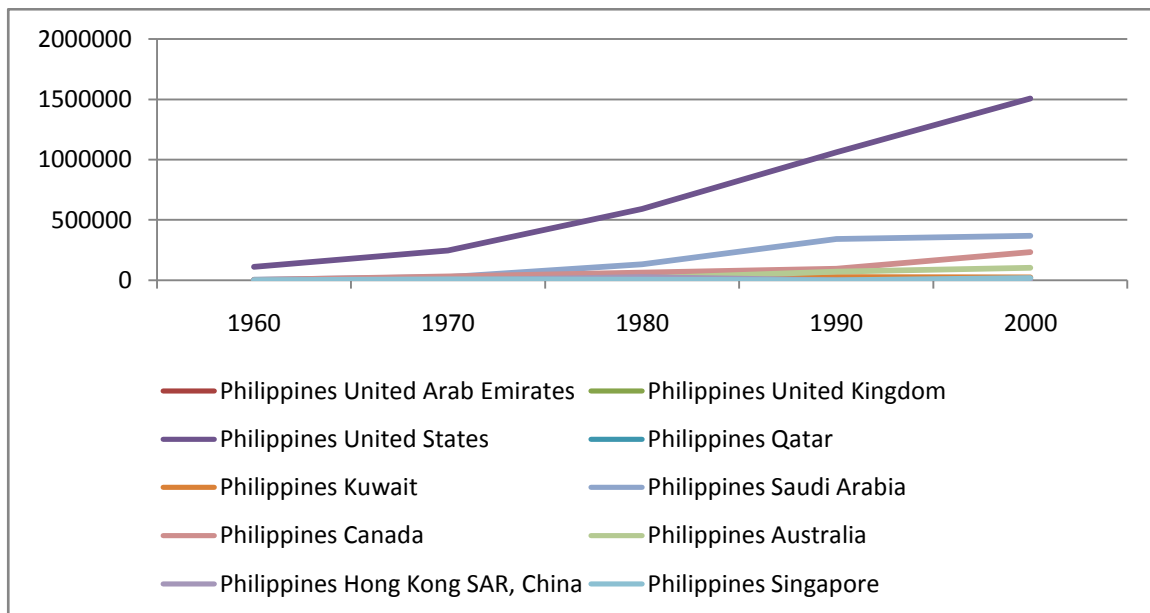
Source: World Bank

Figure A2. Decadal Changes in Migration from Indonesia to select Destinations



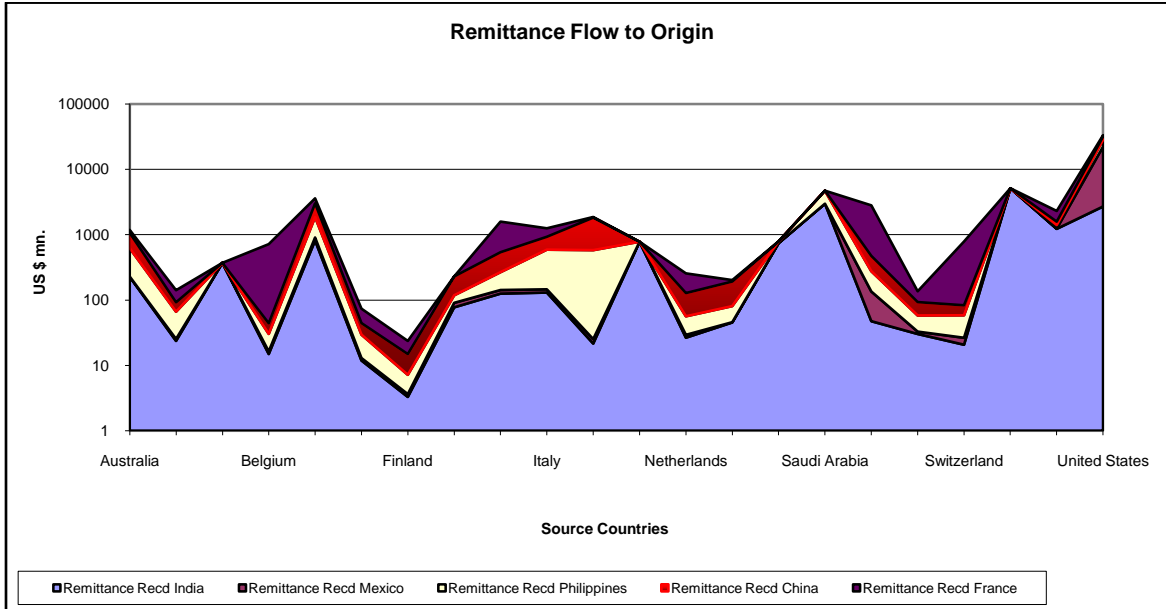
Source: World Bank

Figure A3. Decadal Changes in Migration from Philippines to select Destinations



Source: World Bank

Figure A4. Share of Remittances Received by most Important Recipients



Source: Compilation by Authors from World Development Indicator, World Bank.

Appendix II

Changes in Domestic Wages

From the full employment condition for unskilled labour as specified in (5) in the text, the following proportional change can be obtained:

$$\hat{X} + \hat{a}_{LX} = -\psi\hat{\beta} \quad (\text{A.1})$$

where, $\psi = \frac{\beta}{1-\beta}$.

Similarly, from the full employment condition for skilled labour as specified in (4) we get:

$$\hat{Y} + \hat{a}_{SX} = -\mu\hat{\alpha} \quad (\text{A.2})$$

where, $\mu = \frac{\alpha}{1-\alpha}$.

From the full employment condition for capital, on the other hand, we obtain,

$$\lambda_{KX}(\hat{X} + \hat{a}_{KX}) + \lambda_{KY}(\hat{Y} + \hat{a}_{KY}) = 0 \quad (\text{A.3})$$

Substitution of (A.1) and (A.2) in (A.3) yields,

$$\lambda_{KY}(-\psi\hat{\beta} + \hat{a}_{KX} - \hat{a}_{LX}) + \lambda_{KY}(-\mu\hat{\alpha} + \hat{a}_{KY} - \hat{a}_{SY}) = 0$$

Using the definition of factor substitution elasticity in sector X and Y, $\sigma_X = \frac{\hat{a}_{KX} - \hat{a}_{LX}}{\hat{w} - \hat{r}}$

and $\sigma_Y = \frac{\hat{a}_{KY} - \hat{a}_{SY}}{\hat{w}_S - \hat{r}}$, this boils down to:

$$-\left[\lambda_{KY}\psi\hat{\beta} + \lambda_{KY}\mu\hat{\alpha}\right] + \lambda_{KX}\sigma_X(\hat{w} - \hat{r}) + \lambda_{KY}\sigma_Y(\hat{w}_S - \hat{r}) = 0 \quad (\text{A.4})$$

From the zero profit conditions we get the relationship between changes in wages and in the rate of return to capital:

$$\hat{w}_S = \frac{1}{\theta_{SY}}\hat{T} - \frac{\theta_{KY}}{\theta_{SY}}\hat{r} \quad (\text{A.5})$$

$$\hat{w} = -\frac{\theta_{KX}}{\theta_{LX}}\hat{r} \quad (\text{A.6})$$

Substitution of these values in (A.4) yields the change in the rate of return to capital as specified in the text in (9) as reproduced in (A.7):

$$\hat{r} = -\frac{\lambda_{KX}\mu}{\gamma}\hat{\alpha} - \frac{\lambda_{KX}\psi}{\gamma}\hat{\beta} + \frac{\gamma_Y}{\gamma}\hat{T} \quad (9)$$

Finally, substitution of (A.7) in (A.5) and (A.6) yields the changes in the domestic wages as in the text.

Appendix III

Migration induced wage inequality

Total differentiation of the migration equilibrium condition (14) for skilled labour in the text yields,

$$\hat{W}_s = -\frac{\delta_s}{W_s} \left(\frac{\alpha}{\delta_s} \frac{\partial \delta_s}{\partial \alpha} \right) \hat{\alpha} = -\rho_s \varepsilon_\alpha \hat{\alpha} \quad (\text{A.7})$$

Similarly, from (15) we obtain,

$$\hat{W} = -\frac{\delta}{W} \left(\frac{\beta}{\delta} \frac{\partial \delta}{\partial \beta} \right) \hat{\beta} = -\rho \varepsilon_\beta \hat{\beta} \quad (\text{A.8})$$

Note that ε_α and ε_β , which denote the percentage change in migration cost for one percent change in the stock of skilled migrants and unskilled emigration respectively in the host country, are. positive or negative according as $\frac{\partial \delta_s}{\partial \alpha}$ and $\frac{\partial \delta}{\partial \beta}$ respectively are positive or negative.

Substitution of (A.5) and (9) in (A.7) then yields,

$$\begin{aligned} \hat{\alpha} &= -\frac{1}{\rho_s \varepsilon_\alpha} \left[\frac{1}{\theta_{SY}} \hat{T} - \frac{\theta_{KY}}{\theta_{SY}} \hat{r} \right] = -\frac{1}{\rho_s \varepsilon_\alpha} \left[\frac{1}{\theta_{SY}} \hat{T} - \frac{\theta_{KY}}{\theta_{SY}} \left\{ -\frac{\lambda_{KX} \mu}{\gamma} \hat{\alpha} - \frac{\lambda_{KX} \psi}{\gamma} \hat{\beta} + \frac{\gamma_Y}{\gamma} \hat{T} \right\} \right] \\ \Rightarrow \left[1 + \frac{1}{\rho_s \varepsilon_\alpha} \frac{\theta_{KY}}{\theta_{SY}} \frac{\lambda_{KX} \mu}{\gamma} \right] \hat{\alpha} &= -\frac{1}{\rho_s \varepsilon_\alpha} \frac{\theta_{KY}}{\theta_{SY}} \frac{\lambda_{KX} \psi}{\gamma} \hat{\beta} + \frac{1}{\rho_s \varepsilon_\alpha \theta_{SY}} \left[1 - \theta_{KY} \frac{\gamma_Y}{\gamma} \right] \hat{T} \quad (\text{A.9}) \end{aligned}$$

Similarly, substitution of relevant values in (A.8) we obtain,

$$\left[1 + \frac{1}{\rho\varepsilon_\beta} \frac{\theta_{KX}}{\theta_{LX}} \frac{\lambda_{KX}\psi}{\gamma}\right] \hat{\beta} = -\frac{1}{\rho\varepsilon_\beta} \frac{\theta_{KX}}{\theta_{LX}} \frac{\lambda_{KX}\mu}{\gamma} \hat{\alpha} + \frac{1}{\rho\varepsilon_\beta} \frac{\theta_{KX}}{\theta_{LX}} \frac{\gamma_Y}{\gamma} \hat{T} \quad (\text{A.10})$$

Let $A \equiv \frac{1}{\rho_S \varepsilon_\alpha} \frac{\theta_{KY}}{\theta_{SY}} \frac{\lambda_{KX}}{\gamma}$ and $B \equiv \frac{1}{\rho\varepsilon_\beta} \frac{\theta_{KX}}{\theta_{LX}} \frac{\lambda_{KX}}{\gamma}$. (A.9) and (A.10) can be rewritten as,

$$[1 + A\mu] \hat{\alpha} = -A\psi \hat{\beta} - A \frac{\left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma}\right) \gamma}{\theta_{KY} \lambda_{KX}} \hat{T} \quad (\text{A.9a})$$

$$[1 + B\psi] \hat{\beta} = -B\mu \hat{\alpha} + B \frac{\gamma_Y}{\lambda_{KX}} \hat{T} \quad (\text{A.10a})$$

Rearranging terms in (A.9) and (A.10a) and solving for $\hat{\alpha}$ and $\hat{\beta}$ by Cramer's Rule, we obtain,

$$\begin{bmatrix} 1 + A\mu & A\psi \\ B\mu & 1 + B\psi \end{bmatrix} \begin{bmatrix} \hat{\alpha} \\ \hat{\beta} \end{bmatrix} = \begin{bmatrix} -A \frac{\left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma}\right) \gamma}{\theta_{KY} \lambda_{KX}} \hat{T} \\ B \frac{\gamma_Y}{\lambda_{KX}} \hat{T} \end{bmatrix} \quad (\text{A.11})$$

$$\Rightarrow \hat{\alpha} = -\frac{1}{\Delta} \left[A(1 + B\psi) \frac{\left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma}\right) \gamma}{\theta_{KY} \lambda_{KX}} + \frac{AB\psi\gamma_Y}{\lambda_{KX}} \right] \hat{T} \quad (\text{A.12})$$

$$\hat{\beta} = \frac{1}{\Delta} \left[AB \frac{\left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma}\right) \gamma \mu}{\theta_{KY} \lambda_{KX}} + \frac{(1 + A\mu)B\gamma_Y}{\lambda_{KX}} \right] \hat{T} \quad (\text{A.13})$$

where, $\Delta \equiv 1 + A\mu + B\psi$.

Using (7) and (8) in the text and (A.12) and (A.13), the emigration induced effect of tariff reduction on wages can be obtained as,

$$\hat{w} = \frac{\theta_{KX}}{\theta_{LX}} \left[\frac{\lambda_{KX}\mu}{\gamma} \hat{\alpha} + \frac{\lambda_{KX}\psi}{\gamma} \hat{\beta} \right] = \frac{\theta_{KX}}{\theta_{LX}} \left[\frac{-A\mu \left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma} \right) + B\psi \theta_{KY} \frac{\gamma_Y}{\gamma}}{\theta_{KY} \Delta} \right] \hat{T} \quad (\text{A.14})$$

$$\hat{w}_S = \frac{\theta_{KY}}{\theta_{SY}} \left[\frac{\lambda_{KX}\mu}{\gamma} \hat{\alpha} + \frac{\lambda_{KX}\psi}{\gamma} \hat{\beta} \right] = \frac{\theta_{KY}}{\theta_{SY}} \left[\frac{-A\mu \left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma} \right) + B\psi \theta_{KY} \frac{\gamma_Y}{\gamma}}{\theta_{KY} \Delta} \right] \hat{T} \quad (\text{A.15})$$

Thus, both wages increase subsequently as a consequence of tariff induced emigration of skilled and unskilled workers if $\Delta \equiv 1 + A\mu + B\psi > 0$ and

$$\begin{aligned} & -A\mu \left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma} \right) + B\psi \theta_{KY} \frac{\gamma_Y}{\gamma} < 0 \\ \Rightarrow & \left[\frac{B\psi}{A\mu} + 1 \right] \frac{\gamma_Y}{\gamma} \theta_{KY} < 1 \end{aligned}$$

which is condition (21) in the text.

Finally, subtracting (A.14) from (A.15) we obtain the change in wage inequality as a consequence of tariff-reduction induced emigration:

$$\hat{w}_S - \hat{w} = \left(\frac{\theta_{KY}}{\theta_{SY}} - \frac{\theta_{KX}}{\theta_{LX}} \right) \left[\frac{-A\mu \left(1 - \theta_{KY} \frac{\gamma_Y}{\gamma} \right) + B\psi \theta_{KY} \frac{\gamma_Y}{\gamma}}{\theta_{KY} \Delta} \right] \hat{T} \quad (\text{A.16})$$