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Age patterns of migration among Korean adults in the early 20th century Seoul

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Abstract

In this study, we examined the age patterns of migration among adults who were living in Seoul in the early 20th century. We used information, which we obtained from the Seoul household registers, on the length of time these adults lived in their current residence to estimate age-specific migration rates and construct migration life tables. Our findings point to the following: First, migration rates among Seoul residents were high. On average, Seoul residents in the early 20th century moved more than six times during their primary working age (15-64). Second, individuals in the upper class were more mobile than those in the lower class. While those in the upper class moved more than eight times between ages 15 and 65, those in the lower class moved fewer than six times. This class differential can be explained by frequent duty changes among Korean bureaucrats during this period. Third, household composition also mattered for migration rates. The implications of our findings are discussed.

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1. Introduction

This study uses the Seoul household registers (the *Gwangmu Hojuk*) to examine the age patterns of migration in early 20th century Seoul. Constructing age profiles of migration, in general, is important but challenging. Because migration, together with birth and death, is a fundamental demographic process, understanding the age patterns of migration is essential in any demographic inquiry. Migration rates are often difficult to estimate, however, owing to the lack of adequate data. The data problems are even more prominent in non-contemporary populations. In the current study, we used the Seoul household registers recorded in 1896, 1903, and 1906 to construct our age profiles of migration among adult Seoul residents. Although our data span the late 19th to early 20th century, we refer to the early 20th century for the sake of convenience. The Seoul household registers collected unique information—specifically, how long residents lived in their current place—with which we could study migration patterns. We used this information, together with mortality estimates from life tables, to construct our age profiles of migration.

Migration studies in historical populations typically estimate net migration by comparing two cross-sectional data on age distribution with information on vital rates (Willekens, 1994). Population changes that cannot be explained by mortality and fertility are attributed to net migration. Migration flows are much more difficult to estimate owing to a lack of data. Researchers primarily use indirect methods, such as model migration profiles and time-series of aggregate cross-sectional data, to estimate gross migration (Rogers, 1975). Although the Seoul household registers do not provide complete information with which to estimate migration flows, the duration of current residence was useful for our purposes. From it, we could identify migrants who moved into new residences, which helps us to estimate migration rates. As we will discuss later, duration in current residence, which is available in the Seoul household registers, provided us with much better information with which to estimate migration flows than would most other registration data.

The current study will contribute to current scholarship in two ways. First, it will enhance our understanding of migration patterns among Seoul residents at the beginning of 20th century. In this period, Korea was about to experience modernization, which brought about fundamental socioeconomic transformation including urbanization. Seoul—as a political, administrative, social, and economic center of Korea—was the primary place that drew migrants from other regions of the country. Our examination of the migration patterns in Seoul at the beginning of this process should help us to understand the later process. Second, the data in the current study will allow us to apply a new way of estimating migration flows in historical populations. The information concerning the duration of current residence that we used has not been widely available or employed in previous studies of migration. Our study will therefore show how beneficial it is to use such information to estimate migration flows.

2. Review: Demographic studies of pre-modern Korea

Demographic studies of pre-modern Korea primarily use two types of data: household registers (*hojuk*) and genealogies (*jokbo*). The household registers are used by researchers to estimate population size, fertility, marriage patterns, and occupational composition. For example, Kwon and Shin (1977) used a series of household registers to estimate population size during the Chosun Dynasty. Their estimation suggests that the annual average growth rates at that time were very low and population was basically stationary. This low growth rate should be attributable to high mortality and high fertility—key features that were prevalent before the demographic transition (Livi-Bacci, 2007). K. Kim and Park (2009) used the civil registers to examine differential fertility behaviors by landholding in the Jeju Island between 1914 and 1925. Their findings show that those individuals who had larger landholdings gave birth earlier than those who had smaller landholdings, which is consistent with patterns observed in other pre-transition societies (Skirbekk, 2008). K. Kim (2009; 2005) used 18th-century household registers to examine marriage and remarriage patterns in Taegu and Tansong, which lie in the southeast of Korea. In both areas, he found that high-status people married earlier and remarried less frequently than did middle- and low-status people. High-status people married young to ensure the birth of male heirs, and remarriage rates were low among them because the Neo-Confucian ideology that was prevalent in the late Chosun Dynasty did not recognize sons born to a second wife as legal offspring. Cho (1998) analyzed the occupational and status composition of Seoul in the late Chosun Dynasty. He used 17th-century household registers and the *Gwangmu Hojuk* to demonstrate several characteristics of the Seoul population during that period. Among the characteristics he found were a disproportionately large share of high-status people, the fact that the peasants' primary residences lay outside the city wall, and an increase in the number of merchants over time. Y. Kim (1982) showed, through an analysis of the *Gwangu Hojuk*, that substantial class and geographic mobility occurred in early 20th-century Seoul.

Although these studies contribute to our understanding of population characteristics and changes found in Chosun Dynasty, we should be cautious when we interpret the results using the household registers. This is because the household registers usually counted only about 40 percent of the population (Kwon & Shin, 1977). K. Kim's (2002) careful examination of the changes in the number of households and population in Chosun Dynasty, as shown in the household registers, led him to discover some abnormal population growth or decline during various periods. For example, the number of total households tripled during a period of 50 years in the middle of the 17th century. Because such a rapid population growth is highly unlikely in a pre-transition society, K. Kim (2002) interpreted this increase to be consequent to more active population registration in the late 17th century instead of a sign of real population growth. Thus, K. Kim (2002) argues that the recorded number of households and people in household registers during the Chosun Dynasty was greatly influenced by taxation. The central government seemed to assign a target number of households or people to each area, and household registers used this number to record the total number of households or population rather than recording the actual population. This produced the difference between actual and recorded numbers of households and population. Researchers assume that about 40 percent of households were recorded in the registers throughout the Chosun Dynasty (Kwon & Shin, 1977; K. Kim, 2002; Seo, 2007). Seo (2007) contends that the importance of household registers grew increasingly in the late Chosun Dynasty, and that these household registrations were conducted as part of a solemn ritual that symbolized royal power. This feature warrants careful interpretation of results using the household registers of the Chosun Dynasty. The *Gwangmu Hojuk*, which we used in our study, differed from the previous household registers in that it attempted to enumerate the actual numbers of households and people living within area instead of assigning target numbers (Son, 2005; Son, 2008). Thus, using the *Gwangmu Hojuk* reduces the problem associated with Chosun Dynasty registration practices although it is not still enough. We will discuss the data issue in more detail later.

Another line of research uses genealogies. Lee and Park (2008) analyzed the genealogy of a powerful clan, Andong Kwon clan, in 15th-century Korea to show the importance of marriage in forming a family line. Unlike most genealogies that were available in China and at a later time in Korea, the genealogies that were recorded in the early Chosun Dynasty include information on sons-in-law. Lee and Park (2008) used this unusual characteristic in early Chosun genealogy to demonstrate that family formation through a marriage network was important in shaping this powerful clan. Cha (2009) used the genealogies of four clans to estimate fertility and mortality rates in the late Chosun period. For mortality rates, Cha (2009) used model life table estimates to construct mortality profiles for women before age 19 because these genealogies only recorded males who survived at least 19 years. To estimate fertility rates, he combined the fertility rate of high-status women with the information on differential fertility by social status that was available during the early 20th century. After combining all of this information, he concluded that the average annual population growth rate in the late Chosun Dynasty was 0.62 percent, which is quite similar to the estimates derived from studies using the household registers (Kwon & Shin, 1977).

The studies that use household registers and genealogies contribute to our understanding of demographic patterns in pre-modern Korea. Nonetheless, none of these studies, except for Y. Kim's (1982), examined migration patterns in Korea. Even Y. Kim's (1982) pioneering study did not fully use the information on the time spent in current residences—information that is helpful when estimating migration rates. Migration patterns are often difficult to estimate owing to a lack of adequate data, and the data problems are often exacerbated in historical populations, which has also been the case in Korea. Our study uses the *Gwangmu Hojuk*, which provides the information necessary to estimate migration flows, to attempt to fill in the gap in the literature and contribute to a more complete understanding of demographic behaviors in pre-modern Korea.

3. Historical background: *Gwangmu Reform, Gwangmu Hojuk*, and Seoul at the turn of the 20th century

The Chosun Dynasty faced critical domestic and international challenges in the late 19th century. It encountered a large peasant revolt that forced fundamental social, economic, and politic reform in 1894. The country had also met international challenges since opening its port to trade in 1876. To face these challenges more effectively, the Chosun Dynasty attempted to execute a comprehensive reform—the *Gwanmu Reform*—starting in 1894.[1] This reform included reorganizing the household registers. The household registers that were started by the *Gwanmu Reform* and ended with the collapse of the Chosun Dynasty (1910) are called the *Gangmu Hojuk*. In them, the government departed from its previous practices of collecting household registers to encourage the registration of the actual number of households and people living within the area. However, this effort was not perfect. Son (2005; 2008) contends that the *Gwanmu Hojuk* was in a transitional phase, moving from the traditional registers of Chosun Dynasty to the modern registers that started after Japanese colonization. Although the *Gwanmu Hojuk* is incomplete, its data quality is arguably better than those in previous registers are; this supports its application in demographic studies. Indeed, the *Gwangmu Hojuk* has been widely used to understand the socio-demographic characteristics of various regions in Korea during the late 19th and early 20th centuries (Jung, 2002; Son, 2005; Son, 2008; S. Oh, 1991; Lhim, 2004).

The current study uses the *Gwangmu Hojuk* that was conducted in Seoul in 1896, 1903, and 1906 (hereafter the Seoul Registers). Seoul, in the late 19th and early 20th century, was the political center of the Chosun Dynasty. Consequently, more current and former bureaucrats lived there than in any other regions in Chosun. The proportion of bureaucrats among the total of Seoul residents was much higher than that in Western cities at a comparable period. For example, studies of 19th-century Philadelphia and London do not list bureaucrats as a separate occupation (Hershberg & Dockhorn, 1976; Shaw-Talyor, unknown).

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[1] The characteristics of the *Gwanmu Reform* are under debate among Korean historians. While Shin (1978) argued that it was basically a counter-revolution led by the Royal Court and the highest bureaucrats to subdue the reform requested from the bottom, Kang (1978) contended that it was an internal attempt to modernize the Chosun Dynasty. The debates are ongoing. Please see J. Oh (2007) for a recent literature review.

By contrast, in the analytic sample that we will describe later, the proportion of current and former bureaucrats living in late-19th and early 20th-century Seoul is close to 20 percent. This high proportion of bureaucrats has important implications for migration patterns. Records show that bureaucrats in the late Chosun dynasty changed duties frequently (E. Kim, 2011; Yun, 1990). Because of these duty assignment patterns, they also tended to change residences frequently. The frequent moves made by bureaucrats should affect migration flows in Seoul greatly.

Not only was Seoul a political center of the Chosun Dynasty; it was a planned city composed of 5 districts (the Eastern, Western, Southern, Northern, and Central districts) and had a rampart that connected the mountains surrounding it. The Central district was located inside the city wall; the other districts had inside- and outside-wall areas. There were substantial differences between the inside- and outside-wall areas. While the inside wall was the political, economic, and cultural center of the Chosun Dynasty—that is, the place where the royal palace, government offices, and residence of the elites were located—the outside wall was an agricultural, commercial, and handcraft manufacturing area in which the common people lived and made their livings (Park, 2009). Following its port opening in 1876, Seoul experienced rapid changes, including foreign capital investments, political interference, and the arrival of missionaries. Although these factors substantially changed the configuration of Seoul in the late 19th and early 20th centuries, the distinction between the inside and the outside wall was largely maintained. The available data, which we will discuss later, are largely concentrated on the inside-wall area. Hence, our analysis is more relevant to the inside wall rather than to Seoul as a whole.

4. Theories of migration and research question

We developed research questions based on theories of migration and data availability. A variety of theoretical perspectives have been suggested to explain why people migrate from one place to another. Massey and Espinosa (1997) classify these theories as neoclassical economics, social capital theory, new economics of migration, segmented labor market theory, and world systems theory. Although these theories were developed primarily to explain international migration, they can also be used to explain domestic flows. The neoclassical economics theory emphasizes cost-benefit calculation at individual levels. This means that people may migrate when they think that the benefits of moving exceed the cost. The social capital theory weighs the value of social relationships; it thus emphasizes the importance of migrant networks in migration decision. Simply put, people tend to move to places where they have ties because they can easily obtain useful information on their destination, thereby reducing the cost of moving. The new economics of migration theory is based on geographical market disequilibrium, which motivates households or families to manage the risk associated with potential misfortune in the local economy. People want to prepare for market failure, and one strategy is to have external income from family members in other regions available. According to this theory, more fluctuations in local economy may lead to more out-migration. The segmented labor market theory emphasizes the shortage of unskilled labor supply in advanced industrial societies, which increases demand for migrant workers. The large influx of unskilled Mexican migrants to the U.S. may be a good example to support this perspective. Finally, the world systems theory emphasizes the disruptive effect of a growing global market on peripheral societies. When capitalism expands into the global market, this expansion devastates the peripheral local economy, drawing people out of their homes and impelling them to new destinations in advanced societies. Among these perspectives, the segmented labor market theory and the world systems theory are the ones that are primarily relevant to explaining international migration. The other theories (i.e., neoclassical economics, social capital theory, and new economics of migration) can be applied to international and internal migration because they refer to social and economic differences between places that may or may not involve country borders.

Although these perspectives were in fact developed to explain migration in industrial societies, they can also be applied to migration in preindustrial societies. A few Swedish studies are exemplary in this regard. Dribe (2003a), who used household registration data in 19^{th}-century rural Sweden, found negative evidence against the new economics of migration. Although economic conditions fluctuated greatly, which may have facilitated migration among peasants to minimize the risk associated with local market failure, Dribe (2003a) found that 19^{th}-century Swedish peasants did not make long-distance moves to cope with economic stress. Dribe and Lundh (2005) did find high mobility among 19^{th}-century rural Swedish servants. In fact, their findings indicated that male servants were expected to move 20 times between age 10 and 60 (p.57). These frequent movements reflect the low cost of migration; servants did not have many dependents, servant jobs were mostly homogeneous, and servants were more likely to be dissatisfied with their present situation. In addition, the benefits associated with moving were potentially great: migration could facilitate climbing up the hierarchical ladder of servants (pp.61-63). Interestingly, these frequent movements occurred mostly over short distances. The destinations of more than 40 percent of these migrants were within the same parish, and 90 percent of the male servants did not cross regional boundaries. Dribe (2003b) also showed that Swedish rural families predominantly moved over short distances, and that their moves were influenced by access to land, social network, and family composition and type. In short, these studies point to the following: Rural residents in 19^{th}-century Sweden were quite mobile, their moves were primarily over a short distance, and migration was motivated by economic reasons.

Migration patterns observed in European rural areas may or may not be applicable to our historical context because our study examines migration patterns in early 20^{th}-century Seoul. We are examining a large city in a pre-industrial East Asian country at the time of the Chosun Dynasty. Because Seoul was a large city and the political center of the Chosun Dynasty, its occupation and class composition differed greatly from that of rural Swedish villages, possibly yielding different migration patterns. For example, many Seoul residents were government officials whose places of residence were driven by duty assignments, as we discussed earlier. Theories developed to explain contemporary migration also may not be suitable for our study. Because the underlying logics in migration theories are quite general, however, they should be useful when explaining migration patterns in preindustrial Seoul. Unfortunately, we have only limited, albeit valuable, information on migration; this makes it difficult to test fully the theories discussed above. First, our data are not multi-regional. We have data only on Seoul residents. This limitation means that we cannot construct a complete profile of migration flows in and out of Seoul. We do have good information on migration flows *within* Seoul. Consequently, our analysis is based on migration flows within Seoul, and we will attempt to infer migration flows in and out of Seoul using limited information. The necessary assumptions we will make will be discussed later. Second, we have limited information on the covariates that are related to migration behaviors. We therefore cannot rigorously test competing migration theories. In this sense, the current study will be basically descriptive rather than causal. Although we cannot test theories rigorously, we can attempt to interpret the results carefully by referring to existing theories.

We will build on the discussion above to examine the following research questions: First, how frequent did household migration occur in Seoul in the early 20^{th} century? Did the patterns depend on the age and social class of the household head, household size, housing type, and ownership? Second, how did individual migration rates differ when we take into account the age and social class of the household head? Third, after we have account for mortality, how many times did Seoul residents, on average, move in and out of Seoul? By examining these questions, we can describe the migration patterns among Seoul residents in the early 20th century.

5. Data

We used the Seoul Registers that were collected in 1896, 1903, and 1906. The available observations are geographically concentrated in the central and northern part of Seoul. These areas were more occupied by current and former bureaucrats than the other areas in Seoul. Hence, the data may not be representative of Seoul as a whole during this period. A cautious interpretation of results is therefore warranted. The registers contained information on Seoul residents, including their age, current residence, and previous residence; the number of household members; the housing type; and the social class and occupation of the household heads. These data include 42,829 observations of residents living in 10,510 households. We restricted our sample to households with heads age 15-64 who resided within the inside wall. As we will discuss below, because many respondents residing outside the city wall were missing in the information that is essential to estimating migration rates, we are restricting our sample to inside-wall residents. We also excluded the households that have missing information regarding the previous place of residence and class and occupation of the household head. The resulting analytic samples include 4,890 households and 13,447 individuals.

5.1. A measure of migration

The Seoul Registers provide valuable information with which to estimate migration flows; that is, *duration in current residence*. These registers collected information on the date on which households moved from their previous residence. We assumed that the date recorded is the same as the move-in date when we made our computations on the duration in the current residence. Several features of data warrant discussion. First, we only used the move-in year because many households are missing a specific day and month. As a result, our duration measure is recorded by year. Second, the duration variable is missing in many observations. In particular, it is mostly unavailable for outside-wall residents. Among the 1,458 households that resided outside of the wall, only 8.6 percent had valid information on the duration variable. The corresponding figure for inside-wall residents is 51.0 percent. This suggests that the duration information was not collected efficiently among outside-wall residents. For this reason, we restricted our analysis to inside-wall residents.[2] Third, we define migration as moving outside of the *dong* (village). Many households changed their residence within the same *dong*, which is not classified as migration. Fourth, because the duration information is unavailable for a large portion of the data, our analytic sample might not represent the population of interest. To check this concern, we compared basic demographic characteristics with those that have valid information on duration and those that did not. Our comparison is presented in Appendix Table A1. As we can see in Table A1, the age and household size are almost identical between these two groups (i.e., the inside-wall and outside-wall residents). The differences are not statistically significant. There are discrepancies between them in terms of place of previous residence, social class, and occupation, and these differences are statistically significant. Nonetheless, the makeup of each is quite similar to the other, lessening the selectivity concern. Fifth, we computed the annual migration rates by averaging the percent with a duration of zero year and a percent

[2] Y. Kim (1982) includes the households that were missing the duration variable by assuming that they did not change their residence during the lifetimes of the household heads. We are skeptical of this assumption, however, and treat the household heads as missing in our duration variable.

with a duration of one year. Because the Seoul Registers were largely completed in May and June, some households with duration of one year moved into the current residence before the 1 year shown in the registers, which would produce an overestimation of annual migration rates. To avoid this, we averaged proportion of zero year and one year to compute the annual migration rates. Finally, the place of current residence, previous residence, and duration variable are available only for household heads; the information is not available for other members in the household. We restricted our analysis to family members in households and assumed that all family members moved together. Although some family members in a household may have migration histories that are distinct from that of the household head, we made this assumption because otherwise we could not construct the age profiles of migration on an individual level.

In our analyses, we compared the migration patterns by years of registration, age, household size, housing type, social class, and occupation. Years of registration and age are self-explanatory; we constructed the other measures as follows: First, we measured household size by calculating the number of family members in the household. We excluded non-family members, such as servants. Second, we classified housing into three types: *kiwa* (owning), *choga* (owning), and renting. The *kiwa* is a more luxurious housing type than the *choga*; and we grouped all renters into the same category. Third, we broke social class into two categories: upper and lower. The upper class includes those who served, or whose ancestors served, as government officials (*yangban*). The lower class includes all others. Finally, we also broke occupation into two categories: upper and lower. The upper occupation includes current and former government officials as well as those who were preparing for exams to become an official. The lower occupation includes all others. Consequently, the class and occupation measures are highly correlated with each other.

6. Methods

The current study is basically descriptive. We attempt to describe the age patterns of migration using the Seoul Registers. To this end, we conducted the following analyses.

6.1. Analysis of changes in the number of households per tong

First, we examined the changes in the number of households in *tong*s over time. This method allowed us to estimate internal and external migration rates; specifically, rates of migration into and out of the city wall. The *Gwangmu Reform* reorganized the villages into *tong*s that were made up of 10 households (*ho*). Evidence suggests that the number of *tong*s in Seoul varied little between 1896 and 1906. This suggests that we can estimate population growth in a given area by comparing the average numbers of households in *tong*s across years.[3] If we assume constant fertility and mortality rates[4], we can also estimate net migration rates by comparing the average numbers of households in *tong*s between years. If the average number of households grows, this suggests population growth through positive net migration. As we described earlier, we restricted our sample to inside-wall residents because duration information for outside-wall residents is mostly unavailable. Because our sample includes only inside-wall residents, we cannot directly estimate out-migration rates; to estimate out-migration rates, we should have multi-regional data. However, we can indirectly estimate rates of migration out of the rampart because we can examine the changes in the number of households per *tong* and know the size of inflows into the inside wall. For example, if net migration is zero, the size of outflows (which we do not know directly) is equal to the size of inflows (which we do know from the data). Therefore, through examining

[3] If our data cover the entire area, we may simply compare the total number of households between years and estimate population growth rates. Since the available data are far from complete, however, we needed to use an indirect method to estimate population growth.

[4] This assumption is reasonable in a pre-transition society such as that in early 20th-century Seoul.

the changes in the average number of households in a *tong,* we obtain the information on net migration and out-migration indirectly.

6.2. Estimation of annual migration rates

Second, we estimated the annual rates of migrations. Those individuals who lived in their current residence zero or one year were classified as movers, and those individuals who lived in their current residence longer than zero or one year or whose previous residence was located in the same *dong* as their current residence were classified as non-movers. We then averaged the proportion whose duration of residence was zero and one year. Movers are classified into two groups: internal migrants, who changed their residence outside the *dong* and inside the city wall, and external migrants, who moved from the outside city wall. We used the size of external migrants to estimate the out-migration rates by combining the information on net migration rates. We also compared the migration rates between the upper and the lower classes.

6.3. Migration life tables

Third, we constructed increment-decrement migration life tables (Palloni, 2001). Migration is a demographic phenomenon that, like fertility and mortality, is highly age-dependent. Rogers and his colleagues have been working on discovering the age-patterns of migration and developing a topology of migration for several decades. (See Rogers, Little, & Raymer, 2011 for a review.[5]) If we use the age-dependence of migration and age-specific

[5] Rogers, Little, and Raymer (2011) have developed formal models of age-patterns of migration, and classified migration schedules depending on the values of parameter estimates in each schedule. This topology is based on the level and timing of migration. Rogers and Castro (1981; 1986), by compiling more than 500 multiregional migration schedules, applied the formal models of migration in their presentation of model migration schedules.

mortality rates, we can construct our increment-decrement migration life tables. In conventional life table analysis, a single decrement process is assumed. In other words, observations are excluded from the analysis, upon death. In increment-decrement migration life tables, migration and mortality are treated as competing risks: people either die or migrate during a specific period (between t_0 and t_1). Mortality is an absorbing state, and people who migrated between t_0 and t_1 can migrate or die during the next time period (between t_1 and t_2). We studied three types of migration: migration *inside, into,* and *out of* Seoul. Those who migrated *within* Seoul (between t_0 and t_1) are still subject to the risk of migration and death again during the next time period (between t_1 and t_2). While out-migrants between t_0 and t_1 are no longer subject to the risk of migration and death in the next time period, in-migrants are subject to the risk of migration and death during the next time period. We used the available information and made necessary assumptions to estimate age-specific rates of mortality, internal migration, in-migration, and out-migration. By constructing the increment-decrement migration life tables with this information, we can estimate the average number of migrations among Seoul residents in the early 20th century accounting for morality. We also examined how these estimates differed by social class. In Appendix 1, we formally discuss our increment-decrement life table analysis used in the current study.

We used estimated age-specific migration rates and mortality rates to construct increment-decrement life tables. As we discussed above, we cannot directly estimate out-migration rates using available data. Nonetheless, our analysis of changes in the number of households in *tong*s, which we will show in the Results section below, suggests that the number of households changed little over time. This means that the volume of out-migrations was about the same as that of in-migrations; moreover, all of the information necessary to construct migration life table is available. For mortality rates, we rely on Kwon (1977). Kwon (1977) used census and model life table estimates to construct Korean life tables for the period between 1925 and 1965. If we use Kwon's (1977) mortality estimates and assume that mortality rates were decreasing linearly between 1900 and 1965, we can estimate age-specific mortality rates in 1900. We used this information, together with estimates of migration rates, to construct migration life tables in early 20th-century Seoul.

7. Results

7.1. Changes in the number of households in tongs

Table 1 shows changes in the numbers of households in *tong*s. First, the number of *tongs* fluctuated across years, reflecting differences in coverage. For example, while 44 *tong*s are available in 1896, 384 are available in 1903 and 613 are available in 1906. The 1906 data are primarily available for the inside wall. The difference in the number of *tong*s reflects the changing coverage of our data instead of changes in the number of *tong*s across years. Second, we can see that the average number of households varied little across years. For inside-wall *tong*s, the number increased slightly over time; i.e., from 9.71 in 1896 to 10.40 in 1906. For outside-wall *tong*s, it fluctuated a little. The small change in the number of households in a *tong* suggests that the number of out-migrants from Seoul was close to that of in-migrants into Seoul. In other words, net migration rates were close to zero in early 20th-century Seoul. If we assume a zero-net migration and use the proportion that migrated from the outside wall during each year, we can indirectly estimate out-migration rates. For example, if the proportion of individuals who migrated from the outside wall or non-Seoul area is 10 percent within a given year, this implies that the outmigration rate is also 10 percent in that year. This feature allows us to estimate both internal migration rates and out-migration rates. Hence, in our subsequent analyses, we will assume that the net migration rates were zero in early 20th-century Seoul.

<Table 1> about here

7.2. Household-level analysis

Table 2 shows the household-level annual migration rates by year, age, household size, housing type, class, and occupation. First, we can see fluctuations in annual migration rates. The annual migration rates were 16 percent in 1896, declined to 11 percent in 1903, and rose to 12 percent in 1906. Second, we can see that migration rates varied by age. The annual migration rates were around 16 percent when the household heads were in their early 30s and dropped as the household heads aged. Third, occupational status and class are positively associated with migration rates. As we discussed earlier, previous studies showed that bureaucrats in the late Chosun Dynasty moved residence frequently owing to duty changes (E. Kim, 2011; Yun, 1990). This can explain higher migration rates among high-class and high-occupation household heads. Fourth, household size is negatively associated with migration rates. While less than 10 percent of the households with 0 to 2 members changed their residence across *dong*s, 13 percent of the households with 7 or more members made this change. The difference in household size also reflects higher migration rates among bureaucrats. Fifth, housing status is highly correlated with the chance of migration. Those who owned houses, regardless of the types of houses owned, were less likely to move than those who rented their houses. We may expect that the lower class was more likely to rent than the upper class, so this pattern seems to contradict the higher migration rates among the upper class. Such a relationship was not observed, however, because, while 7.6 percent of the lower class rented houses, 9.6 percent of the upper class also did so. The upper class was more likely to rent houses than the lower class. Such class differences in housing status may be related to the duty assignments of government officials; that is, the government officials might rent a house instead of owning one because they knew that they would need to change their jobs frequently.

<Table 2> about here

Several patterns are worth discussing. First, we observed higher migration rates among the upper class than the lower class. In theory, residential instability among the lower class may lead to higher migration rates among the lower class than the upper class. On the other hand, upper-class individuals may seek better housing options more frequently than those in the lower class, resulting in higher migration rates among the upper class. In addition to these general countervailing factors, the special characteristics of bureaucrats in the Chosun dynasty—specifically, their frequent duty changes—contributed to higher migration rates among the upper class. Although we do not have information on class differentials in residential stability, the results reflect the frequent movements of Korean bureaucrats in the early 20th century, thus outweighing class differentials in residential stability. Second, given the positive relationship between social class and household size, the positive association between household size and migration rates also is distinct from patterns in contemporary societies and consistent with higher migration rates among the upper class. Third, we observed higher migration rates among young adults (before age early 30s) than among older adults. This age pattern can be explained by frequent job-related movements among young adults, which is consistent with the model migration schedules that were developed by Rogers and his colleagues (Rogers, Little, & Raymer, 2011).[6] This confirms that despite the unique features of migration in early 20th-century Seoul—such as higher migration among the upper class and larger households—migration patterns in early 20th-century Seoul followed the general age patterns of migration. The age patterns and class differentials in migration,

[6] According Rogers, Little, and Raymer (2011)'s model of age patterns of migration (Rogers, Little, & Raymer, 2011), migration rates are high in early childhood and young adults. High migration among young adults is attributable to job-related movements, and high migration among young children is consistent with frequent job-related parental movements. According to this model, another peak of migration occurs: the "retirement peak." This may reflect the propensity of an individual to return to his or her hometown or to move to places friendly to the elderly after retirement. In our analysis, we primarily focused on working-age population (ages 15 through 64 years), so we did not examine these pre-labor force and post-retirement peaks.

which we observed from analysis, imply that job-related movements were important in early-20th century Seoul. This is also consistent with economic theories of migration because age and class difference related to the cost and benefit of migration should contribute to the different pattern of migration.

7.3. Individual-level analysis

Table 3 shows individual-level age-specific migration rates. Internal migration refers to inside-wall migration, and external migration refers to migration from the outside wall. As Table 1 shows, net migration rates are close to zero, so we can assume that the number of external migrations is equal to the number of migrations to outside-wall places among inside-wall residents. In Table 3, we present the annual age-specific migration rates by the social class of the household head. Of course, intergenerational social mobility was certainly possible during this period, and an individual's social class may have differed from that of his or her household heads, mostly fathers. Despite the possibility of intergenerational mobility, we present the age-specific migration rates by the social class of household heads to illustrate the differences in migration patterns by social class. Because of the existence of presumably solider-class boundaries in pre-modern societies than contemporary societies, the discrepancies between the actual social class and the assumed social class should not be great.

<Table 3> about here

Compared with the household-level migration rates shown in Table 2, individual-level migration rates are lower among young adults. The differences are notable before age 40. For example, while the migration rate among household heads age 15-19 is 16.5 percent, this number amounts to 10.4 percent among individuals age 15-19. We can explain this difference by the prevalence of extended families at this time, when young adults tended to co-reside with their parents. Hence, elderly household heads (e.g., age 50) were likely to have young adult children who resided with them. Given the negative association between the age of the household heads and the migration rates, the co-residence of young adults with their parents should lower the migration rates among young adults. This also suggests that migration rates among young adults depended on their status within the household. Young household heads were more likely to move than were non-household heads. Table 4 shows this pattern. Before age 40, we can observe much higher migration rates among household heads than among non-household heads. There is little difference between them after age 40. Higher mobility among young household heads than among non-household heads suggests that young household heads were more actively seeking employment opportunity than were the non-household heads. Alternatively, this suggests that the household head's job was more important than that of the non-household head in determining residence. In other words, the residence of non-household head young adults would be determined by household heads who tended to be older and less likely to move. Although we cannot confirm which factor is more dominant, this suggests that age patterns of migration are affected by job-related mobility and family composition. In other words, the higher migration rates among young household heads as compared with young non-household heads should be a combination of more active job seeking among the household heads and the dominant role played by these household heads in deciding where to reside. As in our discussion of household-level migration, age and class differences in individual-level migration implies that job-related movements were important in early 20th-century Seoul. This is also consistent with economic theories of migration, because age and class differences in cost and benefit of migration should contribute to different patterns of migration. The comparison between young household heads and young non-household heads also suggests that the composition of a household may affect the cost-benefit computation on an individual level. In other words, the decision to migrate is not only dependent on job opportunity but also on household composition.

<Table 4> about here

7.4. Migration life tables

Table 5 presents migration life table estimates. As we discussed in the Methods section, we combined two sources to construct the migration life tables. For mortality quantities ($\mu^x{}_{13}$), we extrapolated life table estimates between 1925 and 1965 (Kwon, 1977). The $\mu^x{}_{13}$ in each age group are computed by assuming that age-specific death probability decreased linearly between 1900 and 1965. For internal and external migration rates ($\mu^x{}_{internal}$ and $\mu^x{}_{12}$), we assumed that 1) migration rates are constant within each 5-year age interval, and 2) the number of migrants from the outside wall to the inside wall is equal to the number of migrants from the inside wall to the outside wall. We justified the second assumption by showing the number of households within *tong*s changed little across the register years (1896, 1903, and 1906) in Table 1. Because internal movers are subject to the risk of mobility in the following age groups again and we assumed that migrations into and out of wall were equal, the number of survivors (l_x) was assumed to decrease only via mortality ($\mu^x{}_{13}$). As in Table 3, our migration life tables are presented by social class.

<Table 5> about here

Our results point to the following patterns: First, 5-year migration rates appear to be fairly high. For example, the internal migration rate ($\mu^x{}_{internal}$) varies from 39 percent to 51 percent and the external migration rate ($\mu^x{}_{12}$) varies from 35 percent to 46 percent for the entire sample. These figures are even larger for the upper class; for those in their 20s through early 40s, the sums of internal and external migration rates are even greater than 1. This means that, on average, people in these age groups changed their residence (internally or externally) more than once in five years. This suggests that early 20th-century Seoul was a mobile place. Second, these high migration rates led to many moves throughout the life course. The d^i_x and d^o_x represent the number of internal and external movements per 1,000 in the given 5-year interval. The sums of these figures reflect the total number of migrations between age 15 and 64 and before death, which are presented in the last row in each panel. For the entire sample, the sums of d^i_x and d^o_x are 3,341 and 2,988, respectively. Because we set the radix (l_{15}) to 1,000, this means that, on average, people in Seoul migrated internally 3.34 times and externally 2.99 times between age 15 and 64 before they died. Taken together, the people in Seoul on average migrated internally and externally more than six times during their primary working age. The sums of internal and external migration rates provide estimates of average movements if we assume that there was no mortality between age 15 and 64. This is called the Total Migration Rate (TMR) (Dribe & Lundh, 2005), and it is calculated in the same as Total Fertility Rate. These numbers are, of course, greater than the sums of d^i_x and d^o_x. Without mortality, Seoul residents in the early 20th century would have moved outside of the *dong* more than eight times.[7] Third, we can see even more frequent movements among the upper class. On average, those in the upper class moved 4.11 times internally and 3.78 times externally when we account for mortality; these numbers are 5.39 times and 4.95 times without accounting for mortality. Again, the more frequent movements

[7] Dribe and Lundh (2005) show that the TMR for Swedish male servants in the 19th-century rural area was 20, which is much higher than our estimates. This may suggest that early 20th-century Seoul residents were less mobile than Swedish rural servants in the 19th century. However, we should be cautious when comparing these figures because the definition of migration differs. While we define migration as a movement to different villages (*dong*s), the Swedish study defines migration as any change in residence.

among the upper class than the lower class reflect the duty assignment patterns of bureaucrats in the late Chosun Dynasty.

8. Summary and discussion

In this study, we examined the age patterns of migration in early 20th-century Seoul. We used the information on duration that is available in the Seoul Registers for the current residence, and estimated age-specific migration rates and migration life tables. Our findings point to the following: First, migration rates among Seoul residents were fairly high. On average, Seoul residents during this period were expected to change their residence more than six times during their primary working age (15-64). Second, the upper class was more mobile than the lower class. While the upper class would move more than eight times between age 15 and 65, this number amounts to less than six times among the lower class. This class differential can be explained by frequent duty changes among Korean bureaucrats in this period. Third, young household heads were more mobile than were young non-household heads. This suggests that the decision to migrate is associated with family composition as well as job opportunity.

The current study contributes to our understanding of migration patterns not only in pre-modern Korea, but in pre-modern societies in general. Studies on migration in pre-modern societies are rare owing to the lack of available data. We filled in the gap in this literature by using the unique information available to us from the Seoul Registers on migration. Several limitations remain, however. First, the available Seoul Registers are concentrated in the area in which the upper class lived. Hence, the results may not reflect the Seoul population as a whole in the early 20th-century. Second, our measures of migration are based on various assumptions that are difficult to test empirically. Our study should be validated using historical studies in this period. In other words, we need to check the feasibility of our results by referring to other historical studies on early 20th-century Korea. Despite these limitations, however, our study contributes to our understanding of migration patterns in pre-modern Korea in various ways.

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Appendix 1 Increment-decrement migration life table analysis

In Appendix 1, we summarize the exposition of Palloni (2001). The increment-decrement life table analysis is useful when describing transitions between multiple states. Unlike the single-decrement process, in which observations only transit to an absorbing state (e.g., death), we are dealing with a process in which observations can transit between multiple states. Figure 1A shows this process.

<Figure 1A> about here

As shown in Figure 1A, individuals living inside the city wall can move from the inside wall (S_1) to the outside wall (S_2), move internally (e.g., within the city wall), or die (S_3). The μ^{x}_{ij}'s represent the rate of transitions from state *i* to state *j* between age *x* and *x*+1. The $\mu^{x}_{internal}$ is the rate of transition from one area within the city wall to another area within the city wall. Death (S_3) is an absorbing state, meaning that transitions to S_3 cannot be reversed. Instead of estimating the full increment-decrement life table for migration process, we constructed partial migration life tables by estimating $\mu^{x}_{internal}$, μ^{x}_{12}, and μ^{x}_{13} in this study. First, we estimated $\mu^{x}_{internal}$ by using the data. We know how many people moved inside the city wall (incidences) and how many people resided inside the city wall (exposure). Second, we linearly extrapolated the age-specific mortality rates between 1925 and 1965 in Kwon (1977) to obtain estimates of μ^{x}_{13}. Third, we estimated μ^{x}_{12} indirectly. As we discussed earlier, we do not know the number of migrations from inside the city wall to outside the city wall, although we do know the number of migrations from the outside wall to the inside wall. Hence, we cannot directly estimate μ^{x}_{12}. The analysis shown in Table 1, however, suggests that net migration rates were close to zero in early 20th-century Seoul. By assuming that the net migration is equal to zero, we can also assume that inflows equal outflows and obstain our estimates of μ^{x}_{12}. We used these estimates to construct migration life tables for the inside-wall residents. The increment-decrement migration life tables thus show the expected number of internal migrations and out-migrations, accounting for mortality.

From the estimated transition rates from state *i* to state *j* (μ^x_{ij}), we constructed the life table quantities such as the number of people living inside the city wall at age *x* (l_x), the number of deaths between age *x* and *x*+5 (d_x), and the number of internal migrations (d^i_x) and out-migrations (d^o_x) that took place between age *x* and *x*+5. In the current study, we examined migration during the primary working age (15-64). The mathematical relationships between these measures are as follows:

$$d_x = l_x * \mu^x_{13} \quad (1)$$

$$d^i_x = l_x * \mu^x_{\text{internal}} \quad (2)$$

$$d^o_x = l_x * \mu^x_{12} \quad (3)$$

$$l_{x+5} = l_x - d_x \quad (4)$$

$$\text{Total number of internal migrations} = \sum d^i_x \quad (5)$$

$$\text{Total number of out-migrations} = \sum d^o_x \quad (6)$$

The estimates given in equations (5) and (6) were obtained by accounting for mortality. Hence, we interpreted these quantities as the expected number of total movements between age 15 and 64 before death. Alternatively, we estimated the expected number of migrations by summing the migration rates (μ^x_{internal} and μ^x_{12}). Dribe and Lundh (2005) call this the Total Migration Rate, which is computed in the same way as the Total Fertility Rate. This measure tells us the average numbers of movements without accounting for mortality. As shown in Table 5, we presented both measures by the social class of the household head.

Table 1 Changes in the number of households in tong

	NO. of tongs	Mean	S.D.
Inside wall			
1896	17	9.71	0.59
1903	223	10.00	1.72
1906	585	10.40	2.85
Outside wall			
1896	27	9.30	1.88
1903	161	9.48	1.74
1906	28	9.07	3.02

Table 2 Household-level annual migration rates by year, age, household size, housing type, class, and occupation

	Migration rate	Observations (N)
Year		
1896	0.162	102
1903	0.110	1,252
1906	0.124	3,536
Age		
15-19	0.165	91
20-24	0.156	253
25-29	0.168	390
30-34	0.164	559
35-39	0.131	678
40-44	0.111	583
45-49	0.093	717
50-54	0.093	672
55-59	0.104	540
60-64	0.098	407
Household size		
0-2	0.098	532
3-4	0.124	1,595
5-6	0.118	1,412
7+	0.130	1,351
Housing type		
kiwa	0.118	1,548
choga	0.108	2,966
rent	0.239	376
Class		
lower	0.099	2,726
upper	0.148	2,164
Occupation		
lower	0.101	2,715
upper	0.146	2,175
Total	0.121	4,890

Table 3 Individual annual migration rates by class of household head

	Entire sample		Upper class		Lower class	
Age	Internal	External	Internal	External	Internal	External
15-19	0.104	0.092	0.128	0.104	0.103	0.092
20-24	0.128	0.109	0.152	0.144	0.127	0.106
25-29	0.133	0.114	0.226	0.208	0.122	0.103
30-34	0.122	0.104	0.201	0.160	0.107	0.093
35-39	0.115	0.105	0.146	0.137	0.108	0.098
40-44	0.107	0.097	0.144	0.142	0.097	0.085
45-49	0.093	0.082	0.111	0.101	0.088	0.075
50-54	0.097	0.083	0.136	0.116	0.086	0.074
55-59	0.107	0.090	0.113	0.095	0.105	0.089
60-64	0.098	0.082	0.108	0.095	0.094	0.077
N	13,446		2,163		11,283	

Table 4 Individual annual migration rates by household head status

	Household head		Non household head	
Age	Internal	External	Internal	External
15-19	0.165	0.144	0.101	0.090
20-24	0.161	0.142	0.123	0.104
25-29	0.163	0.140	0.124	0.106
30-34	0.155	0.133	0.104	0.088
35-39	0.121	0.112	0.111	0.100
40-44	0.108	0.103	0.107	0.092
45-49	0.090	0.077	0.097	0.087
50-54	0.090	0.079	0.104	0.087
55-59	0.100	0.085	0.114	0.096
60-64	0.095	0.083	0.102	0.081
N	4,607		8,839	

Table 5 Migration life tables

Age	$\mu^x_{internal}$	μ^x_{12}	μ^x_{13}	l_x	d_x	d^i_x	d^o_x
Entire sample							
15-19	0.424	0.384	0.045	1000	45	424	384
20-24	0.497	0.439	0.056	955	54	475	420
25-29	0.511	0.455	0.062	902	56	461	410
30-34	0.478	0.422	0.068	846	58	404	357
35-39	0.458	0.426	0.078	788	61	361	336
40-44	0.433	0.400	0.088	727	64	315	291
45-49	0.387	0.347	0.100	663	66	257	230
50-54	0.398	0.351	0.121	597	72	238	210
55-59	0.432	0.376	0.158	525	83	227	198
60-64	0.403	0.348	0.216	442	95	178	154
Total	4.424	3.948				3,341	2,988
Upper class							
Age	$\mu^x_{internal}$	μ^x_{12}	μ^x_{13}	l_x	d_x	d^i_x	d^o_x
15-19	0.496	0.421	0.045	1000	45	496	421
20-24	0.561	0.542	0.056	955	54	536	517
25-29	0.722	0.688	0.062	902	56	651	621
30-34	0.674	0.582	0.068	846	58	570	493
35-39	0.545	0.520	0.078	788	61	430	410
40-44	0.540	0.534	0.088	727	64	392	388
45-49	0.443	0.414	0.100	663	66	294	274
50-54	0.518	0.461	0.121	597	72	309	275
55-59	0.451	0.392	0.158	525	83	237	206
60-64	0.435	0.395	0.216	442	95	192	174
Total	5.386	4.949				4,108	3,780
Lower class							
Age	$\mu^x_{internal}$	μ^x_{12}	μ^x_{13}	l_x	d_x	d^i_x	d^o_x
15-19	0.421	0.382	0.045	1000	45	421	382
20-24	0.492	0.430	0.056	955	54	470	411
25-29	0.478	0.418	0.062	902	56	431	377
30-34	0.434	0.388	0.068	846	58	367	328
35-39	0.435	0.401	0.078	788	61	343	316
40-44	0.401	0.359	0.088	727	64	292	261
45-49	0.368	0.324	0.100	663	66	244	215
50-54	0.362	0.318	0.121	597	72	216	190
55-59	0.426	0.371	0.158	525	83	224	195
60-64	0.391	0.329	0.216	442	95	173	145
Total	4.207	3.720				3,180	2,820

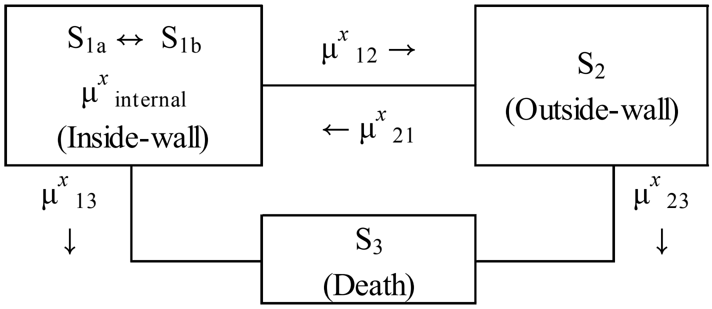
$\mu^x_{internal}$: internal migration rate, μ^x_{12}: outmigration rate, μ^x_{13}: mortality rate

d^i_x: NO. of internal migrants, d^o_x: NO. of outmigrants

Table A1 Comparison between non-missing and missing observations

Variable	Duration is not missing		Durating is missing	
	Mean (percent)	S.D.	Mean (percent)	S.D.
Age (years)	42.8	11.6	42.1	11.5
Household size (persons)	5.2	3.2	5.2	3.2
Origin (percent)				
Inside wall	91	-	85	-
Outside wall	2	-	2	-
Remote	6	-	13	-
Total	100		100	
Class (percent)				
Upper	50	-	55	-
Lower	50	-	45	-
Total	100		100	
Occupation (percent)				
Upper	50	-	55	-
Lower	50	-	45	-
Total	100		100	
	N=5,511		N=1,457	

Figure 1A Increment-decrement process of migration



μ^{x}_{ij}: rate of transition from state *i* to *j* between age *x* and *x+1*