Question 1

Among the three relationship networks, the coworker network is the most tightly knit with a density of 0.222, meaning that 22% of all possible coworker ties are realized. It also has the shortest average path length of 1.886, which means that nearly everyone is just one colleague or at most, two colleagues away, making it the easiest network in which to connect across the firm.

The configuration model was chosen as the baseline because it preserves each lawyer’s degree i.e., it retains how many ties each node has while randomizing who they connect to. This ensures that any differences we observe between the real network and its randomized counterparts arise from higher-order structures such as reciprocity, transitivity and average path length, rather than from simple degree variation.

Accordingly, density of the configuration model remains identical to the empirical network across all three relationship networks since it depends solely on node degrees. In contrast, average path length, reciprocity and transitivity that probe beyond individual ties reveal striking departures from chance. In the coworker network, reciprocity jumps from 20% in the random graphs to 60% in the real network, showing that formal working relationships are far more mutually acknowledged than random wiring would produce. Similar jumps occur in the advice and friendship layers where ties are overwhelmingly mutual. Reciprocity in the advice network is closer to the baseline, suggesting that hierarchical norms may impact two-way acknowledgment. The advice network’s average path length of 2.24 hops versus 2.12 at random indicates that questions funnel through a small number of trusted experts rather than diffusing evenly. The friendship network spans 2.51 friend of a friend steps on average, compared with 2.29 in the random model. This reflects tight social cliques and pronounced triadic closure, which is the tendency for two people who share a mutual friend to also become friends themselves, perfectly illustrating Granovetter’s insight that a friend of a friend is likely a friend (1973). By contrast, the coworker network’s path length remains essentially unchanged—1.88 versus 1.89 steps—demonstrating that formal work ties knit the firm together as efficiently as mathematically possible. These patterns are consistent with homophily theory (McPherson, Smith-Lovin and Cook, 2001). This theory predicts that similarity in attributes, whether it is office location, practice area, or status, drives the formation and reinforcement of ties through triadic closure and mutual acknowledgment well beyond what degree alone would produce.

Question 2

The Friend network displays the highest assortativity across all attributes making it the most homophilous of the three networks. This suggests that friendships are strongly shaped by social similarity, especially by age (0.446) and professional status (0.552). In contrast, the Advice network shows moderate assortativity, led by the same attributes, indicating that advice-seeking is influenced by seniority and experience as well, but less strongly than friendship ties. The CoWork network exhibits disassortativity across all three attributes. This means that individuals are slightly more likely to be connected to colleagues who differ from them in these attributes suggesting that coworking relationships are not shaped by personal similarity and are more heterogeneous.

Infomap identified a single community, offering no meaningful partitioning. Both Louvain and Leiden detected three communities, but Leiden was selected as the final model because its multi-level modularity optimization ensures more stable and well-connected communities (Traag et al., 2019). It was run on an undirected aggregated network, as the focus was on identifying cohesive subgroups rather than modelling directional dynamics.

The office attribute shows the strongest alignment with community structure, with the highest purity (0.930) and assortativity (0.354) among all attributes. Community 1 consists entirely of Boston-based lawyers, and Community 3 is composed exclusively of those in Hartford, indicating strong geographic clustering. Community 2 includes lawyers from all three offices, suggesting it serves as a bridge between locations. Overall, office affiliation is the primary driver of community formation in the network. Figure 2 visualises the distribution of office affiliation within the detected communities.

The practice attribute also aligns strongly with community structure, with a high purity (0.873) and assortativity (0.340). The presence of litigation lawyers across all three communities suggests this practice group is broadly integrated in the network. In contrast, corporate lawyers appear only in Communities 1 and 2, indicating some clustering by practice, but less rigid than office-based clustering. This pattern suggests that office location has a stronger influence on how communities form than professional roles. By contrast, status has minimal influence on network formation with a purity of 0.606, and assortativity of 0.148. Each community contains a mix of partners and associates. This indicates that hierarchical rank does not strongly structure interactions in the aggregated network. Figures 3 and 4 illustrate community composition by practice and status, respectively.

Overall, the Leiden-detected communities are visually well-defined in Figure 1. The modularity score of 0.298 indicates that the network exhibits meaningful clustering and is not purely random, though the division is moderate, with some overlap in node attributes. Office and practice boundaries shape ties across relationship networks, while status plays a minimal structural role. This suggests a network in which collaboration is driven more by geographic proximity and profession than by hierarchy.

Question 3

Advice-giving relationships between lawyers are most strongly predicted by office location, practice area, and partner status. In the fitted ERGM for the lawyers’ advice network, are predictors are statistically significant.

Office homophily emerges as the strongest predictor, with an odds ratio of 5.419, suggesting that lawyers who share the same office are over five times more likely to form advice ties. Practice-area homophily is also substantial, with an odds ratio of 4.160, meaning that colleagues within the same specialty are more than four times as likely to seek advice from one another. Partner status strongly increases one’s viability as an advice source, since partners are 4.624 times more likely than associates to be asked for guidance. They are also 1.351 times more likely to ask for advice from others in the network reflecting the role of seniority in shaping influence. This attribute also demonstrates the asymmetrical influence of hierarchy on advice seeking. Gender homophily is modest, with same-gender pairs about 1.515 times more likely to exchange advice than mixed-gender pairs. Age on the other hand has an odds ratio of 0.979, meaning each additional year of age reduces a lawyer’s likelihood of seeking advice by that amount. These findings highlight that proximity and shared professional context are the strongest drivers of advice-giving, while demographic and hierarchical factors play a secondary role.

The goodness‐of‐fit diagnostics confirm that ERGM provides a good fit for the predictors in the advice network. In the model statistics plot, the observed values fall within the simulated range, showing that the model reflects these effects well and that the terms are correctly calibrated. However, the model does not fit some structural features of the network as well. In both the out-degree and in-degree distributions, the observed values deviate from the simulations—especially at the high end. This means the model underestimates how many people give or receive a large number of advice ties. The edge-wise shared partners plot also shows a poor fit: the model doesn’t fully capture the amount of clustering in the real network. In other words, people who share mutual advice contacts are more common in the actual network than the model predicts. On the other hand, the model performs better on the dyad-wise shared partners and geodesic distance plots. This suggests it reasonably captures how connected the network is overall, even if it misses some of the more detailed local patterns. In summary, the model reflects the effects of individual attributes well but misses important structural features like advice hubs and clustering. Including additional structural terms could help improve the fit.

Question 4

The negative age coefficients across all three networks indicate that as lawyers get older, they become slightly less likely to form advice (−0.009), coworking (−0.008), and friendship (−0.007) ties. Partner status as a receiver has the strongest effect in the advice network where partners are 1.080 times more likely than associates to be asked for guidance. The effect is smaller in the coworking (0.380) and friendship (0.278) networks. As senders, partners are less likely to seek advice (0.361) or nominate coworkers (0.282) than associates. In the friendship network, partner status has no statistically significant effect, suggesting no consistent difference between ranks. Gender similarity modestly increases the likelihood of forming advice (0.271) and friendship ties (0.185), but has no reliable effect on coworking.

Office and practice alignment significantly increase the odds of tie formation across all networks. Lawyers in the same office are 0.943 times more likely to share advice, 0.799 to cowork, and 0.499 to form friendships, compared to those in different offices. This suggests that advice is more influenced by location than friendship. Sharing a practice area increases the likelihood of advice (0.898) and coworking ties (0.821), consistent with expectation on expertise alignment, while its effect on friendship (0.261) is relatively weak.

Reciprocity and transitivity are the strongest structural predictors across all networks. Reciprocity is especially prominent in coworking and friendship, reflecting the mutual nature of those ties. In contrast, advice ties are more directional because a lawyer is 0.642 times more likely to seek advice from someone who has sought advice from them. The significant positive gwesp terms (decay = 0.7) confirm strong triadic closure. Each additional shared advice partner increases the odds of a tie by 1.069, while each extra common coworker or friend raises the odds of a tie by 0.980 and 0.945, respectively.

Overall, physical proximity and shared professional context are the strongest predictors of tie formation. Hierarchy most clearly shapes advice ties, while coworking is driven by office proximity, reciprocity, and closure. Friendship, by contrast, relies more on demographic similarity and transitive clustering. Community detection reinforces these findings, showing that office location is the dominant force behind network structure. Lawyers tend to cluster geographically, while practice area contributes to grouping less rigidly, and status shows minimal influence. ERGM results also align with this structural view because office and practice homophily were strong predictors of advice ties. However, goodness-of-fit diagnostics reveal that while the model effectively captures attribute-based tie formation, it under represents structural features such as clustering and centralisation.

b. Which effects differ between the different models and how?

The striking shifts in predictor strength across advice, coworker, and friendship networks trace directly to the differing social logic of each tie.

Next, partner status exerts its strongest pull in advice giving—partners are almost three times more likely than associates to be asked for guidance—moderate influence on coworker ties (about forty-six percent higher odds), and a smaller boost to friendship nominations (thirty-two percent).

Gender homophily matters for advice and friendship—with same-gender pairs about thirty-one and twenty percent more likely to connect, respectively—but not for coworker ties.

Office homophily is he single most powerful predictor across all networks: sharing an office multiplies the odds of advice exchange by 2.6, of formal collaboration by 2.2, and of friendship by 1.7.

Practice-area homophily also drives ties strongly, especially advice (2.5-fold increase) and coworking (2.3-fold), and to a lesser extent friendship (1.3-fold).

Reciprocity is crucial, doubling the odds of advice ties and increasing formal and social ties by over ten times when the reverse tie exists.

Finally, triadic closure—as captured by a geometrically weighted shared-partners term with decay 0.7—more than doubles or triples the odds of any relationship for each additional mutual contact, underscoring the adage that colleagues and friends of friends become colleagues and friends themselves.

Thus, hierarchical standing most strongly drives advice‐giving, moderately shapes formal collaboration, and only subtly influences social bonding. Thus, partners appear to reach out for advice less often, collaborate more in formal work ties, and show no clear tendency either way when it comes to friendship nominations. Overall, gender homophily plays a meaningful role in advice‐giving and friendship ties but not in coworker relationships. Same office: Because all three effects are highly significant, this underscores physical proximity as a fundamental driver of professional guidance, formal teamwork, and social bonding alike. Because all three effects are highly significant, we can be confident that shared professional expertise drives not only who turns to whom for guidance but also who works together and who forms social bonds. All three effects are highly significant, highlighting that mutual acknowledgment is a core driver of professional guidance, formal teamwork, and social bonding alike—especially in coworker and friendship relationships, where symmetry is nearly essential.

Question 5

Descriptive network metrics offer a clear, intuitive snapshot of connectivity, clustering, and reachability in the advice, coworker, and friendship layers. They reveal that coworker ties are the densest and have the shortest path lengths, but they cannot distinguish whether these patterns arise from simple popularity or from deeper structural forces such as assortative mixing by status or practice, mutual acknowledgment of ties (reciprocity), transitivity or clustering (triadic closure), and core–periphery or community structures. The configuration model isolates these higher-order structures—showing which levels of reciprocity, clustering, assortativity, and path-length deviation exceed what degree alone would produce—but it says nothing about how the network breaks into cohesive modules. Leiden community detection then uncovers those modules, producing internally connected, statistically robust groups that reflect weighted interactions, yet it cannot test the significance of specific attributes like age, status, or gender in forming ties. ERGMs fill that gap by formally testing hypotheses about node attributes and these structural effects and by reproducing observed degree, clustering, and path-length distributions in goodness-of-fit checks, but they demand careful, theory-driven model specification and can be sensitive to isolates or mis-specified terms.

Coworker ties are the densest (22 percent) and most “small-world” (1.88 steps), driven by office proximity, mutual acknowledgment, and triadic closure. Advice relationships are hierarchical and selective: partners are 2.9 times more likely to be consulted, shared offices boost advice odds 2.6×, and practice alignment 2.5×, while each year of age reduces advice-seeking by 2 percent. Friendship ties are sparse but highly homophilous: same-gender, same-age, and same-status pairs are 1.5–2.6 times more likely to connect, clustering into three robust Boston–Providence and Hartford communities. Overall, proximity and shared professional context dominate, hierarchy shapes expertise exchange, and affinity governs social bonds. Advice seeking is essentially gender-neutral and crosses age cohorts, whereas friendships are strongly gendered and age‐clustered.

Triadic closure and reciprocity hold true of every network and will likely be found in other networks as well. Findings about how proximity increases co-working and advice excahnge will hold true in other knowledge-intensive settings as law firms. These professions benefit from exchange of expert advice and collaboration on cases. Heirachical nature of knowledge-intensie jobs will shape information flow in other such jobs as well. Lasltly, homophily effects where people with simialr demographies interact mor organiscally with eachother (as freinds) is likely to be generalisable as well.

The geographic division between Massachusetts offices and the Connecticut branch is specific to this firm and has driven the formation of three distinct communities. Boston and Providence lawyers intermix within two communities, while Hartford forms a more isolated third cluster—reflecting regional distance. Had all offices been in Massachusetts, connectivity might have been uniformly higher. Likewise, the pronounced partner–associate hierarchy reflects the U.S. law‐firm career structure and would not necessarily appear in organizations with flatter or different promotion systems. The clear clustering around litigation versus corporate practice areas also mirrors this firm’s legal subcultures; in other industries—such as marketing or consulting—there is often more cross‐team collaboration and less rigid specialization. Finally, the presence of two isolates in the friendship network highlights how social ties can leave some individuals disconnected; as networks grow or in settings with fewer collaborative touchpoints—like call centers—isolates may be even more common.