Network Analysis
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Research Proposal

Introduction

The last few decades have seen a tremendous increase of non-people interconnectivity between different countries and regions. This connectivity takes the shape of economic, political, and military relationships. For example, the linkage based on trade in the world economy has doubled between 1995 and 2010. Similarly, Foreign Direct Investment (FDI) flows have tripled during the same period. (Kugler & Rapoport, 2005) According to authors such as Fagiolo and Mastrorillo (2014) and Garas et al. (2016), these non-people linkages have a critical effect on migration. (Fagiolo & Mastrorillo, 2014; Garas, Lapatinas, & Poulios, 2016)

Also, since the beginning of the century, countries such a Venezuela, characterized for receiving influxes of migrants, experienced an anomalous increase migration flow out of the country, especially of young professionals. It is estimated that the migration flow out of the country increased up to more than four percent of the population in the last decade. (Mayda, 2010; Subero, 2012) Local scholars have tried to understand the sudden emigration flow from incomplete endogenous and nationalistic perspectives such as political and economic internal crisis. Other authors have used transnational theories to explain the migration of young Venezuelans. However, I am unaware of studies that try to explore the emigration phenomenon of Venezuelans from macro perspectives such as world system theories or the regional interconnectivity of the country. ("Venezuelan Migration," 2012)

This research is a first intent to use a Fawcett's (1989) conceptual framework of non-people linkages in an international system of migration to explore the recent Venezuelan

migration not as a solely endogenous phenomenon but as a resulting event from the country's connectivity and centrality in the region. (Fawcett, 1989) As a hypothesis, I argue that since 2000, Venezuela's loss of centrality in the regional system trade and FDI has resulted in an increase in the migration flow out of the country.

Theoretical Background

I will be using Fawcett's (1989) implementation of migration system framework along with theories of network analysis of Centrality. (Fawcett, 1989; Wasserman & Faust, 1994) It is important to notice that Fawcett's (1989) is not a theoretical framework but a conceptual one that facilitates the development and identification of linkages between the countries to develop a contextual embeddedness of Venezuela and Ecuador and other nations in the regional migration system.

Fawcett (1989) develops a typology of critical linkages that are classified into four categories and three types. The four categories are: state-to-state links (trade flows and others, regulations); cultural ties (international media diffusion such as connectivity to internet and directive and where the companies come from); societal acceptance of migrants (compatibility of value systems, cultural similarity); and family and personal links (remittances and others, cultural notions regarding family obligations and others, community solidarity). For this research, I will be focusing on the following two state-to-state links, trade and FDI.

According to authors such as Fagiolo and Mastrorillo (2014) and Garas et al. (2016), these non-people linkages have a critical effect on migration. (Fagiolo & Mastrorillo, 2014; Garas et al., 2016) The main notion is that migrations flows follow trade flows and FDI flows. There are several mechanisms for this correlation. In the case of trade flows, trade relationships

between countries allow individuals and groups to establish nexuses across nations. These nexuses are later utilized as information or resource channels for potential emigrants. In the case of FDI, there are two main mechanisms. First, the decrease in FDI into a country can result in a decrease of economic opportunities, such as decrease of employment, that motivates emigrants to leave their country of origin in search or better employment and wages opportunities. The second mechanism is when a country receives FDI, in many cases, international businesses are located in the country receiving the investment. The creation of this organization, corporations, or businesses create the opportunities for potential migrants to establish networks of information and social connections that can be used in the future as platforms for migrating. (Fawcett, 1989; Massey, Arango, Hugo, & Kouaouci, 1993)

As analytical and interpretative theories, I will be implementing network analytical principles of Centrality on directional networks. To measure these conceptualizations of importance in a network, I expect to use notions of Centrality based on Weighted In-Degree, Weighted Out-Degree, Closeness Centrality, and Betweenness Centrality. According to Wasserman and Faust (1994), a network is made of two components: a list of the actors composing the network, and a list of the relations (the interactions between actors). As part of a mathematical object, actors are called *vertices* (*nodes*, in Gephi), and relations are denoted as *tiles* (*edges*, in Gephi). Two attributes are attached to the nodes: a label (his or her "name") and a numeric attribute. In the edge list, "Source" and "Target" entries refer to the nodes' identifiers (Id). The size of a node depends on the value of its "degree centrality" (its number of connection). The centrality measures are essential metrics to analyze the position of an actor in a network. In this research, I will be using Weighted In-Degree and Weighted Out-degree (the number of connections getting in or out of the node), Closeness Centrality (the

average distance of a given stating node to all the other nodes in the network), and Betweenness Centrality (how often a node appears of the shortest path between the nodes of a network). (Wasserman & Faust, 1994) These definitions of centralities allowed me to qualify the prominence of countries embedded in the regional networks; for example, networks of migration, trade and FDI.

Literature Review

The reasons why people emigrate have been widely theorized. Some of these theories see the escape from poverty and threats as a causal mechanism. Others see emigrants as seeking access to quality education, employment, health care, amenities, and high wages; or to join a partner, form a family, or reunite the family. In countries without adequate social protection schemes, families often see a migration of family members as a means to diversify risk and sources of income. (Mezzadra & Neilson, 2013) However, recently, the focus has shifted to transnational social networks and transnationalism. Other authors focus on violent conflicts, natural disasters, and other life-threatening situations that trigger peak levels of migration. (Arnold, 2016; Massey et al., 1993; Willekens, Massey, & Raymer, 2016)

Another body of literature about migration focuses on the subjective aspects of migration. For example, Cederberg (2017) explores the effect of social class ideations of migration. Other authors focus on migrants' calculations of the cost of migration and the type of individuals that migrate. (Cederberg, 2017; Willekens et al., 2016). For example, Xiaohua Lin and Xiyan Yang (2017) explore the entrepreneurial aspirations of Chinese students who migrate. (Lin & Yang, 2017)

Since the last decade, network analysis has been growing as an approach to understanding migration. The focus is to understand the function of networks, in particular social networks or networks of people, in shaping the migration process. (Gurak & Caces, 1992) A related approach to network analysis is worlds system. In this perspective, scholars see migration not as resulting from endogenous, but from exogenous factors such as international linkages. For example, the more explored link in a system approach to migration has been the link between foreign direct investment (DFI) and migration. The mechanism behind the influence of FDI on migration is the increasing of demand for workers in a country where FDI has increased. (Kugler & Rapoport, 2005)

In the case of Latin American, authors such as Marroquin concentrate in the qualified migration that leaves their country of origin in search of better employment and a quality of life. As mentioned before, Venezuela has never been a country with a substantial migration flow out the nation. Contrary, it has received several waves on immigration coming from Europe, during WWII, and from the region in the mid and late parts of the last century. ("Venezuelan Migration," 2012) Contrary to the migratory experience of Venezuela, Ecuador is a country with a tradition of migration since the mid-1990's.

More recent bodies of literature such as Passage de Ida (2011) and La Alegria Triste de Emmigrar explore the subjective aspect of Venezuela and Ecuadorian migration through ethnographic work. (Cordoliani, 2011; Subero, 2012) Finally, in his thesis "Negotiating" Belonging as "Ideal Migrants," Saetermo tries to comprehended the connection between a sense of belonging and migration adaptation in the case of Venezuelans in Montreal.(Sætermo, 2016)

Most studies exploring migration in Venezuela and Ecuador have been done from the nationalistic and endogenous perspective, with negative comparisons such as "brain drainage,"

ignoring regional and world patterns that affects migration, and focusing on endogenous factors such as political and economic internal problems. Thus, this research project will contribute to the literature of migration in general. Also, will add to the understanding, globally and regionally, of systems of migration. Finally, it will try to explain the contradictory patterns of migration out of Venezuela from a non-nationalistic and endogenous outlook.

Methods

For this research project, I will be using data mainly from the World Bank, The International Trade Center, and the International Migration Institute, specifically, data from the OCDC countries in Latin America. I constructed three networks that represent the flows of migration, trade, and FDI in four different point in time: 2000, 2005, 2010, and 2015. I use centrality measures, of directional nature, at the actor, Similarly, I expect to build this network of connectivity using Fawcett's (1989) migration system framework, specifically two trade and FDI. (Fawcett, 1989) As an independent variable, I will operationalize the centrality measures Weighted Out-Degree, Weighted In-Degree, Betweenness Centrality, and Closeness Centrality, these measures are explained in (Wasserman & Faust, 1994). The dependent variable is migration flow.

For the creation of the networks, I utilized Microsoft Excel to transform the data into a format that Gephi could process. After, the data was transformed, I saved it is a .csv file. Then, I imported the networks into the network analysis software Gephi version 0.9.1., to build the graphs and tables. All the graphs were filtered using the topology functionality in Gephi, specifically the Degree Range set a 1. Then, to enhance visualization, I ran two basic layout algorithms: Yifam Hu, and Fruchterman Raingold. Then, I ran the key statistics for analysis in

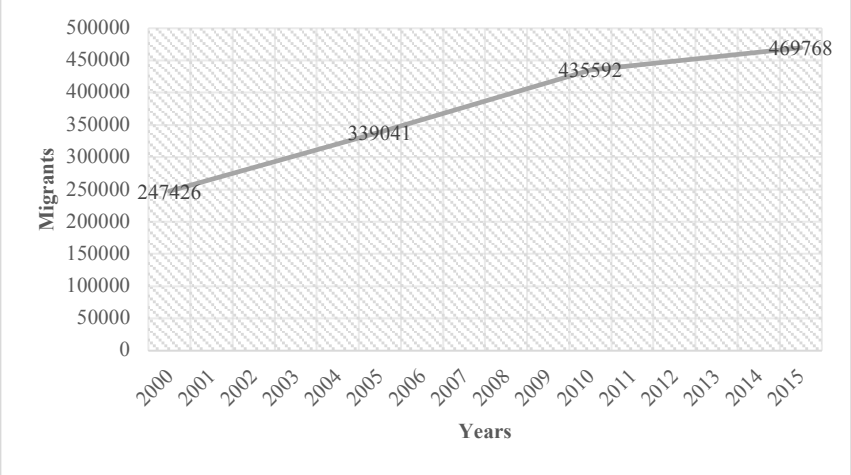
Gephi: Average Weighted Degree, and Network Diameter. Finally, I proceeded to partition the nodes and add colors and size according to the different measures of centrality to use in the analysis: Weighted Out-Degree, Weighted In-Degree, Betweenness and Closeness Centrality. Similarly, most of the edges were weighted according to the weighted variable created in the data set.

Analysis.

Migration Network.

As mentioned before Venezuela has been characterized for being a receiving country rather than a sending country. However, in Graph 1, it is possible to notice that since 2000, the country has experience and increase of emigration with no precedence.

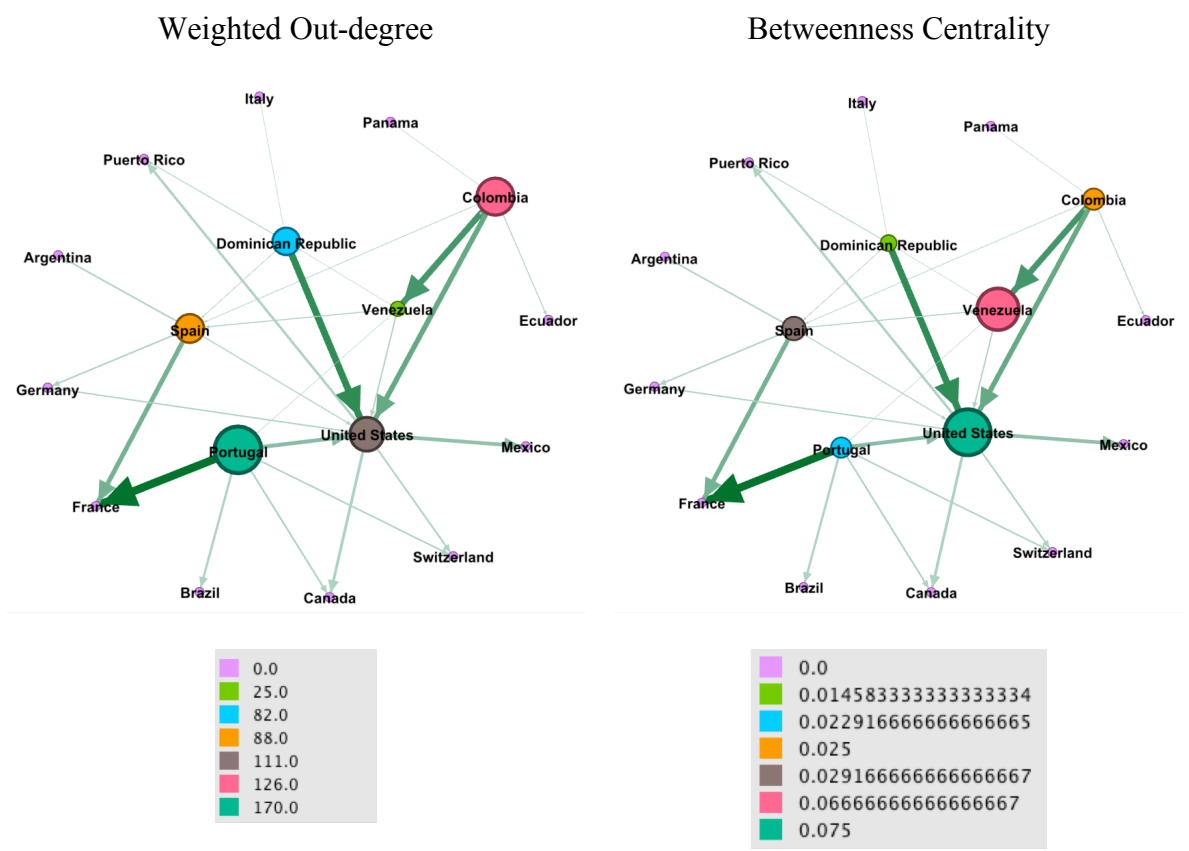
Graph 1. Venezuela total migration flow (2000 – 2015)



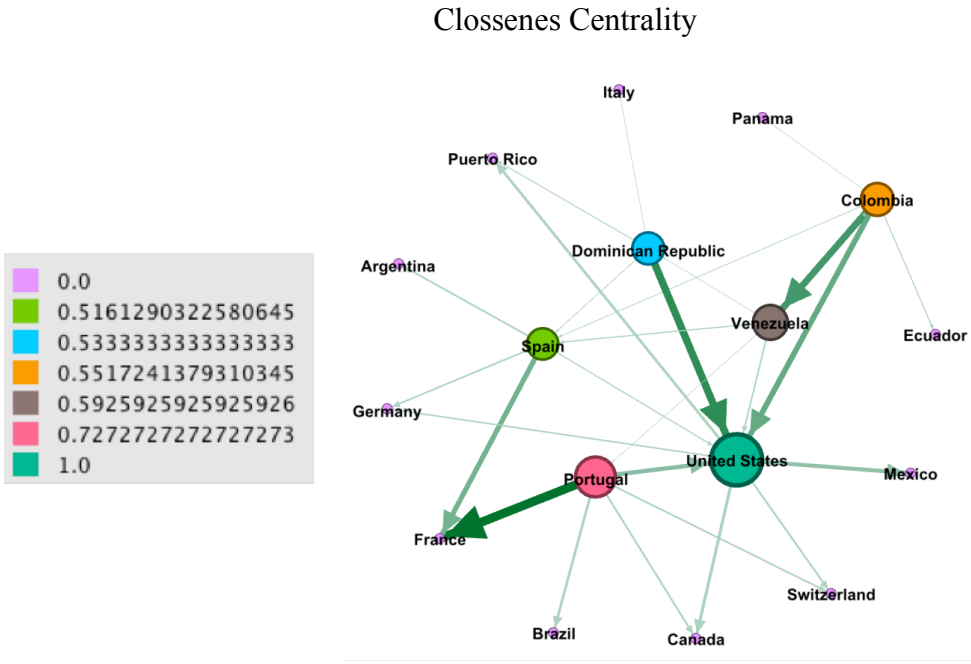
In the first part of this analysis, I will explore the centrality of Venezuela its system of migration from 2000 to 2015. The migration network of Venezuela in 2000 was constituted by

seventeen nodes and thirty edges. In this network, the united stated plays a significant role with a between centrality score of 0.075. In this network, we can see that Venezuela has a high level of Betweenness Centrality (0.066) and Closeness Centrality (0.59). See Graph 2 and 3. At the time Venezuela had approximately a total of 2.474.426 of emigrants in different part of the region and other countries. The main places to emigrate at the time were the USA, Spain, Portugal, and Dominican Republic. However, Venezuela has a much smaller score in Weighted Out-Degree in 2000, than other countries in the region such as Colombia, and Dominican Republic. This indicates that the number of migrants coming out of Venezuela in that year were less than the number of migrants coming out of the mentioned countries.

Graph 2. Venezuela's migrations network in 2000.



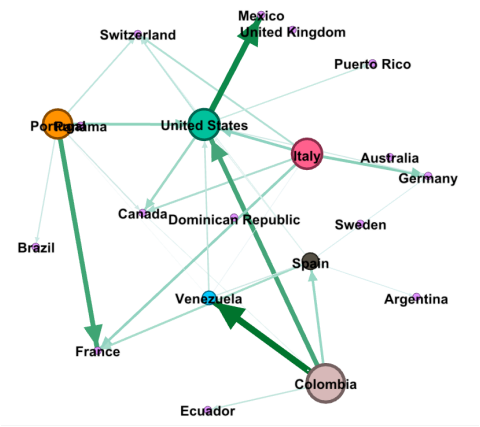
Graph 3. Venezuela's migrations network in 2000.

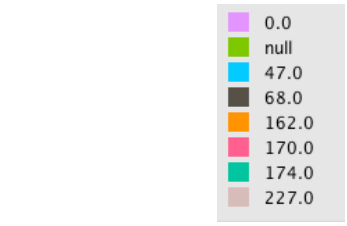


Counterintuitively, by 2015, Venezuelans position of the network in regard of it centrality decreased. For example, its Betweenness centrality fell form 0.066 in 2000 to 0.016 in 2015. On the other hand, its Closeness Centrality increased from 0.59 to 0.60 and its Weighted Out-Degree also went up from 0.25 to 0.47. This is a strong indication that, according to these two measures of centrality, Venezuela's importance in the migration system or network increased. The increase in Closeness Centrality can be given by flows of migrants either in or out of the country. However, the increase in Weighted Out-Degree can be only the result of an increase of the flow of migrants out of Venezuela. See Appendix A for all the centrality measures across all the years.

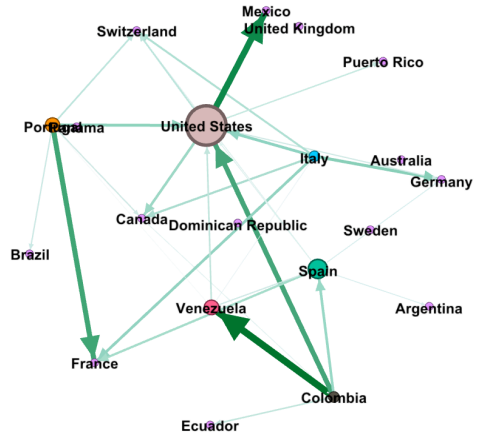
Graph 4. Venezuela's migrations network in 2015.

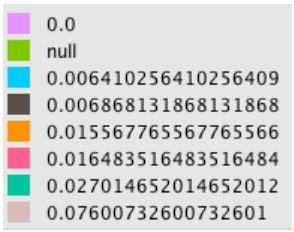
Weighted Out-degree





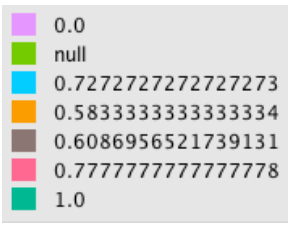
Betweenness Centrality

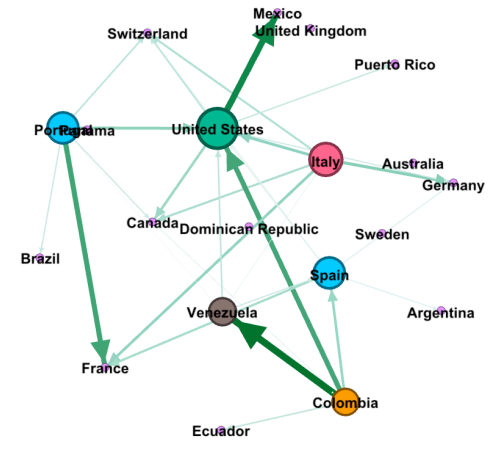




Graph 5. Venezuela's migrations network in 2015.

Clossenes Centrality

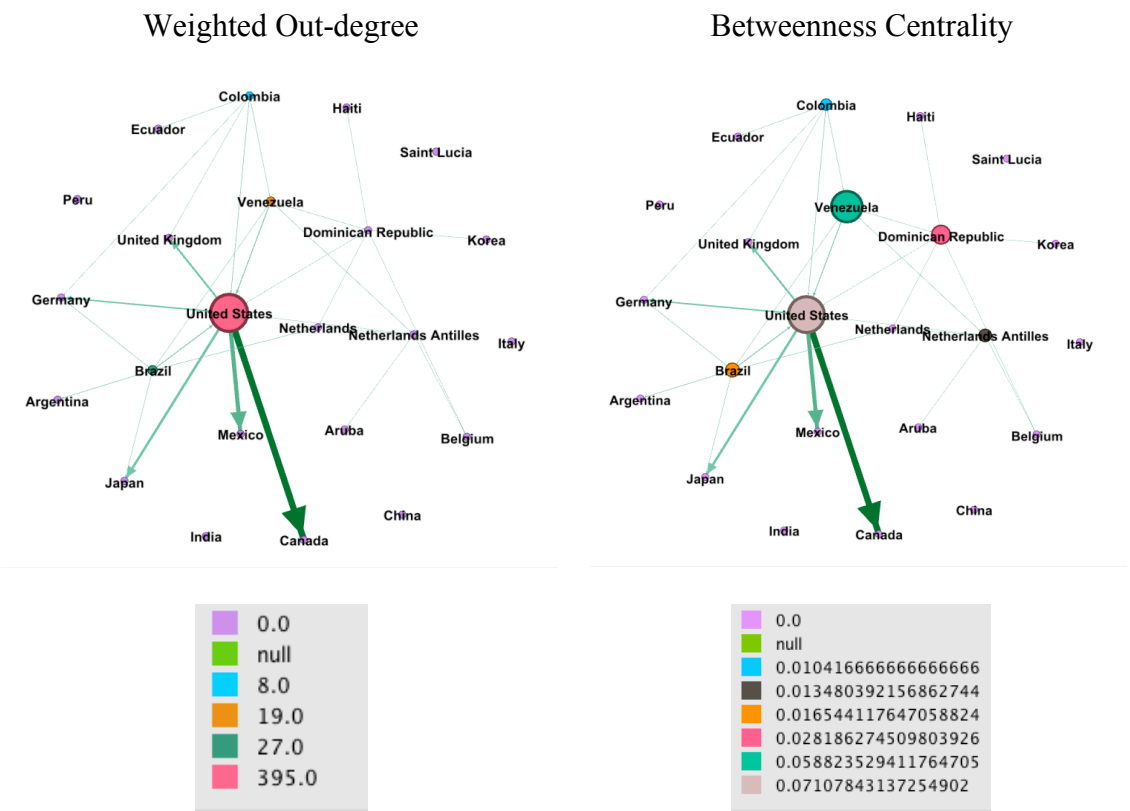




Trade Network

As the next step in the analysis, I will explore the levels of centrality of Venezuela across all the measures (Weighted Out-Degree, Betweenness Centrality, and Closeness Centrality) in the trade network to see if levels of centrality in trade correlate with levels of centrality in migration.

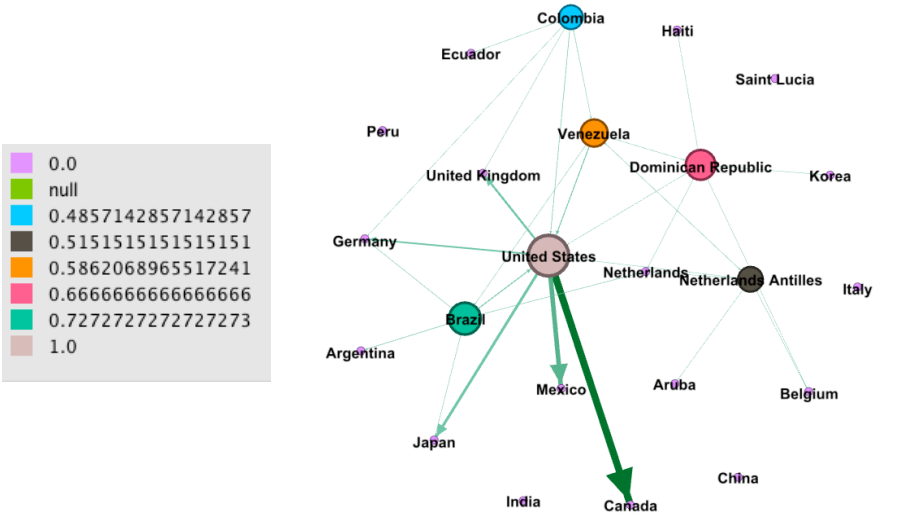
Graph 6. Venezuela's trade network in 2000.



In Graph 6 and 7., we can see that in 2000, Venezuela was an important player (with a Betweenness Centrality of 0.058, a Closeness Centrality of 0.58, and Weighted Out-Degree of 19.0 measures in the system of trade involving the USA, Dominican Republic, Brazil and other

nations in Europe. This make sense since Venezuela has been a major exporter of oil to the USA since the early 1920th when oil was found.

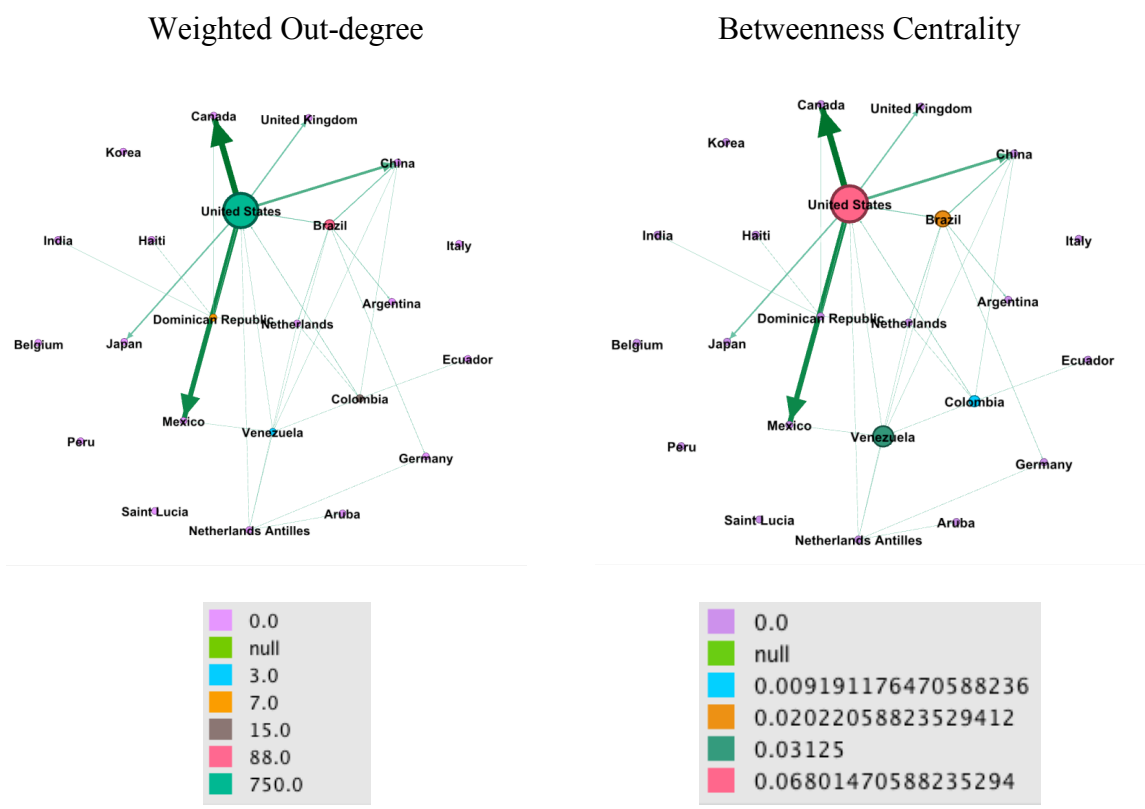
Graph 7. Venezuela's trade network in 2000.



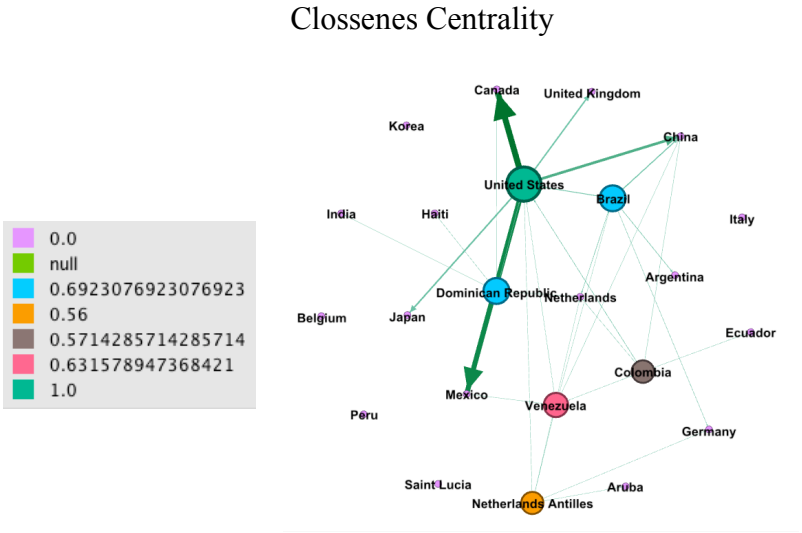
However, while in 2000 Venezuela was a major part of the trade system, in 2015 a substantial decrease in Betweenness Centrality (going form 0.058 in 2000 to 0.031 in 2015) can be noticed in Graph 8., along with a critical decrease in Waited Out-Degree (from 19 to 3). Interestingly the country does not seem to lose its Betweenness Centrality in the trade network. Nevertheless, it seems that the most suggestive measure of centrality is Weighted Out-Degree since this represents in this case the out-going linkages of trade out the country; or exports out of Venezuela. Historically, this decrease in trade of the country can be explained by several factors. Political crisis, since the rise to power of Hugo Chavez and the decrease of oil production. In 2002, there was a cup'deta in Venezuela that resulted in the reduction of the oil extraction and exportations. ("Venezuelan Migration," 2012) More interestingly, this coup'deta resulted in the

firing of more than 20,000 employees form Petroleos de Venezuela (PDVSA), the state-owned oil company. It is well known in the literature that studies Venezuelan migration in this period, that many these fired employees used their connections made through PDVSA with oil companies in other countries to migrate. For example, many came to Houston to work with oil related companies with whom they made connection while in PDVSA. ("Venezuelan Migration," 2012) This pattern of decrease in centrality in the trade correlates with the increase in centrality in the migration network adding strength to the hypothesis that the loss of centrality of Venezuela in network such as trade resulted in an increase of migration. By 2015, the number of emigrants from Venezuela approximately doubled. See Graph 1, Venezuela's migration general trend or Appendix B for all measurements of centrality of Venezuela's trade network.

Graph 8. Venezuela's trade network in 2015.



Graph 9. Venezuela's trade network in 2015.

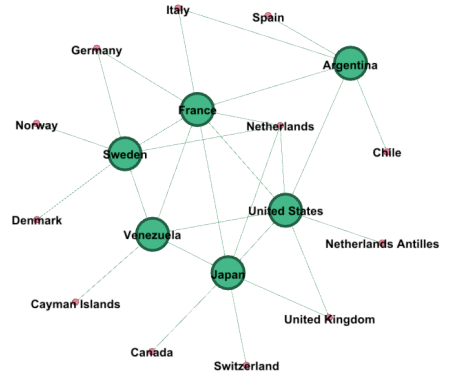


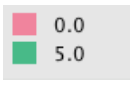
FDI Network

Finally, according to Fagiolo and Fawcetts (2014), linkages such as FDI has an indirect effect in the flows of migration out of a country. Thus, I explore the connection between Venezuela's centrality in a network of FDI and its increasing trend of migration. (Fagiolo & Mastrorillo, 2014; Fawcett, 1989) Below in Graph 10, we can notice that in 2000, Venezuela was a major recipient of FDI coming from France, Japan, Sweden, and the United States. (Weighted In-Degree of 0.5) Interestingly, Venezuela's Betweenness Centrality is low (0.0), while it Closeness Centrality is high (0.60).

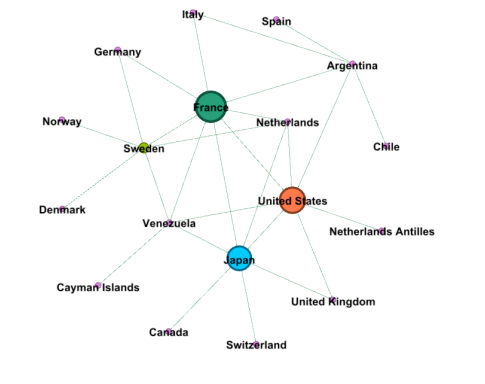
Graph 10. Venezuela's FDI network in 2000.

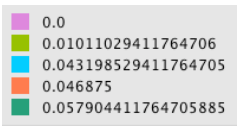
Weighted In-degree





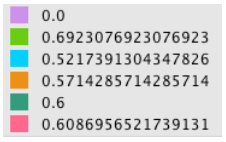
Betweenness Centrality

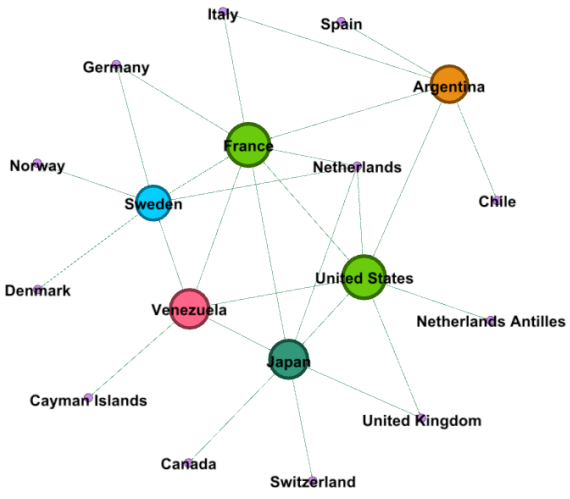




Graph 11. Venezuela's FDI network in 2000.

Clossenes Centrality

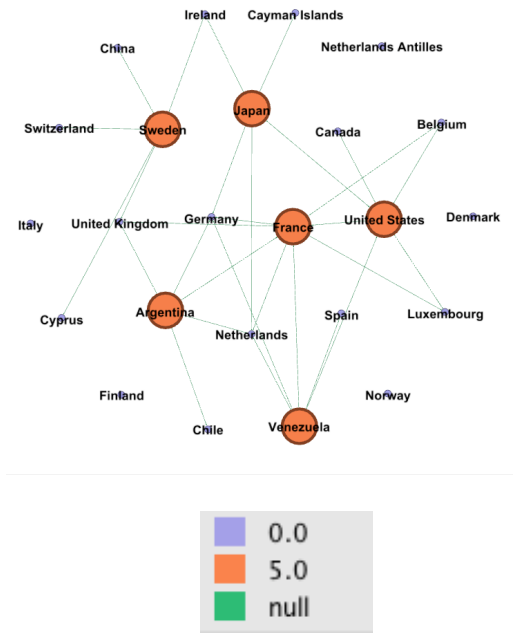




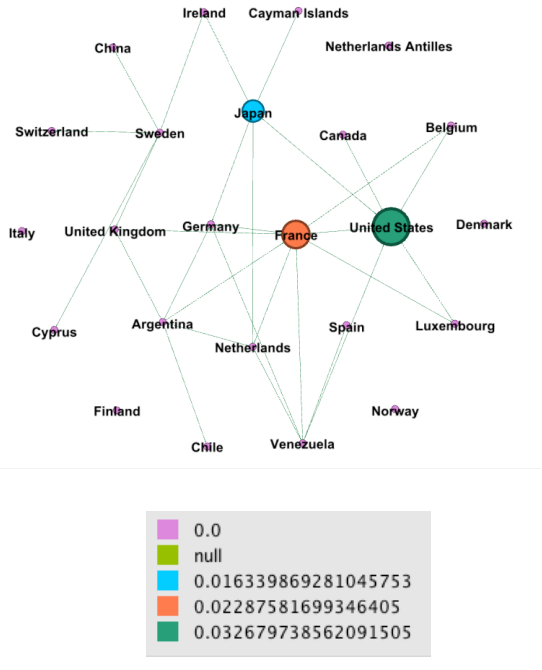
To facilitate the interpretation of measures of centrality in the context of FDI, I proceeded to compare the selected measures in 2000 with the same measures in 2015. Graph 12, shows that in 2015 Venezuela continued being a major recipient of FDI from countries such as United Stated, and France. However, other nations such as Sweden and Japan seen to have decreased significantly their level if investment in the country. Similarly, to 2000, in 2015 the Betweenness Centrality of Venezuela continued to be non-significant, while the country's Closeness Centrality decreased from 0.60 to 0.57. These results are difficult to use to base an inference on the effect of FDI on migrations flow. A possible explanation is that while the country lost major investing partners, new investors took their place; for example, China and Byelorussia. For the full measures on FDI from 2000 to 2015 see Appendix C.

Graph 12. Venezuela's FDI network in 2015.

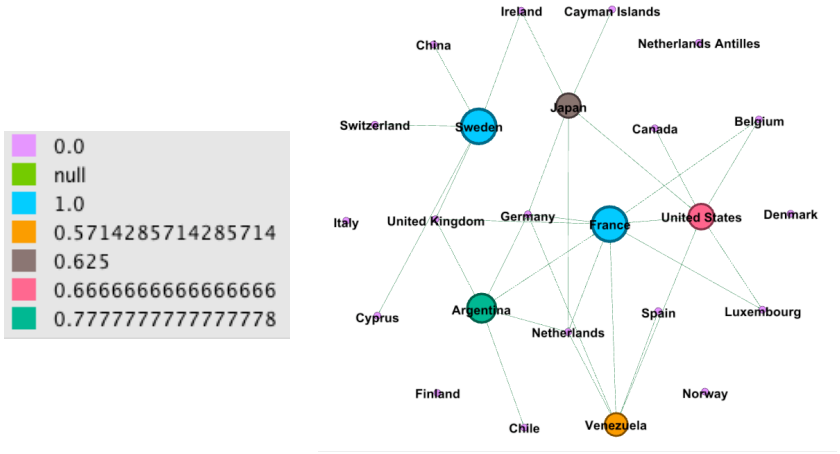
Weighted In-degree



Betweenness Centrality



Graph 13. Venezuela's FDI network in 2015.



Conclusion

After exploring Venezuela's measurements of Centrality in (Weighted Out-Degree, Weighted In-Degree, Betweenness Centrality, and Closeness Centrality), I conclude that there is important evidence that the loss of Venezuela's centrality in these two networks, trade and FDI seem to have an important effect in the increase of migration out of the country. Especially, the loss of centrality in the trade network seems to have the greatest effect on migration. I would argue that through trade relationships, many Venezuelans were able to establish networks of information and resources. Then, these networks of information and resources were used as platforms for finding employment or other types of opportunities in other nations. Finally, this research has several limitations. First, it is not clear if FDI influences migration. The reason is that different measurements of centrality resulted in contradictory evidence; For example, losing investing countries while continuing being a major receiver of investment in the network. Another limitation is the comparative nature of the analysis. The reason is that it does not allow for making strong causal inferences. Thus, as future research avenues, I suggest increasing the

number of nodes in the network to add granularity to the data, and build a model to compare more systematically the effect of different measures of centrality on migration. Similarly, with more data, it will be possible to conduct a block model analysis of major groups of countries in these networks.

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Appendixes

Appendix A: Migration network measures of centrality (2000 to 2015)

ID	Country	Weighted In-degree	Weighted Out-degree	Closeness Centrality	Betweenness Centrality
2000					
1	Argentina	13.00	0.00	0.00	0.00
3	Brazil	21.00	0.00	0.00	0.00
4	Canada	41.00	0.00	0.00	0.00
5	Colombia	4.00	126.00	0.55	0.03
6	Dominican Republic	2.00	82.00	0.53	0.01
7	Ecuador	7.00	0.00	0.00	0.00
8	France	129.00	0.00	0.00	0.00
9	Germany	24.00	0.00	0.00	0.00
10	Italy	2.00	0.00	0.00	0.00
11	Mexico	36.00	0.00	0.00	0.00
12	Panama	2.00	0.00	0.00	0.00
13	Portugal	2.00	170.00	0.73	0.02
14	Puerto Rico	29.00	0.00	0.00	0.00
15	Spain	14.00	88.00	0.52	0.03
17	Switzerland	28.00	0.00	0.00	0.00
19	United States	177.00	111.00	1.00	0.08
20	Venezuela	71.00	25.00	0.59	0.07
2005					
1	Argentina	11.00	0.00	0.00	0.00
2	Australia	22.00	0.00	0.00	0.00
3	Brazil	18.00	0.00	0.00	0.00
4	Canada	73.00	0.00	0.00	0.00
5	Colombia	4.00	163.00	0.56	0.01
7	Ecuador	9.00	0.00	0.00	0.00
8	Germany	127.00	0.00	0.00	0.00
9	Germany	68.00	0.00	0.00	0.00
10	Italy	3.00	175.00	0.73	0.01
11	Mexico	52.00	0.00	0.00	0.00
13	Portugal	2.00	144.00	0.73	0.01
14	Puerto Rico	22.00	0.00	0.00	0.00
15	Spain	38.00	69.00	0.54	0.01
17	Switzerland	31.00	0.00	0.00	0.00
19	United States	159.00	129.00	1.00	0.05
20	Venezuela	75.00	34.00	0.60	0.03
2010					
1	Argentina	8.00	0.00	0.00	0.00
3	Brazil	14.00	0.00	0.00	0.00
4	Canada	76.00	0.00	0.00	0.00
5	Colombia	4.00	218.00	0.58	0.01
7	Ecuador	19.00	0.00	0.00	0.00
8	France	128.00	0.00	0.00	0.00
9	Germany	63.00	0.00	0.00	0.00
10	Italy	5.00	160.00	0.78	0.01
11	Mexico	74.00	0.00	0.00	0.00
13	Portugal	2.00	150.00	0.73	0.02
14	Puerto Rico	19.00	0.00	0.00	0.00
15	Spain	53.00	63.00	0.73	0.03
17	Switzerland	68.00	0.00	0.00	0.00
19	United States	165.00	156.00	1.00	0.08
20	Venezuela	92.00	43.00	0.61	0.02
2015					
1	Argentina	10.00	0.00	0.00	0.00
3	Brazil	16.00	0.00	0.00	0.00
4	Canada	84.00	0.00	0.00	0.00
5	Colombia	5.00	227.00	0.58	0.01
7	Ecuador	19.00	0.00	0.00	0.00
8	France	138.00	0.00	0.00	0.00
9	Germany	65.00	0.00	0.00	0.00
10	Italy	5.00	170.00	0.78	0.01
11	Mexico	88.00	0.00	0.00	0.00
13	Portugal	2.00	162.00	0.73	0.02
14	Puerto Rico	17.00	0.00	0.00	0.00
15	Spain	50.00	68.00	0.73	0.03
17	Switzerland	77.00	0.00	0.00	0.00
19	United States	175.00	174.00	1.00	0.08
20	Venezuela	97.00	47.00	0.61	0.02

Appendix B: Trade network measures of centrality (2000 to 2015)

ID	Country	Weighted In-degree	Weighted Out-degree	Closeness Centrality	Betweenness Centrality
2000					
1	United States	33.00	395.00	1.00	0.07
2	Netherlands Antilles	2.00	0.00	0.52	0.01
3	Colombia	1.00	8.00	0.49	0.01
4	Dominican Republic	1.00	0.00	0.67	0.03
5	Brazil	1.00	27.00	0.73	0.02
6	Canada	164.00	0.00	0.00	0.00
7	Mexico	102.00	0.00	0.00	0.00
8	Japan	60.00	0.00	0.00	0.00
9	United Kingdom	41.00	0.00	0.00	0.00
10	Germany	33.00	0.00	0.00	0.00
11	Netherlands	3.00	0.00	0.00	0.00
12	Aruba	0.00	0.00	0.00	0.00
13	Venezuela	2.00	19.00	0.59	0.06
14	Belgium	0.00	0.00	0.00	0.00
15	Ecuador	1.00	0.00	0.00	0.00
16	Haiti	0.00	0.00	0.00	0.00
17	Korea	0.00	0.00	0.00	0.00
18	Argentina	5.00	0.00	0.00	0.00
2005					
1	United States	50.00	467.00	1.00	0.06
2	Netherlands Antilles	2.00	0.00	0.49	0.01
3	Colombia	1.00	14.00	0.48	0.01
4	Dominican Republic	1.00	4.00	0.69	0.02
5	Brazil	1.00	50.00	0.69	0.02
6	Canada	211.00	0.00	0.00	0.00
7	Mexico	121.00	0.00	0.00	0.00
8	Japan	55.00	0.00	0.00	0.00
9	United Kingdom	39.00	0.00	0.00	0.00
10	Germany	5.00	0.00	0.00	0.00
11	Netherlands	5.00	0.00	0.00	0.00
12	Aruba	0.00	0.00	0.00	0.00
13	Venezuela	2.00	19.00	0.58	0.06
15	Ecuador	1.00	0.00	0.00	0.00
16	Haiti	0.00	0.00	0.00	0.00
17	Korea	0.00	0.00	0.00	0.00
18	Argentina	10.00	0.00	0.00	0.00
19	China	49.00	0.00	0.00	0.00
20	Saint Lucia	0.00	0.00	0.00	0.00
21	Peru	1.00	0.00	0.00	0.00
2010					
1	United States	64.00	613.00	1.00	0.04
2	Netherlands Antilles	2.00	0.00	0.65	0.02
3	Colombia	1.00	24.00	0.50	0.00
4	Dominican Republic	0.00	4.00	0.73	0.01
5	Brazil	0.00	86.00	0.69	0.00
6	Canada	249.00	0.00	0.00	0.00
7	Mexico	164.00	0.00	0.00	0.00
8	Japan	60.00	0.00	0.00	0.00
9	United Kingdom	49.00	0.00	0.00	0.00
10	Germany	8.00	0.00	0.00	0.00
11	Netherlands	12.00	0.00	0.00	0.00
12	Aruba	0.00	0.00	0.00	0.00
13	Venezuela	1.00	30.00	0.58	0.01
14	Belgium	0.00	0.00	0.00	0.00
15	Ecuador	2.00	0.00	0.00	0.00
16	Haiti	1.00	0.00	0.00	0.00
18	Argentina	18.00	0.00	0.00	0.00
19	China	125.00	0.00	0.00	0.00
22	Italy	1.00	0.00	0.00	0.00
2015					
1	United States	39.00	750.00	1.00	0.07
2	Netherlands Antilles	0.00	0.00	0.56	0.00
3	Colombia	1.00	15.00	0.57	0.01
4	Dominican Republic	0.00	7.00	0.69	0.00

5	Brazil	0.00	88.00	0.69	0.02
6	Canada	281.00	0.00	0.00	0.00
7	Mexico	236.00	0.00	0.00	0.00
8	Japan	62.00	0.00	0.00	0.00
9	United Kingdom	56.00	0.00	0.00	0.00
10	Germany	5.00	0.00	0.00	0.00
11	Netherlands	11.00	0.00	0.00	0.00
12	Aruba	0.00	0.00	0.00	0.00
13	Venezuela	1.00	3.00	0.63	0.03
15	Ecuador	1.00	0.00	0.00	0.00
16	Haiti	1.00	0.00	0.00	0.00
18	Argentina	13.00	0.00	0.00	0.00
19	China	155.00	0.00	0.00	0.00
23	India	1.00	0.00	0.00	0.00

Appendix C: FDI network measures of centrality (2000 to 2015)

ID	Country	Weighted In-degree	Weighted Out-degree	Closeness Centrality	Betweenness Centrality
			2000		
1	Argentina	0.00	5.00	0.57	0.00
3	Canada	1.00	0.00	0.00	0.00
4	Cayman Islands	1.00	0.00	0.00	0.00
5	Chile	1.00	0.00	0.00	0.00
8	Denmark	1.00	0.00	0.00	0.00
10	France	4.00	5.00	0.69	0.06
11	Germany	2.00	0.00	0.00	0.00
13	Italy	2.00	0.00	0.00	0.00
14	Japan	3.00	5.00	0.60	0.04
16	Netherlands	4.00	0.00	0.00	0.00
17	Netherlands Antilles	1.00	0.00	0.00	0.00
18	Norway	1.00	0.00	0.00	0.00
19	Spain	1.00	0.00	0.00	0.00
20	Sweden	1.00	5.00	0.52	0.01
21	Switzerland	1.00	0.00	0.00	0.00
22	United Kingdom	2.00	0.00	0.00	0.00
23	United States	4.00	5.00	0.69	0.05
24	Venezuela	0.00	5.00	0.61	0.00
			2005		
1	Argentina	1.00	5.00	0.55	0.01
3	Canada	1.00	0.00	0.00	0.00
5	Chile	1.00	0.00	0.00	0.00
9	Finland	1.00	0.00	0.00	0.00
10	France	2.00	5.00	0.73	0.02
11	Germany	3.00	0.00	0.00	0.00
13	Italy	1.00	0.00	0.00	0.00
14	Japan	2.00	5.00	0.73	0.03
15	Luxembourg	1.00	0.00	0.00	0.00
16	Netherlands	4.00	0.00	0.00	0.00
18	Norway	1.00	0.00	0.00	0.00
19	Spain	1.00	0.00	0.00	0.00
20	Sweden	0.00	5.00	0.55	0.00
21	Switzerland	2.00	0.00	0.00	0.00
22	United Kingdom	4.00	0.00	0.00	0.00
23	United States	5.00	5.00	0.67	0.08
24	Venezuela	0.00	5.00	0.62	0.00
			2010		
1	Argentina	1.00	5.00	0.67	0.00
2	Belgium	1.00	0.00	0.00	0.00
4	Cayman Islands	1.00	0.00	0.00	0.00
5	Chile	1.00	0.00	0.00	0.00
9	Finland	1.00	0.00	0.00	0.00
10	France	3.00	5.00	0.86	0.01
11	Germany	3.00	0.00	0.00	0.00
13	Italy	1.00	0.00	0.00	0.00
14	Japan	0.00	5.00	0.69	0.00
15	Luxembourg	2.00	0.00	0.00	0.00
16	Netherlands	2.00	0.00	0.00	0.00
18	Norway	1.00	0.00	0.00	0.00
19	Spain	2.00	0.00	0.00	0.00
20	Sweden	0.00	5.00	0.69	0.00
21	Switzerland	1.00	0.00	0.00	0.00
22	United Kingdom	5.00	0.00	0.00	0.00
23	United States	5.00	5.00	0.86	0.03
24	Venezuela	0.00	5.00	0.65	0.00
			2015		
1	Argentina	0.00	5.00	0.78	0.00
2	Belgium	2.00	0.00	0.00	0.00
3	Canada	1.00	0.00	0.00	0.00
4	Cayman Islands	1.00	0.00	0.00	0.00
5	Chile	1.00	0.00	0.00	0.00
6	China	1.00	0.00	0.00	0.00
7	Cyprus	1.00	0.00	0.00	0.00
10	France	3.00	5.00	1.00	0.02
11	Germany	4.00	0.00	0.00	0.00
12	Ireland	2.00	0.00	0.00	0.00
14	Japan	1.00	5.00	0.63	0.02
15	Luxembourg	2.00	0.00	0.00	0.00

16	Netherlands	4.00	0.00	0.00	0.00
19	Spain	1.00	0.00	0.00	0.00
20	Sweden	0.00	5.00	1.00	0.00
21	Switzerland	1.00	0.00	0.00	0.00
22	United Kingdom	3.00	0.00	0.00	0.00
23	United States	2.00	5.00	0.67	0.03
24	Venezuela	0.00	5.00	0.57	0.00