

Social Network and Inequality in Career Outcomes:*

Evidence from Prosecutors in Korea

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Abstract

Although a myriad of studies have examined the role of social networks in employment, little attention has been paid to their impact on career outcomes, such as promotion. This paper therefore examines how connections with senior prosecutors with a successful career outcome affect the probability of promotion for junior prosecutors in South Korea. To identify a causal network effect, I exploit exogenous variation in networks arising from personnel transfer assignments. The result shows a positive effect from connections with successful seniors: a one standard deviation increase in the number of connections with successful seniors increases the probability of being promoted for a junior by 10.1 percentage points. Here, I evaluate the importance of three potential mechanisms: (1) skill spillovers from a senior to a junior, (2) transmission of information on a junior's performance between seniors, and (3) nepotism based on alma-mater connections. Empirical evidence consistently points to transmission of information as a major potential mechanism facilitating network effect. Skill spillovers and nepotism also play a meaningful role in determining a junior prosecutor's promotion. My findings thus suggest that matching a successful senior with a junior in minority groups is an effective way of supporting advancement and representation of minority groups within organizations.

Keywords: social networks, career, promotion, manager

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1 Introduction

It is well known that social networks play a crucial role in labor market outcomes. A number of previous studies have provided theoretical and empirical evidence of the impact of social networks on finding jobs, focusing on the role of networks as channels for information transmission. However, little attention has been paid to the impact of social networks on promotion after a worker finds a job. Also, while economists have long sought to identify the functional mechanisms behind social networks, little empirical evidence has been found to be relevant, especially to career outcomes.

This paper presents new evidence on the impact of social networks formed early in a professional's career on his or her probability of promotion. Prosecutors in South Korea will feature as the subject of this study, since the close-knitted, hierarchical nature of their society renders them a group conducive to identifying the importance of coworker connections. Korean prosecutors belong to a centralized organization with a pyramid structure that is strictly characterized by rank. Senior prosecutors train juniors, supervise their tasks, appraise their performance, and ultimately hold the power to recommend juniors for promotion. In this setting, it is more than likely that juniors who have more connections to successful seniors¹ will have more opportunities for promotion.

To construct the data on a worker's co-worker connections and career outcomes, I use web-based individual level bios for all prosecutors in Korea. These bios include each prosecutor's name, age, gender, alma-mater (high school and college), and the history of all branches of practice (office and date of transfer). Such information regarding personnel transfers is particularly significant, for it allows for an examination of an individual prosecutor's career outcomes as well as co-worker connections that occur from co-location of the same branch.

The main challenge in identifying a causal effect of social networks is accounting for unobserved individual heterogeneity. To estimate the impact of a prosecutor's social network on career outcomes, I exploit exogenous variation in networks due to periodic personnel transfers. Prosecutor personnel transfers follow a centralized process: the personnel transfer committee, which consists of high-ranking executives, reassigns all prosecutors to new branches periodically. Most juniors are transferred to a different branch every two years

¹I define a successful senior using the highest rank a senior prosecutor achieves during the course of his or her career. It is defined more precisely in section 2 below.

while seniors are transferred every year. The specific rules for personnel assignment are disclosed to neither the public nor the prosecutors, preventing prosecutors from self-selecting their next branch.

However, despite such an unpredictable rotation system, this personnel assignment process of prosecutors may not be entirely random. Here, a potential risk is systematic selection bias: more capable junior prosecutors are more likely to work with able seniors if they tend to be assigned to branches where more successful seniors are located. To the extent that personnel assignment is selective, estimations of network effect are biased. Hence, the first step in my analysis is to empirically document the extent of selection by focusing on co-location with a successful senior. The data reveals significant selection on juniors' characteristics across branches, which implies variation in network quality across branches (between-branch variation) is invalid for identifying network effects. Therefore, controlling for between-branch variation using branch-fixed effects, I exploit variation in the network within a branch over time (within-branch variation) to identify causal network effects. Empirical evidence supports the assumption that network quality and individual characteristics are independent, conditional on branch-fixed effects.

The second step in my analysis is to study how successful seniors who worked with a junior prosecutor affect the junior's promotion in the future. I assess the successfulness of a senior prosecutor by looking at the highest rank of the positions achieved in the course of his or her career, and I measure a junior prosecutor's network quality based on the number and share of successful seniors with whom he or she worked during his or her career as a junior. To account for potential selection on unobserved heterogeneity across branches, I exploit within-branch variation in network quality, controlling for between-branch variation using branch-fixed effects.

In the final part of my analysis, I explore potential explanations for underlying mechanisms of network effects on career outcomes. Three possible explanations are proposed: i) skill spillovers, ii) information transmission, and iii) nepotism based on same university-alumni connections.² A key question of interest is whether and to what extent each potential mechanism can explain a network effect on a junior's probability of promotion. To answer this question, I compare the impact of incumbent and resigned senior prosecutors based on the idea that seniors who already resigned or retired can no longer influence ju-

²The type of nepotism considered in this paper is an increase in the opportunity of a junior's promotion due to alma-mater ties rather than his or her productivity. See Section 3 for detailed discussion.

niors' promotion serving as employee referrals. To the extent that information transmission is more important than skill spillovers, connections with incumbent senior prosecutors are more valuable than those with resigned or retired prosecutors. Also, as a potential channel of nepotism, I examine the impact of same-university alumni connections on promotion.

The empirical results show that connections with successful seniors play a significant role in a junior prosecutor's career outcomes. A one standard deviation increase in connections with successful seniors raises a junior prosecutor's probability of being promoted by 10.1 percentage points. Similarly, a 10 percentage points increase in the share of successful seniors associated with a given junior increases his or her probability of promotion by 2.7 percentage points. These effects are robust against the adjustment of control variables, alternative measures of network quality, and subsamples by cohorts. I find evidence that supports both skill spillovers and information transmission as explanations of such effects. Moreover, nepotism based on alma-mater ties also exists among the alumni of the universities with relatively smaller networks.

This analysis contributes to the existing body of knowledge regarding the effect of social networks on labor market outcomes. Many studies have documented the importance of social networks in obtaining employment (e.g., Beaman 2012, Glitz 2017, and Nadler 2017), but there exists a glaring neglect of career outcomes after a worker actually finds a job, mainly due to the limited scope of available data. Against the backdrop of such a vacuum, this article goes beyond existing literature by documenting the impact of social networks on a professional's long-term career outcomes. To the best of my knowledge, this is the first paper to document promotion as an outcome of social networking effects.

In addition, this paper further contributes to the emerging literature that studies the role of the manager's characteristics in the employee's career outcomes as a potential policy measure to reduce disparity between gender and racial groups. Existing literature emphasizes the importance of manager-employee similarity in gender and race (e.g. Giuliano, Levin, and Leonard 2009; Karaca-Mandic, Maestas, and Powell 2013; Droганova 2018; Husain, Matsa, and Miller 2018; and Langan 2019). However, the manager's ability has not been considered, despite being a critical characteristic in manager-worker interactions. This paper provides new evidence on how the success of managers influences workers' career outcomes by documenting a universe of professions wherein manager-worker interactions not only serve as a channel of skill spillovers from a senior to junior, but also form the

ground for transmission of information between seniors regarding a junior’s performance. My findings thus suggest that matching a successful senior with a junior of an underrepresented group is an effective way of supporting advancement and representation of the minority.

In the following section, I describe the data and institutional background. Section 3 addresses several theories on mechanisms of social network effects. Section 4 lays out the empirical strategy, and Section 5 presents empirical results for social network effects and potential mechanisms. Finally, Section 6 concludes with a brief discussion on policy implications for supporting underrepresented minorities.

2 Data and Institutional Environment

2.1 Data Source and Sample Selection

Data Source

The dataset used in this paper comes from the web page “Law and Business (LAWnB)” which is a South Korean legal information portal.³ The LAWnB website provides the bio of all legal professionals (i.e. prosecutor, lawyer, and judge) such as their age, gender, alma-mater (high school and college) as well as their professional history, which documents all branches/district offices of one’s practice and respective dates of any changes in office or occupation. A strength of this dataset is that it provides information on each branch and district office where a prosecutor has worked and the year of each personnel transfer. This is particularly valuable in that by exploiting such information, I can measure networks which occur from co-location of the same branch.

Sample Selection

In the dataset, the number of observations who have ever worked as a prosecutor is 3,911. The main sample selection criteria are about outcome and network quality variables. The outcome variable of interest is whether a junior prosecutor achieves a position of Deputy

³The prosecutor bio data was collected in 2017.

District Attorney (DDA).⁴ It usually takes 18 to 19 years for a prosecutor to be promoted to a DDA, and because the data was collected in 2017, I exclude 2,334 prosecutors who had passed the bar exam after 1994 to avoid any censoring issue. As I will discuss below, this paper studies the initial networks formed in the first three branches of a junior prosecutor; therefore, I only consider the prosecutors who have worked in at least three branches.⁵ After excluding observations with any missing value, and following other sample selection criteria, the number of final observations is 1,146. The Data Appendix describes the detailed criteria and the number of observations lost as a result of each selection criterion.

2.2 Institutional Environment and Descriptive Statistics

Organization of the Prosecution Service

All candidates who are to become legal professionals (prosecutors, judges, and lawyers) in South Korea must pass a standardized annual bar exam in order to be certified. Since 1971, candidates who have passed the bar exam are educated for two years at the Judicial Research and Training Institute (JRTI). At the end of the training program, candidates are to apply for either a judge or prosecutor position, and their admissions are determined by their grades at the JRTI. Here, I define a cohort to be the prosecutors who entered the JRTI in the same year.

Once a prosecutor candidate gains admission, he or she is assigned to a branch office as a junior prosecutor. I will term the first branch to which a junior prosecutor is assigned as the initial branch. Initial branch assignments do not follow a random process but are rather based on bar exam and JRTI grades. That is, high-performing candidates are assigned to branches in the capital as junior prosecutors, while low-performing candidates are assigned to more remote branches. Therefore, I account for a junior prosecutor's initial branch as a proxy for pre-career (cognitive or legal) skills.

The organization of the prosecution service is of a pyramidal structure, characterized by a strictly bureaucratic hierarchy. Seniors with higher ranks supervise junior prosecutors

⁴The outcome variable and institutional environment are introduced below.

⁵Usually, a junior prosecutor is reassigned to a new branch every two years. Therefore, working in the first three branches is equivalent to six years of tenure as a prosecutor. This sample selection criterion may exclude junior prosecutors who are not motivated to be successful as a prosecutor from the sample.

with lower ranks within the same office. Figure 1 illustrates the hierarchical levels. Under the Attorney General (who is at the peak of the pyramid), there are four different ranks: District Attorney (DA), Deputy District Attorney (DDA), Head of Department (HD), and junior prosecutors in descending order. The networks of interest in this paper are connections between junior prosecutors and HDs, I therefore call an HD a *senior prosecutor*. Also, I define a *successful senior* as an HD who has achieved the position of DA at some point in his or her career.

Korea's prosecution offices are organized at state and regional levels, and they belong to the executive branch of the government. There is one supreme prosecutor's office, five high prosecutors' offices, 18 district prosecutors' offices and 39 branch prosecutors' offices. Among these various posts, junior prosecutors work in district or branch prosecutors' offices. There are several departments in each branch office, and a department consists of one HD and several junior prosecutors. Hereafter, for the sake of simplicity, both district and branch prosecutors' offices are referred to as *branches*. While the types of tasks performed by junior prosecutors do not change by branch, the number of prosecutors varies greatly across branches. Panel F in Table 1 describes the distribution of branch size during the time period of analysis. Given the large variation in the number of successful seniors across branches, personnel transfers result in the inequality in network quality.

Promotion as a Career Outcome

In this paper, I analyze promotion as a career outcome of prosecutors. This is because other common career outcome indicators, namely wage, fail to yield much useful information: the wage of a prosecutor in Korea is set by a deterministic function based on the prosecutor's tenure. On the other hand, promotion to a high rank is indicative of success and therefore a meaningful measure of a prosecutor's career outcome because the organization of prosecution service follows an up-or-out promotion system. Prosecutors of the same cohort are promoted to the next rank simultaneously, and resign if they fail to get a promotion before the next cohort rises.⁶

The primary outcome variable is a binary variable that indicates whether a junior

⁶When a prosecutor fails to be promoted to a higher rank before the next cohort rises, leaving the organization is not a *de jure* requirement, but a *de facto* requirement. The *de jure* requirement is due to the organization culture which puts emphasis on hierarchy of cohorts. Although a prosecutor who failed to be promoted decided not to resign, which is a very rare case during the period of the analysis, there is no chance of promotion anymore.

prosecutor has achieved the position of DDA during the course of his or her career. As Panel C in Table 1 shows, only 35% of the prosecutors in the sample were promoted to DDAs. Success in being promoted to a DDA is more meaningful than promotion to other positions such as HD or DA for studying the effect of social networks on promotion. This is due to the fact that most prosecutors (78%) were promoted to HDs, which suggests that becoming an HD is not a very meaningful career achievement as a prosecutor. In the case of DDA to DA promotion, on the other hand, it is a widely acknowledged fact that external factors such as affiliations with political parties are critical in rising to the rank of DA.⁷ Therefore, I focus on junior prosecutors' promotion to DDAs as a career outcome of interest.

Personnel Transfer Process and Branch Offices

To identify the causal effect of networks on promotion, the main identification strategy is to exploit exogenous variations in networks that arise from the periodic personnel transfer process of the Korean prosecution service. A junior prosecutor is re-assigned to a new branch every two years, while most prosecutors with seniority (HD, DDA, and DA) are reassigned every one year. A large majority of individual prosecutors therefore build their career by climbing from a small rural branch office up to a larger branch or district office located nearer to the capital city, rotating through different branches.

Periodic personnel transfer follows a centralized process: the personnel transfer committee consists of several high-ranking executives, who reassign prosecutors based on work performance appraisals. The detailed process for personnel assignment is not open to the public or even to prosecutors, which makes it impossible to predict which branch they will be positioned in subsequently. In other words, prosecutors mostly cannot choose in what office or branch they will next work, which alleviates concerns about selection bias in causal inference.⁸

⁷It is acknowledged that promotion to a District Attorney can be affected by the political regime of the time. For example, the president can exercise political leverage to the promotion decision so that prosecutors who have a good connection with the president (through same region of birth, same school alumni connection, etc.) are considerably more likely to be promoted to DA than those without.) are promoted to DA.

⁸Although one's subsequent branch is very unpredictable and most seniors rotate from small branches to larger branches, the personnel assignment process may not be entirely random. Potential threats in identification of network effects will be discussed in Section 4.

Measuring Network Quality

In this analysis, the primary networks of focus are those connections between junior and senior prosecutors (HDs), arising early in the career of a junior prosecutor. I define a junior prosecutor's social network as the junior's connections with senior prosecutors with whom the junior prosecutor worked at the same branch in the same period. Considering that it usually takes a long period (13 to 14 years) for a junior prosecutor to be promoted to the next rank (HD), one concern is that the network formation could be endogenous: a more capable junior may tend to be assigned to a larger branch where more successful seniors are located. To avoid this potential threat, the network building phase is restricted to the networks which are formed early in a junior prosecutor's career. Thus, I define a junior prosecutor's *initial networks* as the connections with seniors which arise from the junior's first three branches of service.⁹

The main hypothesis of this paper is that a junior prosecutor with a high-quality network is more likely to be promoted to a higher-ranking position. To consider heterogeneous network quality across juniors, I define the quality of a senior prosecutor using the final rank in his or her career. Because the prosecution service follows an up-or-out promotion system, the final rank of a prosecutor represents the highest rank achieved over one's career. Specifically, an HD whose final position was a DA is considered as a *successful senior*.

The primary measure of a junior prosecutor's network quality is the *number*(#) of successful seniors with whom the junior worked at the same branch in the same period. Coworkers in the same branch typically know each other, and seniors can observe the juniors at their branch. Therefore, the number of successful seniors who know about a junior's ability is important given that seniors can provide employee referrals. To the extent that the scale of a network is important, the number of successful seniors is a valid measure of the quality of a junior prosecutor's network.

I also use an alternative measure for network quality, *share*(%) of successful seniors, which is calculated as the ratio of the number of successful seniors to the total number of seniors with whom a junior worked at the same branch. A junior prosecutor does not necessarily equally interact with every senior prosecutor at the same branch, especially at large branches where many seniors are located. If the quality or strength of each connection is more important than the scale of his or her network, then the number of successful

⁹I implement a robustness check whether estimates of network effect are sensitive to the network formation period below.

seniors may not properly capture network quality. Given that there is no measure of actual interactions between individuals, I employ the share of successful seniors as a measure of the average quality of senior prosecutors in a junior prosecutor's network.

Panel D in Table 1 provides summary statistics for the measures of initial network quality. During his or her tenure at the first three branches, on average, a junior prosecutor encountered 49.61 seniors and 19.76 successful seniors. The distribution of a junior's connections is right-skewed: the mean is larger than the median ($19.76 > 12$), which suggests that connections with successful seniors are distributed across junior prosecutors in an unequal manner. This inequality in network quality arises from heterogeneous branch size as described in Panel F in Table 1.

Inequality in Network Quality by Alma-Mater Networks

During the period of analysis, the organization of the Korean prosecution service did not show to be diverse in gender or ethnicity. A staggering 99% of the sample are male (Panel B in Table 1), and 100% are Korean. Neither are they from a diverse academic background, as a great majority of these prosecutors have earned their bachelor degrees from a small number of prestigious universities: Panel C of Table 1 shows that more than 80 percent of the prosecutors are from one of the five major universities. Especially, graduates of Seoul National University (SNU) represent 46% of the prosecutors while those of other universities are under-represented within the organization. As presented in Panel E in Table 1, a prosecutor from a major university has much more chance to make a connection within his or her alma-mater network. On average, a junior prosecutor from SNU shares branches with 15.46 seniors who are not only successful in their career but also alumni from the junior's own university. This is more than 20 times larger than the number of such successful alumni seniors whom a junior prosecutor from other universities can meet within his or her branches (0.75). A stream of literature suggests evidence that supervisors who are members of a minority group can support workers of their group and reduce disparity between majority and minority groups. In the case of the Korean prosecution service, supporting prosecutors from under-represented universities by matching them with successful seniors from the same universities would be a suggestive policy to increase diversity and reduce the inequality of network quality. In the Results section below, I provide evidence that a successful senior from non-major universities can help the promotion of juniors within the

same alma-mater network.

3 Conceptual Framework

How do social networks affect a worker’s career outcomes? As standard human capital theory (Mincer 1974) explains, a worker accumulates human capital through on-the-job training and learning by doing. Previous studies provide evidence that social networks can be a channel of skill spillovers. For example, Azoulay, Zivin, and Wang (2010) find evidence that connections to an academic “superstar” have a positive effect on publication rates. The tasks performed by prosecutors are human-capital intensive, and junior prosecutors acquire skills under the supervision of senior prosecutors. Therefore, it is conceivable that a junior who has worked with a successful senior can increase skill level more effectively than others who have no chance to work with a successful senior.

Another potential explanation about network effects on career outcome is the transmission of information on a junior prosecutor’s work quality. Previous literature has studied the impact of social networks in an imperfect market wherein networks play the role of a channel of information transmission. For example, Calvo-Armengol and Jackson (2004) have developed a theoretical model where agents randomly receive job offers, and an employed agent passes his or her job offer to an unemployed member of his or her network. Also, Montgomery (1991) has highlighted the role of network members as employee referrals for firms in application screening processes.

Although existing theoretical frameworks do not discuss career outcomes such as promotion, these theoretical frameworks provide implications to interpret the impact of social networks on career outcomes. If the personnel committee cannot fully observe a junior prosecutor’s ability due to imperfect information, the senior prosecutors of the junior will be asked to work as employee referrals when the junior’s personnel transfer or promotion is to be determined.

Favoritism or nepotism also may exist, but it is little known to what extent nepotism is embedded in network effects. The only study which interprets network effects as nepotism is that of Wang (2013), who documented the impact of the death of a father-in-law on a worker’s earnings. Unlike Wang (2013), the type of nepotism of interest in this paper is

favoritism among coworkers who are collocated in the same branch office, and the favoritism could be strengthened by ties between two workers who have graduated from the same university. In the context of the universe of prosecutors in Korea, I define nepotism as an increased promotion opportunity due to alumni connections rather than productivity. If senior prosecutors have a taste or preference against graduates of other universities in the similar manner as per Becker's taste-based discrimination model (1971), it is likely that seniors may be willing to recommend a junior with an alumni connection to the personnel committee rather than other juniors regardless of the junior's ability.

Without any direct measure of an individual prosecutor's productivity, it is difficult to distinguish one of the explanations from the others. In this paper, I provide indirect evidence to evaluate the importance of each of the potential mechanisms by comparing a junior's connection with the seniors who resigned (or retired) before the junior's promotion is determined (*resigned seniors*) and the seniors who graduated from the same university as the junior (*same-university alumni*). Because the organization of the prosecution service follows an up-or-out promotion system, the timing of a junior's promotion is the same for all prosecutors in a single cohort. Under the assumption that resigned seniors cannot serve as employee referrals, the information-transmission explanation predicts that resigned seniors do not have a positive effect on their juniors' promotion. On the other hand, both resigned and non-resigned seniors have an equivalent impact on their junior's promotion to the extent that skill-spillovers play a major role in the network effect. In the case of nepotism, there will be a positive effect of same-university alumni connections on promotion if nepotism is an important factor of social networks.

4 Empirical Strategy

The aim of this paper is to identify the effect of a junior's connections with successful seniors on his or her probability of promotion. To study a causal network effect, it would be ideal were there random variations in the networks. However, the personnel assignment process may not be entirely random; it is possible that a systematic selection on unobserved characteristics of prosecutors across branches may exist. For example, network formation is endogenous if abler junior prosecutors tend to be assigned to larger branches where

more successful seniors work (selection on ability between branches): the measures of network quality (number and share of successful seniors) are correlated with unobserved characteristics. In this section, I thus discuss the potential endogeneity problem, and suggest an identification strategy.

A simple model to estimate the effect of network quality on promotion is:

$$Promotion_i = NetworkQuality_i\gamma + X_i'\beta_x + Z_i'\beta_z + u_i$$

where $Promotion_i$ is an indicator for whether junior prosecutor i is promoted to a DDA, and $NetworkQuality_i$ is a measure of junior i 's network quality. X_i includes observable characteristics, while Z_i represents the characteristics observed by the personnel committee but *unobserved* by researchers: bar exam and Judicial Research and Training Institute (JRTI) grades, senior prosecutors' appraisal of juniors' performance, etc.

If there is a systematic correlation between unobserved ability (Z_i) and network quality, the estimator of the network effect γ is biased. For instance, it is conceivable that juniors with high grades in JRTI and excellent performance are likely to be assigned into those larger branches with many successful seniors. To check the potential systematic selection, I document the correlation between *observable* measures of a junior prosecutor's ability and network quality: age at passing the bar exam and university selectivity.¹⁰ Panel A in Figure 2 visualizes the correlation between network quality and the observable measures of ability, which implies the existence of selection on ability across branches.

To deal with the potential selection bias across branches, the identification strategy in this paper aims to exploit *within*-branch variation in network quality over time, using branch-fixed effects to control for *between*-branch variation. If the number of successful seniors in a branch is independent of the unobserved ability of juniors who are assigned to the branch conditional on branch-fixed effects, the causal effect of successful seniors is identified.

$$NetworkQuality_{iby} \perp\!\!\!\perp (Z'_{iby}, u_{iby}) \mid Branch_b$$

Subscripts i , b , and y respectively indicate individual, branch, and year. Given a certain branch b , if unobserved characteristics are independent of network quality among

¹⁰It is conceivable that abler people are likely to pass the bar exam at younger age, and that prosecutors who graduated from the most prestigious university are likely to be competent.

the junior prosecutors who worked in branch b during different years, I can utilize year-to-year deviation within each branch as a source of exogenous variation in network quality to identify causal network effects.

There is no direct way to test whether network quality is independent of an individual's unobserved heterogeneity. However, I can show that network quality is uncorrelated with observed characteristics conditional on branch-fixed effects: if network quality is uncorrelated with every observable variable (including observable measures of ability), it will be credible to assume conditional independence between network quality and an individual's unobserved abilities. To examine the credibility of the conditional independence assumption, I empirically check the correlation between network quality and various observables conditional on branch-fixed effects and year-fixed effects. That is, using the final sample, I calculate residuals from the regression of each observable variable on branch-fixed effects and year-fixed effects, and then check whether the residuals are correlated with network quality. I construct branch-year cells again and calculate the average of the residuals of each observable variable for each of the branch-year cells.

Panel B in Figure 2 provides visual evidence of conditional independence: given branch-fixed effects, there is zero correlation between the number of successful seniors and the observable measures of ability. I repeated the same analysis for every single characteristics in my data, and it has been confirmed that network quality is uncorrelated with any observed characteristics, regardless of whether network quality is measured either by the number or share of successful seniors. The number of unsuccessful seniors is also uncorrelated with any observable characteristics. These empirical results support the credibility of the conditional independence assumption.

Based on the empirical evidence above, I estimate the following linear probability model to identify the effect of connections with successful seniors:

$$Promotion_i = NetworkQuality_i\theta + \sum_b^B Branch_{ib}\psi + X_i'\beta + U_i \quad (1)$$

Here, $Promotion_i$ is the indicator for whether individual i achieved to rise to a DDA; $Branch_{ib}$ is the indicator which equals 1 if branch b is one of the first 3 branches of

individual i ¹¹ ($b = 1, 2, 3, \dots, B$, where $B=55$ ¹²); and X_i stands for the individual characteristics which include gender, age of passing the bar exam, 48 high school-fixed effects,¹³ 43 university-fixed effects, 16 region-fixed effects, and 23 cohort-fixed effects; and U_i equals (Z'_i, u_i) . The parameter of interest is θ which represents the effect of junior i 's network quality on his or her probability of being promoted.

Note that the measure of junior prosecutor i 's network quality is i 's stock of the connections with successful seniors. The main measure of a junior prosecutor's network quality is the *number* of the connections with successful seniors that arise from the junior's first three branches. An additional measure is the *share* of successful seniors.

5 Results

Table 2 shows the estimates of the effect of connections with senior prosecutors on the probability of promotion. In panels A and B, a junior prosecutor's network quality is measured using the number and the share of successful seniors in the junior's network, respectively. Without accounting for any covariates, the number of unsuccessful seniors is not associated with a junior prosecutor's promotion probability (column 1), while 10 additional successful seniors is associated with a 2.6 percentage point increase in the probability of promotion to DDA (column [2]). Accounting for observed characteristics in columns (3) to (6), the estimates of network effect are not sensitive to covariates: the number of connections with 10 additional *successful* seniors raise the probability of promotion by 5.1 to 5.8 percentage points, while 10 additional *unsuccessful* seniors lower the promotion probability by 3.1 to 4.1 percentage points. In terms of the share of successful seniors, a 10 percentage point increase in the share of successful seniors increases the promotion probability by 2.7 to 4.3 percentage points. In column (6), I account for cohort effects and branch-fixed effects under the assumption that network quality is independent of an individual's unobserved characteristics conditional on branch and year. Given that the standard deviation of the number of a junior's connections with successful seniors is 17.7 (Table 1), a one standard

¹¹In other words, I control for branch fixed effects using a set of indicator variables for every possible combination of a junior's first 3 branches

¹²The total number of branches in the sample is 56

¹³Prosecutors in the sample graduated from 239 high schools.

deviation increase in the number of connections with successful seniors raises the promotion probability by 10.1 percentage points. Considering that only 35 percent of junior prosecutors are promoted to DDA (Table 1), the estimates of network effects in Table 2 suggest a large impact on promotion.

5.1 Potential Mechanisms

Next, I examine evidence about the potential mechanisms underlying the social network effect. By comparing the importance of resigned and non-resigned senior prosecutors, as discussed in Section 3, I evaluate the relative importance of skill spillovers from a senior to junior prosecutor and transmissions of information on the quality of a junior's performance. I also document same-university alumni connections as a potential channel of nepotism.

Connections to Resigned and Non-resigned Seniors

If networks are merely a channel of information transmission without any skill spillovers, and if senior prosecutors who have already resigned (or retired) can no longer recommend high-performing juniors to the personnel transfer committee, then only non-resigned (and successful) seniors will have a positive effect on the juniors' prospects of promotion. To the extent that skill spillovers are embedded in networks, on the other hand, there will be no difference between the impact of resigned and non-resigned seniors. To explore the importance of each potential mechanism, I measure the effect of successful seniors by categorizing them into the two groups: (i) successful seniors who resigned or retired before junior i 's year of promotion ($SuccessResigned_i$) and (ii) successful seniors who did not resign or retire before junior i 's year of promotion ($SuccessNonresigned_i$). I do not separate unsuccessful seniors ($UnsuccessfulSenior_i$) by resignation due to their extremely low retention rate.¹⁴

¹⁴In the sample, the average number of a junior's connections with unsuccessful & non-resigned seniors is 0.43, while it is 29.4 with unsuccessful & resigned seniors. See Panel D in Table 1 for summary statistics for successful & resigned seniors.

$$\begin{aligned}
Promotion_i = & \alpha_1 UnsuccessfulSenior_i + \alpha_2 SuccessResigned_i + \\
& \alpha_3 SuccessNonresigned_i + \sum_b^B Branch_{ib} \psi + X_i' \beta + U_i
\end{aligned} \tag{2}$$

Panels A and B in Table 3 respectively show the estimate of network effects measured by the number and the share of senior prosecutors in a junior prosecutor's network. In terms of magnitude, column (6) of Panel A presents that 10 additional connections with successful & non-resigned seniors are associated with 6.2 percentage point increase in the probability of promotion, while successful & resigned seniors raise the probability by 5.5 percentage points. In spite of the smaller point estimate of resigned seniors, their impact is not statistically different from that of incumbent seniors. This is consistent with the hypothesis that skill spillover from seniors to juniors is a major mechanism of social networks. However, Panel B provides evidence that transmission of information between seniors is an underlying force that affects network effects: a 10 percentage point increase in the share of successful & non-resigned seniors raises a junior's promotion probability by 5.1 percentage points, which is more than twice as large as the effect of successful & resigned seniors. This result supports that the role of successful seniors in recommending high-performing junior prosecutors is important to the junior's promotion. Putting the estimates in Table 3 together, I find evidence that both skill spillover and information transmission are crucial mechanisms of network effects.

Same-University Alumni Connections

If nepotism among same-university alumni is embedded in the network effect, those seniors who have graduated from the same university with a junior will have a larger impact than the seniors without any alma-mater connections. To provide evidence of the nepotism effect, I re-estimate equation (1) by disaggregating successful (and unsuccessful) senior prosecutors by alma-mater connection: (i) (un)successful seniors with alma-mater connections ($(Un)SuccessSameuniv_i$) and (ii) those without any connections ($(Un)SuccessDiffuniv_i$).

$$\begin{aligned}
Promotion_i = & \theta_1 UnsuccessDiffUniv_i + \theta_2 UnsuccessSameUniv_i + \\
& \theta_3 SuccessDiffUniv_i + \theta_4 SuccessSameUniv_i + \\
& \sum_b^B Branch_{ib} \psi + X_i' \beta + U_i
\end{aligned} \tag{3}$$

Table 4 reports the estimates of network effects by university-*alma-mater* tie. The estimates in columns (1) to (5) show that connections with successful (unsuccessful) seniors are positively (negatively) associated with promotion probability, regardless of same-university alumni connections. In column (6) of Panel A, the probability of promotion increases by 6.2 percentage points for each 10 additional successful & same-university seniors. The point estimate is larger for same-university seniors than for different-university seniors (0.062 vs. 0.054), but the difference is small and statistically insignificant. It is noteworthy that the negative impact of *unsuccessful* seniors is larger within *alma-mater* ties. A junior prosecutor is 5 percentage point less likely to be promoted for each 10 unsuccessful & same-university seniors. Measuring network quality using the share of successful seniors, a 10 percentage point increase in the share of unsuccessful & same-university seniors decreases the probability promotion by 3.4 percentage points.

Previous studies address that an increase in network size can mitigate the network effect on labor market outcomes, since within-network competition is heightened with a large number of network members (Calvo-Armengol 2004, Beaman 2012). In the case of Korean prosecutors, the majority are Seoul National University (SNU) graduates, while graduates of other universities are under-represented: the share of graduates of SNU in the prosecution service is 46 percent (Table 1 Panel C), allowing them to meet 20 times more numbers of successful seniors in their *alma-mater* ties than others (15.46 vs. 0.75; Table 1 Panel E). Therefore, the competition between junior prosecutors within the SNU network may mitigate the impact of *alma-mater* ties.

To examine this possibility, I re-estimate model (2) with the interactions between a network-quality measure and an indicator for SNU graduates. Table 5 provides evidence of differential effect of *alma-mater* ties by network size. In columns (5) and (6), the estimate of 4 successful & same-university seniors is huge for non-SNU graduates (0.328) while the effect on SNU graduates is much smaller. The negative effect of unsuccessful seniors is also

larger for non-SNU graduates than SNU graduates. These results are qualitatively similar even if social network quality is measured by the share of seniors (Panel B). Therefore, the result suggests that nepotism based on alma-mater ties clearly exists and has a meaningful impact among the under-represented minority group whose networks are relatively small.

5.2 Robustness Checks

The estimates of the effect of successful seniors on junior's promotion are robust to various alternative specifications. In this section, I present the results of robustness checks to i) definition of successful seniors, ii) network formation periods, and iii) subsample by cohorts.

Definition of Successful Seniors

In the main specification, a successful senior is defined as a Head of Department (HD) who is promoted to a District Attorney (DA) at some point in his or her career. An alternative and broader definition of a successful senior is an HD promoted to a Deputy District Attorney (DDA), which is a lower rank than a DA. I re-estimate model (1), which corresponds to Table 2, using the alternative definition of a successful senior. The result is reported in Table 6. In both Panels A and B, the estimates are qualitatively similar to the results in Table 2. In terms of magnitude, however, the positive effect of successful seniors decreases with the alternative definition. For example, 10 additional connections with senior prosecutors who achieved the rank of DDA increases a junior's probability of promotion by 3 percentage points (Column 6 in Table 6), which is smaller than the corresponding estimate of DA in Table 2 (5.7 percentage points). On the other hand, the negative impact of unsuccessful seniors increases with the alternative definition: 10 additional unsuccessful seniors who failed to achieve a rank of DDA lower a junior's promotion probability by 6.7 percentage points (Column 6 in Table 6), while seniors who failed to be a DA lower the probability by 4 percentage points (Table 2). The results suggest that less successful seniors more help junior prosecutors, while more unsuccessful seniors more hurt junior prosecutors.

In the main specification, a successful senior is defined as a HD promoted to a District Attorney (DA) at some point in his career. An alternative and broader definition of a

successful senior is a HD promoted to a Deputy District Attorney (DDA), which is a lower rank than a DDA. In Table 7, I repeat the analysis of Table 3 using the alternative definition of a successful senior. In Columns (3)-(6) of Panel A, the estimates are qualitatively similar to the results in Table 3. The effect of the number of successful seniors reported in Panel A is smaller than the corresponding estimates in Table 3. These results make sense because the seniors who are less successful could have a smaller impact on their seniors' career outcomes. In case of share of successful seniors in Panel B, however, the estimates are not quantitatively different from the corresponding estimates in Table 3. The estimate becomes smaller and not precise conditional on cohort and branch fixed effects (column 6).

Network Formation Periods

In the main specification, I measure initial networks as a stock of connections formed within a junior's first three branches, which correspond to approximately five to six years of tenure. As discussed in Section 2, a concern in studying the casual network effect is the chance that network formations may be endogenous. For example, previous studies suggest the possibility that an individual who begins his or her career with a high quality network is likely to make a larger network over time (e.g. Granovetter 1974, 1988, and Nadler 2017). In the context of this paper, a promising junior prosecutor who meets relatively many successful seniors at his or her initial branch may tend to be assigned to a subsequent branch where more successful seniors are located. Although my identification strategy deals with this concern by controlling for between-branch variation in network quality using branch-fixed effects, I can document this concern further by examining whether the estimate is sensitive to the network formation period.

In Table 7, I estimate model (1) by measuring a junior's network during various network formation periods. That is, I redefine a junior's network as the junior's connections with successful seniors formed in the first t branches, where $t = 2, 3, \dots, 7$. In columns (4), (6), (8), (10), and (12), the first t branch-fixed effects are constructed in a consistent manner with the main specification. Because the number of branches where a prosecutor worked as a junior differs by individuals, I additionally control for the number of branches where a prosecutor served as a junior prosecutor.¹⁵ The estimates of the network effect in Panel A decrease as the length of the network formation period increases, which implies that

¹⁵Column (4) of Table 7 corresponds to column (6) of Table 2. The estimates are slightly different because the number of branches where a junior served is controlled for in Table 7.

initial networks are more important than those formed during a prosecutor’s later career. In case of the share of successful seniors in Panel B, the estimates are less precise and do not decrease in the network formation period

Subsamples by Cohorts

The junior prosecutors of my sample passed the bar exam between the years 1971 and 1993. If there was an unknown systematic change in the personnel assignment process or any institutional changes associated with the promotion system, the main identification strategy which exploits year-to-year variation in network quality within-branch may not be valid. To check whether the main findings on the network effects are robust to time, I split the main sample into the two subsamples: prosecutors who passed the bar exam between 1971 and 1985 (*early cohorts*, 572 observations) and those who passed between 1986 and 1993 (*late cohorts*, 574 observations). In Table 8, I estimate model (1) employing interactions between the network quality measures and an indicator for the late cohort. In columns (2) and (4), the estimates are quantitatively similar with the main results in Table 2, and there is no statistical evidence showing that network effects differ between early and late cohorts.

6 Conclusion

While existing literature has provided empirical evidence on the role of social networks in finding a job, there is little evidence on the impact of social networks on a worker’s career outcomes such as promotion. In this paper, I investigate the network effect on promotion in South Korea’s prosecution service, which consists of professionals who perform highly human-capital intensive tasks, and whose promotion is an extremely significant economic outcome. Using year-to-year variation in network quality within branches, I find that one standard deviation increase in the number of connections with successful seniors raises a junior prosecutor’s probability of being promoted by 10.1 percentage points.

Further, I explore potential explanations for underlying mechanisms of the network effect. I document skill spillovers from seniors to juniors as well as transmission of information between seniors regarding a junior’s characteristics by comparing the impact resigned seniors have on a junior’s prospects of promotion to that of incumbent seniors, assuming that senior prosecutors no longer have the power to influence juniors’ promo-

tions after they have resigned or retired. Additionally, as a potential channel of nepotism, I examine the role of same-university alumni connections in getting a promotion. I find evidence that supports each of the aforementioned potential mechanisms.

My findings hence have implications for policies related to reducing minority-majority gaps within institutions. I find that social networks which arise within an organization can reinforce the disparity between the minority and majority groups: in the case of the Korean prosecution service, the alumni of a major university, representing approximately half of the organization, have 20 times more connections with successful seniors within their alma-mater network than the alumni of other universities. Yet there is room for redress: institutions may set policies to support individuals of minority groups by matching them with successful managers. Successful managers of the minority would be even better: the positive effect of successful managers on a junior worker's promotion is much larger within under-represented groups.

References

- [1] Azoulay, Pierre, Joshua Graff Zivin, and Jialan Wang. 2011. "Superstar Extinction." *Quarterly Journal of Economics* 125 (2), 549-89.
- [2] Becker, Gary S. [1957] 1971. "The Economics of Discrimination." 2nd ed. Chicago: Univ. Chicago Press.
- [3] Beaman, Lori. 2012. "Social Networks and the Dynamics of Labour Market Outcomes: Evidence from Refugees Resettled in the U.S." *Review of Economic Studies* 79, 128-161
- [4] Calvo-Armengol, Antoni. 2004. "Job Contact Networks." *Journal of Economic Theory* 115, 191-206.
- [5] Calvo-Armengol, Antoni, and Matthew O. Jackson. 2004. "The Effects of Social Networks on Employment and Inequality." *The American Economic Review* 94 (3), 426-454.
- [6] Droganova, Maria. 2018. "Women Working for Women: Career Advancement and the Gender Wage Gap in the U. S. Federal Government." Working Paper.
- [7] Glitz, Albrecht. 2017. "Coworker Networks in the Labor Market." *Labour Economics* 44, 218-230.
- [8] Granovetter, Mark S. 1973. "The Strength of Weak Ties." *American Journal of Sociology* 78 (6), 1360-80.
- [9] Granovetter, Mark S. 1974. "Getting a Job: A Study of Contacts and Careers." University of Chicago Press.
- [10] Granovetter, Mark S. 1988. "The Sociological and Economic Approaches to Labor Market Analysis: A Social Structural View." in George Farkas and Paula England, eds., *Industries, Firms and Jobs*, Plenum Press, chapter 9, 187-216.
- [11] Gee, Laura K., Jason Jones, and Moira Burke. 2017, "Social Networks and Labor Markets: How Strong Ties Relate to Job Finding on Facebook's Social Network." *Journal of Labor Economics* 35 (2), 485-518.

- [12] Giuliano, Laura, David I. Levine, and Jonathan Leonard. 2009, “Manager Race and the Race of New Hires.” *Journal of Labor Economics*, 27(4), 589-631.
- [13] Husain, Aliza N., David A. Matsa, and Amalia R. Miller. 2018, “Do Male Workers Prefer Male Leaders? An Analysis of Principals’ Effects on Teacher Retention.” NBER Working Paper No. 25263.
- [14] Karaca-Mandic, Pinar, Nicole Maestas, and David Powell. 2013, “Peer groups and employment outcomes: Evidence based on conditional random assignment in the us army.” Working Paper.
- [15] Langan, Andrew. 2019. “Female Managers and Gender Disparities: The Case of Academic Department Chairs.” Working Paper.
- [16] Mincer, Jacob. 1974. “Schooling, Experience, and Earnings.” New York: Columbia University Press (for National Bureau of Economic Research).
- [17] Montgomery, James D. 1991. “Social Networks and Labor-Market Outcomes: Toward an Economic Analysis.” *The American Economic Review*, 81 (5), 1408-1418.
- [18] Nadler, Carl. 2017. “The Dynamics of Networked Labor Markets: Evidence from Freelancers.” Working Paper.
- [19] Wang, Shing-Yi. 2013. “Marriage Networks, Nepotism, and Labor Market Outcomes in China.” *American Economic Journal: Applied Economics*, 5(3): 91-112

A1. Tables and Figures

Figure 1: The Hierarchical Levels in the Prosecution Service

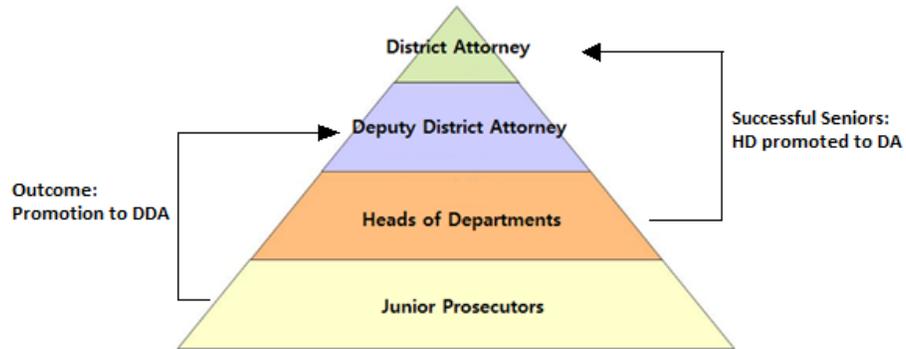
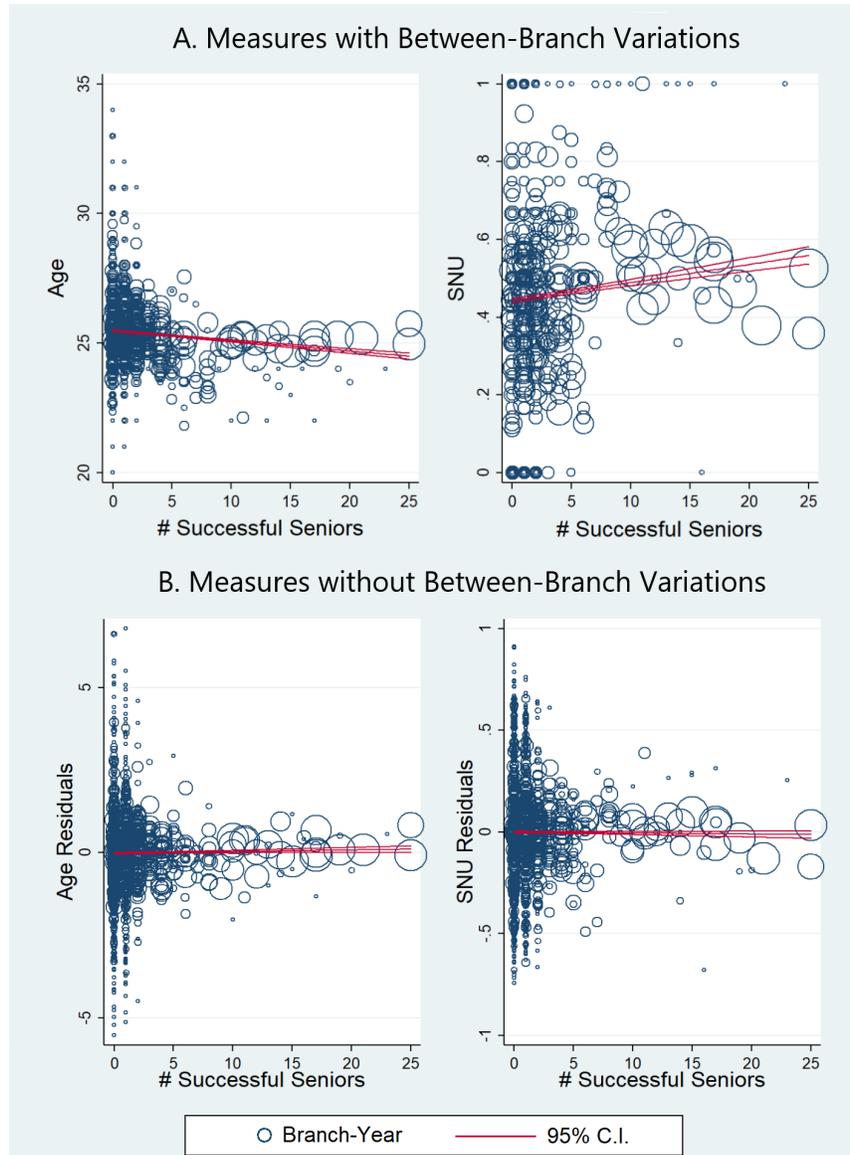


Figure 2: Observable Measures of Ability and Network quality



Note: I construct branch-year cell using the final sample which is selected in Section 2. In Panel A, for each branch-year cell, I calculate average age at passing the bar exam and the share of juniors who are graduates of Seoul National University (SNU), which is the most prestigious university in South Korea. In Panel B, I calculate the average of the residuals from the regressions of each of the characteristics on branch fixed effects and year fixed effects. Each branch-year cell is weighted by the number of juniors who worked at the branch in that year. Size of circle represents the number of juniors in each cell. See text for details.

Table 1: Summary Statistics for Individual Characteristics & Initial Network Quality

Variable	Mean	SD	10th	50th	90th	N
A. Promotion Outcomes						
Head of Department (HD)	0.78	0.42				1,146
Deputy District Attorney (DDA)	0.35	0.48				1,146
District Attorney (DA)	0.15	0.36				1,146
B. Individual Characteristics						
Female	0.01	0.1				1,146
Age at passing bar exam	25.36	2.65				1,146
C. Share of Universities						
Seoul National University (SNU)	0.46	0.5				1,146
Korea University (KU)	0.18	0.38				1,146
Yonsei University (YS)	0.06	0.23				1,146
Hanyang University (HY)	0.06	0.24				1,146
Sungkyunkwan University (SKKU)	0.05	0.22				1,146
Others	0.19	0.39				1,146
D. Initial Network Quality *						
# Seniors	49.61	34.93	17	40	98	1,146
# Successful seniors	19.76	17.65	4	12	46	1,146
# University alumni	16.27	21.26	0	6	47	1,146
# Successful university alumni	7.49	11.38	0	2	26	1,146
# Successful/resigned seniors †	14.32	14.56	2	8	37	1,146
E. Network Quality by Alma Mater						
<i>Graduates of Seoul National University</i>						
# Same university & Successful seniors	15.46	12.77	3	11	34	525
# Same university & Unsuccessful seniors	17.24	11.3	6	14	33	525
# Different university & Successful seniors	6.46	7.07	0	4	17	525
# Different university & Unsuccessful seniors	13.75	12.2	3	9	31	525
<i>Graduates of Other Universities</i>						
# Same university & Successful seniors	0.75	1.41	0	0	3	621
# Same university & Unsuccessful seniors	1.62	2.35	0	1	5	621
# Different university & Successful seniors	17.18	15.91	4	10	43	621
# Different university & Unsuccessful seniors	27.28	16.91	10	24	49	621
F. Distribution of Branch Size ‡						
# Senior prosecutors (HD)	9.29	7.94	1.45	6.45	25.95	56
# Successful seniors	3.5	4.53	0.26	1.69	13.54	56
# Junior prosecutors	31.18	29.26	4.47	21.81	95.17	56

Note: There are 1,146 individuals in 56 branch offices. * Initial networks are defined as the connections with successful seniors formed in the first 3 branches a junior prosecutor worked at. † Resigned seniors are a junior prosecutor’s seniors who left the organization of prosecution 3 years before the timing of the junior’s promotion to a DDA. ‡ Weighted average number of senior prosecutors is reported. Each branch is weighted by the number of juniors.

Table 2: The Effect of Connections with Successful Seniors on Probability of Promotion

	(1)	(2)	(3)	(4)	(5)	(6)
A. Network Quality Measure: # Successful Seniors						
# Unsuccessful Seniors * 10	-0.005 [0.007]		-0.041*** [0.010]	-0.041*** [0.010]	-0.031*** [0.010]	-0.040*** [0.015]
# Successful Seniors * 10		0.026*** [0.008]	0.058*** [0.011]	0.054*** [0.011]	0.051*** [0.012]	0.057*** [0.021]
R-squared	0.001	0.009	0.024	0.054	0.158	0.253
B. Network Quality Measure: % Successful Seniors						
% Successful Seniors			0.428*** [0.083]	0.388*** [0.084]	0.355*** [0.089]	0.272** [0.138]
R-squared			0.023	0.05	0.155	0.249
Demographics				O	O	O
University/High School FE					O	O
Full Branch FE/ Cohort FE						O
Observations	1,146	1,146	1,146	1,146	1,146	1,146

Note: Standard errors in brackets. Dependent variable is the probability of being promoted to a rank of DDA ($Promotion_i$). Demographics include gender, age at passing the bar exam, and region of birth.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 3: The Effect of Successful Seniors by Resignation

	(1)	(2)	(3)	(4)	(5)	(6)
A. Measure of Network Quality: #						
# Unsuccessful Seniors *10	-0.015 [0.012]			-0.023* [0.013]	-0.023 [0.014]	-0.041** [0.016]
# Successful & Resigned Seniors *10		0.030 [0.020]		0.042** [0.021]		0.055** [0.022]
# Successful & Non-Resigned *10			0.010 [0.026]		0.036 [0.031]	0.062* [0.033]
R-squared	0.247	0.247	0.246	0.250	0.248	0.253
B. Measure of Network Quality: %						
% Successful & Resigned Seniors				0.019 [0.130]		0.191 [0.145]
% Successful & Non-Resigned					0.397** [0.174]	0.511*** [0.194]
R-squared				0.246	0.250	0.251
Observations	1,146	1,146	1,146	1,146	1,146	1,146

Note: Standard errors in brackets. The denominator of every share measure (%) is the number of total seniors (#Successful + #Unsuccessful seniors). Dependent variable is the probability of being promoted to DDA ($Promotion_i$). All control variables, cohort fixed effects, and branch fixed effects are controlled for in every specification.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 4: The Effect of Successful Seniors by Same-University-Alumni Connection

	(1)	(2)	(3)	(4)	(5)	(6)
A. Measure of Network Quality: #						
# Unsuccessful & Different university seniors *10	-0.014 [0.016]					-0.034* [0.020]
# Unsuccessful & Same university seniors *10		-0.024 [0.023]			-0.050* [0.028]	-0.051* [0.029]
# Successful & Different university seniors *10			0.018 [0.018]			0.054** [0.024]
# Successful & Same university seniors *10				0.017 [0.022]	0.043 [0.027]	0.062** [0.028]
R-squared	0.246	0.246	0.246	0.246	0.249	0.253
B. Measure of Network Quality: %						
% Unsuccessful & Different university seniors *10	-0.077 [0.145]					
% Unsuccessful & Same university seniors *10		-0.365** [0.185]			-0.344* [0.209]	-0.271 [0.217]
% Successful & Different university seniors *10			0.157 [0.146]			0.206 [0.165]
% Successful & Same university seniors *10				0.174 [0.159]	0.039 [0.179]	0.155 [0.202]
R-squared	0.246	0.249	0.247	0.247	0.249	0.250
Observations	1,146	1,146	1,146	1,146	1,146	1,146

Note: Note. Standard errors in brackets. The denominator of every share measure (%) is the number of total seniors ($\#Successful + \#Unsuccessful$ seniors). Dependent variable is the probability of being promoted to DDA ($Promotion_i$). All control variables, cohort fixed effects, and branch fixed effects are controlled in every specification.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 5: The Effect the Number of Successful Seniors by SNU Graduates

	(1)	(2)	(3)	(4)	(5)	(6)
A. Measure of Network Quality: #						
# Unsuccessful & Different university seniors * 10	-0.010 [0.016]				-0.035* [0.021]	-0.034 [0.023]
# Unsuccessful & Different university seniors * 10 * SNU	-0.022 [0.022]					-0.006 [0.040]
# Unsuccessful & Same university seniors * 10		-0.134 [0.109]			-0.182 [0.119]	-0.19 [0.122]
# Unsuccessful & Same university seniors * 10 * SNU		0.109 [0.106]			0.139 [0.116]	0.168 [0.127]
# Successful & Different university seniors * 10			0.018 [0.018]		0.048** [0.024]	0.052** [0.025]
# Successful & Different university seniors * 10 * SNU			-0.017 [0.037]			-0.053 [0.071]
# Successful & Same university seniors * 10				0.250 [0.162]	0.328* [0.182]	0.305 [0.185]
# Successful & Same university seniors * 10 * SNU				-0.230 [0.159]	-0.272 [0.183]	-0.235 [0.188]
R-squared	0.247	0.247	0.247	0.248	0.255	0.256
B. Measure of Network Quality: %						
% Unsuccessful & Different university Seniors	-0.349** [0.136]					
% Unsuccessful & Different university Seniors * SNU	0.015 [0.213]					
% Unsuccessful & Same university Seniors		-1.494*** [0.474]			-1.341*** [0.490]	-1.317*** [0.492]
% Unsuccessful & Same university seniors * SNU		1.097** [0.507]			1.361** [0.547]	1.280** [0.565]
% Successful & Different university seniors			0.397*** [0.132]		0.319** [0.129]	0.345** [0.137]
% Successful & Different university seniors * SNU			-0.102 [0.370]			-0.231 [0.408]
% Successful & Same university seniors				0.838 [0.885]	1.106 [0.883]	1.093 [0.884]
% Successful & Same university seniors * SNU				-0.468 [0.902]	-0.684 [0.916]	-0.686 [0.916]
R-squared	0.196	0.201	0.197	0.196	0.210	0.211
Observations	1,146	1,146	1,146	1,146	1,146	1,146

Note: Standard errors in brackets. Dependent variable is the probability of being promoted to a rank of DDA. The denominator of every share measure (%) is the number of total seniors (#Successful + #Unsuccessful seniors). All control variables, cohort fixed effects, and branch fixed effects are controlled for in every specification.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 6: The Effect of Connections with Successful Seniors using Alternative Definition

	(1)	(2)	(3)	(4)	(5)	(6)
A. Network Quality Measure: # Successful Seniors						
# Unsuccessful Seniors * 10	-0.025** [0.011]		-0.069*** [0.014]	-0.068*** [0.014]	-0.054*** [0.015]	-0.067*** [0.022]
# Successful Seniors * 10		0.015*** [0.005]	0.035*** [0.007]	0.031*** [0.007]	0.032*** [0.007]	0.030** [0.012]
R-squared	0.004	0.006	0.027	0.055	0.16	0.254
B. Network Quality Measure: % Successful Seniors						
% Successful Seniors			0.427*** [0.083]	0.392*** [0.084]	0.345*** [0.088]	0.175 [0.125]
R-squared			0.022	0.051	0.154	0.247
Demographics				O	O	O
University/High School FE					O	O
Full Branch FE/ Cohort FE						O
Observations	1,146	1,146	1,146	1,146	1,146	1,146

Note: Standard errors in brackets. Successful seniors are defined as the HDs promoted to DDA. Dependent variable is the probability of being promoted to DDA ($Promotion_i$). Demographics include gender, age at passing the bar exam, and region of birth.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 7: The Effect of the Connections with Successful Seniors by Network Formation Period

Network Formation Period	First 2 Branches		First 3 Branches		First 4 Branches		First 5 Branches		First 6 Branches		First 7 Branches	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A. Network Quality Measure: Number of Successful Seniors (#)												
# Unsuccessful Seniors*10	-0.016 [0.020]	-0.033 [0.026]	-0.023* [0.013]	-0.029* [0.015]	-0.002 [0.009]	0.000 [0.011]	0.004 [0.008]	0.008 [0.009]	0.010 [0.007]	0.014* [0.008]	0.008 [0.007]	0.012 [0.008]
# Successful Seniors*10	0.054*** [0.019]	0.028 [0.033]	0.054*** [0.012]	0.055*** [0.020]	0.054*** [0.009]	0.047*** [0.015]	0.049*** [0.008]	0.034*** [0.012]	0.046*** [0.008]	0.026** [0.011]	0.049*** [0.007]	0.026** [0.011]
R-squared	0.218	0.271	0.229	0.294	0.258	0.305	0.271	0.329	0.280	0.336	0.280	0.335
B. Network Quality Measure: Share of Successful Seniors (%)												
% Successful Seniors	0.168** [0.076]	0.024 [0.102]	0.380*** [0.091]	0.213 [0.135]	0.643*** [0.106]	0.247 [0.161]	0.805*** [0.116]	0.362** [0.175]	0.836*** [0.122]	0.289 [0.182]	0.867*** [0.122]	0.295 [0.183]
R-squared	0.213	0.269	0.223	0.290	0.238	0.295	0.246	0.320	0.245	0.325	0.248	0.326
Control Variables/ Cohort FE	O	O	O	O	O	O	O	O	O	O	O	O
Full Branch FE		O		O		O		O		O		O
# Branches where junior worked		O		O		O		O		O		O
Observations	1,146											

Note: Standard errors in brackets. Dependent variable is the probability of being promoted to DDA. Control variables include gender, age at passing the bar exam, and fixed effects for high school, university, region, and cohorts. “# Branches where junior worked” is the number of branches where the individual performed as a junior prosecutor. As mentioned in Section 2, all observations in the final sample worked in at least 3 branches. For each specification, branch fixed effects are constructed in a consistent manner with the main specification (model 1).

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 8: The Effect of Successful Seniors on Promotion by Cohorts

	# Successful Seniors		% Successful Seniors	
	(1)	(2)	(3)	(4)
# Unsuccessful Seniors*10	-0.040***	-0.067**		
	[0.015]	[0.030]		
# Successful Seniors*10	0.057***	0.055**		
	[0.021]	[0.026]		
# Unsuccessful Seniors *10 * Late Cohort		0.033		
		[0.033]		
# Successful Seniors *10 * Late Cohort		-0.004		
		[0.026]		
% Successful Seniors			0.272**	0.286*
			[0.138]	[0.154]
% Successful Seniors * Late Cohort				-0.04
				[0.201]
R-squared	0.253	0.254	0.249	0.249
Cohort FE/				
Branch FE	O	O	O	O
Demographics	O	O	O	O
High school FE/				
University FE	O	O	O	O
Observations	1,146	1,146	1,146	1,146

Note: Standard errors in brackets. Dependent variable is the probability of being promoted to a rank of DDA. The prosecutors in the sample passed the bar exam between 1971 and 1993. Late Cohort is defined as the prosecutors who passed the bar exam after 1985.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

A2. Data Appendix: Sample Selection Criteria

1. From the bio data on prosecutors, I construct an individual level dataset which includes individual career outcomes and network quality variables. In the raw dataset, the number of observations who have ever worked as a prosecutor is 3,911.
2. In 1971, Judicial Research and Training Institute (JRTI) was established and there might be significant institutional change in the admission and promotion process of prosecutors among candidates who passed the bar exam. Also, as mentioned in text, a cohort is defined as the prosecutors who entered the JRTI in the same year. To measure cohort consistently, I exclude 308 observations of prosecutors who passed the bar exam before 1971.
3. The outcome variable of interest in this paper is whether a junior prosecutor achieves a position of Deputy District Attorney (DDA). Because it usually takes 18-19 years for a prosecutor to be promoted to a DDA and the data is collected in 2017, I exclude the 2,334 prosecutors who passed the bar exam after 1994 to avoid any censoring issue.
4. As discussed in Section 2, this paper studies a junior prosecutor's initial networks formed in the first three branches of a junior prosecutor. Therefore, I include only the prosecutors who have worked at least in three branches are included in the final sample, excluding 81 prosecutors who served less than 3 branches and left the organization of prosecution service.
5. 42 observations whose demographic information is missing are dropped from the sample. The number of observations in the final sample is 1,146.