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RESEARCH ARTICLE

Analysis of Interconnectedness in Indian Subcontinent Remittances from the Gulf Cooperation Countries

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Abstract

Indian subcontinent is a major remittance receiver. With similar labor market characteristics, their workers go to same host countries. Therefore, their labor is substitutable for each other with high degree of connectedness with direct consequences on remittance inflows. Yet, due to social and political considerations in host countries, substitution may not take place. The issue is an empirical question. We study interactions of remittance inflows into India, Pakistan, Bangladesh and Sri Lanka via frequency connectedness. We find a low degree of spillovers across countries, i.e., dynamics of remittance inflows in each country are largely explained by internal factors, not due to spillovers from other countries. That is, remittance inflows in these countries are essentially independent. We also observe that information processing is faster in the short-run than the long-run indicating that market participants are aware of dynamics in other markets. The findings have policy implications for unemployment and foreign exchange.

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1. Introduction

Remittances are some of the most stable and reliable sources of foreign income for many countries (Gopalan and Rajan, 2009; Mughal and Makhlouf 2011; Amuedeo-Dorantes and Pozo, 2012). The only way to earn remittances, however, is to send domestic workforce abroad (Acosta et al. 2009). Furthermore, the emigrant workers should not be able to settle abroad, forcing them to keep a perspective to eventually come back home (the country where from the emigrant worker originates). If so, the temporary nature of work abroad would inhibit “investment” options abroad for emigrant workers. This is exacerbated if the foreign income per worker is small compared to investment options in the host country (the country in which the emigrant worker is hired). Nevertheless, this very stream of income may mean significant economic value at home. Thus, concerns for those left behind as well as the need to build a future where home is would guarantee

the inflow of remittances from abroad. Under those circumstances, it is possible to establish a clear correlation between remittances and emigrant labor.

That is almost the textbook portrayal of Indian subcontinent workers in the Gulf Cooperation Countries (GCC, or Gulf), which we intend to study in this paper. More precisely, the central question of this paper is the desire to measure how labor sent abroad from various countries in the Indian Subcontinent (India, Bangladesh, Sri Lanka, Pakistan) are related to one another. Particularly, how substitutable workers from these various countries are for one another in countries around the world that hire emigrants originating in the Indian subcontinent. This is to be measured by tracking remittances that are sent home as remittances are a function of the body of the workforce sent abroad. As we will discuss below, the emigrant worker from the Indian Subcontinent has very similar characteristics in terms of the skillset and the destination, which is the GCC countries. These workers (aka, expatriates or guest workers) have no prospect of a permanent settlement via citizenship in the host countries. Due to the temporary nature of the workplace, guest workers tend to remit a very significant amount of their income back home on a regular basis either for investment purposes or for altruistic reasons (Naufal and Vargas-Silva, 2010). Therefore, there is a close relationship between emigration and remittances in this context.

Since the source of the labor and the destination thereof share a lot of common features it stands to reason that these labor markets could be connected to each other. Naturally, the labor from the aforementioned countries would compete for the job openings in the host countries. Likewise, firms in the host countries would look for workers with a profit maximizing goal. This could point to a possibility of labor substitution from different source (home) countries. Nevertheless, political preferences of the host countries would come in the way to interfere with the final composition of the workforce in the host countries.

We can take advantage of the close relationship between remittances and the labor markets to study the interconnectedness of the labor markets in the Indian Subcontinent. As far as the econometric methods are concerned, we study the connectedness of remittance inflows into four Indian subcontinent countries, namely, India, Pakistan, Bangladesh and Sri Lanka via the Barunik and Krehlik frequency connectedness method. Although we will not investigate the labor markets per se, under the scenario described above, remittance inflows should be closely correlated with the international labor movements. In the section regarding the overview of the Indian subcontinent labor markets below, we will provide a clearer picture of the characteristics of the labor markets in the Indian subcontinent and their movements to GCC as well as the remittance flows between these regions.

Our results have several policy and academic implications, which necessitates such an investigation even though we do not necessarily address those issues in our paper. As the main theme of this paper, we believe the identification of connectedness among the labor markets in the Indian subcontinent, and consequently remittance inflows into these countries, is an important academic and policy question. Connectedness in this context means the substitutability of the foreign workforce in the GCC thanks to the competition among workers with comparable features. Therefore, the interconnectedness of these markets is a possibility given the characteristics of the domestic labor markets and the destination of the emigrant workforce. If in fact it exists, there are specific policy issues to consider such as coping with

the competition with emigrant workforce from other countries and/or containing the negative impacts of a contagion in other labor markets. On the other hand, lack of connectedness is also a likelihood based on the policy choices of the host (destination) countries of the emigrant labor. Therefore, lack of interconnectedness comes with a different set of policy proposals. That is why, the existence of connectedness needs to be discovered to devise the correct policy proposals.

The rest of the paper is organized as follows: The next section presents a succinct overview of the labor markets in the Indian subcontinent in terms of domestic characteristics, likely destinations, and the impact of the host countries' policies on remittances. In Section 3, we provide a short review of the remittance literature, especially regarding the South Asian economies. Section 4 presents a brief theoretical framework for our analysis. Section 5 comprises a discussion on the data including the span and sources, definitions of variables used in the study, and the presentation of the econometric methods of the paper. This section also discusses the findings of the econometric analysis. Finally, the paper concludes in Section 6 with a recap of the study together with the policy implications.

2. An Overview of Indian Subcontinent Labor Markets and Remittances

The Indian subcontinent labor markets have a formidable footprint in the international employment scene. As shown in Table 1, a significant amount of remittances heads to these countries. In particular, India is the largest remittance receiving country in the world in terms of absolute amounts. Although other countries in this list receive smaller amounts of remittances compared to India, remittances make about nine percent of Pakistan's GDP in 2020.

Table 1. Remittance inflows

Country	Rank	Remittances as a share of GDP in 2020 (%)
India	1	0.03
Pakistan	7	0.09
Bangladesh	9	0.06
Sri Lanka	23	0.08

Remittance inflows are in nominal terms in US$ million. The rank of the countries' remittance inflows with respect to the size in year 2020 data are given in the world.
Source: World Development Indicators by the World Bank

These markets are also very similar to each other (Verick, 2018; Najeeb et al. 2020). We investigate this issue in terms of productivity and unemployment via Table 2. Defining productivity as the annual growth rate of output per worker in 2010 constant US$, and averaging over 2017 and 2020, the labor in these countries have quite low productivity as presented in Table 2. On the other, again as shown in Table 2, these economies have high unemployment levels. While domestic unemployment necessitates finding alternative employment opportunities, especially internationally; low productivity of the workers, largely from the same geographical location, would lead these people to the same host countries.

Table 2. Labor market characteristics

Country	Productivity	Unemployment
India	5.72	10.79
Pakistan	2.01	5.61
Bangladesh	4.65	8.48
Sri Lanka	2.74	6.82

Productivity refers to annual growth rate of output per worker (GDP constant 2010 US $) in percentage terms. This is the average of years in 2017-2020. Unemployment rate is for people of 15 years of age or older with intermediate level of education. This is the average of years in 2017-2018.
Source: ILO

The GCC countries are among the most preferred destinations for the international workers from the Indian subcontinent (Naufal, 2011). As shown in Table 3, around 40-50 percent of all foreign workers in the Gulf are from the Indian subcontinent countries. Also, the markets in Europe, especially the United Kingdom as well as the United States are alternative locations. The latter usually attracts more qualified workers. As far as remittances are concerned, a striking observation is made in terms of the percentage of remittances received from the Gulf versus the rest of the world. Indian subcontinent countries earn somewhere between 73 and 91 percent of their worldwide remittances from the Gulf. That shows that GCC is the single most important source of remittances for the Indian subcontinent countries that we study in this paper. Due to strict employment laws, a sizable portion of the foreign workforce (expatriate workers) are not allowed to bring the family along. This is especially the case for unskilled workers, which make up a large segment of the Indian subcontinent workers in the Gulf. Also, thanks to the stringent citizenship laws, expatriates are not allowed to adopt the host countries as permanent residence. All foreign workers have to leave the GCC countries beyond a certain age. Therefore, expatriate workers tend to send a sizable amount of their earnings back home. Within the context of Dubai, United Arab Emirates (UAE), Naufal and Vargas-Silva (2010) find that most expatriate workers share similar characteristics in terms of age, gender, years in the UAE, remitting amount and frequency, level of educational attainment (70 percent has some educational attainment under university). These workers send a huge sum of their earnings to their family members such as parents, spouses, children and siblings. There is some support for other relatives and other persons or institutions, but that amount is negligible.

Table 3. Expatriate labor force from the Subcontinent and GCC Remittance Inflows

Countries	India	Pakistan	Sri Lanka	Bangladesh
United Arab Emirates	3,310,419	950,145	114,911	1,044,505
Saudi Arabia	2,266,216	1,343,737	479,391	1,157,072
Qatar	658,488	135,876	55,825	163,386
Bahrain	310,591	87,892	10,099	100,444
Oman	1,201,995	218,522	26,268	276,518
Kuwait	1,157,072	340,481	39,837	381,669
TotalFROM	8,904,781	3,076,653	726,331	3,123,594
TotFRW	54.15	50.45	42.02	40.06
RGW	73	80	83	91

Data represent the bilateral estimates of migrant stocks in 2017 as reported in the bilateral migration matrix provided by the World Bank in April 2018. The labor sending (source) country is listed horizontally in Row 1 whereas the labor receiving country is listed vertically in Column 1. TotalFROM refers to the expatriate workers from a particular country in the Gulf. TotFRW shows the percentage of expatriate workers from a particular country with respect to all migrant workers from this country in the world. RGC represents the percentage of Subcontinent remittance inflows from the GCC with respect to the those from all countries.
Source: Bilateral Migration Matrix by the World Bank.

As the major labor hosting countries, the United States, the United Arab Emirates and Saudi Arabia send out significant amounts of remittances as shown in Table 4. As a matter of fact, for all countries in the Gulf, remittance outflows make up a substantial share of their GDPs, as presented in Table 4.

Table 4. Remittance outflows

Migrant remittance outflows (US$ million)	Rank		Remittances as a share of GDP in 2019 (%)
United States	1		0.003
United Arab Emirates	2		0.107
Saudi Arabia	3		0.039
Kuwait	9		0.110
Qatar	12		0.065
Oman	17		0.119
Bahrain			

Remittance outflows are in nominal terms in US$ million. The rank of the countries' remittance outflows with respect to the size in year 2019 data are given in the world.
Source: World Development Indicators by the World Bank

So far, we have provided a brief review centered around the main characteristics of the labor markets in the Indian subcontinent as the source of the international labor force, and the Gulf as the main destination of this workforce with a special reference to remittances. All in all, this review of sending and receiving labor markets and remittances should be an indication that Indian subcontinent remittances are very closely related to the expatriate workforce in the Gulf.

Labor, especially in the form of human capital, is a very important factor of production. Sending labor abroad has economic, political and social implications at home and abroad (Amuedo-Dorantes and Pozo, 2004). South Asian countries, in particular those in the Indian Subcontinent, are some of the largest senders of labor abroad, and thus, some of the biggest receivers of remittances. As argued above, the emigrant labor from those countries shares similar characteristics and tends to go to the same host destinations. Whereas these features could make the international labor substitutable in the market, there are non-economic reasons which impede such a phenomenon taking place. Certain policies in place in the host countries are more politically designed rather than economically influenced, potentially rendering economic theoretical expectations ineffective.

Substitution could make these labor markets competitors with domestic and international policy implications. But the aforementioned non-economic reasons prevalent abroad pose a different kind of challenge for the policy makers in the labor markets in the Indian subcontinent countries. It is then an imperative concern for laborers, policy makers, international organizations as well as academics to determine the interaction, if any, among the international labor markets in the Indian subcontinent countries. That interaction would naturally alter the amount of remittance inflows for each country. In this paper, we investigate the possible interactions of remittance inflows into India, Pakistan, Bangladesh and Sri Lanka via the Barunik and Krehlik (BK) frequency connectedness method. Obviously, we focus on remittances instead of the international labor headcount per se as stakeholders are typically interested in the costs and benefits of labor sent abroad. In this sense, while the amount of remittances sent home from abroad represents benefits, the loss of workforce and family separation may be stated as costs. We study the remittance inflows (benefit) in exclusion of emigrant labor costs about which an extensive literature exists due to its significance to human development.

3. Literature Review

The literature on remittances is voluminous with analyses on a number of perspectives. Therefore, we should note that although we attempt to discuss some of the previous work, we do not claim by any stretch of imagination that this is an exhaustive list of such a large body of previous work. We only cite some of the more recent and/or relevant ones for our paper. In that huge scholarship, while some of the papers concentrate on a single country, some others consider a broader outlook. Naturally, data, sample sizes and econometric techniques vary quite extensively, too. It is fair to say that the consensus is not a common trait of this literature regarding some of the most discussed matters such as cyclicality of remittances as motivations of sending money back home. To address these issues, Nishat and Bilgrami (1993), Mishra (2005), Barua et al. (2007), Ahmed (2012), and Anwar and Mughal (2012) conclude that remittances are countercyclical; therefore, altruistic. As such, remittances help recipients cope with natural disasters (Suleri and Savage, 2006; Savage and Harvey, 2007). However, Buch and Kuckulenz (2010) judges that remittances are a form of portfolio investment.

Perhaps, the only consensus point is that remittances are a stable and reliable source of foreign income in general (Amuedeo-Dorantes and Pozo, 2012) and also within the context of South Asia (Gopalan and Rajan, 2009; Mughal and Makhlouf 2011).

Examining the remittances from the macroeconomic perspective, Cooray (2012), Zhunio et al. (2012) and Bang et al. (2016) observe that remittances positively contribute to the GDP growth in the receiver countries. Yet, this assertion is challenged by Amuedo-Dorantes and Pozo (2004) who claim that appreciation of the domestic currency harms the GDP of the labor sending countries. Likewise, Siddique et al. (2010) show that the impact of remittances on economic growth is not necessarily positive, at least for the case of India. The impact of remittances may also carry a time dependent component. That is, while sending labor abroad for the sake of remittances would lead to the shrinkage of available labor at home, the remittance inflows could positively contribute to the quality of future labor via better educational opportunities. To this effect, remittances could also reduce poverty over time (Anwar and Mughal, 2012; Yoshino et al. 2017).

There is also a considerable effort to analyze the nature of remittances within the South Asian context. That literature has not arrived at unanimous conclusions there, either. For example, while Jijin et al. (2021) find some evidence of altruistic behaviour in remittances to India in particular, Dash (2020)'s results are more comprehensive geographically speaking with a similar conclusion. Vargas-Silva et al. (2009) and Khan et al. (2019) extensively review the literature on remittances to the South Asian region. Briefly speaking, their findings may be summarized in terms of remittances having positively impacted consumption, investment prospects of the countries in the region, and alleviated poverty. Additionally, Mughal and Ahmed (2014) and Genc (2022) find that Indian subcontinent labor markets tend to respond to domestic dynamics more than the international ones.

As far as the destination countries are concerned, research shows that an overwhelming portion of the South Asian workforce chooses GCC (Cooray, 2014), leading to over 90 percent of remittances flowing in some countries in South Asia having origins in the Gulf (Chitgupi, 2019).[1] While mostly of these workers are unskilled, they tend to remit a significant share of their earnings back home contributing to the domestic GDP (Cooray, 2014, and Doherty et al. 2014). The GCC, though open to foreign workers, have been following a policy of diversification of the foreign labor force to disallow the domination of workers from a particular country (Birks and Sinclair, 1980; Khadria 2006; Naufal and Genc, 2015; and Thiollet, 2016).

The interconnectedness, or lack thereof, is certainly important for the stakeholders in these labor markets/countries due to the likely competition and/or need to shield own labor markets from a contagion effect in other countries. Yet, there does not seem to be an abundance of studies concentrating on the Indian subcontinent countries from this perspective with the exception of Mughal and Ahmed (2014) and Genc (2022) which study the same region for the same issue though with different methods from ours. This does not mean that there are no papers analyzing the international connectedness from a variety of perspectives including some Asian countries, namely, inter alia, Essaadi et al. (2009); Capannelli et al. (2010); Genc et al. (2010); Colombo (2013); Ajmi et al. (2014); Klossner and Sekkel (2014); Yin and Han (2014); Gupta et al. (2015); Biljanovska et al. (2017); Cavoli and Gopalan (2017); Gabauer and Gupta (2018); Gupta et al. (2019); and Aydemir et al. (2020).

4. Theoretical Framework

A simple and tractable theoretical model can be derived from a labor demand relationship via some production function such as Cobb-Douglas and CES as in Equation 1:

$$Y = AF(L, K) \quad (1)$$

- Y: output
- A: some technology parameter
- L: labor with different characteristics
- K: capital stock
- $F(.)$ exhibits constant returns to scale and positive and diminishing marginal products with respect to each input and satisfies the Inada conditions.

The production function aggregates the labor force by such qualifications as education, experience and national origin. In the case of disaggregation, labor variable would have subscripts indicating separate characteristics of the workforce. However, since we assume that labor markets in the home countries are very similar to each other, there is no extra gain with further delineating the markets for each country. The host countries also show similarities to each other further justifying the simpler notation. Under the simplifying assumptions of perfect competition with perfect foresight, demand for factors of production (in this case, labor and capital) would be determined. In other words, all factors of production receive a return equal to their marginal product. Our variable of interest, which is labor, would have some marginal productivity level.

First, wages are fixed. The elasticity of wage with respect to labor depends on characteristics of the labor (including the national origin). Once wages are fixed, profit maximizing firms hire workers until the marginal product of labor equals the wage rate.

Wages will be a decreasing function of the unemployment rate of the categorizations of the workforce such as with respect to the national origin, education.

5. Data, Variable Definitions, and Econometric Analysis

As far as our review of the literature is concerned, the closest papers to ours are Mughal and Ahmed (2014) and Genc (2022). The former uses a structural VAR (SVAR) method to analyze the impact of host country and home country business cycles on the remittance inflows in the same countries we consider in this paper. The latter also analyzes the remittance inflows in the same countries via the Diebold and Yilmaz (2011) connectedness index within the context of the standard VAR models. Our paper extends these earlier studies in two major directions: First of all, as the basis for the analysis, our VAR includes exogenous variables such as the real GDP growth rate of host countries to explain the remittance behavior. While Mughal and Ahmed (2014) include these exogenous variables, Genc (2022) excludes any exogenous variables beyond a mere constant. We differ from Mughal and Ahmed (2014) in that they impose an empirical

structure on the VAR model to obtain non-recursive orthogonalization of the error terms for their impulse response analysis. Although there could be theoretical (as well as econometric) justifications for such a restriction, we impose no such constraint a priori keeping in line with the original (standard) use of VAR models enhanced with the exogenous variables. Secondly, we employ a different method for the econometric investigation of connectedness from the method used in Genc (2022), namely the Diebold-Yilmaz (DY) method. Our method, the Barunik and Krehlik (BK) à la Barunik and Krehlik (2018), is developed in the frequency domain whereas the Diebold-Yilmaz (DY) method is grounded on conventional time series methods. In brief, the DY measures are based on shares of forecast error variation in one variable due to a shock in another variable of the VAR system, whereas the BK measures are focused on the frequency responses of shocks (Barunik and Krehlik, 2018). However, the BK method has the added advantage that it provides us with a finding of the speed of information processing across markets in the short run vs the long run. This feature of BK helps us discover the awareness of the remittance markets across international borders. While international labor market information may help designing better policies, Lubambu (2014) argues that remittances provide one such avenue to spread information regarding the labor market conditions internationally.

As for the data, we collect remittance inflows data from the November 2021 version of the World Development Indicators by the World Bank. This is the personal remittance inflows in the current USD. It includes the compensation of employees, and personal transfers. We use the GDP per capita, current prices in the U.S. dollars for the Indian subcontinent countries. We also use the real per capita GDP growth of the host countries. These data come from the IMF. Our data span is 1980-2020.

We define log-level remittance inflows with respect to the GDP as

$$LRY_{ti} = log\left(\frac{Rin_{ti}}{y_{ti}}\right) \qquad (2)$$

where Rin_{ti} is the remittance inflows at time t of Country i. Likewise, y_{ti} is the nominal per capita GDP of Country i at time t. The growth rate of the above-defined remittances is denoted by $FLRY_{ti}$.

The Barunik and Krehlik (2018) is based on a covariance stationary VAR(p) process with N variables (countries) such as the following:

$$y_t = A_0 + \sum_{k=1}^{p} A_k y_{t-k} + X\beta + \epsilon_t \qquad (3)$$

where ϵ_t is a sequence of serially uncorrelated random vectors with concurrent full rank covariance matrix Σ; A_k's are (NxN) coefficient matrices for the endogenous variables. On the other hand, X represents a set of exogenous variables. To calculate the impulse response functions, we use the 'generalized variance decomposition' introduced by Pesaran and Shin (1998), which is built on Koop et al. (1996) to compute the connectedness index. Unlike the so-called Cholesky decomposition, Koop et al. (1996)'s method is invariant to the ordering of variables. An impulse response function (IRF) traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables generated with the help of the MA(∞) representation of VAR(p). The BK's total connectedness measure on

connectedness tables, C^d, where $\tilde{\Theta}_d$ corresponding to an arbitrary frequency of band d, is given by $C^d = \sum_{j=1, i\neq j}^{k} (\tilde{\Theta})_{j,i}$. This measure incorporates the contribution of frequency band d to the whole VAR(p) system mentioned above. Further note that Θ in BK plays a role similar to f in DY, although the former is in the frequency domain whereas the latter is in the time domain.[2]

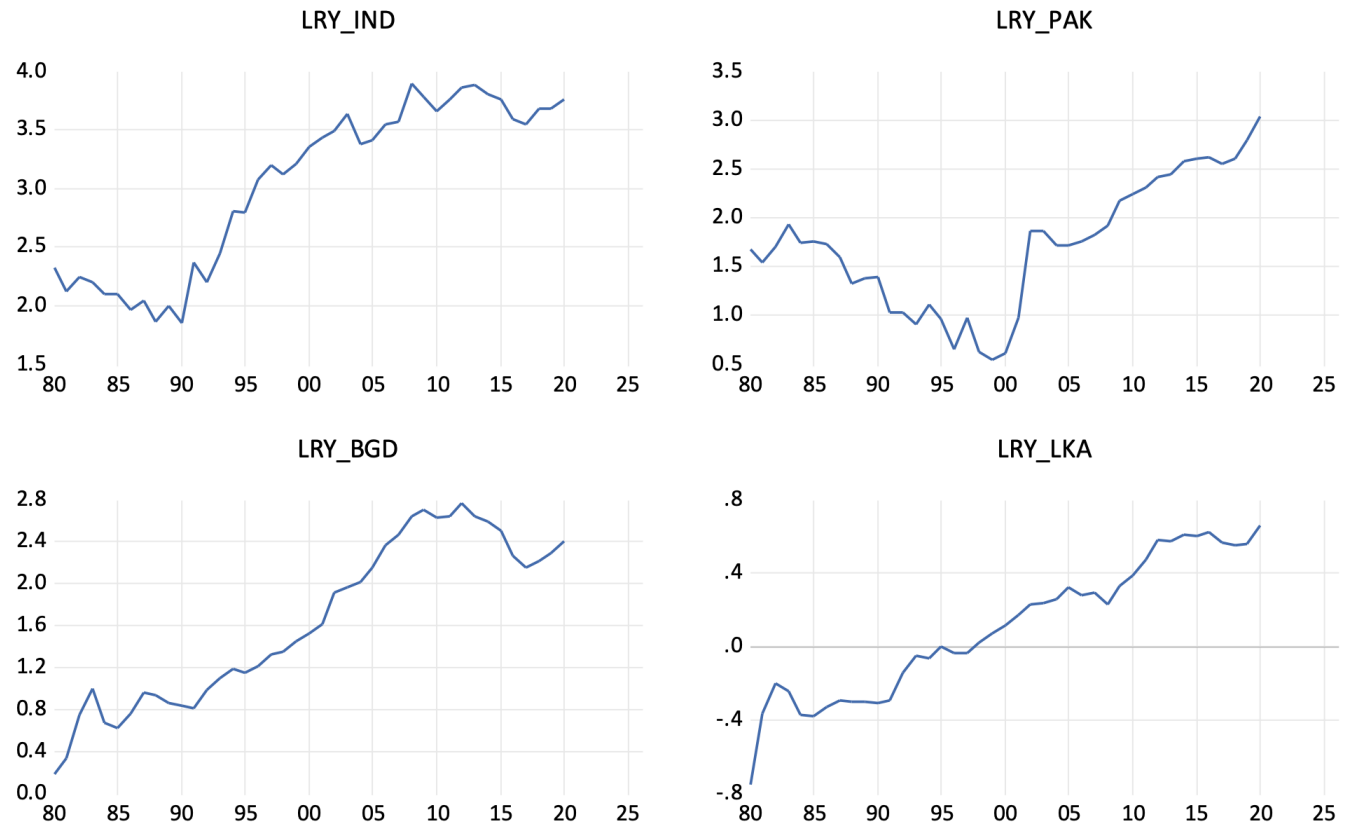

Figure 1. Log-level remittances of the Indian Subcontinent countries; IND (India), PAK (Pakistan), BDG (Bangladesh), LKA (Sri Lanka).

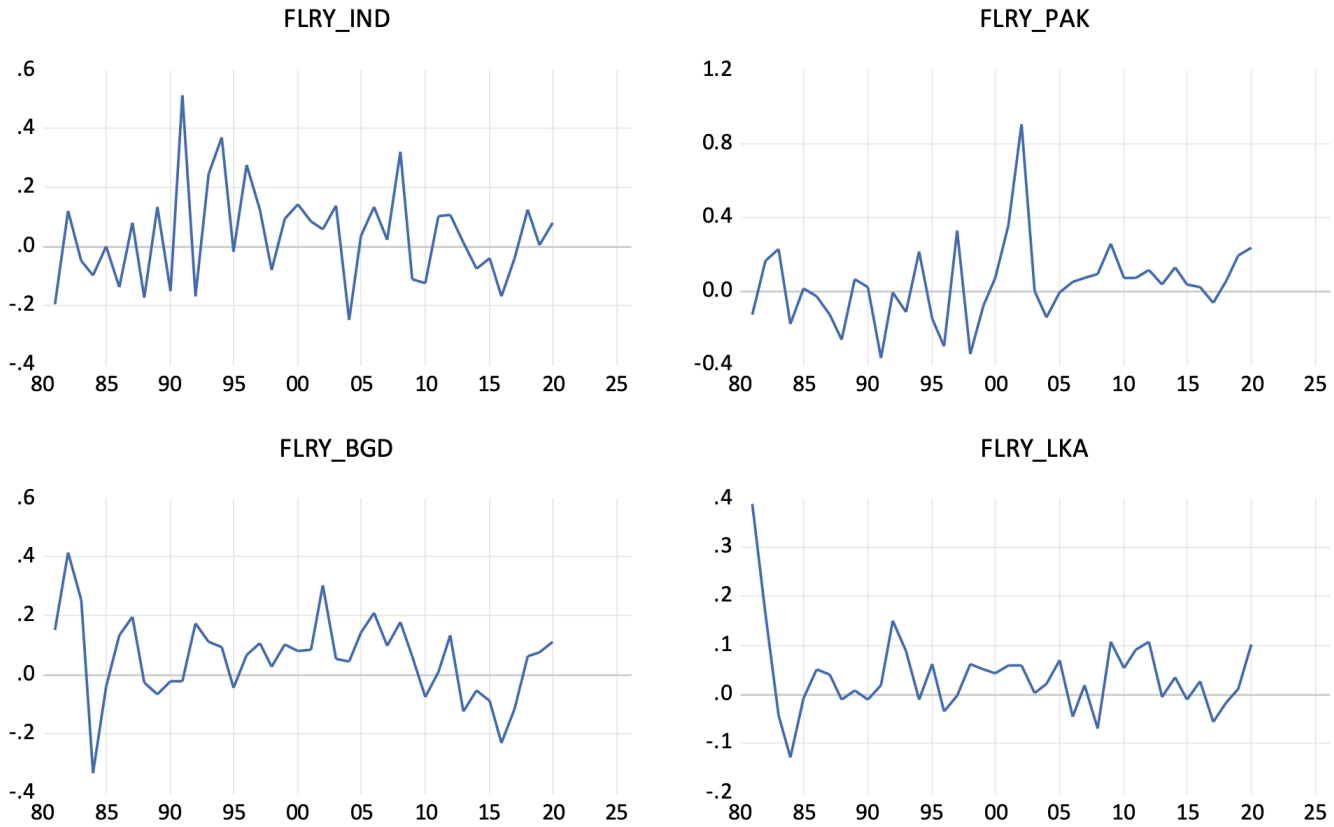

Figure 2. Growth rate of remittances of the Indian Subcontinent countries; IND (India), PAK (Pakistan), BDG (Bangladesh), LKA (Sri Lanka).

As shown in Figure 1 and Figure 2, the share of remittances with respect to GDPLRY_{ti}, are trended while their growth rate, $FLRY_{ti}$, seem to be stationary. We formally test this via the ADF (Table 5) and KPSS (Table 6) tests where the optimum lag length is determined via Schwarz criterion (BIC). It is clear that all growth rate variables are stationary for both tests at the customary five percent level of significance, a prerequisite for the connectivity analysis used in this paper.

Table 5. ADF based unit root tests in levels and first differences

Variables	Constant/Trend	Opt Lag	Test Stat	5%CV	UR/NoUR?
$LRY_{t,ind}$	Constant, Linear Trend	1	-1.11351	-3.52976	UR
$LRY_{t,pak}$	Constant, Linear Trend	0	-1.33304	-3.52661	UR
$LRY_{t,bgd}$	Constant, Linear Trend	1	-1.93023	-3.52976	UR
$LRY_{t,lka}$	Constant, Linear Trend	2	-4.30671	-3.53308	NoUR
$FLRY_{t,ind}$	Constant	0	-8.06222	-2.93899	NoUR
$FLRY_{t,pak}$	Constant	0	-5.37985	-2.93899	NoUR
$FLRY_{t,bgd}$	Constant	0	-4.48631	-2.93899	NoUR
$FLRY_{t,lka}$	Constant	0	-6.7932	-2.93899	NoUR

LRY_{ti} refers to the log-level of remittance inflows of Countryi where countries are represented ind, pak, bgd, and lka in reference to India, Pakistan, Bangladesh, and Sri Lanka, respectively. On the other hand, $FLRY_{ti}$ represents the first difference of LRY_{ti}, corresponding to the growth rate ofLRY_{ti}. Opt lags represent the number of optimum lags in the test equation, which are chosen via BIC. The testing equation may contain a trend and/or an intercept. The existence (absence) of a unit root based on the test equation is identified in the last column as UR (NoUR).

Table 6. KPSS based unit root tests of levels and first differences

Variables	Constant/Trend	Opt Lag	Test Stat	5%CV	UR/NoUR?
$LRY_{t,ind}$	Constant, Linear Trend	5	0.123853	0.146	NoUR
$LRY_{t,pak}$	Constant, Linear Trend	5	0.182487	0.146	UR
$LRY_{t,bgd}$	Constant, Linear Trend	4	0.11461	0.146	NoUR
$LRY_{t,lka}$	Constant, Linear Trend	2	0.051245	0.146	NoUR
$FLRY_{t,ind}$	Constant	3	0.141037	0.463	NoUR
$FLRY_{t,pak}$	Constant	0	0.36102	0.463	NoUR
$FLRY_{t,bgd}$	Constant	2	0.208045	0.463	NoUR
$FLRY_{t,lka}$	Constant	9	0.287883	0.463	NoUR

LRY_{ti} refers to the log-level of remittance inflows of Countryi where countries are represented ind, pak, bgd, and lka in reference to India, Pakistan, Bangladesh, and Sri Lanka, respectively. On the other hand, $FLRY_{ti}$ represents the first difference of LRY_{ti}, corresponding to the growth rate ofLRY_{ti}. Opt lags represent the number of optimum lags in the test equation, which are chosen via BIC. The testing equation may contain a trend and/or an intercept. The existence (absence) of a unit root based on the test equation is identified in the last column as UR (NoUR).

Next, we estimate a VAR with $FLRY_{t,ind}$, $FLRY_{t,pak}$, $FLRY_{t,bgd}$ and $FLRY_{t,lka}$. The matrix of exogenous variables includes the growth rate of the real GDP of the host countries, namely Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates), the USA and the UK. The lag length is imposed due to the short span of data. The generalized impulse response functions (GIRF) follow Pesaran and Shin (1998). As shown in Figure 3, countries' reaction to a one-standard deviation shock in other countries' remittances are largely insignificant except in the case of their own shocks. Although minor, India and Pakistan seem to respond to shocks in Bangladesh. In its turn, Bangladesh responds to other countries except for Sri Lanka. This result is consistent, to a large extent, with the findings of Mughal and Ahmed (2014) and Genc (2022) where they state that remittances respond to changes in home countries' dynamics rather than host countries' economies.

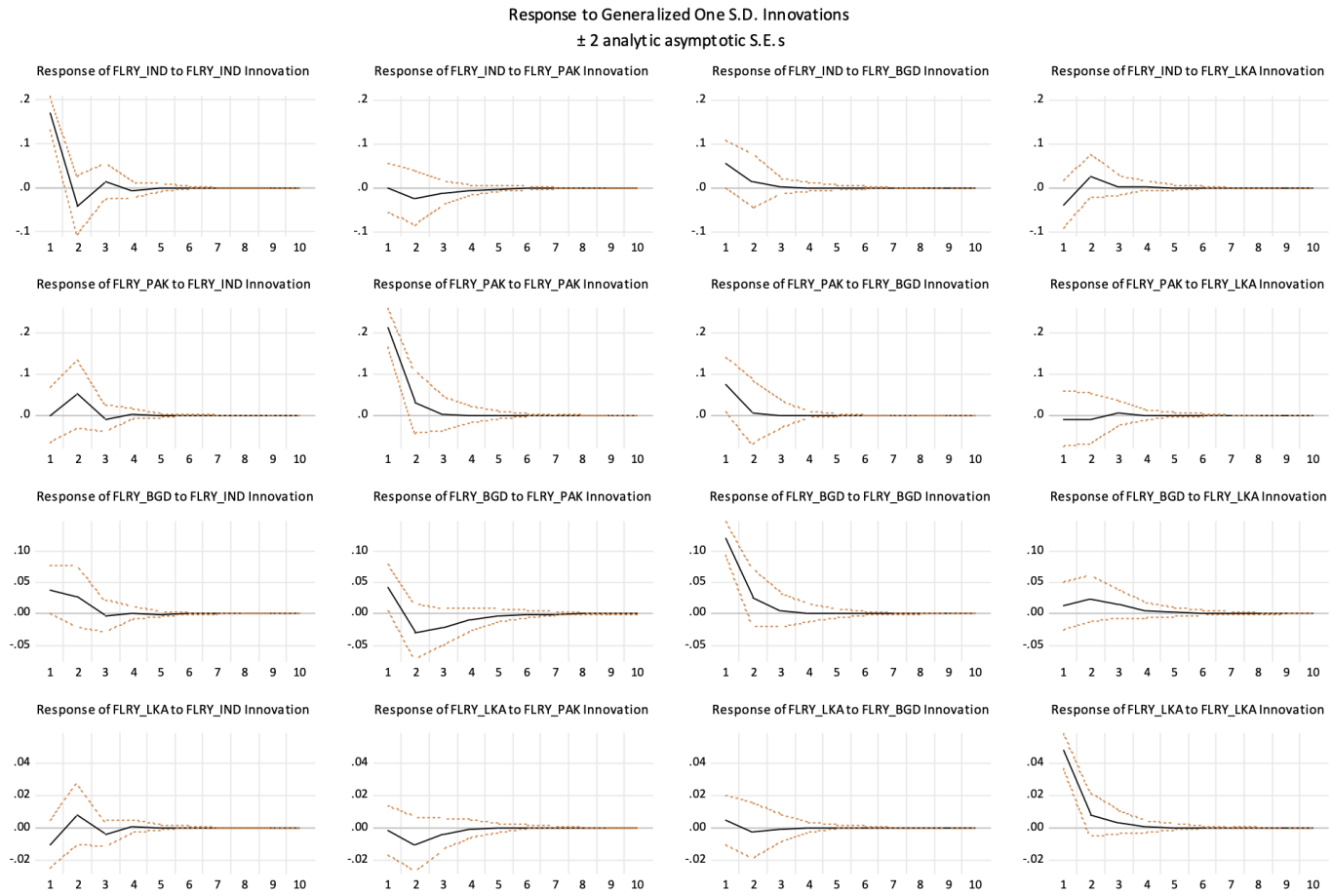

Figure 3. GIRF (Generalized impulse response functions)

FLRY_i refers to the first difference of the log-level of remittance inflows of Country i where countries are represented IND, PAK, BGD, and LKA in

reference to India, Pakistan, Bangladesh, and Sri Lanka, respectively.

BK Connectedness

The BK connected measures for levels of returns are given in Table 7. As seen from the table, we observe that connectedness in the short run is larger than in the long run irrespective of cross-sectional (cross-national) correlations' existence or absence. This means that there is a fast adjustment to the available information in the international remittance flows in the Indian subcontinent. In other words, as the information is processed rapidly and calmly in the short term, shocks tend to die out for longer periods (Barunik and Krehlik, 2018). This is useful for stakeholders with different planning horizons.

We also carry out the spillover estimations free from cross-sectional (cross-national) correlations. This is because, without this adjustment, the connectedness may be driven by cross-sectional correlations among the remittances of the Indian subcontinent countries. Eliminating these correlations, which might otherwise bias spillover computations due to strong contemporaneous inter-market relationships, shows "pure" spillovers among remittance inflows in different countries. Hence, we observe that the connectedness for these markets declines when the relationship is adjusted for cross-sectional (cross-national) correlations. Therefore, the reduced results obtained via BK are consistent with the idea that these markets are largely self-dependent rather than interconnected.

Table 7. Summary of Dynamic Connectedness for Growth Rates of Remittances

BK	No. Corr	Run	ABS	WTH
09	F	SR	11.49	16.46
		LR	4.32	14.29
12	F	SR	13.31	18.78
		LR	5.26	18.06
09	T	SR	7.71	11.22
		LR	4.38	14.01
12	T	SR	7.71	11.22
		LR	4.38	14.01

The results are based on 100 simulations of VAR with the specified parameters of length 1000 with a burnout period of 100. The estimate is computed as the mean of the 100 observations and the standard error is a simple sample standard deviation. 09 (12) in the BK column refers to the version BK09 (BK12) in the empirical version of the BK method. The F (T) in the "No. Corr" column shows the absence (existence) of nullifying correlations. SR (LR) under "Run" indicates high (low) frequency. The ABS corresponds to the sum of the "FROM-ABS" column or "TO-ABS" row whereas WTH corresponds to the sum of the "FROM-WTH" column or "TO-WTH" row in the BK method. The "TO-ABS" and "TO-WTH"

refer to absolute and within the estimated system.

Our findings so far either via the impulse response functions or the BK connectedness measure consistently point in the direction that remittances in the Indian subcontinent are largely dependent on domestic issues, at least within the framework of our model. In support of our finding, we can state that this observation is consistent with Mishra (2005), Mughal and Ahmed (2014), Dash (2020), Jijin et al. (2021), and Genc (2022).

Another interesting observation is that despite the speed of information processing in these markets, interconnectedness is not sizable. That may have a lot to do with the host countries' hiring practices, which we call "structural rigidities in hiring." For example, the GCC countries, one of the most frequent destinations of the subcontinent expatriate labor force, try to diversify their expatriate labor pool (Birks and Sinclair, 1980; Khadria, 2006; Naufal and Genc, 2015; Thiollet, 2016). This is mainly done via a quota system where expatriate workers are supposed to come from a diversified background in terms of religion, ethnicity, etc. (Kapiszewski, 2006). As extensively explained in Genc (2022), such a decision would impede economic functioning of international labor market substitutability.

As a self-critique, arguably, as opposed to our characterization of the finding here, the quota system would be construed in resulting in the "complementarity" of the subcontinent labor force in the GCC. That is, a host country's hiring of a sizable number of workers from Country A in the Indian subcontinent implies that the host country in the Gulf will next hire from Country B in the subcontinent in order to keep the labor force diversified. We do not think it is a justifiable perspective. This is because if the labor markets are assumed perfectly competitive then, (firms in) the host countries would hire ANY worker from ANY source country as all workers would have the same marginal productivity, eliciting the same real wage. That is why, who will get hired would be a completely random occurrence. However, the fact that there is a fixed percentage of workers from certain countries, that is the quota system, is evidence that hiring is not random, but rather targeted. That is why, the quota system eliminates the possibility of substitution. Therefore, the idea of complementarity does not work in this setup.

Another critical view on our findings could be about the impact of home country versus host country shocks. Unexpected economic and social changes may construe examples of shocks which could affect remittances in ways different from the pure labor market dynamics. If the shock happens in the host country, it should affect all expatriates in the same way. Thus, relatively speaking it should have no impact on relative remittance outflows to home countries. If, on the other hand, the shock happens in the home country, then it would have an impact on remittances sent to this country. That means that the behavior of the relative remittance outflows to home countries is not the same. However, we argue that given that these countries have similar economies a shock exclusively affecting only some subset of them is highly unlikely. Additionally, since workers send back almost all of their earnings any how (Naufal and Vargas-Silva, 2010; Cooray, 2014, and Doherty et al. 2014), a shock back home would not mean a new situation altering the amount of remittances sent home. So, the only change in the behavior of remittances should be emanating from the host countries, as mentioned above, having no relative impact on remittances sent home.

Policy Implications

Although we do not directly deal with the analysis of policy implications of our results, we would like to briefly point them out in the way of emphasizing the significance our study. Given the unskilled nature of the domestic labor market coupled with high unemployment, providing domestic and international employment opportunities is a challenge for the policy makers in the home countries. The difficulty is exacerbated with the fact that international labor markets do not always function according to the economic theoretical expectations (Cooray, 2014; Doherty et al. 2014; Chitgupi, 2019). That means that the policy makers in the labor sending countries have to deal with not only economic but also political matters to ensure the stability of an important foreign income, i.e., remittance inflows. As remittance inflows are very significant in terms of absolute amounts and their share in domestic GDP, policy makers should remember that remittances are a reliable source of foreign currency (Amuedeo-Dorantes and Pozo, 2012), adding another dimension to the policy makers' challenge.[3]

Other than being a reliable foreign income source, remittances indicate employment of the workers in the subcontinent. Given the prevalent unemployment in these countries, foreign employment opportunities carry extra magnitude for an important social and economic problem. Speaking of social problems, past experience shows that loosing foreign employment opportunities may present serious political challenges at home as experienced in 1980's and 1990s in the Arab countries that lost GCC labor markets (Sayan and Tekin-Koru 2005; Sayan 2006; Durdu and Sayan 2010).

On an exchange rate front, we observe that the subcontinent countries' economies are examples of small open economies (SOE). SOE are prone to exchange rate risk. Losing remittances from abroad could potentially expose these countries to a phenomenon known as sudden stop. This phenomenon occurs if there is an abrupt reduction in the next foreign capital inflows such as remittances. This once again puts the policy makers in the subcontinent on high alter to design domestic and international policies to guarantee the continuous flow of remittances.

On a positive note, we find that contagion is not a likely problem as the labor markets are segregated from each other, instabilities in one market are not likely to affect another market in terms of remittance inflows.

4. Conclusions

This paper is an effort to investigate the interconnectedness in remittance inflows in the Indian subcontinent with implications domestic labor markets in India, Pakistan, Bangladesh and Sri Lanka. As labor is the only means to earn remittances, there is a close correlation between remittances and expatriate workforce. This seems to be the case for the Indian subcontinent workers. They mostly go to the same part of the world in search of work, that is, the GCC countries. Labor from the subcontinent usually has similar features with a low skillset and high unemployment. They usually must leave family back home due to strict residency laws in the host countries. Also, foreigners in the GCC are required to return to their countries of origin after a fixed length of time.

While labor is an important factor of production, non-employment thereof poses serious challenges for policy makers and

market participants alike. International employment opportunities provide a welcome option in that regard. Nevertheless, the aforementioned labor market characteristics means that there is a large pool of competitors in the international labor markets. Theoretically speaking, there must be a high degree of interconnectedness (substitutability) in the remittance inflows in the Indian subcontinent countries. That means that labor hosting countries should easily substitute a worker from one of the countries in the subcontinent with another, thus potentially altering the flow of remittances. However, considering the political and economic environment where the Indian subcontinent expatriate worker goes, it is also possible that substitution could be rendered ineffective due to hiring market rigidities such as a strict quota for the number of workers from a particular country. A quota-like arrangement would have serious consequences for the ability to increase the inflow of remittances for any country even if it offers a more competitive labor force.

By employing a newly introduced econometric technique, we fail to find an interaction in these markets involving remittance inflows. Instead, we observe that dynamics in these markets are mainly country specific. Although our findings are consistent with the literature, we believe that there is a perplexing anomaly in this result. With the help of previous studies, we notice that this has a lot to do with the policies of the host countries rather than labor sending countries. Since the biggest employer of the Indian subcontinent labor force is the GCC countries, which has a quota-like hiring procedure with the intention of maintaining diversity among the expatriate labor force, remittance inflow interconnectedness does not necessarily work along theoretical lines. We call this “structural rigidities in hiring.” Thanks to our econometric method, we know that there is a high degree of awareness and information processing among these markets despite the insignificant impact on each other.

Remittances provide a reliable source of foreign currency and help alleviate domestic unemployment problem. Expatriate worker in the Gulf tend to send their earnings back home, but, as we find, they are not allowed to compete with workers from fellow subcontinent countries. That is why, securing foreign employment opportunities becomes crucial economically, socially and politically for the policy makers in the subcontinent. To this end, alternative employment opportunities in different parts of the world should be carefully studied if stave off the negative effects of losing the current destinations.

Footnotes

[1] Overall, South Asians, a category that broadly includes people from India, Afghanistan, Pakistan, Bangladesh, Nepal, Bhutan, the Maldives and Sri Lanka, make up about 60 percent of the UAE population. Although much less in Saudi Arabia, still 37 percent of the population is foreigner, and largely hailing from South Asia (De Bel-Air, 2018). The Indians are about half of the Kuwaiti expatriate population (Financial Express, 2020).

[2] An R package implementing both DY and BK is athttps://github.com/tomaskrehlik/frequencyConnectedness

[3] On a side note, we can say that combined with the microeconomic analyses in most of these papers, we can conjecture that remittances in the Indian subcontinent context carry an altruistic nature. In other words, workers abroad tend to send more money back home when the family needs increase. Usually, however, such a change in behaviour would force the expatriate worker to go down to subsistence living levels as s/he already sends most, if not all, earnings back home

(Naufal and Vargas-Silva, 2010). From the macroeconomic perspective this means that when the domestic economies suffer, remittances from abroad increase. We must be clear that we do not directly delineate the nature of remittances in our paper. We only put this conjecture forth based on findings in the previous literature. However, this claim about the altruistic nature of remittances contradicts Buch and Kuckulenz (2010) which consider remittances a form of portfolio diversification.

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