

MULTIPLEX ANALYSIS OF POLITICAL CAPITAL IN U.S. CONGRESS

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Background

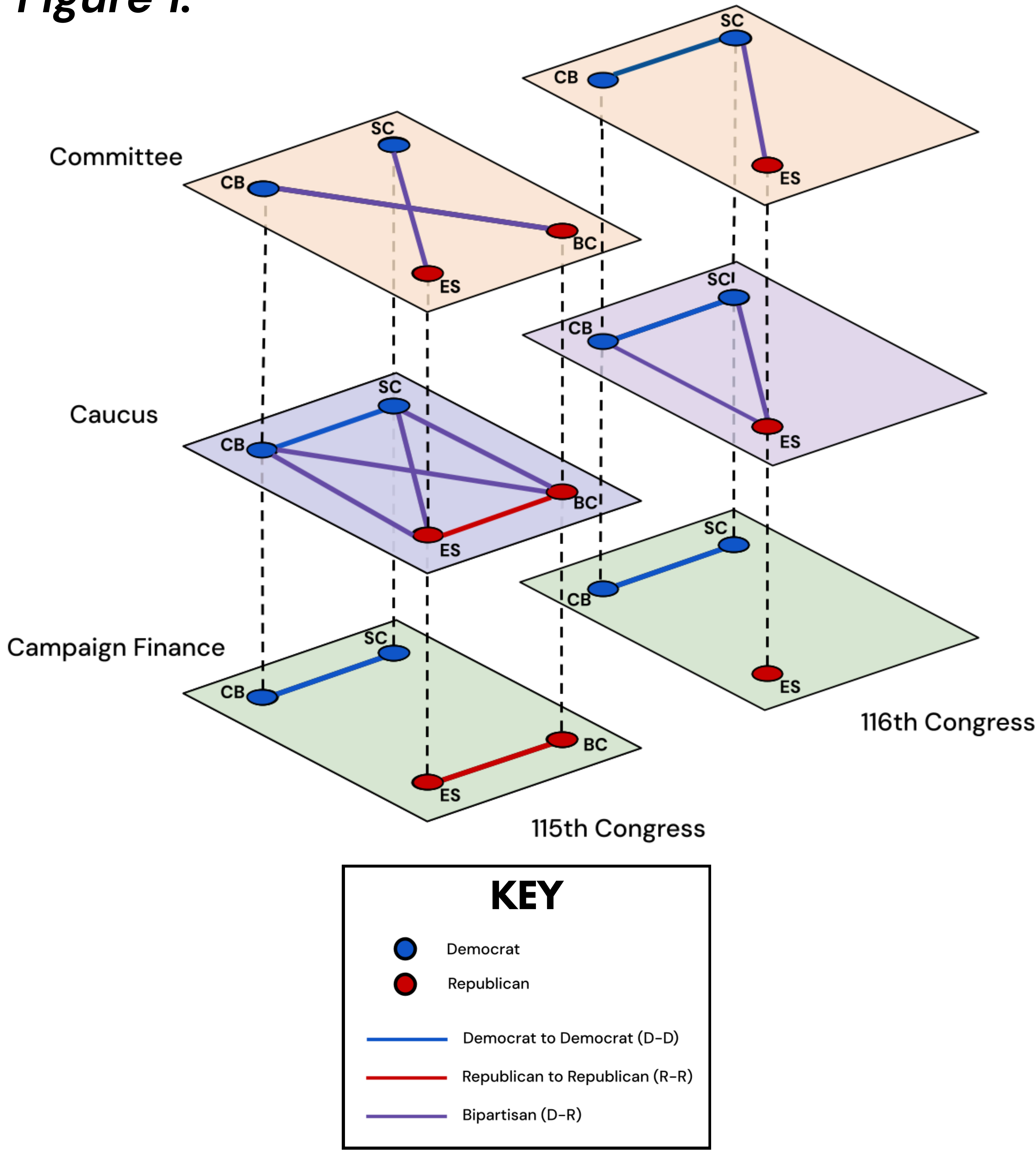
- Why are some legislators more powerful than others?
- Traditional explanations focus on institutions (e.g. parties, positions, etc.).
 - While these do explain a lot of the variation, there is still unexplained variation in legislator’s political capital.
 - **Political capital** refers to a politician’s power.
- Political capital is derived from relationships, not just formal authority
- Legislators are connected through multiple layers:
 - Committees
 - Cosponsorship
 - Co-voting
 - Campaign finance
 - Caucuses
- Because of this, one’s political capital can be difficult to observe or estimate, as we’d have to get the aggregate **across layers**.
- A **multiplex network** can be the solution.
 - A multiplex network is one in which different legislator relationships are shown across different layers.
- A multiplex contains:
 - Nodes (V): the actors or units in the system.
 - Edges (E): the relationships between those actors.
 - Layers (L): a set of connections that map to one type of relationship.
- As part of Dr. Jennifer Victor’s project, I helped construct and visualize a multiplex network of legislative relationships.
- **This poster contributes to a broader project by constructing a multiplex network visualization to illustrate what a multiplex is and its benefits.**

Methodology

- Used legislative data from the 115th Congress through the 116th Congress.
- Randomly selected two Democrat members and two Republican members as nodes.
 - Nodes: **Salud Carbajal** (D), **Cheri Bustos** (D), **Elise Stefanik** (R), and **Barbara Comstock** (R).
- In **Figures 1 and 2**, nodes were colored **red** for Republicans and **blue** for Democrats.
- **Figure 1** shows a multiplex visualization with three networks.
 - **Campaign finance:** Edges represent donations between two members.
 - **Caucus membership:** Edges represent shared membership in at least one caucus.
 - **Committee membership:** Edges represent shared membership in at least one committee.
- In **Figure 1**, edges were color coded based on type of connection.
 - **Blue edges** represent a Democrat to Democrat connection (D-D).
 - **Red edges** represent a Republican to Republican connection (R-R).
 - **Purple edges** represent a bipartisan connection (D-R).
- **Figure 2** represents the network as an layer-colored multigraph.
 - In other words, all layer edges are presented in one plane, with different colors representing different layer connections.
 - **Orange edges** represent relationships on the committee layer.
 - **Purple edges** represent relationships on the caucus layer.
 - **Green edges** represent relationships on the campaign finance layer.

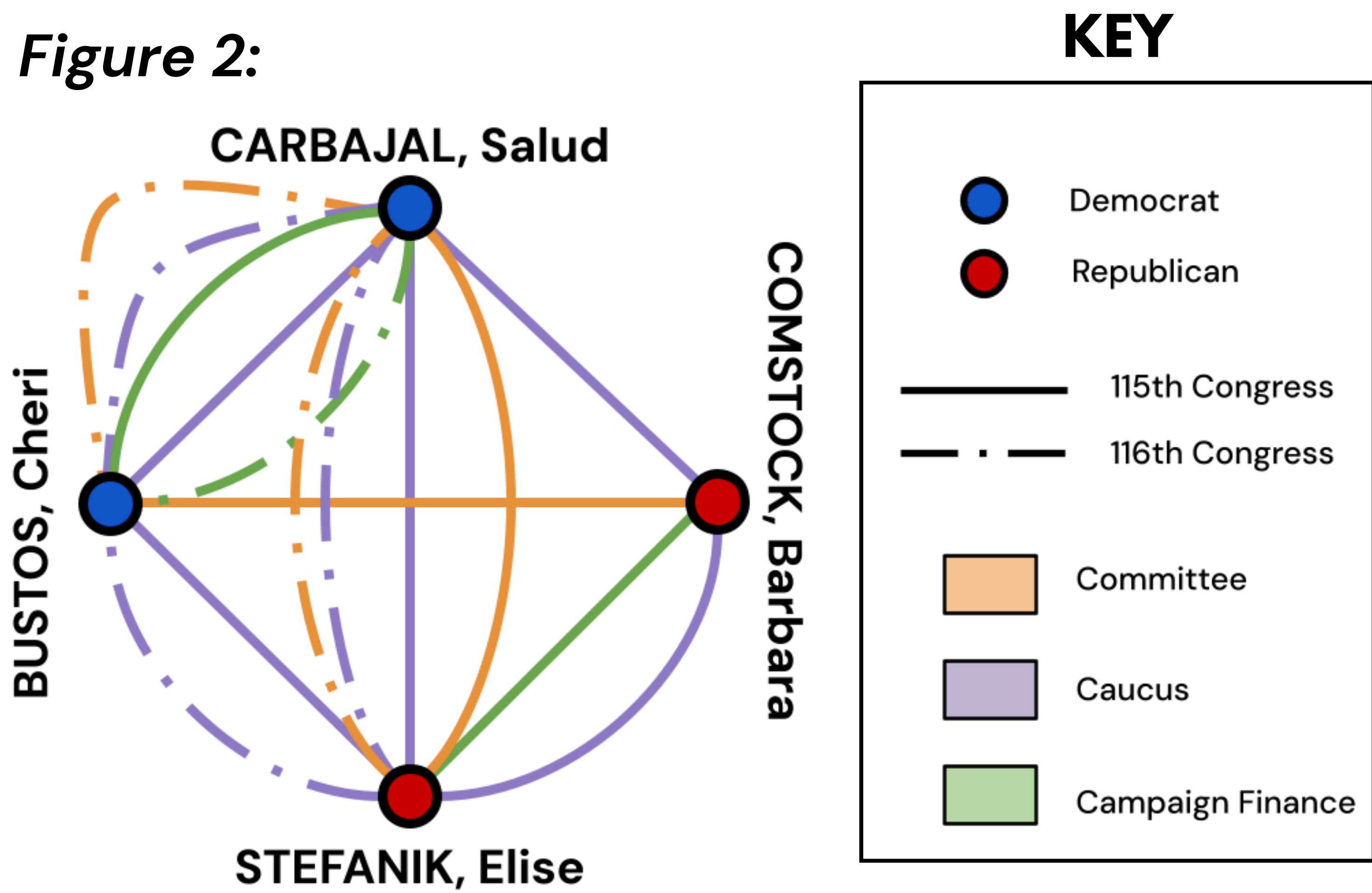
Results

Figure 1:



Adapted from Kivelä et al. (2014).

Figure 2:



Adapted from Kivelä et al. (2014).

Discussion

- The multiplex network reveals variation in overall political capital, with SC (10 connections) and CB (9 connections) more connected than ES (8 connections) and BC (5 connections).
 - These differences emerge only when aggregating across multiple relationship layers, showing that political capital is multi-dimensional and cannot be captured by a single network.
- Patterns of connectivity vary by type:
 - SC and CB exhibit strong same-party ties (5 connections), suggesting coalition-based political capital.
 - ES shows the highest number of bipartisan connections (6 connections), suggesting brokerage role within this multiplex.
- BC appears less connected overall.
 - However, this is partly due to being present only in the 115th Congress, limiting opportunities to form connections.
 - This highlights that political capital is dynamic; time, opportunity, and repeated participation in networks is important.

Limitations

- **Small sample size:**
 - The analysis includes only four legislators, which limits generalizability to the broader U.S. Congress.
- **Partial multiplex structure:**
 - Only three network layers (committees, caucuses, campaign finance) are included, while other important relational ties (e.g., cosponsorship, voting) are not included.
- **Binary relationships:**
 - Relationships are present or absent, without accounting for strength, frequency, or intensity of edges.

Conclusion

- Multiplex networks provide a more complete way to measure legislative political capital than single-network approaches.
- Political capital is **layered** and **relational**, shaped by different types of ties, not just total connections.
- Political capital is dynamic, influenced by time and opportunity to build relationships across Congresses.
- Future work should expand the network to include more legislators and additional layers (e.g., cosponsorship, voting) and move toward weighted ties to capture relationship strength more accurately.
- Comparing non-adjacent Congresses (e.g., 103rd vs. 116th instead of 115th vs. 116th) could also better capture long-term change.

Acknowledgements

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References:

