Special Feature

Lifespans, Exam-Passing Age, and Careers of Joseon *Yangban*: A Prosopographic Analysis of Linked Biographical Records

Donghyeok CHOI

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Introduction

The *yangban* (literally "two classes," from *yang* "two" and *ban* "class," referring to the civil and military official classes) stood at the apex of Joseon dynasty (1392–1897) society, shaping its governance, culture, and ideology. Historical scholarship has examined the social norms associated with this class, the structure of the *gwageo* (civil service examination) system they navigated (from which status groups including *nobi*, *cheonmin*, and *seoeol* were generally barred) and the institutional framework they operated within. Much of this scholarship has proceeded qualitatively, or on samples defined by a single clan or period. One systematic alternative is prosopography, the collective biographical study of a defined group through linked biographical records. Joseon is unusually well documented for such work, preserving genealogies (*jokbo*), examination rosters (*bangmok*), and the *Joseon wangjo sillok* (*Annals of the Joseon Dynasty*, hereafter *AJD*). These sources, however, have largely been analyzed in isolation, so reconstructing individual lives from birth through exam passage, office, and death within a single sample has remained rare. How long the *yangban* typically lived and whether the age at which an official passed the *gwageo* bore any systematic relationship to later career outcomes accordingly remain largely open questions at the individual level.

Existing research on premodern Korean lifespans offers a fragmented picture. A common public perception holds that premodern Koreans lived uniformly short lives, conflating low average life expectancy at birth (driven largely by high infant mortality) with the actual longevity of those who survived until adulthood. Studies of specific groups suggest greater longevity among surviving adults. S. K. Lee (2010) found that Goryeo-era nobles lived to an average age of roughly 65, based on tomb epitaphs. Baek (2023), analyzing the vast genealogical records (*Seonwon sokbo*) of the Jeonju Yi (Lee) clan, provided demographic data for a major royal lineage spanning the 17th to 19th centuries. Research on Korean eunuchs revealed an average lifespan near 70 years, attributed to hormonal factors (Min, Lee, and Park 2012). These studies, while informative, rely on data specific to certain families or groups, underscoring that lifespan varied across social strata and time periods. The *yangban* as a broader class, however, remain largely unexamined.

Scholarship on career outcomes and social mobility within the *gwageo* system is more developed. Whether the examinations served as a "ladder of

success"—a phrase introduced in Ho's (1962) classic study of Ming-Qing China and since widely applied to the East Asian examination tradition—enabling upward mobility or primarily reinforcing existing hierarchies has long animated Korean historical scholarship. Post-colonial Korean historiography, reacting against earlier characterizations of Joseon as a stagnant society, emphasized the institutional openness of the *gwageo* and the relative permeability of *yangban* status; S. M. Lee (1980) articulated an influential four-class theory in which *yangban* standing was anchored in examination-based merit rather than heredity alone, and Han (1985) stressed the variability of elite composition across periods and the methodological limits of treating *yangban* as a closed status group. A revisionist reading from American-school scholarship pushed back: Wagner (1974) pioneered the quantitative analysis of exam rosters, documenting that successful candidates were disproportionately concentrated in a limited set of Seoul-centered leading clans while emphasizing that the examination system nonetheless retained a meaningful degree of openness. Palais (1984) argued more forcefully for the aristocratic element, characterizing Joseon's social elite as a distinctive and unusually stable balance between aristocratic and bureaucratic principles; hereditary status persisted alongside examination-based recruitment, weakened but not replaced by it, in contrast to the fuller transition to bureaucratic recruitment that followed the Tang in China. Chung (2000) subsequently underscored the need to distinguish early- from late-Joseon dynamics, and Duncan (2000) offered a balanced reassessment, showing that continuity in the composition of the central ruling class persisted across the Goryeo-Joseon transition even as the examination system formally opened pathways for new entrants. Revisiting the openness thesis on a systematically quantitative footing, Han (2013) drew on genealogical records to trace the status origins of *mungwa* passers through the early- and mid-Joseon period and argued that a substantial share entered the examinations from non-elite backgrounds.

Recent quantitative work using digitized examination records has advanced this debate considerably. Lee and Park (2019) showed that elite families concentrated investment in promising offspring rather than distributing resources equally, a strategy that sustained lineage status across generations. Lee and Park (2023) found that family backgrounds predicted career advancement among exam passers in certain periods, while Paik, Hong, and Yun (2022) demonstrated that both exam scores and lineage independently influenced the highest office attained, with lineage effects intensifying during political

instability. Na and Cha (2021) measured intergenerational performance among *mungwa* candidates, documenting both upward and downward mobility. Comparative work on Chinese examination systems has similarly explored the interplay between examination performance and social background. Song, Campbell, and Lee (2015), using Qing dynasty genealogies, demonstrated that patrilineage growth and extinction were shaped by both structural advantages and demographic contingency over centuries. Jiang and Kung (2021) showed that the Chinese imperial examinations could facilitate mobility while also transmitting hidden family advantages tied to cultural capital and kin networks, and Wen, Wang, and Hout (2024) documented rising mobility in the Tang dynasty as the examination system expanded and aristocratic pedigree declined.

Across this literature, however, the *timing* of bureaucratic entry (the age at which an official passed the exam) has rarely been treated as a distinct analytical axis alongside lineage and region, even though age-based seniority was the principal mechanism by which the Joseon promotion system translated early structural advantages into later peak rank and duration of service. Whether early entry was associated with cumulative career advantage independent of lineage and region and whether its association was uniform across historical periods are therefore open questions that the closure-versus-openness framing has left largely unaddressed. While these two bodies of research have advanced understanding of lifespan and career outcomes separately, they have rarely been brought together. The *jokbo*, *bangmok*, and *AJD* together provide the data necessary for such integration, yet they have not been systematically linked to reconstruct comprehensive life trajectories for a broad sample of the *yangban* elite. In particular, the joint relationship between timing of exam passage, region of residence at exam time, lineage, and both long-term career outcomes and lifespan has not been examined within a single linked sample. Because age was salient in Joseon administrative practice, shaping official appointments, social hierarchies, and legal standing, the age at which an official entered the bureaucracy is a plausible correlate of later outcomes, though whether it mattered once other factors are controlled remains an open empirical question. Linked biographical records allow demographic and career patterns to be identified that are not readily apparent from qualitative sources alone.

This study draws on linked biographical records to address this gap. It pursues three related lines of inquiry. First, it asks what the characteristic lifespan of the Joseon *yangban* elite was and how longevity differed by region of residence

at exam time and historical period, especially when compared to groups such as royalty and court eunuchs. Second, it examines how the age of exam passage varied across examination tracks and whether region of residence and family background predicted earlier entry into the bureaucracy. Third, it investigates whether passing the *gwageo* at a younger age was associated with greater long-term career success, measured along two complementary dimensions, peak rank attained and duration of service, and whether structural advantages such as elite lineage or capital-region residence were independently associated with those outcomes, net of exam performance. Because the research design is observational, based on retrospective linkage of pre-existing biographical records rather than random assignment, all estimates reported below are interpreted as partial associations conditional on the observed covariates, not as causal effects.

Earlier scholarship has debated the relative weight of timing of entry, family background, and examination performance in long *yangban* careers, reaching different conclusions depending on period, sample, and method. Linked biographical records permit these claims to be evaluated on a common empirical basis rather than adjudicated in the abstract. How does peak rank vary across Early-, Middle-, and Late-passage cohorts, and is any such variation robust once structural factors are accounted for? How does duration of service relate to age at passage? What is the association between the number of *mungwa*-passing ancestors and a descendant's peak rank? Is rank within one's own exam cohort independently associated with career outcomes once lineage, region, and period are accounted for? And do the century-by-century shifts visible in the raw data reflect genuine period patterns, or changes in who sat the examinations?

Data and Methodology

Data Sources

This study integrates two primary sources to analyze lifespan and career patterns among the Joseon elite. First, the foundational dataset comprises biographical information on Joseon officials sourced from Who's Who in Korean History (Hanguk yeokdae inmul jonghap jeongbo siseutem), developed and maintained

이항복(李恒福)

[문과] 선조(宣祖) 13년(1580) 경진(庚辰) 알성시(謁聖試) 병과(丙科) 4위(08/12)

[인물요약]

· UCI	G002+AKS-KHF_13C774D56DBCF5B1556X0
· 자(字)	자상(子常)
· 호(號)	백사(白沙)
· 초호(初號)	필운(弼雲)【補】
· 호(號)	동강(東岡)【補】(주1)
· 시호(諡號)	문충(文忠)
· 생년	병진(丙辰) 1556년 (명종 11)
· 졸년	무오(戊午) 1618년 (광해군 10)
· 향년	63세
· 합격연령	25세
· 본인본관	경주(慶州)
· 거주지	한성([京])

[관련정보]

[사전] 인물 생애 정보

[이력사항]

· 선발인원	12명 [甲1·乙3·丙8]
· 전력	유학(幼學)
· 관직	문형(文衡)
· 관직	의정부영의정(議政府領議政)
· 공신	평난공신(平難功臣)
· 봉호	오성부원군(鰲城府院君)
· 문과시제	표(表) : 송정이등진수정학제(宋程頤等進修正學制)
· 기타	청백(淸白) 무오폐론입절(戊午廢論立節) 율촌찬비(栗村撰碑) 월사찬표지(月沙撰表誌) 계곡찬장(谿谷撰狀) 9의고행소3년(九議孤行素三年)

Figure 1. An Illustration of the *Who's Who in Korean History* (Lee Hangbok)

by the Academy of Korean Studies (AKS).[1] Although public access to this system officially concluded on December 31, 2024, the archived data remains available. It provides essential details, including birth and death dates, family background,

1 Available at http://people.aks.ac.kr/.

examination records, and key appointments, for a wide range of individuals: civil officials (*munban*), military officials (*muban*), technical specialists (*japkkwa*) passers, and *saengwon/jinsa* (classics and literary licentiates). Birth and death years are available for 7,760 officials, enabling lifespan analysis, while birth year and exam pass year data for 77,642 officials enable the analysis of exam-passing age. Figure 1 shows an example entry for the *munban* official Lee Hangbok (1556–1618).

Second, to supplement this biographical base and trace career trajectories, promotion and appointment records were systematically extracted from the *AJD*, curated by the National Institute of Korean History (NIKH).[2] This extensive historical chronicle offers detailed accounts of political activities, allowing for the reconstruction of individual career paths, including ranks attained and tenure in specific positions. Figure 2 illustrates the career records of Lee Hangbok in the Annals, through which 4,006 *munban* officials were identified and matched with their corresponding career records. This metadata was incorporated into the dataset.

To situate official lifespans within a broader social context, two comparison groups were incorporated. Eunuch lifespan data were drawn from the appendix of Min, Lee, and Park (2012), which reports reconstructed lifespans for 81 eunuchs from the Naesibu (Bureau of Palace Eunuchs) registers preserved in the Jangseogak archives. The extracted comparison dataset used here contains

이름	이항복(李恒福)
본관	경주(慶州)
성씨	이(李)
자	자상(子常)
호	필운(弼雲)
시호	문충(文忠)
생년	1556
몰년	1618
신분	문반

관력

왕대	왕력	년	월	일	관력	형태	해당기사
선조	15	1582	6	1	봉교(奉敎)	현직	바로가기
선조	18	1585	9	1	정언(正言)	현직	바로가기
선조	19	1586	8	24	홍문관 수찬(弘文館修撰)	현직	바로가기
선조	19	1586	12	1	수찬(修撰)	현직	바로가기
선조	23	1590	6	1	응교(應敎)	현직	바로가기
선조	25	1592	5	1	이조 참판(吏曹參判)	현직	바로가기
선조	25	1592	6	2	병조 판서(兵曹判書)	현직	바로가기
선조	25	1592	12	13	병조 판서(兵曹判書)	현직	바로가기
선조	25	1592	12	14	병조 판서(兵曹判書)	현직	바로가기

닫기

Figure 2. An Example of Career Records in the *AJD* (Lee Hangbok)

2 Available at http://sillok.history.go.kr.

Table 1. Overview of Datasets Used

Dataset Description	Primary Source	Provider / Curator
Biographical Data of Officials	*Who's Who in Korean History*	The Academy of Korean Studies (AKS)
Promotion & Appointment Records	*The Annals of the Joseon Dynasty*	National Institute of Korean History (NIKH)
Eunuch Lifespan Data	Appendix of "The Lifespan of Korean Eunuchs"	Min et al. (Min et al. 2012)
King Lifespan Data	*Encyclopedia of Korean Culture*	The Academy of Korean Studies (AKS) (AKS 2024)

48 eunuchs with complete birth and death years, so the figures reported below reflect this narrower reanalyzed subset rather than the full 81-person series. Eunuchs differed from examination officials in both physiology and occupation, and Min, Lee, and Park (2012) attributes their marked longevity to endocrine effects of castration. They nonetheless shared the palace environment and elite proximity of senior officialdom without its examination-based career structure. Royal lifespans for all 27 Joseon monarchs were compiled from entries in the *Encyclopedia of Korean Culture*,[3] cross-checked against the *Annals*. Kings faced the distinct stressors of hereditary rule and confinement to the palace, yet their birth and death dates are among the most reliably documented in the historical record. These two groups serve as contextual comparison points for the longevity of examination officials rather than strict upper or lower bounds: because neither group passed the *gwageo*, they do not enter the exam-age or career analyses that follow, which depend on examination and appointment records. Table 1 summarizes the four datasets used in this study.

Data Construction

To integrate these heterogeneous sources, this study constructed a relational database. The database is organized around a core *person_record* entity, linked via junction tables to examination records, geographic-origin data, birth and death years, kinship ties, and career appointment histories (Figure 3). This schema enables prosopographical queries that span multiple source types: for instance, retrieving all officials from a given province who passed the *mungwa* before age 25 and subsequently attained senior rank.

3 Available at https://encykorea.aks.ac.kr.

Each individual in the database is assigned a Universal Content Identifier (UCI), Korea's national standard for persistent digital identifiers, managed by the Korea Copyright Commission and derived from the source document's URI. This enables deterministic cross-source matching; the same person appearing in an exam roster and in the *Annals* can be linked without probabilistic matching. Exam roster entries are connected to person profile records via a curated mapping table, and career records from the *Annals* are linked to exam-roster individuals by matching on UCI. This linkage yielded 4,006 unique *munban* officials with both examination and career data. Kinship ties are encoded using the original Korean relationship terminology: father (*bu*), grandfather (*jobu*), great-grandfather (*jeungjobu*), and maternal grandfather (*oejobu*). This encoding enables computation of the *Ancestors* variable by counting how many direct forebears also passed the *mungwa*.

However, UCI-based linkage has important limitations. Not all officials recorded in *Who's Who in Korean History* have corresponding entries in the *Annals*, so only a subset of *munban* officials could be linked to career records. Moreover, person identifiers in the *Annals* are themselves imperfect; aliases, variant name spellings, typographical errors, and transcription inconsistencies in the original digitization mean that the same individual is sometimes split across multiple identifiers, while distinct individuals sharing similar names occasionally collapsed into a single record. For this reason, the career analysis is restricted to officials for whom a UCI-based match could be established, and posthumous titles (*jeungjik* 贈職) and any appointment dated after the official's death year are filtered out so that both the highest-grade and office-span measures reflect only in-life service. A further selection constraint operates upstream of the data; the *gwageo* was formally restricted by status, with *nobi*, *cheonmin*, and *seoeol* generally barred from sitting the examinations. The analysis sample is therefore doubly selected, first by status-based access to the exams and then by survival of records into the digitized rosters and Annals.

The resulting integrated dataset contains 99,133 exam-roster records spanning the dynasty. Of these, 7,760 individuals have both birth and death years (enabling lifespan analysis) and 77,642 have birth year and exam date (enabling exam-passing age analysis). Family clans were deduplicated by matching origin places and surnames in both scripts. These counts reflect records after applying the inclusion criteria described in the following subsection.

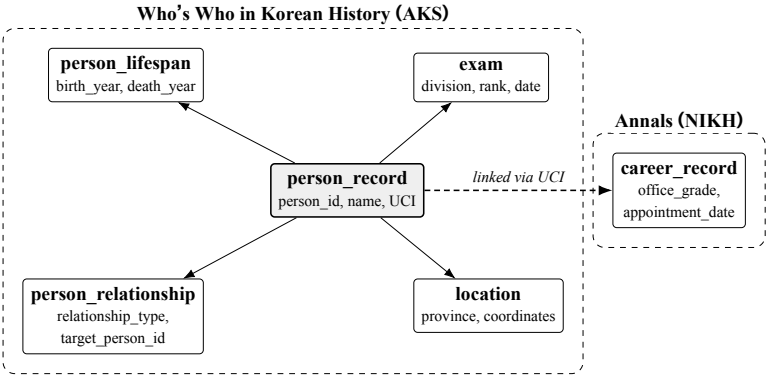

Figure 3. Simplified Entity-Relationship Diagram of the Prosopographical Database

Variable Definitions

Table 2 summarizes the key variables used in this study. The following paragraphs explain the rationale behind their construction and the data handling decisions involved.

The primary outcome in the lifespan analysis is *Lifespan*, calculated as the difference between recorded death and birth years. Birth and death dates come from examination registries in *Who's Who in Korean History*. Because candidates sometimes reported different birth years across repeated exam attempts, only the first reliable record was used for each individual and records with missing or conflicting death data were excluded.

Entry into the Joseon bureaucracy was through the *gwageo* examination system, which classified officials into four tracks: *munban* (civil service), *muban* (military service), *japkkwa* (technical fields), and *saengwon/jinsa*. This classification is captured in the Official Class variable. Although some individuals passed examinations in more than one category, each person is assigned to a single track in the analytical sample based on the first successful exam, yielding mutually exclusive Official Class categories. Closely related is Exam-Passing Age, which records the age at first successful exam and thus captures the timing of entry into officialdom. Records with an exam-passing age under 10 were removed, as these likely reflect transcription errors or idiosyncrasies in the sexagenary calendar system. When an individual passed multiple types of exams, only the first successful attempt was used, since this marks the point of initial

bureaucratic entry.

Two contextual variables capture the individual's background. Region was determined from the location self-reported at the time of first examination; historical locations were standardized to modern South Korean provincial divisions, as administrative boundaries changed over the course of the dynasty. The variable, Ancestors, counts the number of direct forebears (father, paternal grandfather, paternal great-grandfather, and maternal grandfather) who had also passed the *mungwa*. Because the database encodes adoption and remarriage variants of each kinship tie, a single individual can have more than four qualifying forebears, yielding counts above four in some cases. A higher count indicates a more established bureaucratic lineage, which may have provided advantages through social networks, educational resources, or name recognition. Because this variable specifically counts *mungwa* passers, its interpretation differs slightly across official classes; for *munban* officials, it measures direct lineage continuity within the civil service track, while for other classes it captures cross-track elite connections.

Two variables measure career outcomes. *Office Grades* standardizes the Joseon ranking system, which comprised 18 grades from *jong* 9 *pum* (the lowest) to *jeong* 1 *pum* (the highest), on a numerical scale of 1 to 18. When records listed ambiguous ranks, the grade was interpolated by averaging the minimum and maximum plausible ranks for the position. *Office Span* measures career duration in days from first recorded promotion to the last recorded appointment. Because individuals sometimes received posthumous honorific titles or continued to be mentioned in the *Annals* after death, the span was capped at 60 years (21,900 days) and post-mortem records were excluded.

Finally, for the career analysis, exam-passing age was categorized into three Age Groups: "Early" (20 or younger, roughly corresponding to the traditional Confucian age of adulthood), "Middle" (21–35, the most common range based on observed data), and "Late" (over 35, representing delayed entry). These thresholds are informed by historical context but are ultimately heuristic. To reduce the influence of extreme values in the career analysis, a symmetric percentile-based trimming was applied to Estimated Office Span once (excluding observations below the 2.5th or above the 97.5th percentile), and the two career regressions were then run on this common trimmed sample so that the Highest Office Grade and Office Span models share identical observations.

Table 2. Definitions and Handling of Key Variables Used in Lifespan and Career Analysis of Joseon Officials

Variable	Definition	Measurement	Notes
Lifespan	Duration of life	Death Year–Birth Year	Based on *bangmok* / AKS data; earliest reliable birth year used. Records missing death year excluded.
Exam-Passing Age	Age at first successful *gwageo* pass	Calculated in years	Entries <10 excluded. Only first successful attempt used if multiple passes exist.
Official Class	Classification by exam type	Categorical (*Munban*, *Muban*, *Japkkwa*, *Saengwon/Jinsa*)	Assigned by first successful exam pass; individuals with multiple passes are classified by their initial track, yielding mutually exclusive categories.
Region	Self-reported place of residence at time of first exam	Categorical (standardized to modern provinces)	Based on self-report in the *bangmok* roster, not ancestral origin. Adjusted for consistency across historical boundary changes.
Century	Century of birth (Models 1–2) or exam passage (Model 3)	Categorical (14th–19th)	Captures broad temporal variation in institutional and social conditions.
Ancestors	Number of direct *mungwa*-passed forebears (paternal line plus maternal grandfather)	Count (0–6+)	Proxy for elite lineage; reflects inherited advantage in civil service entry. Counts above 4 arise from adoption or remarriage variants in the kinship data.
Exam Rank	Normalized placement in examination	Continuous (near 0 to 1)	Lower values indicate better performance. Calculated as rank divided by cohort size; never exactly 0.
Highest Office Grade	Peak official rank attained during lifetime	Numerical (1 = *jong* 9 *pum* to 18 = *jeong* 1 *pum*)	Maximum grade across all in-life appointments; posthumous titles (*jeungjik*) excluded as AJD records do not consistently capture them.
Office Span	Duration of official service	Days (first to last recorded appointment; capped at 60 years)	Capped at 21,900 days. Records after death disregarded to avoid inflation.
Age Group	Categorized exam-passing age	Categorical (Early: <=20, Middle: 21–35, Late: >35)	Based on normative age stages in Confucian culture; thresholds are heuristic.

Methods

Using the integrated database described above, this study employs two complementary analytical approaches. First, One-Way Analysis of Variance (ANOVA) tests whether group means differ significantly across categories. Where the ANOVA *F*-test rejects the null hypothesis of equal group means, Tukey's Honestly Significant Difference (HSD) post-hoc test (Barnette and McLean 1998) identifies which specific pairs differ. Three ANOVA comparisons are conducted: lifespan across six groups (four official classes, eunuchs, and

kings); exam-passing age across the four official classes; and career outcomes across three exam-passing age groups (Early, Middle, and Late) among *munban* officials. Because some analyses involve very large samples (e.g., $N > 74{,}000$ for exam-passing age), even small differences can reach statistical significance. Throughout the tables, significance levels are indicated by asterisks: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Because each analysis addresses a different research question and draws on different source tables, the three analytic samples differ in both size and scope. The *lifespan* analysis uses 7,485 individuals (officials of all four classes plus kings and eunuchs as comparison groups), restricted to those with both a recorded birth and death year. Before the lifespan ANOVA and regression, officials were trimmed at the 2.5th and 97.5th percentiles of lifespan, while kings and eunuchs were retained in full as comparison groups. The *exam-passing age* analysis uses 74,313 officials across all four classes, restricted to those with a valid birth year and recorded exam pass. The *career* analysis is narrower still, covering 1,174 *munban* officials whose UCI could be matched to career records in the *Annals*. The restriction to *munban* reflects the fact that only *munban* officials appear consistently in the *Annals*; the birth- and death-year requirements follow from the computations of exam-passing age and Estimated Office Span, respectively. Because *muban* (*mugwa*-pass) careers are sparsely covered in the *Annals*, they cannot be subjected to the same appointment-based analysis here; the separate scholarly literature on *mugwa* officials relies on different source bases (military-register and genealogy data) and focuses on military rank trajectories that fall outside the scope of our career findings.

The three samples are related but not identical. Individuals in the career sample have birth and death years, a recorded exam pass, and *AJD*-linked career records, so they belong to the pre-trimming eligibility pool for the lifespan and exam-age analyses. The final analytic samples are not perfectly nested, however, because the lifespan and career analyses apply separate trimming rules to different outcomes. The career sample is therefore best understood as a narrower *AJD*-linked *munban* subset of the broader linked-record population, not as the exact intersection of the final lifespan and exam-age analytic samples. Regression samples are reduced further from the counts above: 6,298 for lifespan, 66,293 for exam-passing age, and 578 for the career regressions. The career regression sample of 578 is obtained from the 1,174 *AJD*-linked *munban* officials by (1) dropping records with missing province, lineage, or rank information and (2)

trimming the top and bottom 2.5% of Estimated Office Span; missingness on province accounts for most of the reduction. These reductions are reported alongside the respective results.

One feature of the career sample warrants explicit comment. Because career records derive entirely from the *AJD*, officials with sparser *AJD* coverage are underrepresented in what the data can measure. *AJD* visibility itself correlates with rank and influence, and within the career sample Late-passage officials have on average fewer than half the *AJD* appearances of Early-passage officials (Early: mean 55.5; Middle: 48.7; and Late: 22.3). A naïve reading of the career results could therefore attribute to Age Group what is in fact a documentation artifact.

We address this concern in the Career Analysis with a robustness check that refits both career regressions while controlling for per-official *AJD* appearances (Table 15); the results are discussed in Section "Robustness to *AJD* Visibility."

Second, Ordinary Least Squares (OLS) multiple linear regression (Montgomery, Peck, and Vining 2012) is used to assess the independent contribution of each covariate while holding others constant. ANOVA reveals *whether* group-level differences exist but cannot disentangle the simultaneous contributions of region, period, lineage, and exam performance. OLS regression addresses this by estimating the partial association of each factor with the outcome, adjusting for the others. Three models are specified, each targeting a distinct research question. All variable definitions follow Table 2. Categorical predictors use treatment coding with Gangwon (Gangwondo) as the reference for Region, the fourteenth century for Century, and Early for Age Group. Gangwon was selected as a substantively neutral baseline, sitting apart from the *yangban*-dense *samnam* (Chungcheong, Jeolla, and Gyeongsang), the politically marginal north (Pyeongan, Hamgyeong, and Hwanghae), and the capital region. For each model, generalized variance inflation factors (GVIF) were examined to check for multicollinearity (Fox and Monette 1992); the maximum $\mathrm{GVIF}^{1/(2\,\mathrm{Df})}$ across all four outcome columns is 1.17, well below the conventional threshold of 2 (Table 3), indicating low linear redundancy among the observed predictors in these specifications. A complementary specification that re-estimates the two career regressions with a clan (*bongwan*) random intercept is reported in Appendix B. Given the large sample sizes in Models 1 and 2, the central limit theorem supports the validity of inference even under moderate departures from normality.

Table 3. Generalized Variance Inflation Factors Across Regression Models

Predictor	Lifespan	Exam Age	Highest Office Grade	Office Span
Region	1.00	1.00	1.02	1.02
Century	1.00	1.01	1.02	1.02
Exam-Passing Age Group	–	–	1.04	1.04
Mungwa Ancestors	–	1.03	1.17	1.17
Normalized Exam Rank	–	1.00	1.04	1.04

Model 1: Predictors of lifespan

The first model asks whether region of residence at exam time and historical period are associated with how long officials lived, after accounting for their mutual confounding. Regional differences in longevity might reflect compositional shifts across centuries rather than a distinct regional association; conversely, apparent temporal trends could reflect changing regional composition of the sample. The model is specified as:

$$L_i = \beta_0 + \beta_1 r_i + \beta_2 c_i + \varepsilon_i \qquad (1)$$

In Equation (1), L_i denotes Lifespan, r_i denotes Region, c_i denotes Century, and ε_i is the error term. The predictor set is deliberately parsimonious. While elite lineage could plausibly be associated with longevity through better nutrition, healthcare, or reduced exposure to physical hardship, the available data do not include direct measures of wealth or living conditions; including ancestry as a proxy would risk conflating its association with those of region and period. Region and century therefore capture the primary environmental and temporal variation available, while keeping the model interpretable. Official Class is likewise omitted. The Tukey HSD comparisons reported below (Table 6) show that lifespan differs significantly across official tracks in only one of six pairwise contrasts (muban vs. munban), indicating that Official Class captures little between-track variation in lifespan beyond what is already visible at the group level. For transparency, Table 16 reports a diagnostic fit of Model (1) that adds Official Class as a predictor; no Official Class dummy attains significance, and the regional and temporal coefficients are essentially unchanged.

Model 2: Predictors of exam-passing age

The second model examines what factors were associated with the timing of bureaucratic entry. Earlier passage may reflect individual preparation, but it may

equally reflect structural advantages; candidates from Seoul had readier access to educational resources, and those from established lineages may have benefited from accumulated cultural capital. The model therefore extends the covariate set to include ancestry and exam performance:

$$E_i = \beta_0 + \beta_1 r_i + \beta_2 c_i + \beta_3 k_i + \beta_4 a_i + \varepsilon_i \qquad (2)$$

In Equation (2), E_i denotes Exam-Passing Age, r_i denotes Region, c_i denotes Century, k_i denotes normalized Exam Rank, a_i denotes the number of mungwa Ancestors, and ε_i is the error term. Including exam rank tests whether stronger performers tended to pass at younger ages; including ancestors tests whether elite lineage independently predicted earlier entry, net of regional and temporal variation. Because exam rank and exam-passing age are measured at the same examination event, the association between them is correlational rather than causal; this model identifies demographic and structural covariates of passing age, not causal determinants. Official Class is omitted from the regression despite its strong association with exam-passing age in the ANOVA. The ANOVA establishes that passing age differed by track; the regression asks a different question, namely which background factors (region, lineage, or period) predicted earlier passage within the system as a whole. Including Official Class dummies would absorb the very between-track variation that reflects these structural factors, since the choice of examination track was itself partly determined by family background and regional norms. The coefficients reported for Model (2) therefore estimate the track-unadjusted total association of region, lineage, and period with exam-passing age, not within-track effects net of Official Class.

Model 3: Predictors of career success

The third model addresses the study's central question: what predicted long-term career outcomes? Career success admits no single measure, so two complementary outcomes are modeled in parallel. The primary outcome is Highest Office Grade, the peak rank an official attained during his lifetime (on the standardized 1–18 scale, where 18 = *jeong* 1 *pum*). This follows the dominant historiographic convention: Joseon genealogies (*jokbo*), conduct biographies (*haengjang*), and tomb inscriptions routinely summarize a career by its highest office, and prosopographic studies of the *yangban* elite have followed suit (Wagner 1974; Paik, Hong, and Yun 2022). The secondary outcome is Estimated Office Span, the number of days between first and last recorded

appointment (capped at sixty years), which captures a distinct dimension of career success: sustained presence in office rather than peak rank. The two outcomes address historiographically distinct questions: who rose highest and who served longest. Posthumous titles (*jeungjik*), which the *Annals* records in-life only rarely and inconsistently, are excluded from both outcomes; this leaves unmeasured the small share of careers whose official memory was elevated after death, a limitation noted in Section "Discussion and Conclusion."

The key covariate of interest is Age Group (Early, Middle, or Late passage), which tests whether the timing of entry into the system, and by extension the compounding advantage associated with the seniority-based promotion system (*gajabeop*) (S. M. Lee 1980; Kim 2017), was associated with career achievement. Region, century, ancestors, and exam rank are included to isolate the independent contribution of each factor:

$$H_i = \beta_0 + \beta_1 g_i + \beta_2 a_i + \beta_3 k_i + \beta_4 r_i + \beta_5 c_i + \varepsilon_i \quad (3)$$

$$S_i = \gamma_0 + \gamma_1 g_i + \gamma_2 a_i + \gamma_3 k_i + \gamma_4 r_i + \gamma_5 c_i + \eta_i \quad (4)$$

In Equations (3) and (4), H is Highest Office Grade, S is Estimated Office Span, and g is Age Group. Both models share identical predictors, sample, and coding scheme, so any divergence in their coefficient patterns reflects a substantive difference in how the predictors relate to peak versus duration.

This model is restricted to *munban* officials whose UCI could be matched with career records in the *Annals*, as career data are available only through this linkage. Unlike Models 1 and 2, which define Century from birth year, Models 3 and 4 define Century from exam year, since the institutional context at the time of bureaucratic entry is more directly relevant to career outcomes. Models 1 and 2 include all officials with valid data for the respective outcome. The three models are expected to explain different shares of variance by construction. Lifespan and exam-passing age are associated with many phenomena that administrative records preserve only indirectly; premodern mortality was dominated by infectious disease, accident, political violence, and life-course contingency, while the timing of exam passage reflects early-life preparation, household resources, and idiosyncratic attempt timing beyond the structural covariates available here. The corresponding R^2 values are therefore expected to be modest. Career outcomes, by contrast, were closely tied to institutional rules the covariates capture directly (seniority-based promotion, rank grade), so the two

career models should recover a larger share of variance. The R^2 patterns reported in the analysis sections reflect this asymmetry.

Lifespan Analysis

We first examine group-level differences in lifespan before turning to multivariate predictors.

Group-Level Patterns in Lifespan

Table 4 presents descriptive statistics for each group. The One-Way ANOVA (Table 5) confirms that not all groups experienced the same average lifespan (F (5, 7,479) = 17.20, $p < .001$). The significant F-test nonetheless warrants closer examination of specific group comparisons
using the Tukey HSD post-hoc tests.

Figure 4 shows eunuchs with the highest mean lifespan (72.3 years) and kings with the lowest (46.2 years). Kings also show the widest variability (SD = 16.7). The four official groups cluster between approximately 59 and 62 years, showing broadly similar central tendencies.

The Tukey HSD post-hoc comparisons identify two main patterns (Table 6). Court eunuchs lived significantly longer than every other group, averaging about 26 years longer than kings and approximately 10–13 years longer than

Table 4. Lifespan Statistics by Group

Official Class	Count	Mean	Std
Eunuch	48	72.33	13.90
Japkkwa	37	62.46	12.82
King	27	46.15	16.65
Muban	363	59.39	14.01
Munban	1,541	61.74	12.47
Saengwon/Jinsa	5,469	60.80	12.83

Table 5. ANOVA Results on Lifespan Differences Among Cohort

Source	DF	Sum of Squares	Mean Square	F	p-value
Classes	5	14,168.47	2,833.69	17.20	<.001***
Residual	7479	1,232,372.45	164.78		

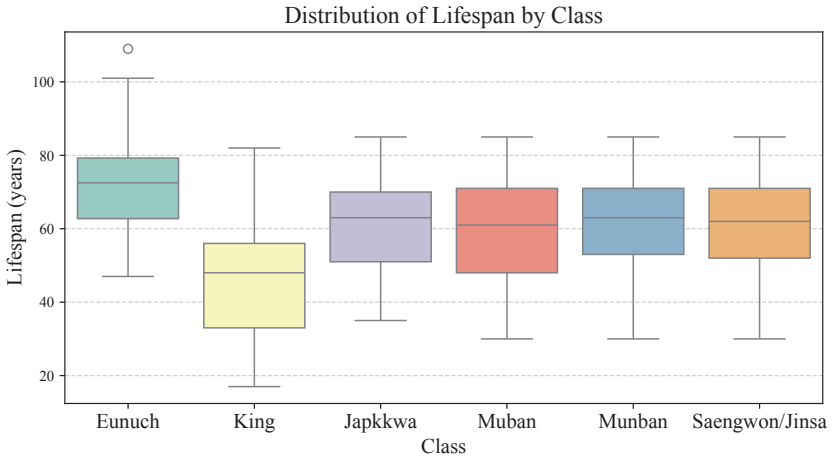

Figure 4. Distribution of Lifespan by Group

Table 6. Tukey HSD Pairwise Comparisons of Lifespan

Group 1	Group 2	Mean Diff (Group 2 - Group 1)	p-adj
Eunuch	*Japkkwa*	-9.87	0.006**
Eunuch	King	-26.19	<.001***
Eunuch	*Muban*	-12.94	<.001***
Eunuch	*Munban*	-10.60	<.001***
Eunuch	*Saengwon/Jinsa*	-11.53	<.001***
Japkkwa	King	-16.31	<.001***
Japkkwa	*Muban*	-3.07	0.737
Japkkwa	*Munban*	-0.72	0.999
Japkkwa	*Saengwon/Jinsa*	-1.66	0.971
King	*Muban*	13.25	<.001***
King	*Munban*	15.59	<.001***
King	*Saengwon/Jinsa*	14.65	<.001***
Muban	*Munban*	2.34	0.022*
Muban	*Saengwon/Jinsa*	1.41	0.329
Munban	*Saengwon/Jinsa*	-0.93	0.118

the four official classes (all $p < .01$). Kings had significantly shorter lifespans than all other groups (all $p < .001$), possibly reflecting the distinct pressures and circumstances of royal life.

Figure 5 visualizes pairwise differences in mean lifespan. Each cell compares the group on the vertical axis to the group on the horizontal axis; positive values (red) indicate longer life, negative values (blue) shorter. Significance markers are

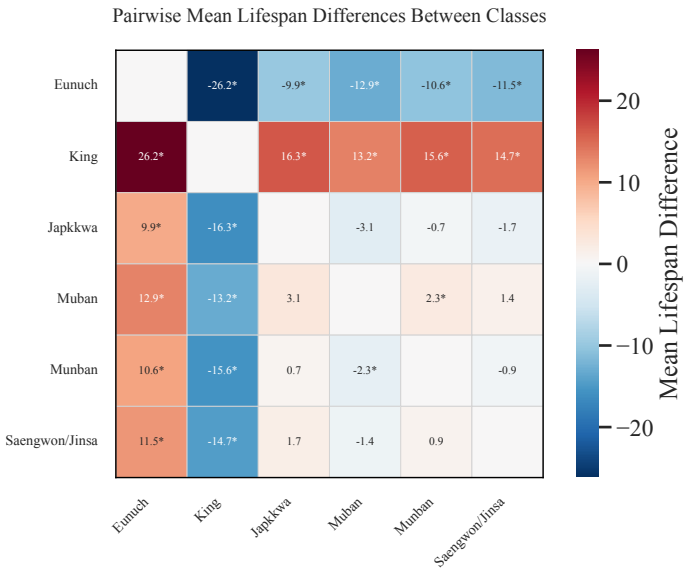

Figure 5. Pairwise Differences in Mean Lifespan Among Official Classes
Note: Asterisks indicate significance under Tukey HSD ($p < .05$).

based on the Tukey HSD results reported in Table 6.

Among the four official tracks, most pairwise comparisons show no significant lifespan differences. The one exception is *muban* versus *munban*: military officials lived on average 2.34 years less than civil officials ($p = .022$). The remaining five pairwise comparisons among official tracks, including *japkkwa* and *saengwon/jinsa*, yielded non-significant results ($p > .05$).

This pattern suggests that while the specific career path showed little overall association with longevity at the class level, the physically demanding nature of military service or compositional differences in the *muban* population may be consistent with their modestly shorter lifespans. These group-level patterns raise the question of whether regional and temporal factors are independently associated with lifespan variation.

Regional and Temporal Patterns in Lifespan: A Multivariate Analysis

The multiple linear regression model (Equation 1) examines lifespan as a function of region and century (Table 7). The regression sample comprises 6,298 officials (excluding eunuchs and kings, who lack region data) with valid province

Table 7. Multivariate Regression Results for Lifespan: Regional and Temporal Effects

Variable	Coef.	Std.Err.	t	P>|t|
Intercept	64.836	4.730	13.708	<.001***
Region: Gyeonggi	-3.475	1.571	-2.213	0.027*
Region: Gyeongsang	-1.360	1.431	-0.950	0.342
Region: Seoul	-4.132	1.394	-2.965	0.003**
Region: Jeolla	-3.139	1.479	-2.122	0.034*
Region: Chungcheong	-2.572	1.491	-1.725	0.084
Region: Pyeongan	-4.020	2.065	-1.946	0.052
Region: Hamgyeong	-2.640	2.514	-1.050	0.294
Region: Hwanghae	-1.393	2.158	-0.645	0.519
Century: 15th	-3.815	4.573	-0.834	0.404
Century: 16th	-1.769	4.532	-0.390	0.696
Century: 17th	-0.633	4.531	-0.140	0.889
Century: 18th	1.158	4.535	0.255	0.798
Century: 19th	1.566	4.547	0.344	0.731

of origin, reduced from the 7,485 individuals in the ANOVA sample. The overall model is statistically significant (F (13, 6,284) = 10.40, $p < .001$), but the adjusted R^2 of 0.019 indicates that these factors account for only about 1.9% of the total variance, leaving most variability unexplained.

Controlling for centuries, several regions show significantly shorter lifespans than the reference region (Gangwon). Seoul officials lived approximately 4.13 years less ($p = .003$), followed by Gyeonggi (–3.48 years, $p = .027$) and Jeolla (–3.14 years, $p = .034$). No other regional differences reached significance.

Century shows no significant association with lifespan. Although some later-century coefficients are positive relative to the 14th-century baseline, none reached statistical significance (all $p > .05$). Any underlying temporal patterns may require more granular periodization to detect. In summary, region of residence at exam time (particularly Seoul) showed a stronger association with lifespan variation than century-level periodization. A diagnostic refit that adds Official Class to Model 1 is reported in Appendix A (Table 16); no Official Class dummy attains significance, and the regional and temporal coefficients are essentially unchanged, supporting the parsimonious specification used here. With these demographic baselines established, we turn to the timing of bureaucratic entry.

Exam-Passing Age Analysis

Group-Level Patterns in Exam-Passing Age

Exam-passing age reveals distinct patterns by examination track (Table 8). While earlier dynasty data are limited, the *bangmok* records, particularly from later periods, often include candidates' birth years, which enables this analysis (Won 2007; 2023).

ANOVA (Table 9) confirms that mean exam-passing age differs across the four official classes ($F(3, 74{,}309) = 1{,}496.24$, $p < .001$). Figure 6 shows the distribution of exam-passing age by official class.

Table 8. Exam-Passing Age Statistics by Official Class

Official Class	Count	Mean	Std
Japkkwa	5,467	24.50	7.12
Muban	24,019	32.80	8.07
Munban	6,136	33.62	9.18

Table 9. One-Way ANOVA Results on Exam-Passing Age Differences Among Class Groups

Source	DF	Sum of Squares	Mean Square	F	p-value
Classes	3	337,334.76	112,444.92	1496.24	<.001***
Residual	74309	5,584,426.35	75.15		

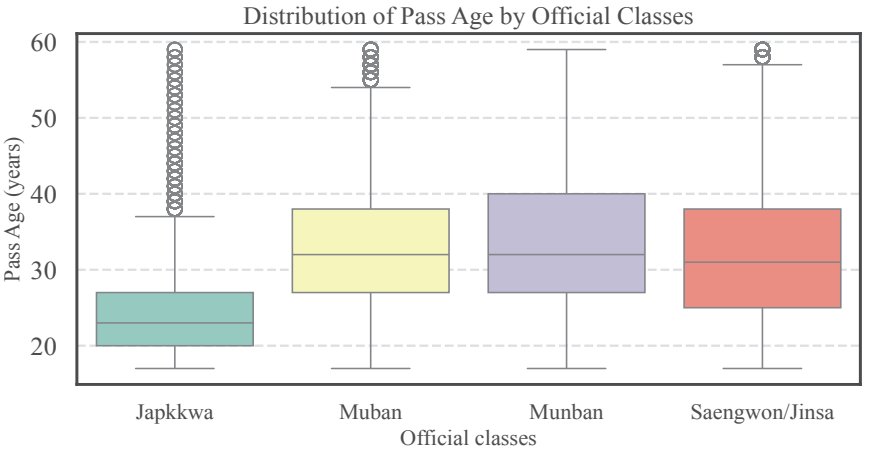

Figure 6. Distribution of *Gwageo* Exam-Passing Age by Official Class

Table 10. Tukey HSD Pairwise Comparisons of Exam-Passing Age

Group 1	Group 2	Mean Diff (Group 2 - Group 1)	p-adj
Japkkwa	*Muban*	8.29	<.001***
Japkkwa	*Munban*	9.11	<.001***
Japkkwa	*Saengwon/Jinsa*	7.54	<.001***
Muban	*Munban*	0.82	<.001***
Muban	*Saengwon/Jinsa*	-0.75	<.001***
Munban	*Saengwon/Jinsa*	-1.57	<.001***

Tukey HSD post-hoc tests reveal statistically significant distinctions in all pairwise comparisons ($p < .001$; Table 10). The results establish a clear hierarchy in average passing age, ordered from youngest to oldest: *Japkkwa*, *Saengwon/Jinsa*, *Muban*, and *Munban*. At the extremes, *japkkwa* technical specialists passed approximately 9.1 years earlier than *munban* civil officials. *Saengwon/Jinsa* and *muban* fell between these two groups, with *saengwon/jinsa* passing slightly earlier than *muban*.

Figure 7 visually summarizes these pairwise differences, following the same

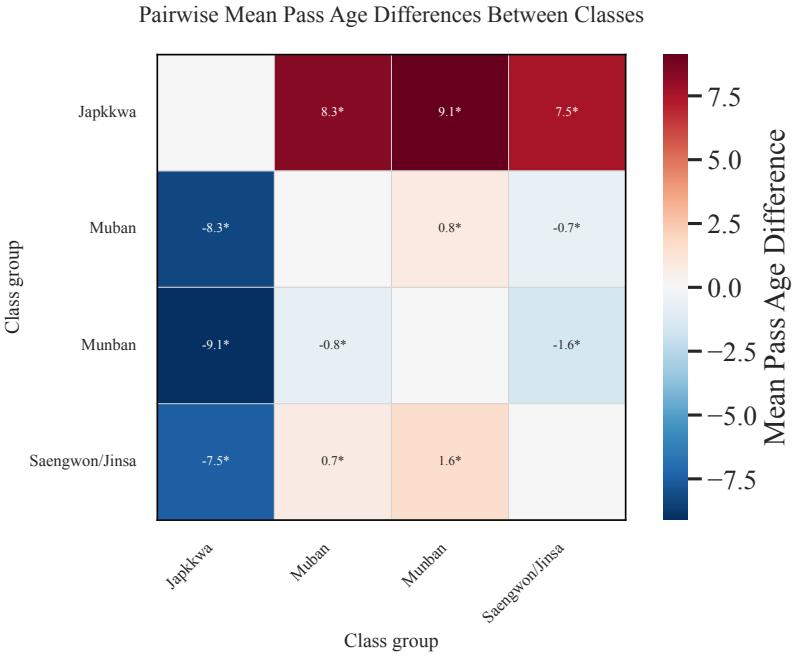

Figure 7. Pairwise Differences in Mean *Gwageo* Exam-Passing Age Among Official Classes
Note: Asterisks indicate significance under Tukey HSD ($p < .05$).

layout as Figure 5. The systematic differences highlight how the typical timing of bureaucratic entry varied considerably by career track. To identify which background factors independently predicted exam-passing age, we turn to a multivariate regression.

Regional and Temporal Patterns in Exam-Passing Age: A Multivariate Analysis

A multivariate linear regression (Equation 2; Table 11) examines covariates of exam-passing age. The regression sample comprises 66,293 individuals with valid data for all covariates (region, century, exam rank, and ancestry), reduced from the 74,313 in the ANOVA sample primarily due to missing region or ancestry data. The model is statistically significant ($F(15, 66{,}277) = 222.2$, $p < .001$), though its adjusted R^2 of 0.048 indicates that the included covariates account for about 5% of the variance, more than the lifespan model but still modest.

The results nonetheless reveal substantively meaningful regional and background associations.

Table 11. Multivariate Regression Results for Exam-Passing Age: Regional and Temporal Effects

Variable	Coef.	Std.Err.	t	P>|t|
Intercept	32.827	3.042	10.790	<.001***
Region: Gyeonggi	0.068	0.206	0.329	0.743
Region: Gyeongsang	0.069	0.213	0.322	0.747
Region: Seoul	-3.317	0.196	-16.921	<.001***
Region: Jeolla	-0.024	0.219	-0.109	0.914
Region: Chungcheong	-0.155	0.214	-0.722	0.470
Region: Pyeongan	-2.089	0.224	-9.333	<.001***
Region: Hamgyeong	-0.637	0.257	-2.482	0.013*
Region: Hwanghae	-0.944	0.231	-4.093	<.001***
Century: 15th	-4.564	3.065	-1.489	0.136
Century: 16th	2.686	3.037	0.884	0.376
Century: 17th	0.771	3.037	0.254	0.800
Century: 18th	1.821	3.037	0.599	0.549
Century: 19th	-0.858	3.037	-0.282	0.778
Normalized Exam Rank	-0.066	0.017	-3.832	<.001***
Number of *Mungwa* Ancestors	-0.404	0.136	-2.975	0.003**

Geographic origin shows a strong association. Seoul candidates passed approximately 3.32 years earlier than those from Gangwon ($p < .001$), and Pyeongan candidates 2.09 years earlier ($p < .001$). Hwanghae (–0.94, $p < .001$) and Hamgyeong (–0.64, $p = .013$) also showed significantly earlier passing ages. No significant differences emerged for Gyeonggi, Gyeongsang, Jeolla, or Chungcheong.

No century coefficient reached statistical significance (all $p > .1$), suggesting that broad temporal periodization does not account for meaningful variation in exam-passing age once regional and background factors are controlled.

The analysis also examined individual achievement and background. Normalized exam rank (where 0 represents the top-ranked candidate and 1 the lowest) shows a statistically significant but negligible association with exam-passing age (coefficient = –0.066, $p < .001$). The negative sign indicates that lower-ranked candidates (worse performance) passed marginally younger, but the magnitude is trivial: moving across the entire range of the scale corresponds to a difference of less than one month. This association, while statistically significant given the large sample size, is not substantively meaningful and may reflect compositional differences among cohorts rather than any causal relationship between performance and timing. Having a greater number of *mungwa* ancestors, by contrast, was associated with a more substantive and significant reduction in exam-passing age (coefficient = –0.404, $p = .003$), consistent with the advantage typically attributed to established elite lineage. In summary, family background and regional origin showed the strongest associations with exam-passing age, while exam performance and broad century-level temporal variation showed negligible or non-significant associations after adjusting for other covariates. Given that the timing of entry varied systematically by background, we next ask whether this timing was itself associated with long-term career outcomes.

Career Trajectory and Exam-Passing Age

Group-Level Patterns in Career Outcomes

The two primary outcomes, *Highest Office Grade* and *Estimated Office Span*,

Table 12. ANOVA Comparison of Career Success Metrics Across Exam-Passing Age Groups

Metric	F	p-value	Late - Early	Middle - Early	Middle - Late
Highest Office Grade	8.80	<.001***	-1.37**	-0.579	0.790**
Estimated Office Span	45.63	<.001***	-3,839.37***	-910.26	2,929.11***
dangsanggwan Status	8.34	<.001***	-0.165**	-0.048	0.118***
Appearances in *AJD*	21.61	<.001***	-33.23***	-6.83	26.40***

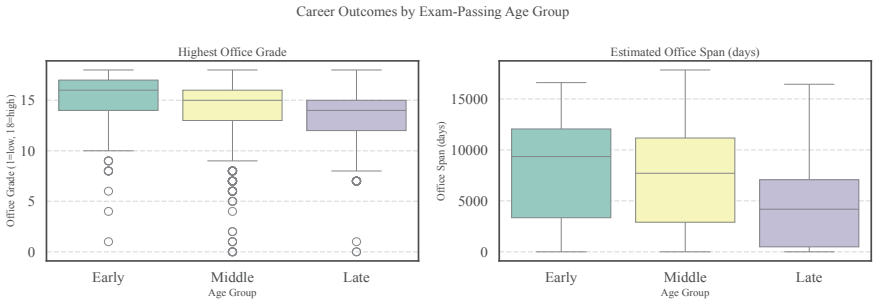

Figure 8. Distribution of Highest Office Grade and Estimated Office Span by Exam-Passing Age Group

follow the definitions set out in Section "Methods" and Model 3. Two further measures appear as supplementary outcomes in the group-level analysis. *dangsanggwan Status* is a binary indicator of whether an official attained the senior third rank (*dangsanggwan*) or above, the threshold marking clear elite status. *Number of Appearances in the AJD* indexes political visibility, since frequent mentions in the *Annals* reflect sustained engagement with court deliberations. Both are reported alongside the ANOVA as complementary perspectives; the multivariate regressions focus on Highest Office Grade and Office Span.

All four measures were tested across three passage groups: Early (≤20), Middle (21–35), and Late (>35). All four show significant differences by group (Table 12); Highest Office Grade yields F (2, 1,171) = 8.80, p < .001, and Estimated Office Span yields F (2, 1,171) = 45.63, p < .001.

Figure 8 shows the distributions of the two primary career outcomes by exam-passing age group. The paired panels make the contrast between peak rank and service duration visible: later passers show especially shorter office spans, while the peak-rank differences are more compressed.

Table 13. Highest Office Grade and Estimated Office Span by Exam-Passing Age Group

		Highest Office Grade		Office Span (days)	
Exam-Passing Age Group	Count	Mean	Std	Mean	Std
Early	89	14.57	3.42	8,295.47	5,292.16
Middle	786	13.99	3.31	7,385.21	4,993.29
Late	299	13.20	3.07	4,456.10	4,065.01

Table 13 summarizes the two primary outcomes by age group. For *Highest Office Grade*, early passers (N = 89) reach the highest peak ranks on average (mean 14.57, SD 3.42), middle-age passers (N = 786) a slightly lower average (13.99, SD 3.31), and late passers (N = 299) the lowest (13.20, SD 3.07). Translating these means into attainment rates, 76.4% of Early, 71.6% of Middle, and 59.9% of Late passers reached the *dangsanggwan* threshold (grade 14 or above), consistent with the historical observation that late entrants were less likely to attain senior officeholding status.

For *Estimated Office Span*, the gradient is steeper and roughly parallel to the rank gradient; early passers served on average 8,295 days (about 23 years; SD 5,292), middle passers 7,385 days (about 20 years; SD 4,993), and late passers only 4,456 days (about 12 years; SD 4,065). The Tukey HSD contrasts in Table 12 show that the Early–Late and Middle–Late gaps are significant for both outcomes, while the Early–Middle gaps are not. The dominant pattern is therefore a disadvantage associated with late entry rather than a graded advantage across all three groups, a pattern that is consistent across peak rank, duration of service, *dangsanggwan* attainment, and *Annals*-visibility.

Regional and Temporal Patterns in Career Outcomes: A Multivariate Analysis

To isolate the independent contribution of each factor, we estimate two OLS regressions in parallel on the same *munban* sample (N = 578; see Section "Methods" for how this sample is obtained from the 1,174 *AJD*-linked officials). The first takes Highest Office Grade as the outcome (Model 3); the second takes Estimated Office Span (Model 4).

Exam-passing age shows the most consistent association across both outcomes, but the pattern differs in a substantively telling way. For Highest

Table 14. Multivariate Regression Results for Career Outcomes

	Highest Office Grade		Office Span (days)	
Variable	Coef.	Std.Err.	Coef.	Std.Err.
Intercept	11.628***	1.064	6,481.06***	1,544.29
Exam-Passing Age Group: Middle	-0.566	0.483	-1,442.82*	700.721
Exam-Passing Age Group: Late	-1.082*	0.519	-3,735.07***	753.999
Region: Gyeonggi	-0.386	1.235	-424.071	1,792.71
Region: Gyeongsang	-1.156	1.210	-1,942.74	1,756.12
Region: Seoul	1.335	1.180	1,908.92	1,713.16
Region: Jeolla	-1.170	1.260	-2,655.62	1,829.55
Region: Chungcheong	-0.041	1.243	-827.346	1,805.32
Region: Pyeongan	-2.265	1.448	-2,937.48	2,101.97
Region: Hamgyeong	-2.606	1.934	-3,237.00	2,808.38
Region: Hwanghae	-5.463	3.297	-5,979.49	4,786.95
Century: 15th	3.828***	0.788	1,735.63	1,143.54
Century: 16th	1.212**	0.466	162.240	676.217
Century: 17th	1.695***	0.393	1,741.95**	571.245
Century: 18th	2.364***	0.352	1,872.07***	510.767
Century: 19th	2.529***	0.312	969.159*	453.000
Number of *Mungwa* Ancestors	0.330*	0.136	171.487	198.096
Normalized Exam Rank	-0.905	0.510	-197.927	740.117

* $p < .05$, ** $p < .01$, *** $p < .001$.

Office Grade (Table 14, left panel), Late passage is associated with a –1.08-grade gap relative to Early passage (p = .038), while Middle passage is not significantly different from Early (–0.57, p = .242). The gradient is therefore step-shaped; Early and Middle passers reached comparable peak ranks on average, but Late passers fell roughly one full grade short. For Estimated Office Span (Table 14, right panel), both later groups show significantly shorter terms than Early passers: Middle by 1,443 days (about four years, p = .040) and Late by 3,735 days (about ten years, p < .001). Office Span thus shows the expected monotone gradient, while Highest Office Grade does not; even officials who entered in their twenties and early thirties eventually climbed to roughly the same peak as the early passers, just over a shorter service window.

Region did not reach conventional significance in either model. Seoul shows the largest positive coefficient in both (+1.34 grades, p = .259; +1,909 days, p = .266), and the northern provinces (Pyeongan, Hamgyeong, and Hwanghae) show the largest negative point estimates in the rank model

(Hwanghae −5.46, p = .098; Pyeongan −2.27, p = .118), but the trimmed sample (N = 578) leaves limited power for regional contrasts with eight non-reference categories.

The null finding for Seoul is nonetheless notable; while capital-region candidates passed the examinations significantly earlier (Model 2), this earlier entry was not associated with significantly higher peak rank or longer service once age group, lineage, and period were included as covariates.

The century coefficients trace a general rise in both outcomes after the founding period. For *Highest Office Grade*, all five later centuries exceed the 14th-century baseline by positive and significant margins, ranging from +1.21 grades for the 16th century (p = .010) to +3.83 grades for the 15th (p < .001), with the 18th (+2.36, p < .001) and 19th (+2.53, p < .001) showing the next largest coefficients. For *Estimated Office Span*, the 17th through 19th centuries show positive and significant coefficients (+969 to +1,872 days, $p \leq .033$), while the 15th (p = .130) and 16th (p = .810) do not differ significantly from the 14th. The upward pattern on peak rank is therefore broad-based across post-founding centuries, while on service duration it is concentrated in the latter half of the dynasty. The magnitudes of the contrasts themselves are somewhat sensitive to the small 14th-century reference group, which comprises only about a dozen passers from the first decade of the dynasty, but the direction is consistent across both outcomes.

Family background diverges sharply between the two outcomes. Each additional *mungwa* ancestor is associated with a +0.33-grade increment in peak rank (p = .016), but the associated difference in service span is only +171 days and far from significant (p = .387). Elite lineage was therefore associated with *how high* an official rose, but not with *how long* he served. Exam rank, by contrast, is non-significant in both models (p = .076 and p = .789); relative placement within a successful cohort showed no meaningful association with either peak rank or service duration.

The two regressions differ in overall fit. Highest Office Grade yields R^2 = 0.195 (adjusted R^2 = 0.172), $F(17, 560) = 8.47$ (p < .001); Estimated Office Span yields R^2 = 0.241 (adjusted R^2 = 0.219), $F(17, 560) = 11.12$ (p < .001). Office Span is therefore somewhat better predicted by the structural covariates than is peak rank, a gap that is itself consistent with the pattern above; duration of service is more tightly pinned to timing of entry, while peak rank depends on promotion decisions that our predictors capture only partially.

Across the two regressions, late entry is associated with lower values on both peak rank and service length, but asymmetrically; relative to Early passers, Middle passers show shorter service durations but no significant gap on peak rank, while Late passers show reductions on both. Lineage is significantly associated with higher peak rank (+0.33 per ancestor, $p = .016$)but shows essentially no association with service duration. Exam rank shows no association with either outcome once the structural covariates are included.

Robustness to AJD Visibility

Because the career outcomes are measured entirely from the *AJD*, officials with richer *Annals* coverage are mechanically more visible; more appointments recorded means more opportunities for a high grade or a late terminal date to enter the data. Within the career sample, the mean number of *AJD* appearances per official differs sharply across age groups (Early: 55.5; Middle: 48.7; and Late: 22.3), raising the concern that the Age Group coefficients reported above could partly reflect differential documentation rather than differential careers.

As a robustness check, we refit both career regressions with per-official *AJD* appearances added as an additional covariate. Table 15 reports the focal coefficients side by side with the main specifications. The pattern is instructive. For Estimated Office Span, the Late coefficient attenuates only modestly (from −3,735 to −3,388 days) and remains significant at $p < .001$; the Middle coefficient is essentially unchanged, moving from −1,443 to −1,487 days ($p < .05$). Office Span is therefore robust to *AJD* visibility; even among equally well-documented officials, Late passers serve substantially shorter terms. For Highest Office Grade, the Late coefficient attenuates more sharply (from −1.08 to −0.88) and loses conventional significance, while the Middle coefficient is essentially unchanged.

This divergent pattern makes substantive sense. *AJD* appearances is itself partly a consequence of career success (high-rank officials generate more mentions), so controlling for it partially controls for the outcome of interest. The attenuated HOG Late coefficient should therefore be read as a plausible lower bound on the true coefficient under a sensitivity specification that partly absorbs the outcome, rather than as evidence that the Late gap is spurious. The survival of the Span gap at roughly 85% of its original magnitude, despite this

Table 15. Robustness of Age Group Effects to AJD Visibility Control

	Highest Office Grade		Office Span (days)	
Variable	Main	+ AJD Vis.	Main	+ AJD Vis.
Exam-Passing Age Group: Middle	-0.566	-0.592	-1,442.82*	-1,487.01*
Exam-Passing Age Group: Late	-1.082*	-0.878	-3,735.07***	-3,388.33***
AJD Appearances	–	0.033***	–	55.74***
Region, Century, Ancestors, Exam Rank	Yes	Yes	Yes	Yes
R^2	0.195	0.346	0.241	0.436
N	578	578	578	578

Note: Focal rows only: all models control for Region, Century, *mungwa* Ancestors, and Normalized Exam Rank. "+*AJD* Vis." adds per-official Annals appearances. * $p < .05$, ** $p < .01$, *** $p < .001$.

overcontrolling, strengthens the case that Late passers genuinely served shorter bureaucratic careers. The weaker robustness of the HOG association suggests that peak rank, which turns on observing any single high appointment, is more sensitive to documentation density than Span, which depends only on the interval between first and last recorded appointment.

A second concern, beyond *AJD* visibility, is that lineage plausibly operates at the clan level; officials from the same ancestral seat (*bongwan*) share patronage networks, residential clusters, and factional alignments that the covariate set does not measure directly. To check whether the individual-level coefficients are absorbing clan-level variation, we re-estimate Models 3 and 4 as linear mixed models with a *bongwan* random intercept; the full specification, coefficient comparison, and ICC diagnostics are reported in Appendix B (Table 17). In this specification, the focal coefficients are substantively unchanged, most notably the *mungwa* ancestry coefficient (from +0.330 to +0.335 on peak rank), and the intraclass correlation is about 1% on each outcome. The result suggests that adding a simple clan random intercept does not materially alter the main coefficients, though it does not rule out more complex clan-by-period or network effects.

Discussion and Conclusion

This study examined the lifespans and career trajectories of the Joseon dynasty's

yangban elite using linked biographical records. Three parallel analyses of overlapping but non-coextensive samples (lifespan, exam-passing age, and career outcomes) converge on a central finding; structural factors, particularly family background and the timing of bureaucratic entry, were associated with life outcomes at least as strongly as individual achievement within the examination system. Geographic origin played a selective role, associated with lifespan and exam-passing age but not with career outcomes independently.

In the lifespan analysis, court eunuchs had the highest average longevity, living about 26 years longer than kings and approximately 10–13 years longer than the four official classes, echoing the pattern reported by Min, Lee, and Park (2012); as in that earlier work, the eunuch sample here is restricted to court-registered individuals who survived to adult palace service, so the comparison reflects longevity conditional on entry into that specific role rather than castration effects in the general population. Kings had the shortest lifespans among the groups examined. Among the four official tracks, only *muban* officials showed a significantly shorter lifespan than *munban* officials (2.34 years, $p = .022$); the remaining pairwise comparisons were non-significant. Given the modest fit of the lifespan model (Section "Methods"), these null contrasts should be read as bounding rather than ruling out small class-level differences.

Exam-passing age varied systematically by examination track, with *japkkwa* technical specialists entering earliest and *munban* civil officials latest. Seoul residence at exam time and established *munban* lineage were both associated with earlier exam passage, consistent with the enduring advantages of proximity to the capital and inherited social capital.

The career analysis showed the highest explanatory power of the three models (Table 14). Age group and lineage show asymmetric associations across the two outcomes. Late passage is associated with lower values on both; Late passers reach peak ranks about one grade below Early passers and serve roughly ten years less. Middle passage, by contrast, shows a gap only on duration; Middle passers reach peak ranks statistically indistinguishable from Early passers while serving about four years less. This pattern is consistent with the mechanics of the seniority-based promotion system (*gajabeop*); Middle-group officials had enough runway to climb the *pum* ladder, but not the longevity bonuses that favored the earliest entrants. The Early group is comparatively small (N = 89 versus N = 786 for Middle), so the non-significant Middle–Early gap on peak rank could

in principle reflect limited power rather than a true near-equivalence. Lineage shows the opposite asymmetry; *mungwa* ancestry is independently associated with higher peak rank (+0.33 grades per additional ancestor, p = .016) but not with longer service (+171 days, p = .387), raising peak rank without extending service duration and pointing beyond pure seniority toward the informal networks and social capital long linked to promotion to the highest offices (Han 1985; Lee and Park 2023). Cohort-internal exam rank shows no significant association in either model. The fact that passing was associated with career outcomes while performance was not, once structural variables were controlled, contrasts with Paik, Hong, and Yun (2022), who report a significant exam-score association; one plausible reconciliation is that their broader control set, including political faction, may absorb some of the variance attributed here to age group and lineage.

Seoul residence showed its strongest association with the timing of bureaucratic entry; capital-based candidates passed their examinations significantly earlier than those from other regions. However, this earlier entry was not associated with significantly higher career outcomes once exam-passing age, lineage, and temporal factors were included. Region here is measured as the candidate's self-reported place of residence at the time of the first successful exam (Table 2), not ancestral origin, so the "Seoul" coefficient captures residence at the moment of entry; officials who relocated over the course of service careers are not recoded. At the same time, Seoul-registered officials lived significantly shorter lives than counterparts from Gangwon, the reference category in the lifespan regression (Table 7). The underlying mechanisms cannot be identified from the available data, but the shorter lifespans may reflect the heightened political risks of capital life; Seoul-based officials were more exposed to court factionalism (*dangjaeng*) and political purges (*sahwa*), episodes in which entire factional networks could be imprisoned, exiled, or executed. This interpretation remains speculative. Any capital advantage therefore appears to have operated indirectly through earlier bureaucratic entry rather than as a direct, independent association with career achievement.

Elite lineage emerges as a consistent thread across the two analyses that could measure it: more *mungwa* ancestors were associated with both earlier exam passage (Model 2) and higher career achievement (Model 3). Combined with the null finding for exam rank, this pattern is consistent with a chain of structural advantages in which established families saw earlier bureaucratic

entry, which in turn corresponded to greater career outcomes through the seniority system, independent of relative performance on the examination. The results here contribute to the long-running debate over whether the *gwageo* functioned as a vehicle of social mobility or primarily reproduced existing hierarchies (Wagner 1974; Han 1985; Duncan 2000; Paik, Hong, and Yun 2022). Against that spectrum—Palais's (1984) aristocratic/bureaucratic balance thesis, Han's (1985) emphasis on the openness and variability of *yangban* composition, Duncan's (2000) demonstration of continuity in the composition of the central ruling class across the Goryeo-Joseon transition, and the recent quantitative work of Paik, Hong, and Yun (2022) and Lee and Park (2023) on lineage-inflected career outcomes—the present estimates quantify at the individual level a process earlier scholarship could characterize only in the aggregate.

This is consistent with Wagner's (1974) descriptive finding that *mungwa* passage was concentrated in a limited set of leading clans even as the system retained real openness, and with what Lee and Park (2023) describe as the residual weight of lineage in Joseon officialdom. Two illustrative clans, the Daegu Seo and the Yeoheung Min, are compared in Appendix C: the former fits the covariate-based picture closely, while the latter, a prominent oligarchic in-law *sedoga* clan, illustrates a possible form of lineage-level political capital that the measured covariates do not capture.

The temporal dynamics of career outcomes deserve a closer look. After adjusting for age group, region, lineage, and exam rank, period variation does not vanish; both Highest Office Grade and Estimated Office Span rise above the 14th-century baseline, though not in the same pattern. Peak rank climbs significantly in every later century, while service duration rises significantly only from the 17th century onward. Because Century is defined here on exam year (as specified in Models 3 and 4), these coefficients describe the institutional context at the time of bureaucratic entry, not the cohort conditions at birth tracked by Models 1 and 2, and the two sets of century coefficients should not be read as measuring the same latent trend. The visible shift in the raw distributions across centuries therefore reflects both compositional differences in age-at-passage, lineage density, and regional representation, and a residual period association that the structural covariates leave unexplained, especially for peak rank. Comparative work on Chinese examination systems has documented analogous period variation in mobility patterns (Jiang and Kung

2021; Wen, Wang, and Hout 2024); direct cross-case comparison would require matched variables and periodization.

Several limitations warrant consideration. The regression models explain varying shares of variance (1.9%–24.1%) for reasons anticipated in Section "Methods." A limitation specific to the career outcomes is the exclusion of posthumous promotions (*jeungjik*); because the *Annals* records in-life appointments only, officials whose highest rank was conferred after death are scored by their final living grade. Integrating *jokbo* or royal-decree sources would allow this bias to be quantified in future work. The three analytic samples are overlapping but not coextensive (Section "Data Construction"), and the career sample is additionally subject to selection on *AJD* visibility; the robustness check in Section "Robustness to *AJD* Visibility" (Table 15) shows that the Office Span association with Late passage survives this concern while the Highest Office Grade association attenuates, so we treat the duration finding as the more conservative of the two. A simple clan random-intercept specification (Appendix B, Table 17) leaves the focal coefficients substantively unchanged, with an intraclass correlation of about 1%, but this should be read as a sensitivity check rather than a full model of lineage politics. The models are informative at the structural level, but individual life trajectories plainly turned on personal health, patron-client ties, factional alliance, and historical contingency that prosopographical sources cannot measure.

Future research could address these limitations in several ways. Incorporating interaction terms (such as Region by Century) would test whether geographic advantages varied across periods; the present parallel-outcome specification also invites a fuller decomposition into initial-appointment associations (rank at first office) versus mid-career promotion velocity, which the two outcomes here approximate only indirectly. Beyond the variables available in bureaucratic records, integrating factional affiliations, marriage networks, and regional economic indicators would help account for more of the variation in life outcomes. Genealogical records (*jokbo*) that include unsuccessful candidates could shed light on the selection process itself and would also permit direct measurement of posthumous promotions (*jeungjik*) that the *Annals* alone cannot capture. Comparative analyses with other premodern examination-based bureaucracies, particularly in China and Vietnam, would help situate the Joseon case within a broader East Asian context. Such comparisons could test whether the greater weight of timing and background over exam performance is specific

to Joseon or recurs wherever examination systems mediated access to state power.

Taken together, these results move the discussion from qualitative assertion to measured association. Specialists have long argued that timing of entry and lineage were central to *yangban* careers; the linked-records regressions here attach specific magnitudes to those claims and show which hold up under joint controls. Relative to the longstanding historiographic debate over whether the *gwageo* functioned as a vehicle of mobility or as a reproducer of elite closure, these estimates recast the question in a finer frame; within the doubly selected *munban* career sample analyzed here (exam-passers with birth-death dates and *AJD* coverage), structural advantage is measurable at the individual level and broadly comparable in direction to findings from the Chinese imperial-examination literature (Jiang and Kung 2021; Wen, Wang, and Hout 2024).

References

Baek, Kwang Ryeol 백광렬. 2023. "17–19 segi Hanguk samangnyeok ui gyejeoljeok paeteongwa geu janggi chui: jokbo jaryo ui hwaryong" 17–19세기 한국 사망력의 계절적 패턴과 그 장기 추이: 족보 자료의 활용 [The Seasonality of Mortality and Its Long-term Trends in 17th to 19th Centuries Korea: Using the Jeonju-Lee Clan Genealogy]. Hanguk inguhak 한국인구학 [Korea Journal of Population Studies] 46 (4): 51–81. https://doi.org/10.31693/KJPS.2023.12.46.4.3.

Barnette, J. Jackson, and James E. McLean. 1998. "The Tukey Honestly Significant Difference Procedure and Its Control of the Type I Error Rate." Paper presented at the 27th Annual Meeting of the Mid-South Educational Research Association, Hotel Monteleone, New Orleans, LA, November 4–6, 1998. https://files.eric.ed.gov/fulltext/ED427043.pdf.

Chung, Doo-hee 정두희. 2000. "Joseon chogisa yeongu ui jaengjeom" 조선초기사 연구의 쟁점 [Issues on the Study of the History of Early Joseon Dynasty]. *Seogang inmunnonchong* 서강인문논총 [Sogang Humanities Journal] 13: 3–29.

Duncan, John B. 2000. *The Origins of the Chosŏn Dynasty*. Seattle: University of Washington Press.

Fox, John, and Georges Monette. 1992. "Generalized Collinearity Diagnostics." *Journal of the American Statistical Association* 87 (417): 178–83. https://

doi.org/10.1080/01621459.1992.10475190.

Han, Young-woo 한영우. 1985. "Joseon chogi sahoe gyecheung yeongu e daehan jaeron" 조선초기 사회계층 연구에 대한 재론 [A Reconsideration of the Study of Social Stratification in Early Joseon]. *Hanguk saron* 한국사론 [Korean History Review] 12: 305–58.

———. 2013. *Gwageo, chulse ui sadari*: *jokbo reul tonghae bon Joseon mungwa geupjeja ui sinbun idong. Taejo–Seonjo dae. 1392–1608* 과거, 출세의 사다리: 족보를 통해 본 조선 문과 급제자의 신분 이동. 태조–선조 대. *1392–1608* [The Civil Service Examination, the Ladder of Success: Social Mobility of Joseon Civil Examination Passers Seen through Family Genealogies, King Taejo–Seonjo, 1392–1608]. Seoul: Jisik sanupsa.

Ho, Ping-ti. 1962. *The Ladder of Success in Imperial China*: *Aspects of Social Mobility, 1368–1911*. New York: Columbia University Press. https://doi.org/10.7312/ho--93690.

Jiang, Qin, and James Kai-sing Kung. 2021. "Social Mobility in Late Imperial China: Reconsidering the 'Ladder of Success' Hypothesis." *Modern China* 47 (5): 628–61. https://doi.org/10.1177/0097700420914529.

Kim, Yul 김렬. 2017. "Joseon sidae gwallyo ui seungjin siltae" 조선시대 관료의 승진 실태 [A Study on the Determinants of Bureaucrats' Promotion in the Joseon Dynasty]. *Hanguk haengjeong nonjip* 한국행정논집 [Korean Public Administration Quarterly] 29 (4): 637–57. https://doi.org/10.21888/KPAQ.2017.12.29.4.637.

Korea Copyright Commission (KCC) 한국저작권위원회. 2024. "Universal Content Identifier (UCI)." Accessed January 15, 2025. https://www.uci.or.kr/.

Lee, Sangkuk 이상국. 2010. "Goryeo sidae gwijokcheung ui samangnyulgwa gidaeyeomyeong ui chuse: bigyosajeok gwanjeomeul jungsimeuro 고려시대 귀족층의 사망률과 기대여명의 추세: 비교사적 관점을 중심으로 [The Trend of Mortality and Life Expectancy of the Nobility in Koryŏ from Comparative Perspective]." *Yeoksa wa gyeonggye* 역사와 경계 [History & the Boundaries] 74: 129–52.

Lee, Sangkuk 이상국, and Jong Hee Park 박종희. 2019. "Quality over Quantity: A Lineage-Survival Strategy of Elite Families in Premodern Korea." *Social Science History* 43 (1): 31–61. https://doi.org/10.1017/ssh.2018.38.

———. 2023. "Gwageojeneun 'widaehan gyunhyeongja (the Great Equalizer)' yeonneunga?: Mungwa bangmok eul tonghan Joseon sidae

jibae elite ui gwanjik idong bunseok" 과거제는 '위대한 균형자(the Great Equalizer)'였는가?: 「문과방목」을 통한 조선시대 지배엘리트의 관직 이동 분석 [Was the Civil Service Examination System of Joseon 'the Great Equalizer'?: Evidence from Civil Service Examination Passers' Career Path Data]. *Joseon sidaesa hakbo* 조선시대사학보 [The Journal of Choson Dynasty History] 105: 51–87. https://doi.org/10.21568/cdha.2023.06.105.51.

Lee, Sung-mu 이성무. 1980. *Joseon chogi yangban yeongu* 조선초기 양반연구 [A Study of the Yangban in Early Joseon]. Seoul: Iljogak.

Min, Kyung-Jin, Cheol-Koo Lee, and Han-Nam Park. 2012. "The Lifespan of Korean Eunuchs." *Current Biology* 22 (18): R792–93. https://doi.org/10.1016/j.cub.2012.06.036.

Montgomery, Douglas C., Elizabeth A. Peck, and G. Geoffrey Vining. 2012. *Introduction to Linear Regression Analysis*. 5th ed. Hoboken, NJ: Wiley.

Na, Robin Wooyeong, and Javier Cha. 2021. "Snakes or Ladders? Measuring the Intergenerational Performance of Chosŏn's Munkwa Exam Candidates." *International Journal of Korean History* 26 (1): 145–76. https://doi.org/10.22372/ijkh.2021.26.1.145.

Paik, Christopher, Sok Chul Hong, and Yang-keun Yun. 2022. "The Road to Ascension: Exams, Lineages and Civil Servants of the Joseon Dynasty." SSRN Working Paper. https://doi.org/10.2139/ssrn.4011834.

Palais, James B. 1984. "Confucianism and the Aristocratic/Bureaucratic Balance in Korea." *Harvard Journal of Asiatic Studies* 44 (2): 427–68. https://doi.org/10.2307/2719038.

Song, Xi, Cameron D. Campbell, and James Z. Lee. 2015. "Ancestry Matters: Patrilineage Growth and Extinction." *American Sociological Review* 80 (3): 574–602. https://doi.org/10.1177/0003122415576516.

Wagner, Edward W. 1974. "The Ladder of Success in Yi Dynasty Korea." *Occasional Papers on Korea*, no. 1, 1–8.

Wen, Fangqi, Erik H. Wang, and Michael Hout. 2024. "Social Mobility in the Tang Dynasty as the Imperial Examination Rose and Aristocratic Family Pedigree Declined, 618–907 CE." *Proceedings of the National Academy of Sciences* 121 (4): e2305564121. https://doi.org/10.1073/pnas.2305564121.

Won, Chang-ae 원창애. 2007. "Joseon sidae mungwa geupjeja ui gwanjik jinchul yangsang" 조선시대 문과 급제자의 관직 진출 양상 [Assignment of

Successful Candidates of the Civil Service Examination to Regular Official Positions in the Choson Dynasty]. *Joseon sidaesa hakbo* 조선시대사학보 [Journal of Choson Dynasty History] 43: 5–50.

———. 2023. "Mungwa bangmok haeje" 문과방목 해제 [Commentary on the Civil Examination Rosters]. Accessed January 15, 2025. http://people.aks.ac.kr/front/haeje/haeje.aks?h=MN.

Donghyeok CHOI (dhchoi@hkbu.edu.hk) is affiliated with Hong Kong Baptist University. His research focuses on Korean history, digital humanities, and computational approaches to premodern East Asian sources. His recent work uses linked biographical records, bureaucratic appointment data, and prosopographical methods to study social mobility, elite formation, and career trajectories in Joseon Korea.

Abstract

This study examines the lifespans and career trajectories of Joseon *yangban* elites using linked biographical records. Drawing on *Who's Who in Korean History* and the *Annals of the Joseon Dynasty*, the study links examination rosters, biographical records, and appointment histories to reconstruct lifespan and career patterns across the dynasty's five-century span. Findings reveal significant lifespan variations; court eunuchs lived longest, kings shortest, while officials across tracks averaged around 61 years. Exam-passing age differed systematically by track (*japkkwa* youngest, *munban* oldest) and varied by region of residence at exam time and by lineage. Earlier exam passage and established family lineage were associated with greater long-term career success, while exam rank itself showed no significant association with eventual career achievement after adjusting for other covariates. Seoul residence at exam time was associated with earlier exam passage but showed no independent association with career outcomes once timing and lineage were included as covariates. These results suggest that early bureaucratic entry and established family background showed stronger associations with long-term advancement than either region of residence or performance among successful candidates.

Keywords: *yangban*, exam-passing age, lifespan, career trajectory, prosopography

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Appendix A: Lifespan Model with Official Class

As a check on the decision to omit Official Class from the main lifespan model, we refit Model 1 with Official Class added; *japkkwa* serves as the omitted reference, as it is first in alphabetical order. Table 16 reports the results. None of the Official Class dummies reach significance (all $p > .2$), the regional and temporal coefficients shift negligibly, and adjusted R^2 rises only from 0.019 to 0.020. This pattern supports retaining the parsimonious specification as the main lifespan model; Official Class adds three parameters without explaining meaningful additional variance once Region and Century are accounted for.

Table 16. Supplementary Lifespan Regression Including Official Class. *japkkwa* is the omitted (reference) category for Official Class.

Variable	Coef.	Std.Err.	t	P>|t|
Intercept	72.942	10.192	7.156	<.001***
Region: Gyeonggi	-3.396	1.570	-2.163	0.031*
Region: Gyeongsang	-1.432	1.430	-1.001	0.317
Region: Seoul	-4.242	1.393	-3.044	0.002**
Region: Jeolla	-3.149	1.478	-2.130	0.033*
Region: Chungcheong	-2.668	1.490	-1.791	0.073
Region: Pyeongan	-4.215	2.069	-2.037	0.042*
Region: Hamgyeong	-2.573	2.514	-1.024	0.306
Region: Hwanghae	-1.297	2.157	-0.601	0.548
Century: 15th	-3.496	4.587	-0.762	0.446
Century: 16th	-1.324	4.547	-0.291	0.771
Century: 17th	-0.199	4.545	-0.044	0.965
Century: 18th	1.509	4.544	0.332	0.740
Century: 19th	1.798	4.550	0.395	0.693
Official Class: *Muban*	-10.978	9.059	-1.212	0.226
Official Class: *Munban*	-8.008	9.033	-0.887	0.375
Official Class: *Saengwon/Jinsa*	-8.356	9.024	-0.926	0.354

Appendix B: Sensitivity to Hierarchical Lineage Structure

A distinct concern, beyond *AJD* visibility, is that the career covariates may not be fully independent at the individual level. In particular, lineage plausibly operates at the clan level:

officials from the same ancestral seat (*bongwan*) share patronage networks, residential clusters, and factional alignments that the present covariate set does not measure directly. If within-clan observations are more alike than between-clan observations, the individual-level coefficients reported in the main text may be partly absorbing clan-level variation rather than isolating the individual-level associations of ancestry counts, timing, or rank.

We address this concern in two steps. First, the generalized variance inflation factors reported in the Methods section (Table 3) indicate low linear redundancy among the observed covariates: the maximum $GVIF^{1/(2\ Df)}$ across the four outcome columns is 1.17, well below the conventional threshold of 2, and the category-valued covariates (Region, Century) are within rounding distance of 1.00. This diagnostic does not establish substantive independence among the predictors, but it suggests that the fixed-effect estimates are not being driven by severe multicollinearity.

Second, we re-estimate Models 3 and 4 as linear mixed models, adding a random intercept for *bongwan* to the primary specifications. The *bongwan* variable is available for every official in the career sample, which contains N = 578 officials distributed across K = 137 clans (median clan size 2, maximum 41). The mixed model therefore uses the same analytic sample as the primary OLS. A random intercept is preferred over 137 clan fixed-effect dummies because the median clan contributes only two officials and many contribute a single observation, which would render per-clan dummy coefficients unstable and consume degrees of freedom without producing interpretable clan-level estimates. The random-intercept specification instead summarizes clan-level heterogeneity in a single variance component, preserving estimation efficiency. Table 17 reports the OLS and mixed-model coefficients side by side. The shifts are small for Highest Office Grade but one Span contrast attenuates notably. For Highest Office Grade, the Late coefficient moves from −1.082 to −1.031 (both $p < .05$), the Middle coefficient from −0.566 to −0.522 (both non-significant), and *mungwa* Ancestors from +0.330 to +0.335 (both $p < .05$). For Estimated Office Span, the Late coefficient changes by less than two per cent (from −3,735

Table 17. Sensitivity to Hierarchical Lineage Structure: OLS vs. Clan (*bongwan*) Random-Intercept MixedLM

	Highest Office Grade		Office Span (days)	
Variable	OLS	MixedLM	OLS	MixedLM
Exam-Passing Age Group: Middle	-0.566	-0.522	-1,442.82*	-1,375.44
Exam-Passing Age Group: Late	-1.082*	-1.031*	-3,735.07***	-3,663.67***
Number of *Mungwa* Ancestors	0.330*	0.335*	171.49	181.13
Normalized Exam Rank	-0.905	-0.894	-197.93	-197.98
Region, Century fixed effects	Yes	Yes	Yes	Yes
Var (*bongwan* random intercept)	–	0.083	–	201,693.23
Var (Residual)	–	9.354	–	19,748,094.18
ICC (*bongwan*)	–	0.009	–	0.010
N officials / K clans	578 / –	578 / 137	578 / –	578 / 137

Note: Focal rows only: Mixed-LM adds a *bongwan* random intercept (REML). ICC = share of variance attributable to clan membership. * $p < .05$, ** $p < .01$, *** $p < .001$.

to −3,664, both p < .001), while the Middle coefficient attenuates from −1,443 (p = .040) to −1,375 (non-significant); the Middle–Early gap on duration is therefore less robust to clan-level clustering than the other focal coefficients. The implied intraclass correlation is only 0.009 for peak rank and 0.010 for office span; clan membership accounts for roughly one per cent of residual variance, and allocating that share to a random intercept does not substantively reorder the coefficients of interest.

Two observations follow. First, the individual-level ancestry association does not materially attenuate when a simple clan random intercept is added, suggesting that the coefficient is not driven entirely by stable between-clan differences in this specification. Second, the very small ICC values (about 1 per cent) indicate limited residual clan-level variance under this model, with the caveat that the median clan contributes only two officials so the random-intercept specification estimates clan-level heterogeneity from thinly populated groups. A fuller hierarchical specification with clan-by-century interactions and time-varying clan fortunes is left for future work.

Appendix C: Two Illustrative Lineages

Two specific lineages, selected for illustration rather than through a systematic residual analysis, display the contrast between covariate-consistent and covariate-underpredicted trajectories.

The Daegu Seo, with 29 officials in the career regression sample, fit the model's predictions closely: a mean of 1.52 *mungwa*-passing ancestors accompanies a mean peak rank of about 13.5 (near the *dangsanggwan* threshold) and a mean service duration of roughly fifteen years, with only one of the twenty-nine (3.4 per cent) passing in the Early age group. Moderate ancestry density and a small Early share yield moderate peak rank and moderate tenure; the clan reads as an ordinary elite *munban* lineage well described by the measured covariates. The Yeoheung Min, with 41 officials, diverge upward: their mean *mungwa*-ancestor count is lower (0.83), yet mean peak rank is approximately 14.5 and mean service duration about nineteen years, longer than the Daegu Seo at roughly half the ancestor density. Historically the Yeoheung Min were one of the oligarchic in-law *sedoga* clans whose influence ran through royal affinal ties, factional consolidation at court, and dense intermarriage with other *sedoga* houses—forms of lineage-level political capital that lie outside the individual ancestor counts available to the model. The Daegu Seo trajectory is largely explained by the measured covariates; the Yeoheung Min trajectory illustrates a possible form of lineage-level political capital that the measured covariates do not capture. The small *bongwan*-level intraclass correlation reported in Appendix B (about 1 per cent on each outcome) indicates that such patterns are limited in the aggregate specification, even as individual lineages like the Yeoheung Min show why qualitative lineage context remains useful.

Table 18 summarizes the descriptive contrast. The Yeoheung Min exceed the Daegu Seo on peak rank, service duration, and Early-passage share despite holding only about half the average *mungwa*-ancestor count, suggestive of the clan-level political capital described in the text.

Table 18. Illustrative Lineage Comparison: Daegu Seo vs. Yeoheung Min

Lineage	N	Mean *Mungwa* Ancestors	Mean Peak Rank	Mean Service Duration (yr)	Early Share (%)
Daegu Seo	29	1.52	13.50	15.3	3.4
Yeoheung Min	41	0.83	14.52	18.7	12.2