Group Project

* Either an html or pdf markdown article analyzing the economic trade zones from a network perspective
* Write as a blog post
* Highlight insights that escape non-network analysis
* Investigate fragmentation
* add additional data like trade flows between countries to see if it matches the network structure
* Create insightful infographic using a network perspective
* Look at third party data: commercial flight frequency, labor migration
* If the second image is not used in the analysis, produce a separate analysis of the logistics networks in Africa in a similar manner

To do:

1. Get NLA for countries?
2. Figure out transitivity
3. Last point: If the second image is not used in the analysis, produce a separate analysis of the logistics networks in Africa in a similar manner
4. North and South
5. Compare with GDP
6. Compare with random graphs to decide if it’s less then or more than random
7. Die

Amy: If you can come up with other ways to say “this suggests” that would be great. I said it too much

The following is a network analysis on the Trade Zones and countries in Africa. Firstly, the data was plotted as a bipartite graph. It was then projected separately into Zones and Countries. The Country projection proved to be visually unhelpful. The graph level indices also revealed that it was extremely dense. Therefore we decided to focus our analysis on the Trade Zones.

Since every country is part of the African Union Trade Zone, we decided to analyse the network with and without this node and then compare the results in hopes to gain insight.

The African Union is the most central node. All 55 African countries in the data set are connected to it. As a result, it causes the network to be dense due to the high amount of connections. Removing this node allows use to see how other trade zones are related to one another.

**Graph Level Analysis**

The graph with the African Union included has a density of 0.212 and an average distance of 1.58, whereas the graph without the African Union has a lower density of 0.171 and an average distance of 1.85. The average distance is higher without the African Union because it is no longer connected to all nodes. This is reflected in the African Union’s node level analysis, where the closeness centrality is equal to 1. *This suggests that the Zones are not associated with each other as much if the African Union is not present in the network.*

To understand how our data was fragmented we looks at the density and average distance between nodes as well as a calculated fragmentation value. By removing the African union the distance of the nodes increased and the density of the nodes decreased. This is consistent with our fragmentations values as the fragmentation values increased when the African union was removed thus resulting in a more fragment data set as the African union was connected to all nodes. *From this we can deduce that the African Union is the glue that holds the zones together.*

**Node Level analysis**

Secondly, to further understand how our data changed with and without the African union, we looked at various node level centrality and transitivity measures.

When the African Union was removed, the degree of each node decreased by 2. This value represents the 2 (non directed) connections that each node had to the African Union. After the African Union was removed, the betweenness centralities of each node increased.

Nodes with higher betweenness centralities have more control over the network. Previously, most information passed through the African Union (Due to it having the highest betweenness centraility). Without the African Union, CEN-SAD has the highest betweenness centrality, meaning that it now has the most control over the network. *This suggests that it is a more influential and larger trade zone, second to the African Union.*

WAMZ, CEPGL, SACU, LGA’s betweenness centrality were equal to 0 before the African Union was removed as well as afterwards. This is expected since they didn’t have any influence on the network beforehand due to their low betweenness centralities. *This suggests that these 4 Trade Zones are the least significant in Africa.*

The higher the centrality, the closer the node is to all other nodes. Since we only removed one node, it is expected that the centrality didn’t change much and only slightly impacted the average distance. *This suggests that even though the African Union is the most important node in the network that brings all the Zones closer together, they are still not entirely dependent on its presence. The slight change in average distance shows that other Zones are highly connected as well.*

All nodes that have a betweenness centrality of 0 have a transitivity of 1. If the betweenness centrality is 0, this means that the node does not lie on any paths to other nodes. The African Union has the lowest clustering coefficient of 0.3428, this suggests that, on average, the chances of two trade zones that share a common country is nearly 1/3.