Equilibria, Efficiency, and Inequality in Network Formation for Hiring and Opportunity[1]

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We analyze a model of the transfer of opportunities — jobs, talks, gigs, favors, referrals, etc. — in a professional network. In the model, a set of individuals $\{1, \ldots, n\}$ each derive utility from receiving an opportunity either exogenously or from one of their social contacts in a network $G = ([n], E)$. For most of our analysis, exogenous opportunities come i.i.d. from a discrete distribution, and individuals may receive one more or one fewer opportunity than they need. If an individual receives an extra opportunity, they pass it to one of their social contacts at random.

The focus of our analysis is on how individuals would strategically form connections in order to maximize their utility. An individual derives utility 1 from having an opportunity (either realized exogenously or transferred from a neighbor), but must pay a cost $\gamma \geq 0$ for each edge they participate in. In the game we consider, before any exogenous opportunities are determined, individuals form connections amongst themselves to maximize expected utility. Social welfare is defined as the sum of individuals' utilities. As our equilibrium concept, we use a generalization of that from stable matching, where a network is stable if no pair of individuals could form a connection between them and/or, simultaneously, drop some of their existing connections. We derive several insights from this very simple model:

- We explore causes of inefficiency in the transmission of opportunities. In particular, we show how professional social networks balance the need for connectivity (if someone has an extra opportunity and they do not have many connections, there may be no person who needs an opportunity who it will get passed to) and congestion (if the network is too densely connected, individuals may inadvertently route too many opportunities to some people and not enough to others). Surprisingly, our model exhibits losses in efficiency — formulated as a price of anarchy — *even in the absence of costs associated with forming connections with others*, unlike canonical network formation games in the literature.

- We show that inequality that can arise from our model, even when individuals are *a priori* equal, and quantify it. Our model also provides structural insights about inequality: equilibrium networks exhibit *status homophily*, where at equilibrium, individuals contribute similar benefits to their neighbors as their neighbors provide to them (and potentially different from those in other parts of the network).

- We explore how a platform on which the members of the professional network interact, like LinkedIn, might try to induce better equilibria for users and prove that two natural policy levers — changing the amount of friction to connect and providing information about individuals' bandwidths — have nonmonotonic effects and may have either beneficial or adverse consequences depending on whether they are applied in a sophisticated or naive manner.

[1]The full version of the paper available here: https://arxiv.org/abs/2402.13841