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GCC Migration: A Longitudinal Migrant Network Approach

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GCC Migration - A Longitudinal Migrant Network Approach

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Abstract

International migration is attracting growing interest in academia and policymakers in both hosting and sending countries. International migration is central in improving living standards of migrants and their families, supporting the sustainable development goals (SDGs) of the 2030 global development agenda, and has the potential to significantly boost world production. Although GCC migration is the third most important migration corridor in terms of total migrant stock, the topic has been underrepresented in the academic literature, which focuses mostly on South-North migration (Naufal 2015). The purpose of this paper is to fill this knowledge gap in two directions. First, the paper will be using an innovative dataset that estimates international migrant flow data instead of international migrant stock data. Migrant flow is more relevant as the changes in migrant stock are the outcome of demographic factors such as migrant births, migrant deaths, and migrant naturalization. Second, the paper will be applying network analysis to flow data. Recently, network analysis has been applied to other migration corridors, such as the US (Charyyev et al., 2017) and Europe (Lenkewitz et. al 2019). Despite migration's network character being established in migration studies, no research has so far been done on the GCC using network analysis.

Two key preliminary findings emerge from this paper. First, it shows that the GCC corridor (made of six Arab Gulf countries) stands out as the most important migration corridor over the period 2005 to 2010 in terms of flow, and a close second over the period 2010 to 2015. When looking at just migrant stock data, the GCC's significance is less pronounced. Second, after applying network analysis to migrant flow data, the paper reveals that the GCC is even more central to the global migration network when compared to its position with more standard econometric measures that ignore network effects. Our ranking measure is less destination biased than most migration literature (de Haas 2011). One potential explanation that the GCC (a net inflow destination leader) ranks even higher in a less destination-biased ranking measure is that over the past two decades, the GCC has emerged not only as a migration hub, but as a node strongly connected to other key international migration players. Future research can test network theories and identify regularities using (a) random graph methods, (b) strategic, game theoretic techniques, and (c) hybrid, statistical models. Such analysis can provide a network perspective to the more common analysis of push and pull factors between individual countries. Future research can also focus on individual GCC countries.

Introduction

The GCC consists of six neighboring countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. The rationale for considering this political and economic union as a group is driven by the common characteristics of their economy, the composition of migrants they attract, and similarities in their labor regulations (Al-Ubaydli 2015). The majority of GCC migrants are low-skilled, and the GCC is highly dependent on migrant labor when compared to other resource-rich countries (IMF 2013). The GCC labor markets are also becoming more open, transitioning from a sponsor-based kafala system to a more open contractual system that strengthens migrant rights (World Bank 2018). GCC migration is unique with its specific economic and cultural circumstances for host countries, source countries, and migrants (Al-Ubaydli 2015).

Although GCC migration is the third most important migration corridor in terms of total migrant stock, the topic has been underrepresented in the academic literature, which focuses mostly on South-North migration (Naufal 2015). Given the lack of migrant flow data when compared to migrant stock data, research on the GCC's role in global migration flow is even more limited. Only 45 countries report migration flow to the UN, none of which are in the GCC, compared to over 200 countries reporting bilateral stock data (UN DESA 2015). To our knowledge, our paper is the first to explore the significance of the GCC in the evolution of global migration flow network by using a large sample of countries. This is because we are using an innovative dataset that estimates migration flow from stock data and other demographic factors (Abel and Cohen 2019). In this paper we show that using flow data positions the GCC as the most important migration corridor over the period 2005 to 2010, and a close second over the period 2010 to 2015.

Migration is central to regional economic development, future goals of global development, and world GDP. Remittances, an important developmental consequence of migration, are particularly relevant for many countries in the MENA region. For example, GCC remittances to Egypt totaled more than $12 billion in 2016, more than five times the amount of all official development aid received during the same time period (World Bank 2019; World Bank 2016). Remittances are also important because of their countercyclical nature. When a crisis erupts, investments tend to flee but migrants feel extra compelled to support their families. In terms of future goals of global development, 10 out of the 17 SDG goals are related to migration (UN 2015). In terms of world GDP, if everyone with migration aspirations had the ability to do so, world GDP would double. A literature survey estimates that world GDP would increase by 67 to 147 percent with free global labor mobility, and estimates a plausible gain of 20 to 60 percent (Clemens 2011).

In addition to a general academic knowledge gap on GCC migration, no research has been done on the GCC using network analysis, despite migration's network character being long established in migration studies (Bilecen et al., 2018). Recently, network analysis has been applied to other corridors, such as the US (Charyyev et al., 2017) and Europe (Lenkewitz et. al 2019). Our analytical technique is a longitudinal whole network design to explore key migrant flow network indicators, where countries are nodes and the GCC is grouped as a single node. Our network is weighted (edges are flow count, not binary connections) and directed (edges have direction, both inflows and outflows).

Network analysis carries explicit theoretical commitments, like connectivity and centrality, which standard econometric methods fall short of (Robins 2015). Our rationale for using a network conceptualization is because of the inherent network structure of migration. This allows us to make explicit observations of the network, and to speak about nodes in a relational manner. Network analysis has already been used extensively in other economics fields (Jackson et al.

2016). Networks help us better understand economic behavior (Jackson 2014). Network structure also has economic consequences (Jackson et al. 2017).

Although migrant flow is more appropriate than migrant stock in network research, flow data is limited and excludes the GCC (UN DESA 2015). This means that the few network research papers on global migration using migration flows ignore the GCC.

As mentioned earlier, we are using an innovative dataset that estimates migration flow (Abel and Cohen 2019). Abel and Cohen estimated migration flow with six different methods using various demographic data. We chose the Pseudo-Bayesian estimation method of Azose and Raftery (2018). Out of six estimation methods for calculating migrant flow data, this technique had the highest correlation with actual flow data reported for available periods. As illustrated in our stylized facts, patterns of migrant stock are noticeably different from patterns of migrant flow. Migrant flow is estimated for 5 five-year periods: 1990 to 1995; 1995 to 2000; 2000 to 2005; 2005 to 2010; and 2010 to 2015.

The outline of our paper is as follows. The first section is a literature review. The second section is stylized facts introducing migrant flow versus migrant stock, with the introduction of simple measurements for node centrality. The third section is the core of our network analysis, where we present a more advanced measurement of node centrality, explore the correlation between methods of centrality, attempt to explain the correlation between the centrality measures with a network-wide indicator, and then put the network-wide indicator in context with a randomization test from simulations of random graphs. The final section concludes the paper with the importance of our findings, economic and policy implications, as well as suggestions for future applications of network analysis to GCC migration.

Literature Review

On the macro-level, equilibrium migration models explain migration as global differences between the supply and demand of labor, driven by differentials in wages, unemployment, and other factors. On the micro-level, equilibrium migration models explain migration as individuals maximizing their economic gain. On the meso-level, some theories take into consideration the network effect of communities attracting their own community members. Although there is agreement that all levels drive migration, there is no consensus on their relative importance and mutual interaction (de Haas 2011). Our literature review focuses mostly on the macro-level, where migration network analysis is starting to be used to explore network effects even at the country level.

The GCC migration corridor is important in terms of relative size, representing 11% of global migrant stock in 2019. GCC countries also have the highest percentage of migrants in their population, with UAE, Qatar and Kuwait having the highest three percentages in the world at 88, 79, and 72 percent respectively in 2019 (UN Population Division 2019). The majority of migrants are low-skilled workers in the private sector (IMF 2013). The region is currently making efforts to attract and retain high-skilled talent, with the UAE achieving the most success in shifting economic activity to higher value-added and technology-focused sectors (World Bank 2018). The GCC labor market is also becoming more open, transitioning from a sponsor-based kafala system to a more open contractual system that strengthens migrant rights (World Bank 2018).

Network analysis has been applied to a variety of applications in economics such as targeting key players in criminal networks, analyzing the spread of information for job openings, quantifying financial contagion, and explaining movements in trade flows (Jackson et al. 2016).

An early paper quantifying global migration flows was done by Abel and Sanders in 2014. It was significant in bringing attention to the need to look at migrant flow instead of stock in the analysis of the global movement of labor. Take the edge case where a country has total inflows equal to total outflows, or zero net inflows, for one period. There would be no movements in migrant stock, and we would be unable to detect any movement in global labor for that country. Since flow data is less prevalent than stock data, the authors estimated migrant flow from migrant stock and other demographic factors.

Migrant stock can be used for single period analysis of country pairs, but does not make sense for measuring movement across a migration network through edges. With stock counts, edges are only meaningful connections between isolated country pairs. A traverse on the network from Country A to Country B to Country C where edges are stock counts does not make sense, because migrants of Country A coming to Country C through Country B will be shown as migrants residing in Country C born in (or citizens of) Country A in the migrant stock count of Country C. Stock can be useful for non-network related description, but flow, a migrant's change in residence, is more useful for analyzing a network's spatial structure.

We find that a number of migration network analysis studies use migrant stock instead of migrant flow. This is unfortunate not only because (a) movements in flow could be ignored in stock data when net inflow is zero and (b) network edges are not meaningful, but also because (c) movements in stock do not equate to flow. Migrant births, migrant deaths, and migrant naturalization at a destination country change total migrant stock but should not reflect any change in migrant flow, as there would be no movement into and out of a country (Tbl. 1). One study performed topological analysis of migration over a four year period by calculating migration flow simply from the stock data of two separate years (Porat and Benguigui 2016). Another study in 2016 explored the community evolution of global migration structure on stock data, not flow (Peres et. al 2016). Another author uses network analysis for 202 countries to explore the determinants of network migration in the context of network structure on stock data, not flow (Windzio 2017). The same author ran a similar network analysis technique with intra-EU migration, but this time with flow data instead of stock (Lenkewitz et. al 2019). Goldade and Gunes use network analysis on internal US migration meaningfully with flow data (2017). One useful paper explored eight different network centrality measures on flow data (Aleskerov et. al 2016). However, the analysis was limited to only 45 countries, none of which were in the GCC.

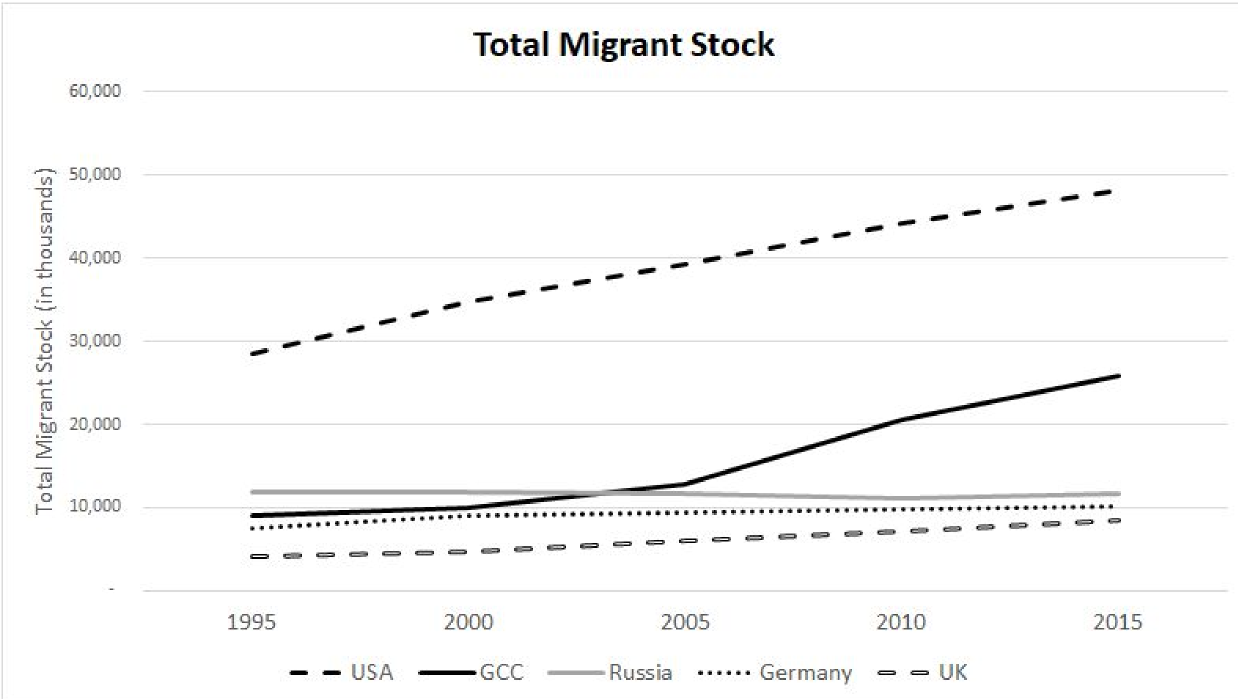
	Total Migrant Stock	Net Migrant Inflow
Migrant Inflow	Increases	Increases
Migrant Outflow	Decreases	Decreases
Migrant Deaths at Destination	Decreases	No effect
Migrant Births at Destination	Increases	No effect
Naturalization of Migrants	Decrease	No effect
Accumulation over time?	Yes	Not Applicable
Network Effects?	Not Applicable	Applicable

[Tbl. 1]

We measure the centrality of nodes in our network with a more comprehensive dataset that includes the GCC. There are over 140 measures of centrality in Ashtiani's survey (Ashtiani et. al 2018). Not all indicators are suitable to our network topology, which is weighted (edges are flows, not binary) and directed (inflows and outflows). There are over 40 potential measures for weighted and directed networks (Ashtiani et. al 2018). We focus on Eigenvector Centrality for reasons explained in our network analysis section.

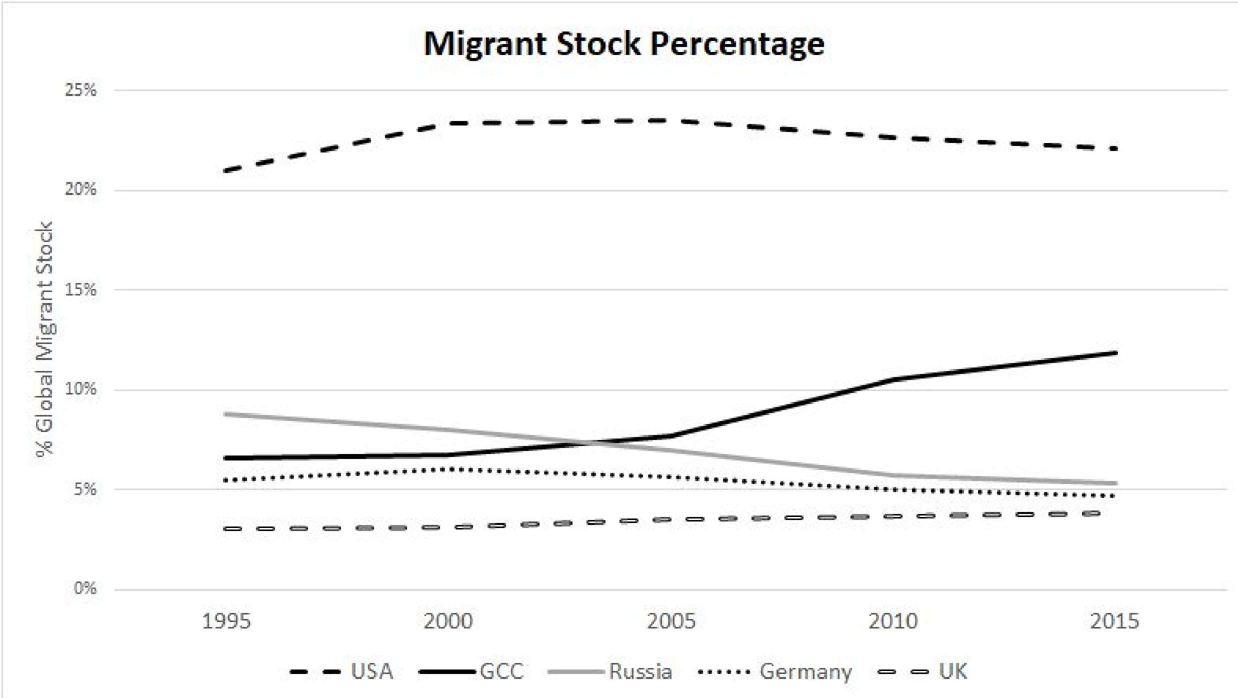
Stylized Facts

As mentioned earlier, changes in migration stock does not indicate flow, the movement of migrants from one country to another. In addition to migrant flow, changes in migrant stock can come from a number of other demographic indicators like migrant births, migrant deaths, and migrant naturalization [Tbl. 1]. Total migrant stock will also be affected by the accumulation of migrants over time. USA would have a high stock of migrants given its long history of accepting migrants into the country. When looking at total migrant stock in Fig. 1, we notice that the USA is the clear leader in all five periods, with the GCC sharply increasing in importance after 2005 as the second leader.



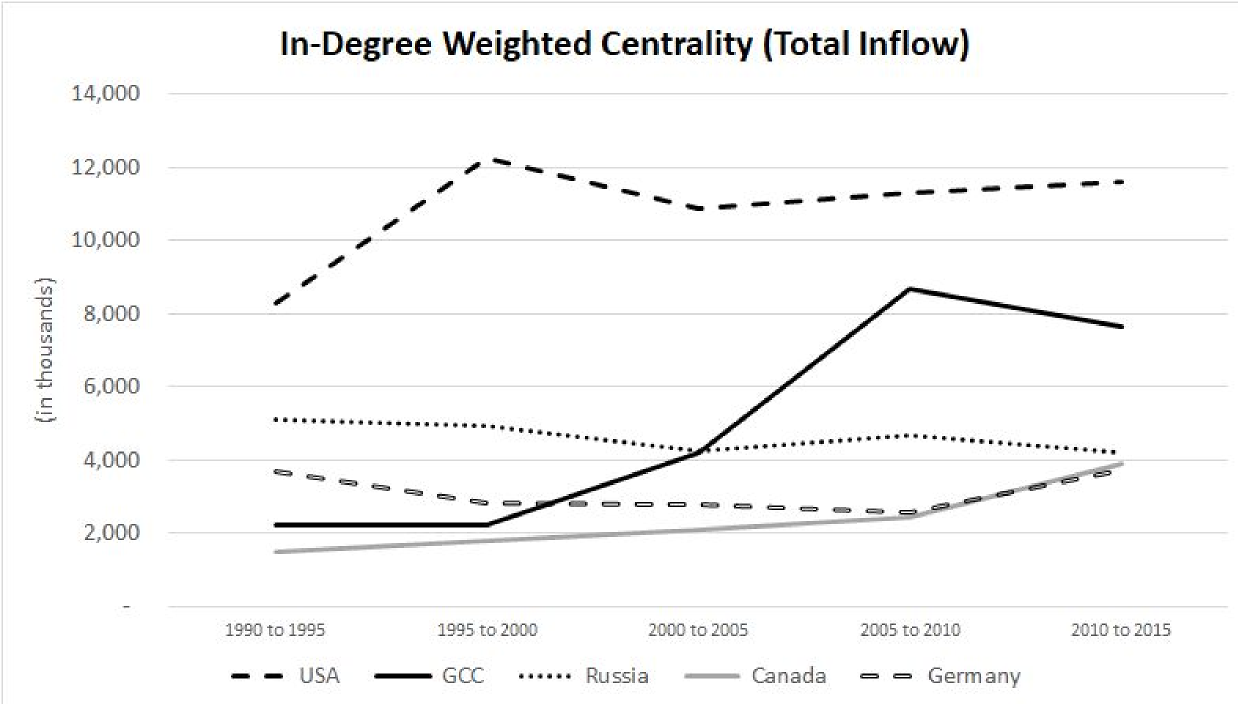
[Fig. 1]

When looking at migrant stock percentages in Fig. 2, we notice that the USA is still the leader for all five periods, representing between 20 to 25 percent of global migrant stock. Although the USA is the leader in all periods, its percentage of global migrant stock is decreasing over time. The GCC is still the clear second, sharply increasing in importance after 2005.



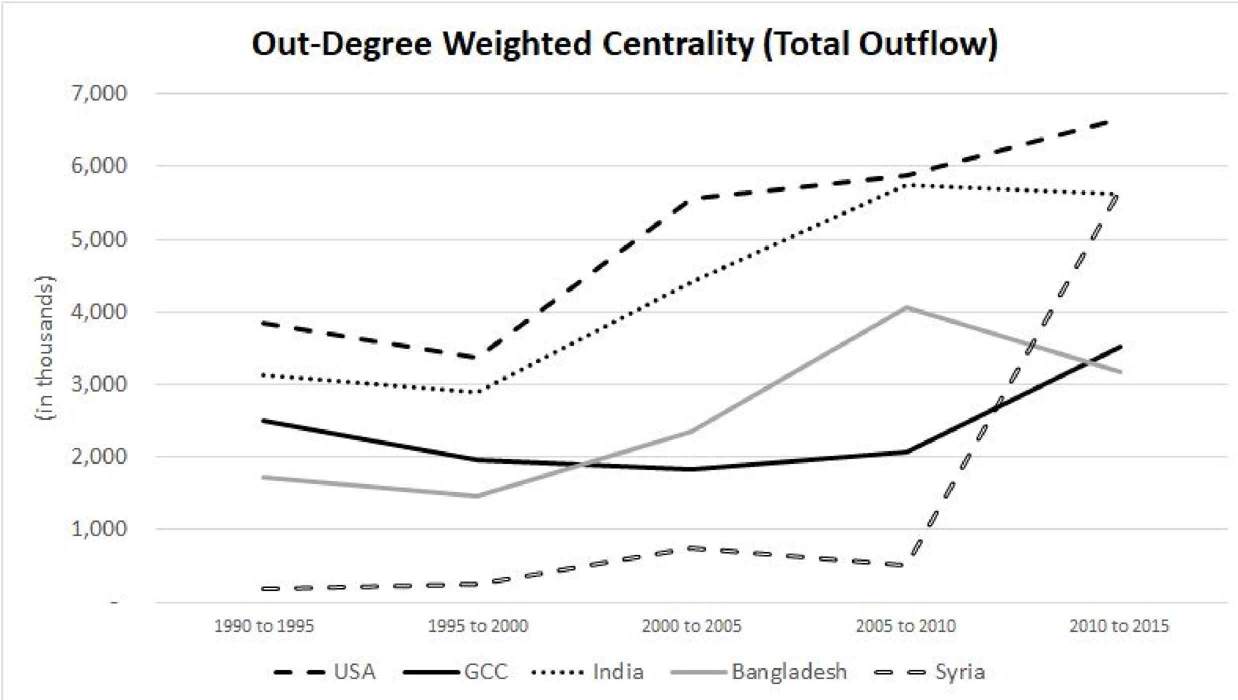
[Fig. 2]

Fig. 3 looks at total inflow, which is the in-degree weighted centrality of each node in the network in each time period, a variant of the centrality measurement of Strength which is explored in more detail in the network analysis section. GCC is the clear second place leader for migrant inflows after the USA. The GCC had a sharp increase in total inflows after the period of 1995 to 2000. Total inflows to the GCC actually decreased in the final period.



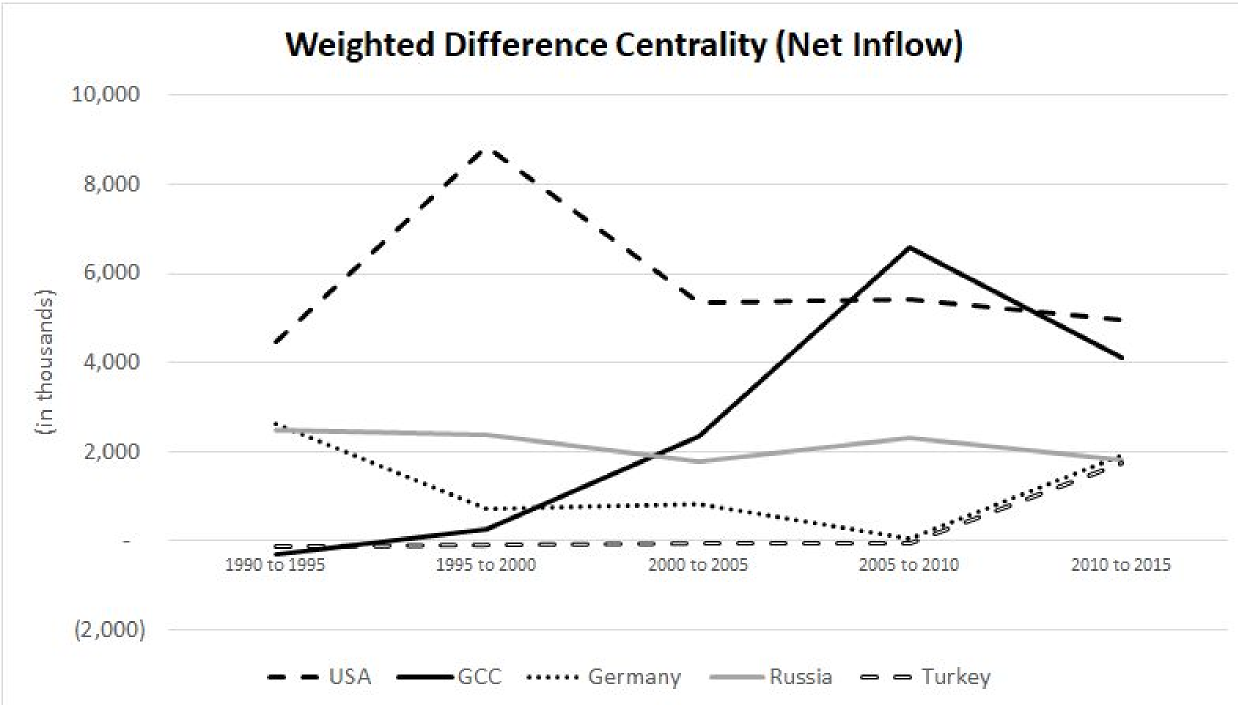
[Fig. 3]

Fig. 4 looks at total outflow, which is the out-degree weighted centrality of each node in the network in each time period, a variant of the centrality measurement of Strength which is explored in more detail in the network analysis section. In addition to inflows illustrated in Fig. 3, Fig. 4 shows that the GCC is also a significant migration corridor for outflows.



[Fig. 4]

Fig. 5 looks looks at net inflow, which is the weighted difference centrality of each node in the network in each time period, a variant of the centrality measurement of Strength which is explored in more detail in the network analysis section. From this graph, we see that the GCC was the most important node in the five-year period of 2005 to 2010, after sharply increasing in importance from the previous five-year period. The GCC is also a close second in the period of 2010 to 2015. GCC net inflow decreased when comparing the 2005 to 2010 period to the 2010 to 2015 period. USA and Russia net inflow also decreased over the same period. Turkey and Germany net inflows increased over the same period.

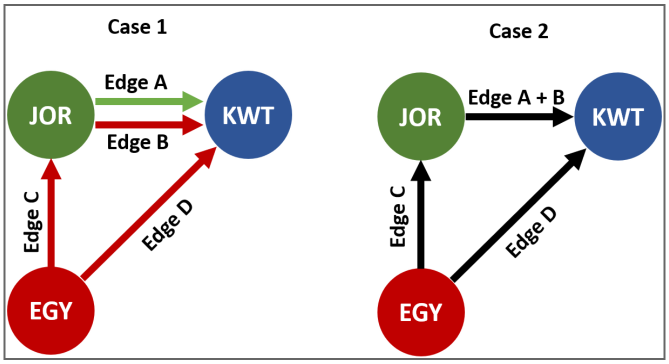


[Fig. 5]

Network Analysis

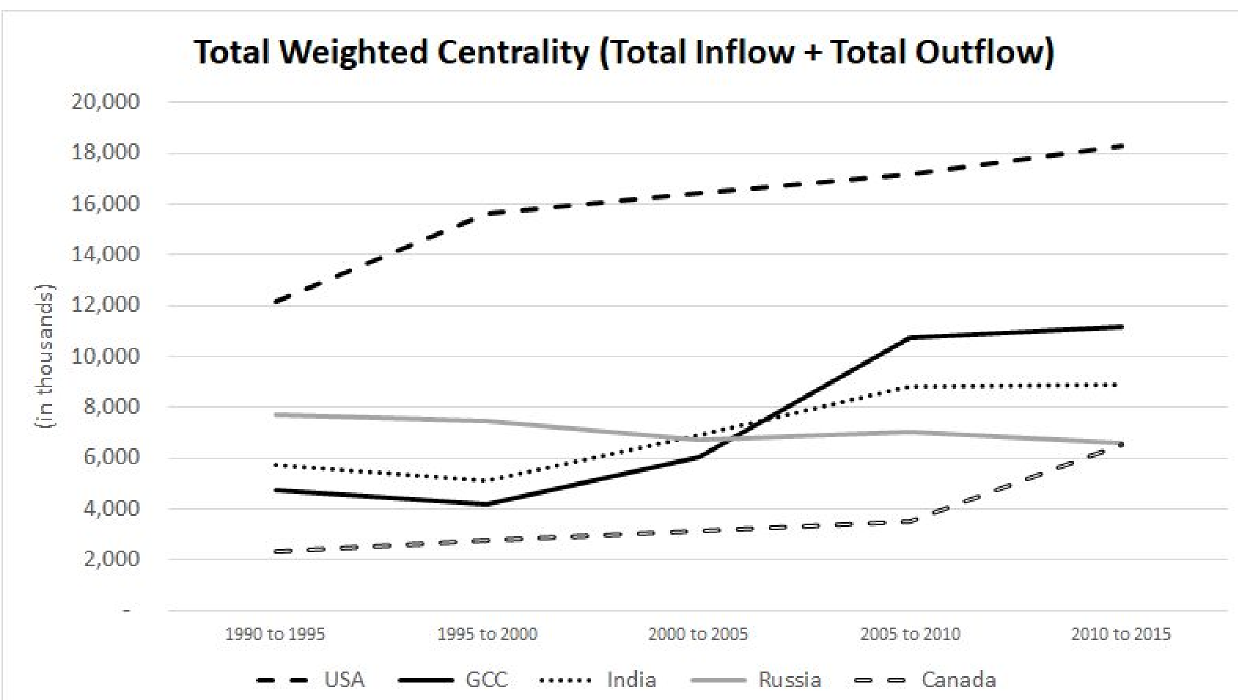
In this section, we first introduce our basic network centrality measure, Total Weighted Centrality, which is total inflow plus total outflow. We then present a more advanced measure of centrality, Eigenvector Weighted Directed Centrality. Eigenvector Centrality captures network effects in addition to total flows. Next, we quantify the similarity between the two measures. We then explain the relationship of these two measures by calculating average transitivity, a network-wide indicator of clustering. We end by adding context to our measurement of transitivity by using a randomized test from simulated graphs.

For our network, it is important to clarify that our data is represented in Case 2 in Diag. 1. We cannot differentiate between Edge A, Jordanian migrants to Kuwait, and Edge B, Egyptian migrants to Kuwait because Edge A and Edge B are grouped together. Migrant flows between countries are not broken into the nationality of migrants. Migrant flows are simply changes from one country residence to another.

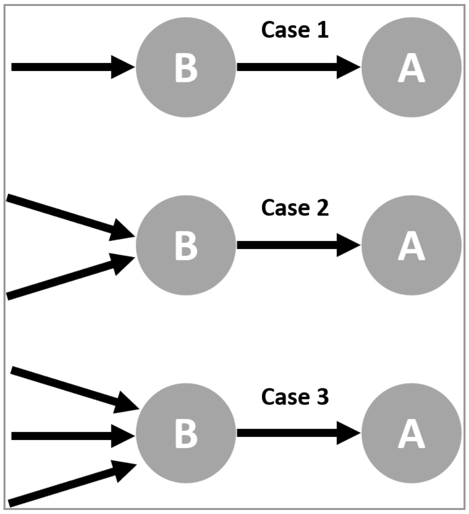


[Diag. 1]

Total Weighted Centrality illustrated in Fig. 6, defined as Strength in the rest of our paper, is simply total onflow + total outflow in our network. For each node, it is measured as the sum of the total weight of its connections (Barrat et. al 2004). For example, if Country A was connected to Country B and Country C, then the strength of Country A would be the sum of all inflows and outflows in relation to Country B and Country C. Strength only takes into consideration edge weights of directly connected nodes. Strength does not capture network effects of indirect connections, without differentiating between (a) a node that is connected to another node that is a migration hub versus (b) a node that is connected to another node that is not a migration hub. Assuming all arrows in Diag. 2 represent the same weight, the strength of node A is the same in all three cases. In this sense, we can say that Strength does not capture the importance of network effects. GCC is the second most important node after the USA for the most recent period in Fig. 6.

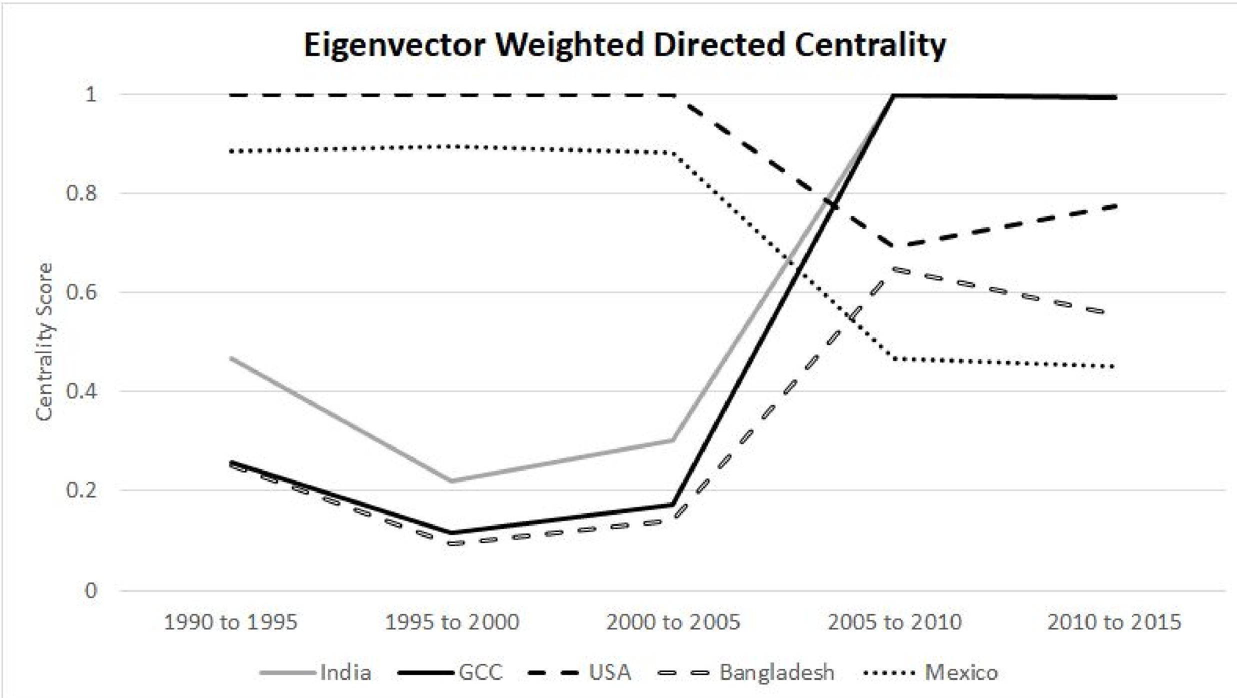


[Fig. 6]



[Diag. 2]

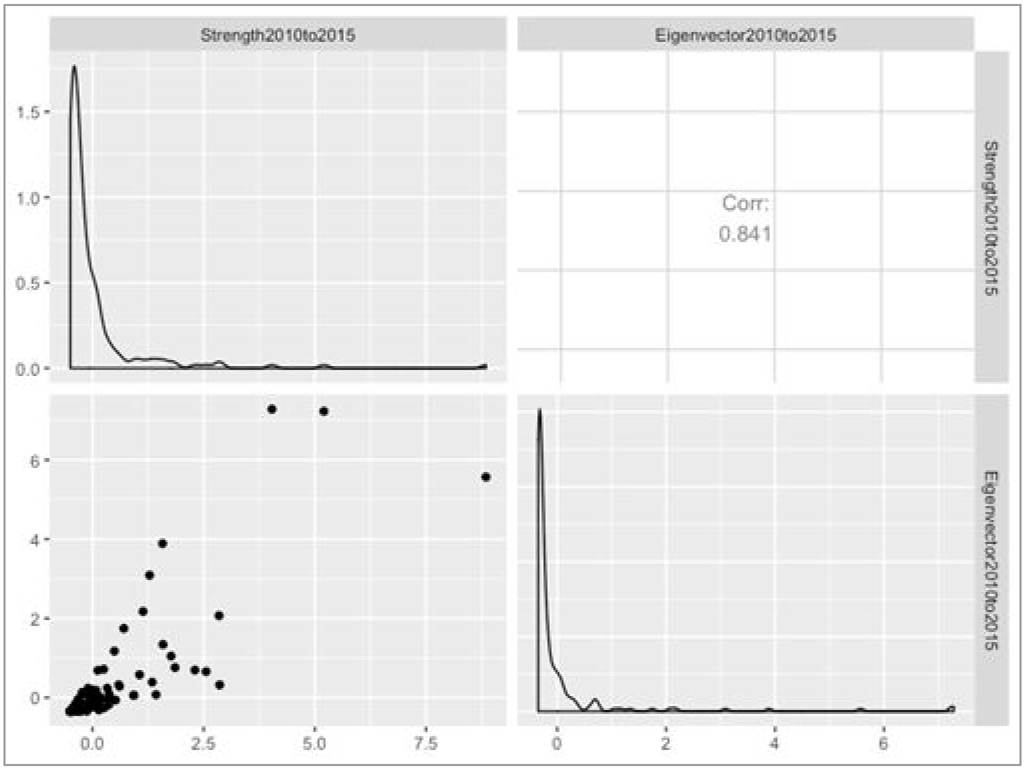
Eigenvector Centrality in Fig. 7 is a more advanced measure of centrality that captures network effects in addition to total flows (Bonacich 1987). Going back to Diag. 2, assuming all arrows in the diagram represent the same weight, the eigenvector centrality for node A is not the same in all three cases. The centrality index will be highest for Case 3, then Case 2, then lowest for Case 1. A node is important if it is connected to other important nodes. In the context of migration flow, this index would highlight centers of international migration and nodes directly connected to them. This measure is less destination biased than both Strength and net inflow, a variant of Strength previously illustrated in Fig.5. Using this measure would addresses the general criticism that migration literature destination focused (de Haas 2011). GCC is still very important when correcting for destination bias, and was still the most important node for the period of 2005 to 2010 with an Eigenvector Centrality of 1, and a close second to India for the period of 2010 to 2015, with an Eigenvector Centrality of 0.99. The Eigenvector Centrality for the most important node in the network will always be 1.



[Fig. 7]

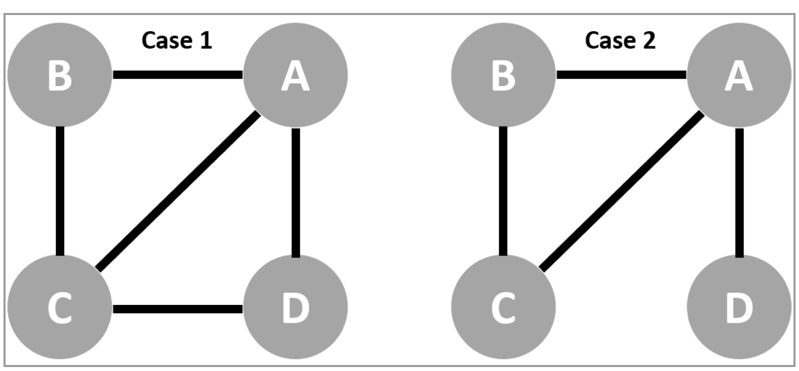
Eigenvector Centrality could also hold a number of forward looking network implications. Going back to the diagram in Diag. 2, with the arrows representing the same weights, although case 1 and case 3 both have the same Strength equal to the weight of the directed edge between node A and node B, one may predict case 3 to have a higher inflow in the next period than case 1, all else equal. Although the edge between node A and node B is the same, there is more “network pressure” from node B in case 3. Countries with the same Strength but different Eigenvector Centralities have different forward-looking implications in the context of migrant flow.

The two centrality measures are highly correlated for all 5 five-year periods. Fig. 8 compares the distribution of Strength to the distribution of Eigenvector Centrality for the period of 2010 to 2015 for all 200 countries in our sample. The other 4 five-year periods have similar centrality distributions and correlations, with 0.816 for 1990 to 1995; 0.801 for 1995 to 2000; 0.82 for 2000 to 2005; and 0.829 for 2005 to 2010, with the two centrality measures becoming slightly more correlated to each other over time. Running a simple regression of Eigenvector Centrality on Strength for the period of 2010 to 2015 shows that 71% of the variance in Eigenvector Centrality is explained by Strength, our basic centrality measurement representing total flows. The rest of the variance is potentially being explained from the network structure.



[Fig. 8]

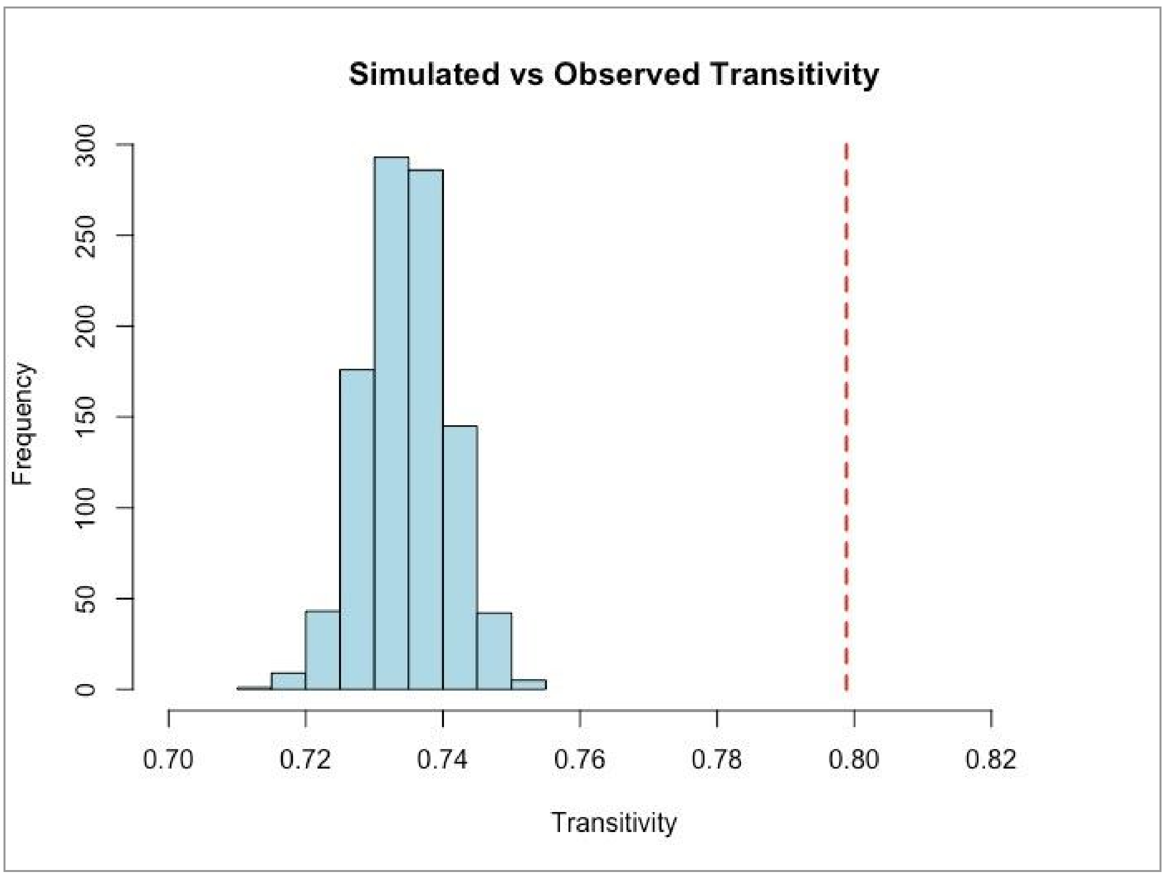
The high correlation between Strength and Eigenvector Centrality could be explained by a high degree of network-wide clustering, where nodes of high Strength tend to be connected to other nodes of high Strength. Our measurement for network-wide clustering is transitivity, which computes the observed number of closed triangles on our network divided by the potential amount of closed triangles on our network. In Diag. 3, node A would have higher transitivity in Case 1 than in Case 2. With weights, we are not only considering the observed number of closed triangles, but also their relative weights with respect to each node's strength (Barrat et al 2004). Transitivity will be between 0 and 1 for each node.



[Diag. 3]

The average transitivity for all nodes for the period of 2010 to 2015 is 0.7899. However, it is not meaningfully clear how high is this value without context, so we use a randomization test from simulated random graphs (Jackson 2011).

We use the Erdos-Renyi model for generating simulations of random graphs, which assumes that the edges are independent and that each edge is equally likely (Erdos and Renyi 1959). We generate 1000 random graphs with the same number of nodes and approximately the same edge density, the ratio of number of edges to the number of possible edges. For each simulated random graph, we assign a random sample with replacement of our actual edge weights to each edge. We calculate our network-wide indicator of clustering, the average weighted transitivity of all nodes on the network, on each simulated graph. We then compare our observed weighted transitivity to the distribution of the 1000 simulated networks.



[Fig. 9]

From this comparison, we find that our observed value is significantly different from the simulated random networks. Our observed value is exceptionally high, to the far right of distribution of simulated values in Fig. 9, higher than all simulated values. In this context, we can say that global migration flow is highly transitive. In terms of the economic consequence of this observed network structure, if one migrant path, represented as an edge on our network, was to significantly decrease in flow or be removed, migrants can traverse the network to their desired destination. A specific edge has little influence on network-wide behavior. This fits with current migration theory, where states may have control in “structuring emigration through influencing the (initial) composition, rather than in affecting overall volumes and long-term trends” (de Haas 2011). This may be particularly relevant for the GCC as it moves from a sponsor-based kafala system to a more open contractual system that strengthens migrant rights (World Bank 2018).

Conclusion

This section concludes the paper with the importance of our findings, economic and policy implications, as well as suggestions for future applications of network analysis to GCC migration.

Migration is central to economic development, global development goals, and world GDP. The GCC is particularly underrepresented in migration literature, although it is the third most important corridor in terms of migrant stock. The GCC has been ignored in studies using migrant flow data due to data unavailability. We were able to put the GCC in focus given our ability to use an innovative dataset of estimates for flow counts.

When looking at migrant flow data instead of stock data, the GCC is of even more importance. Using a variant of the Strength centrality measure (net inflows), the GCC was the most important corridor in the period of 2005 to 2010, and close second to the USA in the period of 2010 to 2015. The GCC is of even more importance using a centrality measure that takes into consideration network effects, with the highest possible Eigenvector Centrality of 1 in 2005 to 2010, and an Eigenvector Centrality of 0.99 in 2010 to 2015. This indicates that the GCC has a say in global migration flows. The GCC is not only a significant player in the global migration network, but highly connected to other significant players in the global migration network.

Global network structure has economic consequences. In our case, if one migrant path was to significantly decrease or be removed, migrants will still be able to traverse the network to their desired location due to the high transitivity (clustering) of the global migration network, which was relatively high when compared to random graph simulations of the global migration network.

Our Eigenvector centrality measure is important for three reasons. First, it is less destination biased than Weighted Difference Strength Centrality (net inflow) and In-Degree Weighted Strength Centrality (total inflow) (and yet the GCC, a destination hub, is of more importance with this metric). Using this measure would addresses the general criticism that migration literature is destination focused (de Haas 2011). Eigenvector centrality is also less source biased than Out-Degree Weighted Strength Centrality (total outflow). Second, Eigenvector centrality captures network effects, giving weight to not only migration hubs, but also nodes connected to migration hubs. This was illustrated in our comparison of Strength (Total Flows) to Eigenvector Centrality, as well as our explanation of Diag. 2. Third, given that the GCC ranks highly in Eigenvector centrality, this metric may hold a number of forward looking migration flow implications. Given two nodes with the same Strength but differing Eigenvector centralities, the node with the higher Eigenvector centrality may have more pressure for an increase in flows in the next observed period. Eigenvector captures network effects, which might predict future change in flow. As a highly connected player in international migration, any policy considerations for the GCC needs an intimate understanding of the GCC's network dependencies and influence.

Given the clear economic consequences of network analysis presented in our paper, we hope to encourage more empirical work on GCC migration flow. In addition to analyzing the network, pattern and influence of migrant flow, researchers can test theories and identify regularities using (a) random graph methods, (b) strategic, game theoretic techniques, and (c) hybrid statistical models. Such analysis can provide a network perspective to the more common analysis of push and pull factors between individual countries. Given the highlighted importance of the GCC as a whole, future research can also be done on individual GCC countries.

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