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Changes in informal society and slavery during the *Chosun*-Era in Korea

Heeho Kim [1,2]✉

While slavery was unconventional in Northeast Asia in the eighteenth and nineteenth centuries, it has been documented in Korea from the Three Kingdoms period (BC 57–AD 668). In 1731, a new slavery regulation was introduced in Korea that stipulated that a child was a slave only if its mother was a slave, regardless of the status of the child's father. This led to a dramatic decrease in the number of slaves. In addition, slaves also deserted more frequently after 1731 because the 'not-freed', remaining slaves tried various ways to secure their freedom amid the ensuing societal instability. The easiest way for slaves in Korea to achieve freedom was to flee their owners since they were of native descent. Slave desertions and entry into the informal economy may be attributed to the exclusion of slaves from social institution. Slaves attempted to escape from their current status to the informal sectors of society, where they could manage a subsistence-level existence without being caught. This study explores government registries of household tallies in three counties of Korea's *Kyungsang* province and data on slave transaction. We consider the role of slave desertion in order to examine a relationship between the 1731 regulation change, the institution of slavery, and society. We find that the evidence indicates that the 1731 regulation change led to more desertions, and the costs of monitoring slaves increased; slaves were replaced with daily-wage workers on farmlands. This study contributes to the literature by tracing the causality of slave desertions to informal society that led to the collapse of slavery in eighteenth- and nineteenth-century Korea.

[1] Kyungpook National University, Daegu, South Korea. [2] London School of Economics and Political Sciences, London, UK. ✉email: kimhh@knu.ac.kr

Introduction

Slavery in Korea has been documented from the Three Kingdoms period (BC 57–AD 668).[1] At that time, slaves were either former prisoners of war between tribes and states, or criminals, who were public slaves of the state government. Subsequently, the government conferred these public slaves to the noble class in the nineth and tenth centuries, thus engendering the practice of privately owned slaves.[2] Alternatively, slavery was the result of punishment for criminal behaviour or parents being forced to sell their children into slavery due to economic hardships. Slavery in Korea was distinct from that in Africa, wherein enslavement was usually through kidnapping and seizing (e.g., Nunn, 2008; Nunn and Wantchekon, 2011).[3] In Africa, individuals who were captured when villages or states raided one another were forced into the slave trade (e.g., Lovejoy, 1994, 2000; Northrup, 1978). Relationships between villages often turned hostile, although groups of villages had previously clustered into larger-scale village federations (Easterly and Levine, 1997; Inikori, 2000; Kusimba, 2004).[4]

People in the *Chosun* era (1392–1910) of Korea were divided into four social classes that were determined by heredity: the elites (*Yangban*), the middle class (*Chungin*), commoners (*Sangmin*), and slaves (*Nobi*).[5] Only commoners had to pay taxes, serve in the military, and perform various public duties. While the government owned numerous public slaves during this period (e.g., 450,000 slaves in 1467), slaves were also privately owned by the elites, middle class, and commoners. The original rules of slavery imposed stringent regulations concerning the status of slave children. The *Jongcheon* law between 1430 and 1731 stated that a child was a slave if either parent was a slave, regardless of the status of the other parent.[6] Consequently, the *Jongcheon* law ensured more slaves for agrarian work. The population of slaves varied over the period, ranging from 25–40% of the total population prior to 1731 (Kwon and Shin, 1977).[7]

The Korean government changed the regulations governing slaves' status in 1731 by switching from the *Jongcheon* law to the *Jongyang* law. The new slave regulation, *Jongyang*, stated that a child was a slave only if the mother was a slave, regardless of the status of the child's father. This effectively elevated some children —who otherwise would have been potential slaves—to a tax-paying, commoner status. The dramatic decrease in the number of slaves did not satisfy the small ruling elite class (e.g., Choi, 1978; Ji, 1995).[8] This regulation change might not have been a response to the relative efficiency of the availability of slaves and their prices; rather, it could have been a result of political conflicts between the interests of King *YoungJo* and the small but powerful, elite rent-seeking groups. Notably, slavery was officially abolished in 1894 by law (*Gapo*).

This conflict would lead to a shift in the institution of slavery towards an alternative equilibrium (North, 1990; Ogilvie, 2007).[9] Despite the public proclamation that Confucianism's emphasis on humanity was the primary reason for this regulatory change, King *YoungJo* likely wanted to undermine the power of the small elite groups that used slave labour extensively to cultivate major portions of their agricultural lands. The number of slaves declined rapidly thereafter (Pyung, 1982; Park, 2007). The number of slaves in Korea is estimated to have been 6.9 million in the seventeenth century, declining to 0.1 million by 1867 (Choi, 1974).

The not-freed, remaining slaves tried various ways to secure their freedom or improve their status amid the societal instability. The easiest way for slaves to achieve freedom was to arbitrarily flee their owners since they were of native descent, had the same appearance and spoke the same language as commoners. Some slaves who lived apart from their owners' houses accumulated substantial wealth and paid their owners for their release from slave status; in other words, they bought their freedom. Other slaves attained their freedom by sabotaging, killing or betraying their owners. The regulation change in 1731 also led to a decline in the demand for slaves due to desertion rather than a decreasing slave population.

Studies on the economic history of slavery in Korea are sparse and have focused primarily on Korea's legal system of slavery or on the demographic aspects of the slave population (Palais, 1996; Patterson, 1982). Explanations regarding the evolution of slavery in Korea's economic history are limited because of the challenges in obtaining data.

This study explores the role of slave desertion to examine the relationship between the regulation change regarding children's status as slaves, the institution of slavery, and society. Exploring government registries of household tallies in three counties of Korea's *Kyungsang* province and data on slave transactions, this study finds evidence of the consequent slave desertion and traces its causality to the shift in the institution of slavery in a panel two-stage least squares (2SLS) analysis in eighteenth- and nineteenth-century Korea. Our hypothesis posits that as more slaves deserted to the informal sectors, the costs of monitoring slaves increased. Frequent slave desertions reduced slave demand, and dismantled the hierarchical status of society. Slave prices declined rapidly on farms, where slaves were replaced by wage workers long before the legal abolition of slavery in 1894. Real wages gradually increased as slaves were in less demand. This is a distinct feature of slavery history in Korea relative to global slavery in the eighteenth and nineteenth centuries. This study contributes to the literature by collecting evidence on slave desertion and tracing its causes to the informal society that led to the collapse of slavery in eighteenth- and nineteenth-century Korea.

Conceptual framework and literature review

Slaves deserted to the informal sectors of society to escape capture. It was easy for slaves to flee since they had the same appearance and spoke the same language as commoners whereas the appearance and language of the Black slave populations in the U.S. and the Caribbean were distinct from that of the common population.[10] Slave desertion influenced market fragmentation in the informal sectors, where trust does not develop over time, according to the social network theory (e.g., Granovetter, 2005). No social capital is expended to help markets function smoothly in the informal sectors. Mobility between social groups and networks is limited in the informal sectors due to the lack of accumulated social capital. Low mobility makes people trade less and is self-perpetuating. The informal sectors that existed in Korea during the study period restricted indications of creditworthiness among individuals. The disintegration of markets and distrust made commodity prices and loan rates unevenly distributed and high (Geertz and Clifford, 1978).

Annual loan rates in the agricultural sector were as high as 35–50% in Korea compared to 2–10% for European countries during the study period (Lee and Park, 2004; Choi, 1997).[11] Lending was subject to severe default risk, given a lack of fixed assets with which to secure loans (Clark, 2005; Ogilvie, 2000). Given the lack of formal credit markets, pricing commodities and credit loans would depend primarily upon high observability in an informal sector where there was no information asymmetry, and where the lender and the borrower lived in the same village and typically knew each other very well (e.g., Uzzi, 1999; Geertz, Clifford (1978); Collier and Gunning, 1999).[12]

Slave desertions and entry into the informal economy may be attributed to the exclusion of slaves from social institutions. Slaves were excluded from all privileges of social networks such as

property rights, marriage and family, opportunities to gain official employment, and social security. Therefore, slaves attempted to escape into the informal sectors of society where they could manage small plots of farmland in mountain areas and have a subsistence-level existence without being caught. Informal sectors of society tend to make social networks less dense and less normative, limiting the flow of information and the extent to which culture is embedded into economic activities. This restricts information diffusion on a large-scale, leading to market disintegration (e.g., Granovetter, 2005).

The urbanisation during this period and a new agricultural approach that utilised small farm holdings provided a momentous opportunity for fleeing slaves to hide and sustain their lives without getting caught. They could make a living through cultivation in small farmlands in remote mountainous areas, while using their family members as farm workers. Mountainous areas comprise over 70% of the total land in Korea; vital farmland is located in small plots scattered around the mountains. Therefore, this new agricultural approach utilising small farm acreage was well-suited to mountainous Korea.

However, few studies have paid attention to slave desertion and its relationship to the end of slavery. Although the official household tally records and old private records from the small elite groups regularly reported many cases of slave desertions and their relation to social problems, no studies have investigated the social and economic consequences of slave desertion on the agricultural economy. This study explains the informal society and the shifts in slavery in the form of slave desertion since the regulation change in 1731. This study also examines whether slavery was inefficient, based on the falling slave prices. The end of slavery in Korea was not via abolitionist rebellions and violent actions as elsewhere in the world, but rather through a Pareto optimal shift in the form of slave desertions.

The first strand of research on slavery in Korea focuses on legal conflicts among the ruling classes, and between the government and the ruling classes over slavery policy. This is because the number of slaves could increase or decrease depending on their legal status. Among these studies, Pyung (1982), Park (1986, 2007), Jeon (1989, 1998), Choi (1978), and Ji (1995) provided detailed works on changes in slavery policy and the legal system in *Chosun* era Korea. The second strand of research examines the demographical aspect of slaves and changes in the slave population using micro-data of slaves from old private diaries and records of small elite groups or the official household tally registers of the government. All of these are in Korean except Palais (1996) and Patterson (1982), which are in English. Palais (1996) was the first study on Korean slavery and the slave population written in English. Its data on the Korean slave population is based on Shikata (1938) and Chong (1983). Patterson (1982) provides a general overview of Korea's social and economic system and slavery in Korea during the eighteenth and nineteenth centuries, and stresses that slaves were part of the dowry or given as wedding gifts.

The most important work on the slave population is that of Shikata (1938), who collected data on the household tally registrations by class from the *Daegu* area in *Kyungsang* province. He showed that the proportion of slaves in the Korean population went from 43% in 1690 to 15% in 1789.[13] Chong (1983) reported data on the slave population in the *Ulsan* area in *Kyungsang* province. Investigating the slave population in *Kyungsang* province, Han (1978) showed that the ratio of slaves to total population was 39.5% in *Danseong* in 1606, and Choi (1974) pointed out that the slave ratio was 14.3% in *SanEum* in 1630. Park (1986, 2007), Hong (1981) and Lee (1998) also focused on the demographic aspects of slavery in Korea.

The condemnation of slavery has been based on philosophical argumentation, moral values and the conjecture that slavery was inefficient. This led to one of the most passionate debates in economic history. On the one hand, Conrad and Meyer (1958), Eltis et al. (2005), Findlay (1975), and Fogel and Engerman (1974, 1977) claimed that slavery was efficient. On the other hand, David and Temin (1979) claimed otherwise. The study on slave transactions and their efficiency in Korea are nearly non-existent, except for Chong (1983) and Lee (1981). Chong (1983) provides 143 observations of slave transactions for the eighteenth and nineteenth centuries from a single historical source named *GyujangGak*, an official nationwide record made by the central government. Lee (1981) presents only 17 slave transactions from the private records of elite families in *Kyungsang* province for the seventeenth and eighteenth centuries.[14]

Data sources, slave population, and desertion

Data sources. Exploring the official household tallies collected by the central government from three counties (*Danseong*, *Eonyang*, and *Daegu*) in *Kyungsang* province during the eighteenth and nineteenth centuries, this study first examines how the slavery regulation change of 1731 encouraged slave desertions. The official household tallies were recorded by the Korean government for state taxation on households. The register of a household shows the official record of a representative family, including a record of all members who lived in it. The head of a Korean household (usually the father) was generally the manager of the family unit living together in the same house, which included his family members, his slaves, free workers labouring for the household, and any other relatives living with them. Two or more family units could be included in a single household register; however, they were recorded by individual members combined in a single family. The household tally was legally required to be recorded every three years. The official household tallies also recorded the number of slaves that continuously resided in the household, the number of departures, new arrivals, and those exempted from slave status. *Kyungsang* province, the area studied, was a primarily agrarian area in south-eastern Korea, which included the districts of *Kyungbuk and Kyungnam* in modern-day Korea.

Figure 1 illustrates an example of an official household register from *Eonyang* county recorded between 1777 and 1861. The records from *Eonyang* county include registers from all six towns in the county during 1777, 1795, 1813, 1825, 1858, and 1861. However, the records from 1795 and 1813 included data for only three of its six towns, whereas the records in 1825 included only one town.

The records for *Danseong* county include the household registers of the eight towns within the county for 1678–1789, 1825–1832, and 1861.[15] The records from *Daegu* county include the household register of an individual *Daegu-Choi* family. The records for the *Daegu-Choi* family were obtained from three different types of records for a family—the *Danja* register of the household tally (*Dan*), the *semi*-register of the household tally (*Semi*), and the official household tally record. The first and second records of the household tally included preliminary data/were the preliminary records before the full version of the official record was submitted, which directly impacted the amount of tax and military duty imposed upon the family. Although the data on slaves in the *Daegu-Choi* family had a smaller sample size than records in other counties, they are unique and valuable as they contain consistent data series for both slaves and wage workers living within an individual household over a long time period.[16]

This study also examines the role of slave desertion in monitoring costs of keeping slaves and the changes in slavery in the study period. The monitoring cost was not observable,

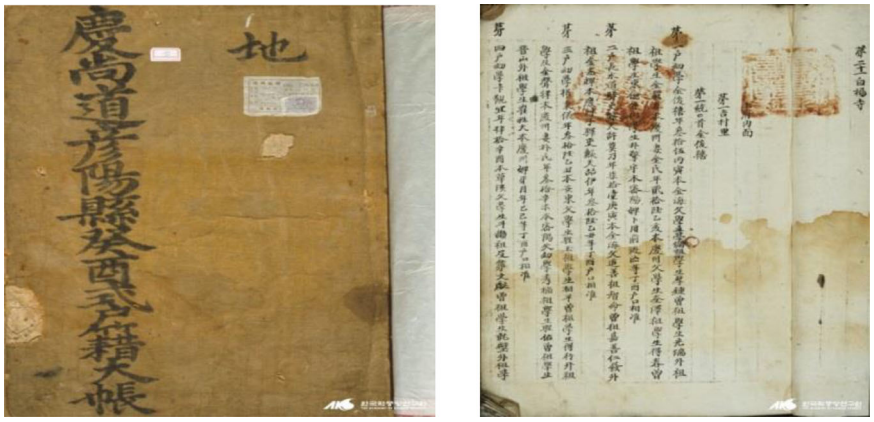

Fig. 1 Official register record of household tallies in *Eonyang* county of *Kyungsang* province in 1777–1861.

and, thus, measured as a proxy using real slave prices from slave trading documents, representing nominal slave prices deflated by the price of rice. Rice was the main representative good, used as a medium of exchange along with nominal coin money in Korea's agricultural economy (Lee, 1996). We explore unique data on slave transactions, with a wide geographical perspective and consistent time series, using 634 cases of private slave transactions based on a nationwide survey of over 25 historical records and trading documents of slaves from private slave owners between 1690 and 1893 (Kim and Lee, 2007).[17],[18],[19],[20],[21],[22],[23],[24]

The data on slave transactions used in this study are limited, compared to numerous studies on the slave trade and slavery in the Caribbean or the antebellum south in the U.S. by Eltis et al. (2005) and Fogel and Engerman (1974, 1977). The trading companies played an important role in the transactions of slaves in the American and Caribbean areas through the slave markets. Meanwhile, data on slave transactions in this study were obtained mainly from private slave trading documents between individual families in Korea, where a slave market was not officially developed. Observations of slave transactions were scattered across various families in different regions.[25]

The data on population are from Kwon and Shin's (1977) demography research, although their data may be affected by estimation bias due to measurement errors and missing values. The data of real wages for farm workers were in a unit (*suk* = *80 kg*) of rice and available between 1780 and 1861, from the old records of the *Park* family in *Kyungsang* province. Farm workers in the agricultural sector were employed daily, and, thus, paid daily wages. Since data were available only for daily wages, they were converted to yearly wages by multiplying the daily-wage by 25 days for a monthly wage, and by 10 months for the yearly wage in the agricultural sector.

Slave population and desertion. Capturing escaped slaves was challenging because slaves in Korea were of native descent and slavery policies changed in favour of the slaves during the eighteenth and nineteenth centuries. Among such conspicuous changes imposed in 1774,[26] the following slave policies would have been prominent catalysts for change: inflicting bodily harm on slaves as punishment was prohibited; requiring specific physical signs on slaves to distinguish them was prohibited under the Confucianism philosophy; enslaving criminals over multiple generations was prohibited; enslaving private debtors was prohibited; slave owners were prevented from chasing slaves who had fled; slaves were allowed to move and roam freely. Therefore, the easiest way for slaves to achieve freedom was to arbitrarily flee their owners.[27] All these increased the monitoring costs for slave owners. Slave owners began to reduce demands on slaves, and with the challenges in monitoring, slaves were replaced by short-term wage workers for agricultural work. The percentage of slaves among the total population had declined to 1–2% by the late nineteenth century. The hierarchy based on distinct status-driven classes began disappearing and its grip on Korean society weakened.

Many private records of elite families and the public registry of household tallies reported frequent slave desertions. Table 1 presents the change in the slave population from an official household tally of the *Daegu-Choi* family that lived in *Daegu* county in the *Kyungsang* province from 1672 to 1801.

Table 1 also shows how slaves entered and left the family and the various reasons for their departures namely—moving to other places, desertion, and death. The number of slaves held by the *Daegu-Choi* family decreased quickly from 157 in 1731 to 73 in 1801. Figure 2 shows the trends of the number of slaves owned by the *Daegu-Choi* family from 1672 to 1801. Figure 3 shows trends of slave desertion rate over periods based on the record of household tallies in Table 1.

The rate was 12.5% in 1681, and accelerated rapidly to 56.1% in 1801. The average desertion rate over the entire period between 1672 and 1801 was 20.8%, implying that more than two out of ten slaves had deserted in the eighteenth- and nineteenth-century Korea. Among slaves deserted from the *Daegu-Choi* family during the seventeenth and early eighteenth centuries, 53% were male and 47% female. The rate of desertion among the slaves in the family increased between the years 1731 and 1801. However, this number declined after 1801, when public slavery was abolished. The relationship between the change in slavery status in 1731 and slave desertion appears to be positive and significant.[28]

The change in regulations regarding slavery in 1731 rapidly reduced Korea's slave population. Slaves on the demand side began to flee from an unstable equilibrium of slavery status to informal 'fringe' sectors of society, where they could hide and sustain their livelihood without being caught. The adverse effects of a social network can explain why slaves were not a part of the general society (Granovetter, 2005; Ogilvie, 2007). The rate at which slaves fled their owners can also be obtained from the official household tally registers of the three counties of *Kyungsang* province: *Danseong, Eonyang*, and *Daegu* (the location of the *Daegu-Choi* family). The desertion rates in the eighteenth and nineteenth centuries were 17–37% in *Danseong*, 9–14% in *Eonyang*, depending on the region within the county, and 12–56% in *Daegu*. Generally, the desertion rate seemed to increase rapidly after the change in slavery status in 1731, and declined after public slavery was abolished in 1801.

Table 1 Number of slaves and ratio of slave desertion in the *Daegu-Choi* family in 1672–1801* (unit; person, %).

Year of register**	Continuously residing slaves	Slave departures					Newcomers	Slave status exempted	Numbers of total slaves (male/female)	Ratio of slave desertion (%)
		Moved	Deserted	Died	Others	Total				
1672			**14**						73(40/33)	19.2
1681	31	5	**11**						88(52/36)	12.5
1684 *semi*	19	2	**17**						77(46/31)	22.0
1684	20	11	**11**	3			3		86(49/37)	12.8
1687	16	4	**16**	1					73(45/28)	21.9
1690	14		**6**						64(38/26)	9.3
1690 *dan*	7	3	**6**						58(37/21)	10.3
1693	15		**14**						74(39/35)	18.9
1696 *semi*	19	4	**14**	7					82(36/46)	17.1
1696 *dan*	22		**4**	1					59(27?/32)	6.8
1696	17		**2**				1		55(28/27)	3.6
1705			**23**						158(80/78)	14.5
1708			**23**						148(73/75)	15.5
1714				2					155(77/78)	
1717			**2**						70(41/29)	2.9
1720									5(3/2)	
1723			**8**						94(52/42)	8.5
1729			**22**	4					157(80/77)	14.0
1735	1		**23**	16					164(84/80)	14.0
1735 *semi*			**29**						142(76/66)	20.4
1738			**17**	2					149(77/72)	11.4
1738 *semi*	4		**23**	2					152(78/74)	15.1
1741	12		**16**						145(77/68)	11.0
1744	42		**23**	3					153(79/74)	15.0
1747			**15**						159(81/78)	9.4
1750 *semi*	37		**24**						132(66/66)	18.2
1750 *dan*	40		**25**						135(67/68)	18.5
1753	39		**23**						137(69/68)	16.8
1753 *dan*	39		**23**	1					138(69/69)	16.7
1759	23		**27**						132(62/70)	20.4
1762	27		**36**	4					134(59/75)	26.7
1768	22		**33**	2					144(68/76)	22.9
1774	19	4	**29**	2					133(58/75)	21.8
1777	11		**28**	3					129(60/69)	21.7
1786	16		**27**						94(38/56)	28.7
1789	16	1	**20**	1					93(38/55)	21.5
1789 *semi*	14	3	**20**	3					84(35/49)	23.8
1792	3	1	**10**	1					77(33/44)	12.9
1792 *semi*	13								75(33/42)	
1795	3	5	**21**	5					72(31/41)	29.1
1798	9	1	**35**	1					69(29/40)	50.7
1801	4	2	**41**	2					73(32/41)	56.1
Total (Average)	570	71	**702**	64			4		4418	(20.8)

*Source: Official register records of a representative family, *Daegu-Choi*, in the seventeenth–eighteenth centuries.
**_Semi_ represents a semi-register record of household tallies; *dan* implies Register Danja of household tallies; they were temporarily prepared to submit official register records. The heads of the household for the *Daegu-Choi* family were *Kyunham Choi* (71 years old in 1690) from 1672 to 1696, *Suhak Choi* (57 years old in 1708) from 1696 to 1708, *Jeongsuk Choi* (56 years old in 1735) from 1714 to 1735, *Hongwon Choi* (82 years old in 1786) from 1735 to 1786, *Hong Choi* (28 years old) in 1789, *Suk Choi* (40 years old in 1801) from 1792 to 1801.
Bold values stress the number of the deserted slaves or the ratio of desertion.

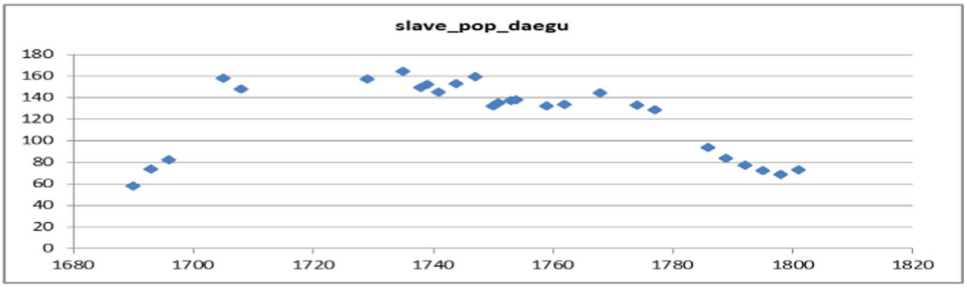

Fig. 2 Salve population (persons) in the *Daegu-Choi* Family, 1672–1801. Source: Official household register of the *Daegu-Choi* family of *Kyungsang* province.

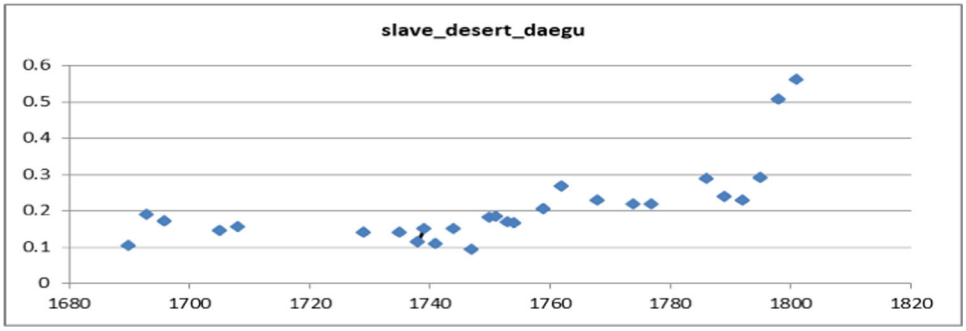

Fig. 3 Ratio of deserting slaves in *Daegu-Choi* Family, 1672–1801. Data source: Official household register of the *Daegu-Choi* family of *Kyungsang* province.

Table 2 Ratio of slave desertion in *Danseong* county of the *Kyungsang* province in the eighteenth and nineteenth centuries* (unit; persons, %).

Year of register	Continuously residing slaves	Slave departures					Newcomers	Slave status exempted	Total slaves	Ratio of slave desertion (%)	Total population
		Moved	Deserted	Died	Total	Others					
1678	43	867	**1170**	267		236	5	14	5102	22.9	8251
1717	27	475	**1798**	339		116	13	16	5874	30.6	11999
1720	32	530	**1948**	450		93	18	28	5690	34.2	12042
1729	1	1023	**2048**	409		58	5	19	6233	32.8	13386
1732	5	481	**1973**	500		71	2	22	5832	33.8	13124
1735	9	299	**1251**	401		43	2	7	3732	33.5	8547
1759	16	365	**1082**	239		71	4	1	4040	26.7	11331
1762	4	311	**1131**	153		44	3		3826	29.5	11585
1780	1	206	**1140**	175		55	4	7	3418	33.3	13342
1783		226	**1235**	156		38	1		3337	37.0	13565
1786	4	221	**1160**	181		42	3	5	3247	35.7	13403
1789		151	**923**	148		33	1	2	2832	32.6	11792
1825		51	**458**	155			1		2145	21.3	11000
1861		6	**412**	249					2408	17.1	9795

*Data sources: Author's data from official household tally registers held by the central government on the slave populations of *Kyungsang* province (*Eonyang*, *Danseong*, and *Daegu*). The author obtained data on *Eonyang*, *Danseong*, and the *Daegu-Choi family* from the official household tally register, whereas data for *Daegu* county referred to Shikata (1938). Data on the total population was extracted from Kwon and Shin (1977).
Bold values stress the number of the deserted slaves or the ratio of desertion.

Table 2 presents the total population and slave population (in numbers and percent of the total) of *Danseong* households in the eighteenth and nineteenth centuries. Table 2 also reveals how slaves were added to and departed from households in the *Danseong* county, similar to how it was done for the household registers of the *Daegu-Choi* family.

The ratio of slave-owning households to total households in Korea was over 50% in 1678, declining to 30% in the early eighteenth century, 10% in the late eighteenth century, and less than 5% in the nineteenth century. The rate of slave desertions in the *Danseong* county in the eighteenth and nineteenth centuries increased after the change in slavery status in 1732 to 33.8%, and it reached a high of 37% in 1783. However, it declined after government-owned slavery was abolished in 1801, falling to 21.3% in 1825 and 17.1% in 1861. The slave population in *Danseong* county decreased from 6,233 in 1729 to 2,145 individuals in 1825.

Table 3 shows the total population, slave population, and rate of slave desertion appearing in that register from *Eonyang* county in the eighteenth and nineteenth centuries. The total population of *Eonyang* county increased until the early nineteenth century and then witnessed a decline. Slave-owning households in *Eonyang* ranged from 51–75%, and the ratio of slaves to the total population was 15–17% in the early nineteenth century. Slave desertions were responsible for many slaves who left their households in 1777 and 1798, representing 40% and 42%, respectively.

However, beginning in 1801, the number of slave desertions rapidly declined, falling to 74 in 1813 and to 20 in 1825. The rate of slave desertion increased from 11.5% in 1777 to 14.1% in 1798, which subsequently declined to 8.7%, 5%, and 4.6% in 1813, 1825, and 1861, respectively. No new slaves were added in 1858 or 1861; however, slaves who continuously resided in a household rapidly increased from 684 to 1264 during this period. This implies a long-term holding period for slaves in *Eonyang* county. The reason for increasing number of slaves held for a long period is ambiguous. However, one explanation may be that long-term wage workers were converted into slaves in exchange for sustenance during the severe economic recession of the early- and mid-nineteenth century. Among the total slave population, the desertion ratio averaged 7.9% for the period covered in the register records of *Eonyang* county.

Evidence

The descriptive statics. Exploring data on private slave transactions, this study empirically tests whether slave desertion would increase monitoring costs of holding slaves during the study period. Slave prices fell continuously after slavery regulations changed in 1731. Since data for these monitoring costs were

Table 3 Ratio of slave desertions in *Eonyang* county of the *Kyungsang* province, 1777–1861* (numbers in parentheses are percentages).

Year	Continuously residing slaves	Slave departures				Newcomers	Slave status exempted	Total slaves	Ratio of slave desertion (%)	Total population
		Moved (%)	Deserted (%)	Died (%)	Total (%)					
1777	1391	276 (46)	**243 (40)**	87 (14)	606 (100)	105	8	2110	11.5	8802
1795	566	32 (25)	**41 (32)**	56 (43)	129 (100)	137	4	836	4.9	4904
1798	815	192 (37)	**218 (42)**	110 (21)	520 (100)	199	5	539	14.1	10200
1813	645	71 (40)	**74 (42)**	31 (18)	176 (100)	24	0	845	8.7	5515
1825	350	15 (36)	**20 (48)**	7 (17)	42 (100)	5	0	397	5.0	2547
1858	684	9 (13)	**52 (74)**	9 (13)	70 (100)	0	1	755	6.8	3680
1861	1264	1 (1)	**63 (66)**	32 (33)	95 (100)	0	0	1359	4.6	4667
Average									7.9	

*Data source: Author's data from the official household registry of *Eonyang* county of *Kyungsang* province.
Bold values stress the number of the deserted slaves or the ratio of desertion.

unobservable during the study period, prices of slave transactions are used to examine the relationship between slave desertions and monitoring costs. This is because a decline in slave demand due to the high monitoring costs was captured by the decrease in the number of slave transactions and declining prices of slaves.

Korean slaves were sold infrequently up to the late seventeenth century because commodity markets were not well-developed until the appearance of nominal money in the 1680s. As commodity markets developed and coin money circulated nationwide in the 1680s, slave transactions became more frequent. Unlike in West Africa, where slave prices declined due to illegalised slave trade (Law, 1995), higher monitoring costs and slave desertion reduced slave demand, and played a primary role in the declining slave prices in Korea. Regarding slave transactions, female slaves were more frequently traded by 20% than male slaves during the eighteenth and nineteenth centuries. The average age of slaves sold was approximately 18 years during the entire period and declined over time until the nineteenth century.

Female slaves were not only employed on the farm, but also in domestic work, child-rearing, and other tasks such as making fabric. The intensity of labour performed by female slaves would not have been less than it was for male slaves. Most slave transactions occurred in the *Kyungsang* province in southeast Korea, representing 52% of the total slave transactions. Slaves worked primarily on agricultural farmlands. While the proportion of the slave population decreased after 1731, slave transactions became more active until the early nineteenth century.

Table 4 shows trends in slave prices and real slave prices during 1690–1893 in *Chosun* era Korea. Slave prices are obtained from the 634 cases based on more than 25 private documents of slave transactions, as mentioned before. Slave prices and their real prices continued to decline between 1731 and 1801, thus indicating that falling demand had a stronger, negative impact on slave prices than a shrinking slave population.

The data on slave prices are modified using the technique referred to as 'hand equivalent' in Fogel and Engerman (1977).[29] The average price for male slaves was 13.6 *nyang* (a unit of copper coinage), whereas the average price for female slaves was 19.4 *nyang*—40% more expensive than male slaves. Among the many possible explanations for the decline in the real prices of slaves, the hypothesis of this study is that the more the slave desertion rate rises, the greater the resulting increase in monitoring costs.

Figure 4 depicts the U-shaped trend of real prices for slaves, which declined between 1731 and 1801 and increased again after 1801. The *y*-axis represents the real slave prices as inverse monitoring costs of holding slaves, and the *x*-axis is the year.

The solid line indicates a mean trend of real slave prices over time. The rate of slave desertion followed an increasing trend since 1731, peaking when public slavery was abolished in 1801, and then decreasing rapidly thereafter. Slave desertions and real slave prices moved inversely over time. Real slave prices in the United States' antebellum south based on nominal slave prices and cotton prices provided by Conrad and Meyer (1958) demonstrated an increasing trend in the nineteenth century. The contrasting results between *Chosun* era Korea and the antebellum south in the U.S. reflect the declining demand for slaves in Korea due to the high monitoring costs and slave desertions, at least between 1731 and 1801.

Table 5 shows the descriptive statistics about slave prices, real slave prices, slave population, slave desertion ratio, and rice prices between 1690 and 1861, when data on slave desertion rates and slave prices are available. The monitoring cost of keeping slaves was not observable, and, thus, measured as a proxy using real slave prices. Statistics of slave desertion rates and slave population are obtained from an official household tally register for the *Daegu-Choi* family in *Kyungsang* province for a consistent data series.

The real price of slaves in Korea averaged 708 kg of rice or 8.85 *suk* (a unit of rice; *1 suk* = 80 kg of rice) during the eighteenth and nineteenth centuries. Minimum living costs for an adult expressed in terms of rice were used to grasp the level of real slave prices in the period under study. According to *JinHulgok*, an official record of the government salvage administration, the minimum cost of living in terms of rice was 101.6 kg (1.27 *suk*) annually for an adult male and 76 kg (0.95 *suk*) for an elderly person or a child.[30] Real slave prices averaged 708 kg, which means that the value of a slave was roughly equivalent to the annual rice consumption of seven adult men in a year. The decline in real slave prices did reflect higher monitoring costs caused by slave desertions. The average rate of slave desertion was 20.8% in *Daegu* county. Between 1731 and 1801, a rapid increase in the rate of desertion caused a decline of 42% (from 11.88 to 6.89 rice *suk*) in real slave prices.

Estimation results. Equation (1) is built up to examine our hypothesis that a rise in slave desertion would increase monitoring costs of holding slaves, and thus, reduce real slave prices. Equation (1) also includes other control variables such as the slave population and a dummy variable for a regulation change in

Table 4 Slave prices and real slave prices in the *Chosun era* Korea* (unit; *nyang* of a coin money, *suk* of rice).

	Slave price** (unit; *nyang*, coin money)	Real slave prices** (unit; *suk*. 1 *suk* = 80 kg of rice)
1689	35.00	-
1690–4	24.60	-
1695–9	24.07	37.60
1700–4	21.86	17.07
1705–9	20.38	13.45
1710–4	16.26	9.10
1715–9	18.95	12.45
1720–4	15.15	10.98
1725–9	10.75	8.31
1730–4	17.55	-
1735–9	12.88	10.27
1740–4	11.09	8.53
1745–9	11.25	9.38
1750–4	11.24	7.89
1755–9	9.98	6.95
1760–4	12.00	6.38
1765–9	13.13	8.11
1770–4	17.93	9.94
1775–9	13.58	8.27
1780–4	18.98	10.26
1785–9	12.09	6.72
1790–4	12.43	5.51
1795–9	9.95	4.66
1800–4	17.26	10.05
1805–9	14.35	6.58
1810–4	10.98	3.64
1815–9	7.00	3.17
1820–4	16.85	7.95
1825–9	26.69	11.78
1830–4	17.74	6.55
1835–9	26.04	8.17
1840–4	20.66	9.55
1845–9	21.83	11.89
1850–4	21.77	9.61
1855–9	12.15	4.71
1860–4	40.60	10.87
1865–9	20.00	3.89
1870–4	32.50	6.16
1875–9	34.35	7.13
1880–4	21.30	3.49
1885–9	14.25	2.02
1890–3	50.00	6.19
1689–1893	18.99	8.85

*Data source: quoted from Kim and Lee (2007).
**Nominal and real slave prices are in the monetary unit *nyang*, a copper coin in Korea, and in units of rice (1 *suk* = 80 kg = 4.963 bushels).

1731 as determinants of monitoring costs. A reason for using the slave population as a control variable in the estimation of monitoring costs is that the collapse of slavery could be generally associated with an exogenous reduction in the slave population (Temin, 2016).

$$\ln\ real\ slaveprice_t = a_0 + a_1\ \ln desertion_t + a_2\ \ln slavepop_t + a_3\ dummy_t + u_t \quad (1)$$

where ln *real slaveprice* is the natural logarithm of real slave prices, and the subscript t is a time-varying variable. ln *desertion* is the log of the slave desertion rate; ln *slavepop* is the log of the slave population; *dummy* is a dummy variable representing the regulation change in 1731, which takes a value of 1 after the change in 1731 and 0 before then; All dependent and independent variables in Eq. (1) are in log terms except a *dummy* variable. Error terms are assumed to be white noise, independent of other explanatory variables.

According to our hypotheses, in Eq. (1), a_1 represents the negative (positive) effect of slave desertion on real slave price (monitoring costs); a_2 is the negative effect of slave population on real slave price; a_3 is the negative effect of the regulation change after 1731.

This study adopts the robust and cluster panel Generalised Least Squares (GLS) technique to relax the assumption that errors are identically distributed, and relax the assumption that errors are independent of each other. The robust GLS estimation results of Eq. (1) are provided in the first panel of Table 6. R^2 is 0.7516 and F-statistics is statistically significant at the conventional significance level, indicating that the independent variables explain the monitoring costs model of Eq. (1) very well. In parenthesis underneath the estimated coefficients, numbers are t-statistics. In the robust GLS estimation results in the first panel of Table 6, there seems to be no multicollinearity between independent variables because the variance inflation factor (VIF = 2.21) is much less than 10. The Breusch–Pagan test-statistics (χ^2) is not statistically significant, implying the non-existence of heterogeneous disturbances in Eq. (1) estimation.

The robust GLS estimation results show that only the effect of the dummy for regulation change in 1731 on monitoring costs of holding slaves (minus real slave prices) is statistically significant at a conventional significance level, whereas the slave desertion and population are not significant.

The insignificant effect of the slave population may be due to endogeneity problem or measurement errors of the slave population. Data about the slave population from the household tally registers depend on slave desertions, which would create an endogeneity problem or a measurement error of any exogenous change in the slave population. To avoid statistical bias from measurement errors of the slave population, we estimate the slave population at the first stage using the relevant, valid instrument variables (IVs)—slave prices, slave desertions, and a dummy for regulation change in 1731. Then, at the second stage of the panel 2SLS analysis, we re-estimate Eq. (1) using the estimated slave population with IVs from the first stage. The second panel of Table 6 represents the 2SLS estimation results that slave desertions and the regulation change in 1731 had significant negative (positive) effects on real slave prices (monitoring costs). It implies that the monitoring costs increased as a result. However, the changes in the slave population did not have a significant effect on real slave prices at the 5% significance level.[31] This shows that the slavery system in Korea began to change informally, which was not due to a decline in the slave population, but from slave desertions and an associated increase in monitoring costs, which led to a fall in slave demand.

Notably, slavery was largely abolished worldwide during the nineteenth century (Fogel and Engerman, 1974). One of the many reasons for this abolition can be illustrated by the illegality of the slave trade and a decline in the slave population as shown in the antebellum south in the U.S.; unlike countries that continued with the institution of slavery, the change in slavery regulations in 1731 in Korea mainly caused more frequent slave desertions and consequently reduced the slave demand. Both changes in the slave population and the demand for slaves could explain the severe economic hardships and recession in Korea during the eighteenth and nineteenth centuries, because as slavery collapsed, the agricultural economy of Korea contracted.

Substituting slavery with wage labour is a Pareto improvement, shifting from unstable slavery to a stable equilibrium (Fenoalte, 1984). No supervision is required, and the labour contract is more

Fig. 4 Real slave prices as inverse monitoring costs in eighteenth and nineteenth centuries (1780 = 100). Data source: author's own data.

Table 5 Descriptive Statistics about slave prices, real slave prices, slave population, slave desertion rates and rice prices in eighteenth and nineteenth-century Korea*.

Variables	Mean	Min.	Max.	Std. Dev.	Variance	Skewedness	Kurtosis
Slave price (*nyang/person*)	14.96	2.9	50	8.47	70.17	1.59	6.36
Real slave price (*suk* in rice)	8.85	1.55	30.08	5.41	28.71	1.70	6.40
Slave population*** (person)	121.5	58	164	33.91	1150	0.58	1.79
Slave desertion rate*** (%)	20.8	9	56	0.10	0.01	2.04	7.20
Rice price** (*nyang/suk*)	2.04	0.63	5.77	0.82	3.76	2.46	11.34

*Observation numbers for rice prices, slave prices, and real slave prices are 139, 119, and 103 due to missing observations.
**Rice prices are the weighted rice prices in the *Kyungsang* and *Cheonla* provinces. *Suk* is a unit of rice (=80 *kg*).
***Data on slave desertion rates and slave population are from the *Daegu-Choi* family for securing consistent series.

Table 6 Robust GLS and 2SLS estimation results in the relationship between slave desertion and real slave prices in Eq. (1).**

Robust GLS estimation

Dep variable: Real slave prices (-Monitoring costs)	Const.	Slave desertion	Slave population	Dummy of regulation change in 1731	Remarks
Coefficients (*t*-statistics)	27.9825* (3.99)	−8.2878 (−0.99)	0.0038 (0.10)	−18.8027* (−13.24)	$F = 14.120(0.0002)$ $R^2 = 0.7516$ Root MSE = 3.0225 VIF*** = 2.21 $\chi^2 = 0.29(0.5912)$

2SLS with instrument variables (IVs)

Dep variable: Real slave prices (-Monitoring costs)	Const.	Slave desertion	Slave Population (predicted)	Dummy of regulation change in 1731	Remarks
Coefficients (*t*-statistics)	41.0974* (4.42)	−20.1968* (−2.00)	−0.0678 (−1.40)	−21.1491* (−7.79)	$F = 19.630$ (0.0001) Centre $R^2 = 0.8160$ Root MSE = 2.266

*Indicates significance at 5% level. Numbers in parenthesis underneath the estimated coefficients are *t*-statistics.
**Data source: Author's data.
***VIF indicates variance inflation factor, and $\chi^2 = 0.29(0.5912)$ is the Breusch–Pagan test-statistics for heteroscedasticity.

Pareto-improving than monitoring slaves. Slaves had a special advantage in performing physical labour such as agricultural work. However, although slavery is a pain-supervision structure, after the regulatory change in 1731, it was no longer Pareto-stable because of slave desertions. The high probability of a successful escape from slavery caused extremely high monitoring costs and lowered slave productivity. The shift from slavery to a daily-wage labour market towards the end of Korea's era of slavery in the late nineteenth century was a Pareto-improving shift to a new Pareto optimum.

The ratio of slaves to wage workers and the proportion of households holding slaves or wage workers from 1777 to 1825 are

found in the household registers for *Eonyang* county. The register shows that households had slaves and wage workers as labourers simultaneously.[32] The average ratio of slaves to wage workers in a household was 1.54 in 1777, gradually decreasing to 1.32 in 1798, 1.20 in 1813, and 1.08 in 1825 in *Eonyang* county. This decline indicates an increase in the substitution of slaves with wage workers. Male wage workers represented 9–16% of the total workers, and accounted for a smaller percentage than female wage workers, who ranged from 10–20%. Female slaves averaged 45% of the total workers, whereas male slaves averaged 30%. There were more female workers and female slaves than male workers and male slaves.

Slaves between 16 and 40 years old were considered most physically fit for agricultural work; the larger the percentage of 16–40-year-old slaves, the larger role they played in agricultural production. Among the total slaves in *the Eonyang* area in 1777, 13% were 1–15, 29% were 16–40, and 7% were 41–50 years old. By 1825, the percentage of 16–40-year-old slaves had increased to 48%, the percentage aged 1–15 was 12%, and 12% were 41–50 years old. Through 1861, the largest percentage of slaves was from the 16–40-year age group. Since this age group was best suited to agricultural work, it suggests that the major role of slaves was working in the fields.

Slaves freed by the change in slavery status in 1731 had to work for sustenance wages. They were generally poor, owned no property and had no wealth. When nominal money was introduced in Korea in 1678, the land was sold more frequently than before. The sale of land by landowners expelled the farm workers who had been working on the land. Subsequently, they wandered into other towns or mines to work for wages. Even elites who had lost their land for some reason had to work for wages, thus weakening the order of the hierarchical society. Famine, inflated rent, severe tax burdens, civil wars, and higher costs of living continued to plague the peasant farmers who worked in small plots of land rented from landlords. Some of these 'wanderers' sold their sons and daughters as slaves in Korea where the slavery system still prevailed, whereas others became daily-wage workers. During the study period, wage workers (called *Kogong*) were a substitute for slave-labourers in agricultural production. The real wage of farm workers based on the old records of the *Park* family in *Kyungsang* province tend to increase since 1801 when slaves were substituted with wage workers towards the Pareto optimal shift from slavery to the wage labour contract system.

Summary and implications

The collapse of the unstable institution of slavery in eighteenth- and nineteenth-century Korea was not induced by law or violence; instead, it occurred organically through slave desertions. Slaves deserted more frequently after a regulation change in 1731 curtailed the stringent restriction on children's status as slaves. Slaves were excluded from all privileges of social networks such as property rights, marriage and family, opportunities to gain official employment, and social security. Therefore, slaves attempted to escape from their current status into the informal sectors of society, where they could manage small plots of farmland in mountain areas and lead a subsistence-level existence. Slave desertion influenced market fragmentation in the informal sectors, where social trust did not develop over time. The informal society may provide a good explanation for the lack of development of the Korean economy during the eighteenth and nineteenth centuries.

Slave desertion into informal sectors of Korean society engendered the economic costs of informal society through market fragmentation, high goods prices, high loan rates, and lower social capital of the trust. This study provides a strong empirical support for our hypotheses that the relationship between the regulation change in 1731 on children's status of slaves and the slavery institution shift towards the Pareto-improving labour contract are statistically significant, and highlights the role of slave desertions. Additionally, there was a significant decline in real slave prices due to substituting slaves with wage workers. Indeed, explaining the institution of slavery and its evolution remains weak in economic history because it is challenging to observe. Testing institutional change is even more challenging due to multivalent causalities of culture and politics. This study contributes to the literature by collecting evidence on slave desertions in eighteenth- and nineteenth-century Korea and finds a relation to the institutional change that led to the informal collapse of slavery.

Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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Notes

1 See Lee Ki-baik (1968) for further information on slavery in various periods of Korean History.
2 Only the noble class were allowed to own slaves during the Sung dynasty of China (960–1279).
3 Nunn (2008) and Nunn and Wantchekon (2011) refer to Koelle's inventory showing that regarding methods of enslavement, 24% were taken in war, 40% were kidnapped or seized, 16% were acquired via a judicial process, and 19% were sold or tricked by a relative or acquaintance.
4 The slave trade caused and perpetuated social insecurity and increased the need to enslave others to protect one's self (Hawthorne, 1999). These internal conflicts increased long-term political instability and in many cases led to the collapse of pre-existing structures of government (e.g., Lovejoy, 1994, 2000). The failure of the West African states stemmed from Africa's weak and unstable pre-colonial political structures (Herbst, 1997, 2000).
5 A new working class, the Korean *Chonmin*, emerged in the fourteenth and fifteenth century as large farmlands were developed. They were not slaves but free men who had to work to sustain their livelihoods; thus, they were economically enslaved. However, they disappeared soon after the enactment of the *Jongcheon* law in 1430.
6 See Hong (1981) for changes in the slave population in *Chosun*-era Korea.
7 According to Kwon and Shin (1977), the total population of Korea in the early eighteenth century was estimated to have increased from 16.3 million in 1717 to 18.5 million in 1804. However, it dramatically dropped down to 16.2 million in 1825 due to pandemics and civil wars, and then went back to 16.7 million in 1867.
8 Refer to Choi (1978) and Ji (1995) for state policy regarding slavery during early *Chosun*-era Korea.
9 In a conflict-based approach to institutional change, Ogilvie (2007) states that economies with similar resources and technologies develop along different paths because of the game rules in a society or distribution effects of institutions. Institutions affect economic efficiency and the distribution of resources. Some groups want to maintain the current institutions and others want change. The results of this conflict are affected by its distributional implication for the most powerful individuals or groups (the elites or king). An efficient outcome is possible only when all social groups involved negotiate a binding agreement, but this assumes an enforcing party with a monopoly on physical violence. Since no other party can enforce the agreement, the party with a monopoly on the use of physical violence will be under constant temptation to use its capacity to cheat, exploit, or oppress others.
10 Slaves in Korea would have been indistinguishable from the commoners and elites. They spoke the same language and followed the same culture and customs.
11 Lee and Park (2004) reported high loan rates charged by a landlord family (the *Daegu-Woo* family) in the agricultural sector.
12 To avoid adverse selection among borrowers, Uzzi (1999) shows that clients who have personal contacts with bankers pay lower interest rates on loans, and that banks cultivate such contacts as a business strategy. Interest rates are lower for clients with

continuing ties to banks because of the trust developed over time, and norms of reciprocity.

13 During the *Chosun* dynasty, Korea was divided into eight provinces: *Kyungsang* (southeast) and *Cheonla* (southwest) were the main agricultural sectors. *Kyungki, Chungcheong, and Kangwon* were located in central Korea; the three other provinces, *Hwanghae, Pyungan, and Hamkyung*, were in the northern part of Korea.

14 The detailed descriptions of slave transactions show the numbers, gender, and age of slaves traded, respectively. Data of slave trading documents also include the price per slave and the total sum of the slave transaction, and present the specific sources.

15 *Danseong* county in the *Kyungsang* Province is located on the downhill side of *Jiree* Mountain, where fields were small and not level. However, the land was fertile, and farming took advantage of water from the mountains for cultivating grains. The temperature was warm year-round, and many elite families had lived there for a long time. *Eonyang* county is located on the side of the mountains where fields were not fertile and produced few agricultural products. Most residents in *Eonyang* were commoners, not the elites. An interesting characteristic of *Eonyang* demographics is that the average household had 8–9 persons in 1795–1825, with an increasing trend until the early nineteenth century. This was quite high compared to the nationwide average of 4.2 persons. The larger household size may reflect the characteristics of farming in these mountainous areas and the low productivity of its unfertile lands.

16 Large numbers of observations on slave prices in the antebellum United States were systematically obtained mainly from the large slave trading companies through the slave markets.

17 勝聰明錄 (*Seungchong Myonglok*) an old diary of Goosangdeok, 1706–1761.

18 慶尙道丹城縣戶籍大帳 Official register records of household tally from Eonyang.

19 慶尙道大邱府戶籍大帳 Official register records of household tally from Daegu.

20 慶尙道丹城縣戶籍大帳 Official register records of household tally from Dansong.

21 奎章閣所藏 奴婢賣買明文 Old records of *GyujangGak*.

22 万機要覽 (*Manki Yoram*) Manki review.

23 牧民心書 (*Mokminshimseo*) A guide to ruling and controlling people.

24 朝鮮王朝實錄 (*Chosun WangJo Sillok*) Royal records of *Chosun* dynasty Korea.

25 Each individual family sold slaves in the *Chosun*-era Korea, in contrast to the slave trading companies in the antebellum southern United States. This explains the relatively few small observations of slave transactions in Korea.

26 Royal records of *Chosun* Dynasty Korea (*Chosun WangJo Sillok*). There were 36,974 public slaves and 29,093 private slaves belonging to the government in 1801.

27 A diary of an elite (*Seungchong Myonglok* by *Goosangdeok*, 1706–1761) states: 'A slave named *Geumdong* returned home a few days ago after having fled. I did not punish him, but just asked him to do simple housework instead. He, however, stole rice and beans to eat and ran away again after a stay of a few days.'

28 Among the deserting slaves, 39% were an average age of 30–50 years, and 15% were 20–30, as per the register of household tally of a *Daegu-Choi* family. More than 54% of the deserting slaves were between the ages of 30 and 50, which was the best age to work in the fields.

29 The weights for the equivalent full hand were 0.40 for ages 10–15, 0.90 for ages 16–20, 1.00 for ages 20–50, and 0.75 for ages 51–60, following the method of Fogel and Engerman (1971, 1977). To get a hand-equivalent female slave price, a weight of 1.4 was applied based on a ratio of male and female slave prices during the study period.

30 Data from *JinHulgok*, official records of the government salvage administration, for minimum consumption levels of rice were taken from *Manki Yoram (Manki Review)*, and *Mokminshimseo* (*A Guide to Ruling and Controlling People*).

31 The explanatory power (R^2) of the 2SLS estimation increased significantly to 0.81 from 0.75, the R^2 from the OLS estimation.

32 Among households holding slaves, according to the household tally in 1777, 61% were in the elite class, 16% were middle class, and 22% were commoners. Commoners and slaves also held slaves for agricultural work. The proportion of elites holding slaves declined to 55%, the middle class increased to 28%, commoners declined to 12%, while slaves themselves represented 5% in 1825. However, in *Eonyang* in 1865, elites were 91% of slave holders, while 7% were middle class, and commoners represented only 2%.

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Informed consent
I confirm that informed consent was deemed not necessary.

Additional information
Correspondence and requests for materials should be addressed to Heeho Kim.

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