

Building an Archival Database for Visualizing Historical Networks. A Case for Pre-Modern Korea

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Building an Archival Database for Visualizing Historical Networks

A Case for Pre-Modern Korea

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ABSTRACT

In this paper, we share the experience of collecting and organizing pre-modern Korean historical materials into a searchable digital archive. The Ajou Interdisciplinary Research Group (AIRG) has continuously collected historical data of pre-modern Korea for the past 10 years to assist the study of family history, historical demographics, and social mobility. This paper describes the rich data sources for historical studies of Korea, such as household registers, genealogies, and state examination registers, and we summarize contributions to the study of historical demography and related fields.

Keywords: Korean historical material, Historical demography, Social mobility, Life course studies, Household registers, Genealogies, State examination registers, Longitudinal data, HAVNet DB

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1 INTRODUCTION

The Ajou Interdisciplinary Research Group (AIRG) has continuously collected historical data of pre-modern Korea for the past ten years to assist the study of family systems, population, and social mobility. To this end, the AIRG formed a comprehensive research group of experts in history, linguistics, computer science, data science, statistics, and visualization technology. In this paper we introduce the main sources that we describe the AIRG's contributions to historical demography and family history.

Collecting data over a long-time horizon and across a wide range of fields is challenging. More often than not data from different sources lack identifying information, which is necessary to match individuals and a large amount of non-random missingness is very common. Recent advances in data technology in storing, analyzing, and visualizing large-scale data, so-called "big data techniques", provide immense opportunities to easily transform historical data into a digital form. The collaboration of experts in various fields is essential for the digital transformation of historical data, but that alone is not enough. The insights and leadership of historians are essential to lead the entire process of data transformation to an organic workflow. By "organic workflow" we mean that numerous decisions made in the process of data transformation are consistent with each other.

In Korea, government-led research support organizations such as the National Research Foundation and the Korean Academy of Sciences have taken the lead in digitizing historical data since 2000. In this way, the transition of Korean historical data to digital data was carried out on a large scale. Since 2015 the Ajou Interdisciplinary Research Group started seriously using these digitized historical data to establish a database for historical research and social science research. The Historical Archives Visualization Network Database (HAVNet DB) was built to read historical characters and extract information. For a full description of the HAVNet DB see Lee (2016a) and S. Choi, J. Choi, Paek, Yeh, and Lee (2021).

In this paper, we describe the most important sources that form the basis of the HAVNet DB, such as the household registers, the genealogies and the examination lists, and we explain their importance for the study of family history, historical demography and social mobility. Secondly, we give an overview of the results of research in these fields.

2 HISTORICAL MATERIALS OF PRE-MODERN KOREA

Korea is said to be a repository of recorded history. Historical facts have been recorded in various forms for a long span of time by a variety of social actors. The historical materials originate from government as well as from individuals and families. Some of them were listed as UNESCO's Memory of the World Program including *Joseonwangjo sillok* [The Annals of Joseon Dynasty, 朝鮮王朝實錄], *Seungjeongwon Ilgi* [The Diaries of the Royal Secretariat, 承政院日記], *Ilseongnok* [The Records of Daily Reflections, 日省錄], *Uigwe* [The Royal Protocols of the Joseon Dynasty, 儀軌], printing woodblocks of the Tripitaka Koreana and miscellaneous Buddhist scriptures. These various pre-modern historical materials have been digitized in various forms since 2000, making them easily accessible to all interested people. We can classify these sources into unstructured and structured data. Table 1 provides an overview of the websites publishing digitized historical sources, including scans of original sources, tables with structured data, etc. This article focuses on structured data.

2.1 STRUCTURED DATA

2.1.1 HOUSEHOLD REGISTERS

In Korea, *hojeok* [household registers, 戶籍] have been compiled for more than two thousand years. The oldest extant household register is the *Silla jangjeok* [The Silla village document, 新羅帳籍] compiled in the Silla Kingdoms (B.C. 57–935) of which only a small portion remains. The *Silla jangjeok* combined both characteristics of a household register and of a land register. In the Goryeo dynasty (918–1392), the household register and the land register were separated. From the Joseon dynasty (1392–1910) onwards the household registers were compiled every three years for the purpose of taxation and obligatory services, and in principle, all regions and peoples were subject to registration (Son, 2007). The household registers from the Joseon government have survived in some areas, such as Danseong, Daegue, etc. Household registers provide great opportunities to examine demographic behavior over periods of 200 years (about 17th to 20th centuries) by linking individuals and households in consecutive triennial registers into family trees. Moreover, household registers give tremendous opportunities to research and explore social mobility thanks to the recording of people with a variety of social statuses.

Table 1 *Websites including Korean historical sources*

Data Type	Sources	Websites
Unstructured data	<i>Samguksagi</i> [History of the Three Kingdom], <i>Samgukyusa</i> [Memorabilia of the Three Kingdom], <i>Goryeosa</i> [History of Goryeo Dynasty], <i>Goryeosa jeoryo</i> [Condensed History of Goryeo Dynasty], <i>Joseonwangjo sillok</i> [The Annals of Joseon Dynasty], <i>Seungjeongwon Ilgi</i> [The Diaries of the Royal Secretariat], <i>Ilseongnok</i> [Records of Daily Reflections], etc.	Korean History Database by National History Compilation Committee
	<i>Uigwe</i> [The Royal Protocols of the Joseon Dynasty], Historical documents, Stone and bronze inscriptions, etc.	Kyujanggak Institute for Korean Studies, Digital Archives for Korean Studies Digital Jangseogak
Structured data	Household Registers of Danseong and Daegu-bu in Joseon Dynasty	Human Resources Information System in Korean History Daedong Institute for Korean Studies
	Jokbo [genealogy]	Korean Jokbo Data System
	The List of State Examination Rosters, etc.	Korea Historical Information Integration System

From all Joseon dynasty household registers, those from Danseong and Daegu (see map 1) are the most well-known in the academic world. Danseong household registers recorded people who lived in the Danseong area (present Sancheong-gun county, Gyeongsangnam-do province) through 1606–1888. The Danseong area was a typical rural area. On the other hand, Daegu (present Daegu Metropolitan City) was a mixed area with urban and rural characteristics. Daegu was one of the major administrative cities of the Joseon dynasty, where the headquarters of the provincial governor [*gamyeong*, 監營] of the Gyeongsang-do province was established. After 1601, Daegu-bu expanded its size as it developed into an administrative hub of the Gyeongsang-do province. In addition, Daegu was also one of the top three commercial cities of the late Joseon dynasty. In other words, Daegu-bu was not only a representative administrative city but also served as a center of commerce. Accordingly, *seosang-myeon* and *dongsang-myeon*, where *gamyeong* was located, were areas where urban characteristics were strongly reflected, while the rest of the areas were typical rural areas. Besides those of Danseong and Daegu, also the household registers in Ulsan, Eonyang, Jeju, and Sangju have survived.

Map 1 *South Korea, with the areas where Joseon's household registers [hojeok] have survived*



Table 2 Basic statistics of the households register datasets from the Danseong and Daegu areas

	Time span	Myeon [面, township]	Household records	Person records
Danseong	1606–1888	8	42,795	240,692
Daegu	1681–1876	30	275,073	1,516,273
Total		38	317,868	1,756,965

Source: HAVnet DB, see Choi et al. (2021).

Figure 2 shows a screenshot of the digitized household registers in Excel format. For each individual, the following information is available: the name of household head (①), relationship to household head (②), occupational title (③), surname and given name (④), age calculated by subtraction from compilation year minus year of birth (⑤), year of birth (in animal sign with the period name from the sexagenarian cycle) (⑥), exit from the register (emigration, out-marriage, death, escape) (⑦). Other fields (not shown in figure 2) describe the entry into the register, ancestral seats, the occupational titles and names of parents, grandfathers, great-grandfather, and fathers-in-law of a head and his wife. At the end of each *myeon* [township], informative statistics of each *myeon* are recorded, and at the end of each year of the register, various official statistics constructed by the local government such as the number of households, so called *doisang* [都已上], are recorded. This official statistic from *doisang* does not match the actual statistic calculated from the text of the household registers because the goal was not to show the actual number of individuals and households of the area, but to secure the necessary tax sources for the government. The range of demographic information contained in Danseong household registers is very rich and can be used for the study of families over a long time (Park & Lee, 2008). Table 2 shows the total number of households and persons included in the dataset of the household registers, adding up to about 1.8 million person records from 38 townships of Danseong and Daegu household registers covering the period 1606–1888.

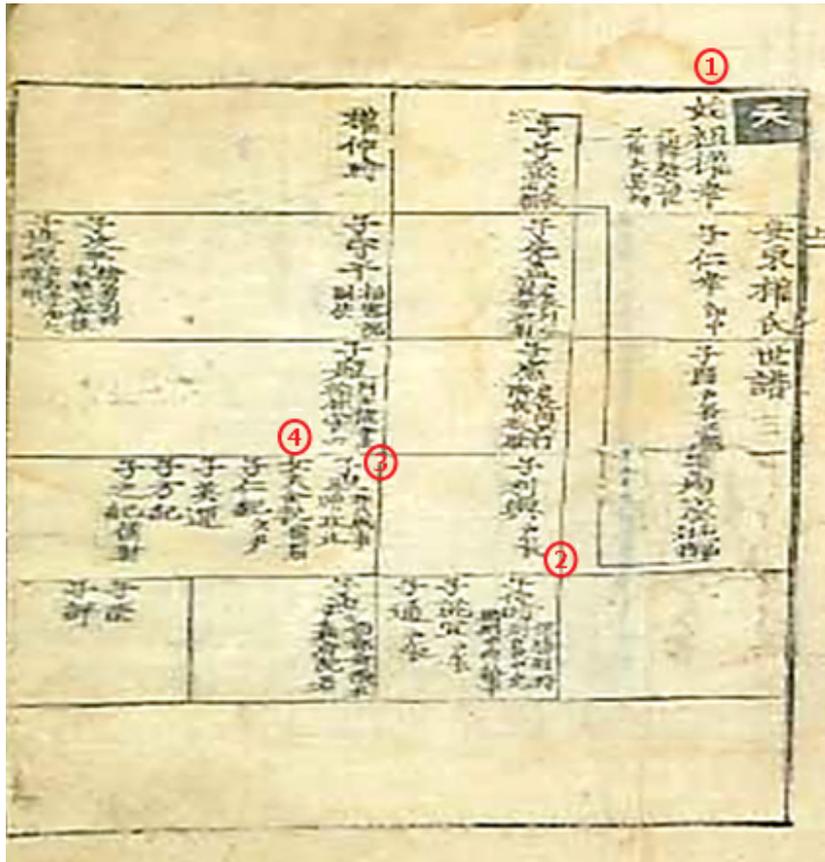
2.1.2 FAMILY GENEALOGY

The *jokbo* [genealogy, 族譜] consists of multi-generational records of families from the progenitor of the clan to his descendants at the time of publication. It has been published continually for hundreds of years from the early Joseon dynasty and it is still being produced to this day. A clan in *jokbo* refers to the paternal blood relationship, which honors the same ancestor by carrying the same surname [姓] and ancestral seat [本貫]. Although there are differences depending on the period and type of publication, the Korean genealogy generally records individual demographic records with date and place of events as birth, death and official ranks.

Andong Gwon-ssi clan's *jokbo*, called *Seonghwa-bo* [成化譜], is the oldest extant genealogy in Korea, which was first published in 1476. *Seonghwa-bo* contains detailed demographic information of more than 10,000 Andong Gwon-ssi clan members. According to *Seonghwa-bo*, the progenitor of the Andong Gwon-ssi clan is Gwon, Haeng, who lived in the early Goryeo dynasty (918–1392). The last entry of *Seonghwa-bo* is the 21st generation of the progenitor. Another important *jokbo* in early stage is *Gajeong-bo* [嘉靖譜] of the Munhwa Ryu-ssi clan. *Gajeong-bo* was first published in 1565 and contains detailed demographic information of more than 49,000 Munhwa Ryu-ssi clan members. The progenitor of Munhwa Ryu-ssi clan is Ryu, Chadal and the last entry of *Gajeong-bo* is the 24th generation. The publication of these two *jokbos* by powerful elite families of the Andong Kwon-ssi clan and the Munhwa Ryu-ssi clan prompted the publication of *jokbo* by other elite families in the 16th century. The number of genealogical records published before 1945 is known to be 3,389 *jokbos* for 143 different surnames (Lee and Park, 2008).

Figure 3 is a picture of the first page of *Seonghwa-bo*, showing the beginning of the Andong Gwon-ssi clan from the progenitor to the 13th generation. The first person listed is the progenitor, Gwon, Haeng [權幸] (①) who received an official position as a vassal of merit from Wang, Geon, the founder of the Goryeo dynasty. Before the 9th generation, only one member was recorded per generation. From the 9th generation onwards, also a second sibling began to be recorded (②). At the 12th generation (③), six siblings (five sons and one daughter) were recorded by birth order. Note that the recording by birth order, instead of gender, is unique to these early family genealogies. After the 17th century, the recording order changed into putting the sons first and the daughter at the end of the row, reflecting social changes.

Figure 3 First page of the Andong Gwon-ssi Clan's Jokbo (Lee & Lee, 2017)

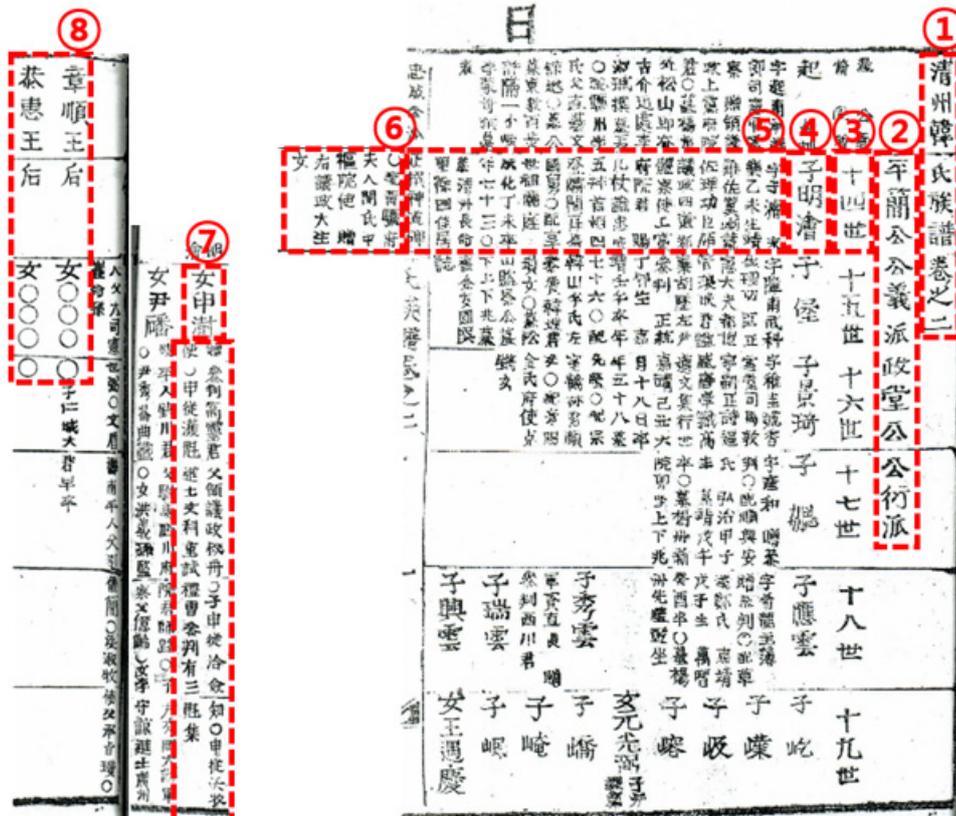


Note: For the explanation of the reference numbers, see the text. The source has to be read from right to left and from top to bottom, each rectangle presents one generational level.

Another distinct aspect of Korea's family genealogy is that *jokbo* records not only the complete list of sons' family lines but also that of the daughter's family lines. When a daughter marries, the record of her husband is listed in her family's *jokbo* as a son-in-law [*yeobu*, 女夫] (④) of her family's head. The Korean concept of family embraces in-laws as family members. For this reason, the Korean genealogy contains a wide range of information not only about members of the family, but also about members of other prestigious families outside the family. This makes Korea's family genealogies a valuable resource for the study of the elite society in pre-modern Korea (Lee & Lee, 2017).

The *jokbo* is abundant in the demographic, historical, and sociological information on family members. Figure 4 shows another example, which is the second volume of the *jokbo* of the Cheongju Han-ssi clan in late Joseon dynasty (①), presenting the 14th and further generations. The Cheongju Han-ssi clan branched out into multiple lines, called "pa" [派], two of which are represented in this *jokbo*: *Pyeonggangong Gongui-pa* [平簡公 公儀派] and *Jeongdangong Gongyeon-pa* [政堂公 公衍派] (②) which indicate the first name of the person and his government office title, respectively. If we move to the 14th generation [十四世] line (③), we can find the name of *Myeonghoi* [明澗] (④), who was the first-born son (子) of the previous generation. More information can be found from ⑤ such as the courtesy name [字], given to a man when he becomes an adult expressing specific preferences or virtues, the year of birth, the career as government official, the spouse and information about the affinal family, the year of death, and the location of his grave. Reading this line of information, we can also find information about the husbands of the daughters of *Myeonghoi* [明澗] (⑦). For example, *Myeonghoi's* first son-in-law is *Sin, Ju* [申澗], his government office was *Jeong Champan* [贈 參判], and his government office title was *Goryeong-gun* [高靈君]. Moreover, we can also find that his father's name was *Sin, Sukju* [申叔舟] reaching *Yeonguijeong* [the chief state counselor, 領議政], which is one of the most prestigious government positions. *Myeonghoi's* two daughters were queen consorts. Instead of a queen's name, the two daughters' posthumous titles are reported as *Jangsun-wanghu* [Queen Jangsun, 章順王后] and *Gonghye-wanghu* [Queen Gonghye, 恭惠王后], which can be interpreted as 'the gentle queen' and 'the benevolent queen' respectively (⑧). The two daughters' titles are written in a new line which means that they were honored with a lot of respect as being members of the royal family members (Hong, Lee & Yoo, 2021).

Figure 4 A part of Cheongju Han-ssi Sebo in late Joseon dynasty (Hong, Lee, & Yoo, 2021)



Note: For the explanation of the reference numbers, see the text. The source has to be read from right to left.

Figure 5 Example of the digitization of the Andong Gwon-ssi Clan's Jokbo

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	
code_LWJ	last_name	last_name	first_name	string	line	sex	son_in_law	Gov_Exam	op_rank	op	ancestral_seat	period	birth_year	death_year	op_year	fa_name	grandfa_n	greatgran	greatgreat	grandfa_n	
1	kwon	1	haeng	a 1	0	0	0		1	삼한백상공신	andong	1									
2	kwon	1	inhaeng	a 1 1	0	0	0		5	남종	andong	1									kwonhaeng
3	kwon	1	chaek	a 1 1 1	0	0	0		12	조정장조	andong	2									kwoninhai kwonhaeng
4	kwon	1	gyunhan	a 1 1 1 1	0	0	0		12	조정장조	andong	2									kwonchae kwoninhai kwonhaeng
5	kwon	1	japaeng	a 1 1 1 1 1	0	0	0		12	조정장조	andong	3									kwongyur kwoncha F kwoninhai kwonhaeng
6	kwon	1	seongae	a 1 1 1 1 1 1	0	0	0		12	조정장조	andong	3									kwonjapai kwongyur kwoncha F kwonhaeng
7	kwon	1	ryeon	a 1 1 1 1 1 1 1	0	0	0		12	조정장조	andong	4									kwonseon kwonjapai kwongyur kwoncha F
8	kwon	1	lyeon	a 1 1 1 1 1 1 1 1	0	0	0		12	조정장조	andong	5									kwonyeon kwonseon kwonjapai kwongyurhan
9	kwon	1	joongsil	a 1 1 1 1 1 1 1 1 1	0	0	0		12	보승별장 부포장중윤	andong	6									kwoniyeo kwonyeon kwonseon kwonjapaeng
10199	kwon	1	chiyi	a 1 1 1 1 1 1 1 1 2	0	0	0		12	조정장조	andong	6									kwoniyeo kwonyeon kwonseon kwonjapaeng
10203	kwon	1	tong	a 1 1 1 1 1 1 1 1 3	0	0	0		12	조정장조	andong	6									kwoniyeo kwonyeon kwonseon kwonjapaeng
10	kwon	1	supyeong	a 1 1 1 1 1 1 1 1 1 1	0	0	0		3	추밀원부사	andong	6		1250							kwonjoon kwoniyeo kwonyeon kwonseongae
6061	kwon	1	chapyeong	a 1 1 1 1 1 1 1 1 1 2	0	0	0		13	정충별장 식록정	andong	6									kwonjoon kwoniyeo kwonyeon kwonseongae
6062	kwon	1	seongwon	a 1 1 1 1 1 1 1 1 1 3	0	0	0		14	대선사	andong	6									kwonjoon kwoniyeo kwonyeon kwonseongae

Note: For the explanation of the reference numbers, see the text.

We are in the process of digitizing family genealogy information in the format shown in Figure 5. The principle of digitization is to ensure that all the relationships between the individuals can be easily identified. To this end, we have developed a simple, precise, and easy-to-understand coding scheme for family genealogy. This coding scheme (①) can be explained in the following algorithm.

- The progenitor of a family genealogy is recorded as 1. In Figure 5, Gwon, Haeng is the progenitor and he is recorded as 1.
- The offspring is recorded by their birth order. In Figure 5, Gwon, In-haeng is the first-born of Gwon, Haeng and hence recorded as 11.

Then, the length of the digit indicates the generation and the last digit indicates the ego's birth order (starting with the 9th generation in Figure 5). Also, we can easily track the ancestry history by comparing the sequence of the digit. For example, 1114 indicates that the ego is the fourth child in the 4th generation from the progenitor and the fore-going generations are all first-borns (great-grandfather, grandfather, and father). The ego's siblings can be identified by the same ancestor history (111). In this way, we can easily identify relatives of the ego. For example, nieces and nephews in the 4th generation are indicated by having the same first two digits: 1121, 1134, etc.).

For the title of the official rank in the governmental bureaucracy recorded in the genealogy, we use various historical materials to find the most accurate information of individuals' titles of the official ranks. Fortunately, the government offices are clearly divided into nine levels [poom]. Thus, the official ranks are coded from 1 (highest) to 9 (lowest) (②). We also coded for ranks outside the government offices: 12 and 13 for a provincial official, 14 for a Buddhist monk, 15 for royal family members, and so on. A more daunting task in collecting office information is how to match records from different sources. We first use the UCI which stands for the Universal Content Identifier developed by the Academy of Korean Studies (<http://people.aks.ac.kr/front/uci/uciInfo.aks?isEQ=false&kristalSearchArea=P>). The basic structure of UCI consists of three parts:

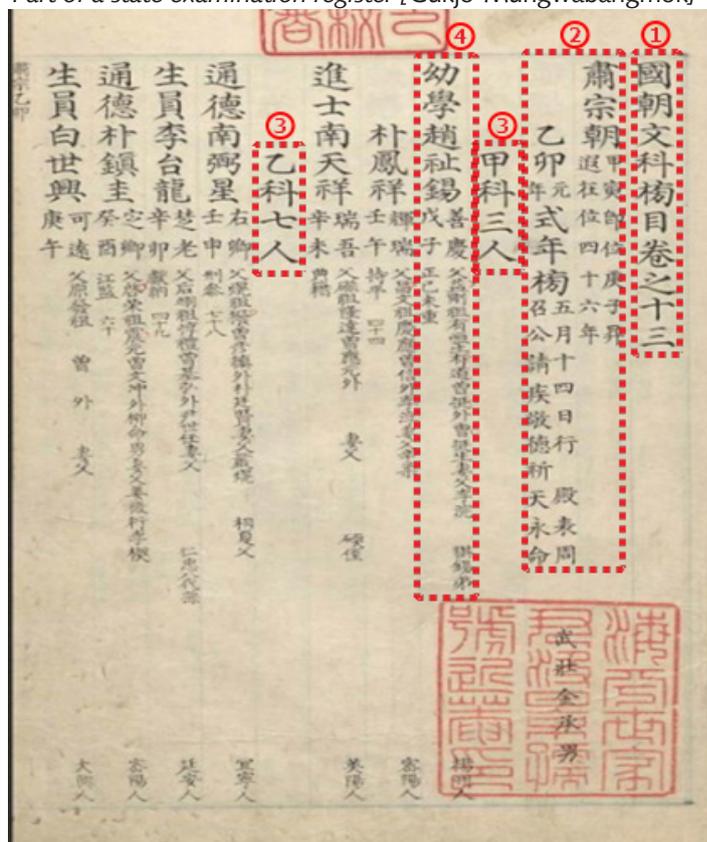
- institution code;
- code to classify the source of the historical data;
- a unique individual identifier: gender, name by Unicode encoding, birth year, death year.

For documents without a UCI, we use comparable identifying information to match individuals across documents, namely the first name, family name (both in Chinese characters), birth year, death year, and father's name.

2.1.3 STATE EXAMINATION REGISTERS

Persons who successfully passed the civil service examinations during the Joseon dynasty were compiled in a list, called *Gukjo-Mungwabangmok* [國朝文科榜目]. The list contains the entire record of 15,151 successful candidates of the civil service examination for the 804 examinations from 1393 to 1894. Among all the state examinations, the civil service examination [*mungwa*, 文科] was considered to be the most important for an individual to acquire a public office. The Academy of Korean Studies collects various individual-level information on 15,151 successful candidates and makes them publicly available (<http://people.aks.ac.kr/index.aks>).¹

Figure 6 Part of a state examination register [*Gukjo-Mungwabangmok*]



Note: For the explanation of the reference numbers, see the text.

1 Because only successful applicants are recorded, information on the failed applicants is not known. But it is possible to estimate the number of people that applied looking at historical materials such as The Annals of Joseon Dynasty.

Figure 6 shows the basic structure of *Gukjo-Mungwabangmok*. The beginning of the page shows the title and volume number of the book (①). In the column referenced by ②, we recognize when the examination was carried out — in this case 1675, the first year of King Sukjong's reign — and what type of the examination it is [*singnyeonsi*, 式年試, regular examination]. We know the examination division and ranking of the individual out of total number of successful candidates: *Gabgwa* [甲科, first-grade group] is successful candidates ranked in 1st, 2nd, 3rd, followed by *eulgwa* [乙科, second-grade group] for 4th through 7th ranks, and the last one is *byeonggwa* [丙科, third-grade group] in ③. The next column ④ presents a variety of individual information on the successful graduate including their names and offices, previous office positions, and the name of their fathers, grandfathers, great-grandfathers, fathers-in-law, and grandfathers-in-law. What is interesting in *Gukjo-Mungwabangmok* is that the document records the names of all the successful candidates' family members who also passed the exam, regardless of their blood ties. That is, the *Gukjo-Mungwabangmok* registers how the names and office positions of the successful candidate's maternal as well as paternal ancestors who were also successfully examined.

Figure 7 shows a part of a table with data compiled from the examination lists. The dataset can be divided into three types of data: individual demographics, family-related information, and career-related information. The demographic data includes the surname (①), first name (②), birth and death year (③) and region of living (④). The family-related information includes the ancestral seat [*bongwan*, 本貫] and the names and office records of the father. Comparable information from the grandfather, great-grandfather, father(s)-in-law and grandfather(s)-in-law is also included but not shown in figure 7. The career-related information includes the entire history of the office records that were retrieved from The Annals of Joseon Dynasty [*Joseonwangjo sillok*, 朝鮮王朝實錄]. Because of the wide range of information at the individual and family level, the data provides tremendous potential for various purposes of research. For example, the data can be used to study how family background of an individual affected his social mobility, how an individual's exam performance shaped the history of his career over his lifetime, or the process a family lineage used to successfully produce more of their members in high offices and become more powerful.

Table 3 summarizes the number of examinations and successful candidates for each king's reign. Note that there are two types of civil service examination: regular and irregular examinations. Regular examinations were held every three years and account for 39.8% of all cases and irregular examinations account for the rest. The number of examinations and the number of successful candidates increase over time because of the more frequent implementation of irregular examinations. Irregular examinations were conducted without notice when the state had something to celebrate such as the inauguration of a new king, the birth of a prince, the kings journey to the provinces, etc.

Figure 7 Screenshot of a table with state examination graduates

	A	①	②	D	E	F	G	H	③	④	L	M	N	O	
1	순번	성	명	성명	자	호1	본관	생년	몰년	거주지	급제시험종류	급제식년	급제년도	합격등급	
2	1	송	개신	宋介臣	미상	미상	휴재(休齋)	홍주(洪州)	1373	미상	미상(未詳)	식년시(式年試)	태조2	1393	을과(乙科) 1[壯元]위
3	2	김	호원	金孝源	미상	미상	김해(金海)	1370	미상	미상(未詳)	식년시(式年試)	태조2	1393	을과(乙科) 2[亞元]위	
4	3	이	담	李擔	미상	미상	경주(慶州)	1370	1405	미상(未詳)	식년시(式年試)	태조2	1393	을과(乙科) 3[探花郎]위	
5	4	탁	함	卓誠	미상	미상	광산(光山)	1345	미상	미상(未詳)	식년시(式年試)	태조2	1393	병과(丙科) 1위	
6	5	윤	정	尹定	미상	미상	함안(咸安)	1376	미상	미상(未詳)	식년시(式年試)	태조2	1393	병과(丙科) 2위	
7	6	변	계순	卞季孫	미상	미상	조계(草溪)	1368	미상	미상(未詳)	식년시(式年試)	태조2	1393	병과(丙科) 3위	
8	7	변	처후	邊處厚	미상	미상	장원(長淵)	1373	1437	미상(未詳)	식년시(式年試)	태조2	1393	병과(丙科) 4위	
9	8	신	개	申龜	자격(子格)	인재(仁齋)	평산(平山)	1374	1446	미상(未詳)	식년시(式年試)	태조2	1393	병과(丙科) 5위	
10	9	홍	중강	洪仲剛	미상	미상	남양(南陽[唐])	1373	미상	미상(未詳)	식년시(式年試)	태조2	1393	병과(丙科) 6위	
11	10	이	숙번	李叔蕃	미상	미상	안성(安城)	1373	1440	미상(未詳)	식년시(式年試)	태조2	1393	병과(丙科) 7위	
12	11	소	호인	蘇好仁	미상	미상	진주(晉州)	1356	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 1위	
13	12	유	흘	柳洽	미상	미상	백천(白川)	1356	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 2위	
14	13	김	식	金澀	미상	미상	미상(未詳)	1356	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 3위	
15	14	서	선	徐選	미상	미상	이천(利川)	1367	1433	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 4위	
16	15	김	호손	金孝孫	미상	미상	의성(義城)	1373	1429	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 5위	
17	16	이	조	李椒	미상	미상	광산(光山)	1372	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 6위	
18	17	한	겸	韓兼	미상	미상	평산(平山)	1365	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 7위	
19	18	송	호	宋瑚	미상	미상	태인(泰仁)	1373	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 8위	
20	19	유	의	柳儀	미상	미상	고흥(高興)	1373	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 9위	
21	20	나	득경	羅得卿	미상	미상	나주(羅州)	1369	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 10위	
22	21	최	예	崔潏	미상	미상	경주(慶州)	1371	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 11위	
23	22	민	안	閔顔	미상	미상	여흥(驪興)	1350	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 12위	
24	23	박	조	朴澡	미상	미상	미상(未詳)	미상	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 13위	
25	24	한	련	韓璉	미상	미상	미상(未詳)	1367	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 14위	
26	25	황	현	黃鉉	미상	미상	평해(平海)	1372	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 15위	
27	26	이	증명	李仲明	미상	미상	미상(未詳)	1370	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 16위	
28	27	김	자린	金自麟	미상	미상	광산(光山)	1372	미상	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 17위	
29	28	이	관	李倓	미상	미상	인천(仁川)	1372	1418	미상(未詳)	식년시(式年試)	태조2	1393	동진사(同進士) 18위	

Note: For the explanation of the reference numbers, see the text.

Table 3 *Number of exams and successful examinees of the Civil Service Examination, 1393–1894*

King (Year)	Exams	Successful Graduates
Taejo (1393–1396)	2	66
Jeongjong (1399–1399)	1	33
Taejong (1401–1417)	11	281
Sejong (1419–1447)	21	510
Munjong (1450–1451)	2	73
Danjong (1453–1454)	3	106
Sejo (1456–1468)	23	402
Yejong (1469–1469)	1	33
Seongjong (1470–1494)	29	473
Yeonsan (1495–1506)	13	261
Jungjong (1506–1544)	57	933
Myeongjong (1546–1566)	26	497
Seonjo (1567–1606)	61	1,129
Gwanghae (1608–1621)	28	510
Injo (1623–1649)	52	784
Hyojong (1650–1657)	15	253
Hyeonjong (1660–1673)	24	405
Sukjong (1675–1719)	78	1,465
Gyeongjong (1721–1723)	9	183
Yeongjong (1725–1776)	126	2,179
Jeongjo (1776–1800)	41	798
Sunjo (1801–1834)	51	1,058
Heonjong (1835–1849)	23	463
Cheoljong (1850–1863)	26	476
Gojong (1864–1894)	81	1,780
Total	804	15,151

Source: <http://people.aks.ac.kr/index.aks>

2.2 UNSTRUCTURED DATA

There are many sources with unstructured data written by the government as well as individuals and families in Korean history. As explained above, some of them were listed as UNESCO's Memory of the World Program. Out of them, we introduce two representative historical materials by the Joseon government. First, the *Goryeosa* [高麗史, History of Goryeo Dynasty] is a historical book compiled by Jeong, In-ji and others who were the Confucian scholars under order of King Taejo (reign year 1392–1398, founder of Joseon dynasty). The *Goryeosa* is considered as one of the most authoritative sources for studying the Goryeo dynasty (918–1392). The *Goryeosa* was known to be compiled in 1449 since King Taejo ordered, completed in two and a half years, and finally published in 1454. The composition of the book follows the annalistic form [紀傳體], consisting of 139 volumes. Among them, 46 volumes are annals of kings [sega, 世家], 39 volumes are brief descriptions of important facts, systems, geography, etc. [ji, 志], 2 volumes are time tables [pyo, 表], and 50 volumes are arrayed biographies of historical figures [yeoljeon, 列傳].

A second example of unstructured data is The Annals of Joseon Dynasty [*Joseonwangjo sillok*, 朝鮮王朝實錄]. These annals consists of official records of Joseon kings over 25 generations and 472 years from 1392

onwards.² They are considered as the most important resource to study the history and culture of the Joseon dynasty. The Annals of the Joseon Dynasty are recorded in chronological form [編年體] and totaling 1,893 volumes. They were usually published during the period of a king's succession. The Annals of the Joseon Dynasty are considered as valuable historical records that contain detailed history of various aspects of Joseon including politics, diplomacy, military, system, law, economy, industry, transportation, communications, society, customs, astronomy, geography, science, medicine, literature, music, art, crafts, ideology, ethics, religion, etc. Figure 8 shows a screenshot of the webpage that provides the access to the book. The website currently provides digitized contents in Chinese classical characters and in Korean language. The row indicated with ① gives the date that the specific historical event happened and ② supplies the abstract of the event in Korean. A full description of the event appears both in Korean and Chinese classical characters (③). And the row indicated with ④ presents the original references from The Annals of Joseon Dynasty.

Figure 8 Capture of The Annals of the Joseon Dynasty from Korean History Database by National History Compilation Committee



Note: For the explanation of the reference numbers, see the text.

3 RESEARCH ON DEMOGRAPHIC BEHAVIOR, FAMILY HISTORY, AND SOCIAL MOBILITY IN KOREA

In this section, we highlight research results for demographic behavior, family history, and social mobility by the Ajou Interdisciplinary Research Group (AIRG) and other researchers. These contributions to social science history reflect the dedicated work of many Korean scholars. As we review these studies, we look back on previous work and establish milestones for future studies.

2 The Annals of the last two kings including King Gojong and King Sunjong of the Joseon dynasty are not recognized as The Annals of the Joseon Dynasty because they were published during the Japanese colonial period. Refer to <http://esillok.history.go.kr/about/veritableRecordsInfo.do?jsessionid=9B8A53FBBD024C8A14FE3E4CD55395E>.

3.1 DEMOGRAPHIC STUDIES

Korea's rich household registers and family genealogies have long been considered valuable resources for historical demographic research (Wagner, 1974a). Social demographers used these data to understand the population dynamics of the Joseon dynasty (Cha, 2009; Kwon & Shin, 1977). A major breakthrough came with the digitization of the Danseong and Daegu household registers since around 2000, which allowed full-fledged historical demographic research using computerized data. However, after carefully reviewing the nature of the collected data, these scholars concluded that both the household registers and the genealogical data were recorded by the state or family in a selective way and hence these data could not be considered as a representative sample of the population (Household Registers Research Team, 2003; Lee, 2010a; Park & Lee, 2008).

These findings have had a significant impact on future research of historical demography in Korea. First, scholars realized that the history of the entire population of the Joseon dynasty could not be understood using the household registers and genealogical data. They record only a part of the historical reality from which we do not know how to construct missing demographic data (Jung, 2007; Kim, Park, & Jo, 2013). Scholars warn that strict verification is necessary to use the genealogies and the household registers as data for historical demographic studies (Miyajima, 2004; Son, 2016). Second, as a result, scholars turn their attentions to comparative historical studies in which characteristics of Korean data are compared with those of the West and China (Han, 2020; Park & Lee, 2008; Rhee, 2004).

3.1.1 FERTILITY AND MORTALITY

Thanks to studies that are a milestone in data utilization, Korea has actively contributed to historical demographic research. Above all, using genealogical and household register information on birth and death, researchers have estimated life expectancies and fertility rates. Male life expectancy at birth was estimated to be 23 years during the 18th and 19th centuries, based on information about mortality in the early 20th century and model life tables from genealogies. Age-specific marital fertility rates for upper class females were calculated from genealogies and were combined with estimates of age at first marriage and information on colonial fertility to derive a total fertility rate of 6.81 (Cha, 2009). Given that life expectancy of the nobility during the Goryeo dynasty (918–1392) was 34.8 years (Lee, 2010a), the gap between the figures from this period and the 18th and 19th centuries was very large. More case studies are needed to arrive at more definitive conclusions, because the results vary depending on the circumstances of the data.

It has been confirmed that fertility is affected by social status and economic power. A study on the household registers of Jeju Island of Korea from 1914 to 1925 found a positive relationship between the size of the land holdings and the childbearing. Since this relationship was not linear, an analysis of nonlinear relationships was attempted using qualitative examples (Kim & Park, 2009). Marital fertility was also investigated through data from the family registers of the Japanese colonial period. This study suggested that improvement in child survival is a prerequisite for lower birth rates (Kye & Park, 2016). Women's age at first childbirth was estimated using household registers of late 17th to early 18th century Joseon dynasty. Family histories reconstructed by the connection of consecutive household registers to compensate for the defects of these registers confirmed that cultural factors such as social status and marriage customs are closely related to fertility (Son & Lee, 2010). Combining household registers and genealogical data from the 19th to the mid-20th century made it possible to determine the relationship between the social status of parents and the number of children. High socioeconomic status proved to be a factor in having more children (Lee & Yoo, 2018).

Research has also been focused on mortality. The nobility belonging to the Goryeo dynasty (918–1392) shows a lower level of mortality than the nobility in China and England during the same period (Lee, 2010a). This result is limited to an elite population, but it is important to learn that mortality was lower in Korea than in China and England at the time. Estimates of child mortality in mid-20th-century population registers have examined the effects of gender, birth order and sibling composition. The relative strength of social and biological factors on mortality was by historical context, and Korean families actively respond to these constraints (Park, Han, & Kye, 2018).

3.1.2 MARRIAGE, ADOPTION, AND MIGRATION

Male and female ages at marriage have been calculated over the period 1678–1789 using Danseong household registers. Most first marriages took place between the ages of 15 and 20. During this period, marriage in Korea was earlier than in Europe, later than in Japan, and similar to China (Kim, 2005). Marriages tended to be homogeneous in terms of social background. Since the 17th century, when tribal villages

organized on the basis of patriarchal blood relations [*dongseong chonrak*, 同姓村落] gradually became more concrete, marriage to spouses of other influential family members living in nearby areas has become common (Kwon, 2006). Comparisons of urban and rural marriage have been conducted using the household registers of Daegu in the 18th century. Differences in marriage ages and remarriage rates are attributed to differences between agricultural and urban lifestyles, value systems, and occupations (Kim, 2009).

Studies of family succession have considered duration of residence, adoption, and re-marriage. The specific characteristics of Korean adoption differ from practices in China and Japan (Kim & Park, 2010). Upper-status genealogies [*Bulcheonwye jokbo*, 不遷位族譜] suggest that the close relationship between adoption and birth rates is only partly explained by cultural factors such as status maintenance. The correlation between male remarriage and adoption has also been examined. The number of remarriages among men peaked at the end of the 17th century and decreased rapidly until the 19th century. Meanwhile, adoption was more frequently used to maintain the social and economic status of the family (Son, 2010).

A recent genealogical analysis of Korea's 13th- to 15th-century marriage networks examines the role of marriage in family succession and maintenance of social status (Lee & Lee, 2017). Marriage was an important strategy of maintaining social status. Even if the existing power structure changed because a dynasty was replaced, political elites wanted to maintain the existing marriage network. However, appointments of new officials outside the existing family network showed that the system was not as closed as one might think. Along the same line, the impact of marrying into the royal family was also studied (Hong, Lee, & Yoo, 2021). Genealogies of 15 elite families show that they regarded marriage as a means of managing the socio-political inner circle of elite families in early Joseon Korea (1392–1506). Marriage patterns indicate that the socio-political power of affinal kin has a greater effect on promotions than descent or meritocratic considerations. In particular, marrying into a queen consort's family increased the likelihood an individual would end up in a high position, which was beneficial for retaining the political power of the family.

Although migration is a significant life course event, it is not studied as often as it should be. Nevertheless, several studies of migration have used household registers from the 19th century to the Japanese colonial period in Korea (1910–1945). One study examined patterns of geographic mobility in association with migration distances and migrants' ages. The results suggest that as soon as Korea headed down the road to modernity, individual movements followed mixed migration patterns. Prior to modernization, migration in Korea exhibited both a stability-oriented pattern and a life-at-stake-oriented pattern. These findings confirm the context-specific diversity of migration processes across different societies and historical periods (Son & Lee, 2013). Migration patterns of people who lived in Seoul in the early 20th century were examined through age-specific migration rates and migration life tables using household registers (Kye & Park, 2013).

3.2 SOCIAL MOBILITY

Given the characteristics of the stratification system of the Joseon dynasty, social mobility is a critical issue in Korean history. The social stratification system in Korea has been called 'ambiguous' (Miyajima, 2003), because it had features of both the Japanese and Chinese models. Social status was not legally inheritable and depended on the reputation of the family. Social status played an impressive role in various ways. For example, social status was a more important criterion for being listed in a certain genealogy than lineage or birth order (Lee, 2010b). Therefore, elite family members had to make all kind of efforts to maintain their social status (Wagner, 1974b). Several studies examined the process and structure of reproduction of the elite family in pre-modern Korea. Using genealogical data, a study analyzed the hereditary tendency of bureaucratic reproduction in the 13th and 15th centuries by measuring the influence of fathers and grandfathers on the acquisition of official positions by individuals. According to this analysis, fathers had a strong influence on the acquisition of government posts, but the influence of grandfathers was low except for high-ranking government posts (Lee, 2013). In addition, there is a study that analyzed the intergenerational status mobility using family registers produced from the late 19th century to the early 20th century. Long-term mobility trends were identified based on the status of great-grandfathers, showing that absolute and relative mobility increased significantly in the late 19th century (Kye & Park, 2019).

Several researchers introduced methodology and theory enabling more advanced social mobility research. By linking genealogies to household registers, lineages can be linked to individual and household data on residence and social status (Kwon, 2014). This work challenges conventional views of intergenerational mobility of social status. Lee and Park (2018) constructed a prospective genealogical database containing all the records of public offices and family reproduction data over five generations of two elite family lineages in pre-modern Korea. They argue that the confluence of an ambiguous stratification system with a limited

number of high-ranking offices generated a trade-off for parents between the quantity and quality of positions attained by their offspring. The result of the trade-off was an unequal distribution of family resources aimed at reaching the lineage's collective goal, rather than maximizing the social rankings of individual children. Using a novel empirical strategy to consider the heterogeneous resource-allocation within elite families, this paper presents empirical evidence on associations between parents' and grandparents' social ranks and the quality of offices achieved by children of elite Korean families (Lee & Park, 2018).

4 FUTURE RESEARCH AT AIRG

As we have seen, Korean researchers have many achievements in social science history. Ongoing work at AIRG will extend historical and social science history through collaborations between historians and computer scientists (Lee, 2016b). A new field of research called 'digital history' is investigating the life courses of pre-modern Koreans, intergenerational- and multigenerational-effects of social mobility, the structure and function of the Korean family, the power mechanisms of the elite families, and other topics.

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