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The Enduring Legacy of Educational Institutions: Evidence from Hyanggyo in Pre-Modern Korea*

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Abstract

This study examines the long-term impact of Hyanggyo, state-sponsored educational institutions established during the early Joseon Dynasty in Korea (1392-1592), on human capital accumulation. Although these schools largely ceased functioning as educational centers by the late 16th century, their influence has endured to the present day. Drawing on a newly constructed township-level dataset, we find a robust positive association between historical exposure to Hyanggyo and modern educational attainment. This relationship appears to be driven by enduring local demand for education, supported by three complementary findings. First, regions with greater historical exposure experienced larger gains in Japanese literacy during colonial era school expansions. Second, residents in these areas express stronger pro-education attitudes today. Third, historically exposed regions exhibited lower fertility rates, consistent with a quantity–quality tradeoff in parental investment. Together, our findings highlight the lasting legacy of early educational institutions.

Keywords: Historical institutions, Human capital, Hyanggyo, Joseon, Cultural transmission
JEL Codes: I23, J24, N35, O15

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1 Introduction

Why do some communities continue to invest more heavily in education, long after the institutions that originally promoted it have vanished? According to cultural transmission models (e.g., Bisin and Verdier, 2001; Fernández, 2013; Alesina and Giuliano, 2015), preferences—such as the value placed on education—can persist in the long run through socialization within and across communities. Early institutional exposure may shape not only immediate behavior but also durable local norms and aspirations.

We apply this idea to the context of Korea's Joseon Dynasty (1392–1910), during which hundreds of state-run schools, *Hyanggyo*, were established between the late 14th to 16th centuries to cultivate talent through higher education. Hyanggyo offer a unique context for investigating the long-term effects of pre-modern educational institutions. Their establishment was a state-driven initiative during the emergence of the dynasty, with the intention of uniform distribution across regions to cultivate talent independent of the local elites from the preceding regime. This provides a valuable setting to isolate their persistent effects from the influence of other historical factors. Moreover, given the series of profound institutional changes in Korea, including fundamental shifts in the educational system—the fall of the Joseon Dynasty, Japanese colonial rule, postwar authoritarianism, and democratization—any persistent effects arising from educational institutions established over six centuries ago likely reflect a durable influence on attitudes toward education.

We propose two cultural channels through which local exposure to Hyanggyo may have left lasting imprints on human capital. The first is the formation of pro-education norms. As the only state-run higher education institutions with nationwide reach, the visibility of Hyanggyo likely fostered educational aspirations. Their presence offered salient examplars—a crucial determinant of community attitudes and behavior (Wilson, 1997; Ainsworth, 2002; Wodtke et al., 2011)—while also serving as communal hubs that facilitated information exchange, potentially amplifying cultural spillovers. Once established, these beliefs could be transmitted across generations, entrenching durable pro-education norms in exposed communities (Bisin and Verdier, 2001; Doepke and Zilibotti, 2008; Giuliano and Nunn, 2021). Second, the cultivation of meritocratic values could offer an alternative explanation. Despite its strict class system, the Joseon dynasty institutionalized a merit-based path that allowed commoners to attain elite status through academic achievement. Hyanggyo was central to this system: attendance was required for eligibility, and examinations were administered through their network (Park, 2023). They also reduced the educational costs of commoners by providing free tuition and military exemptions, thereby in principle creating a pathway to upward mobility through education (Ch'oe, 1974). By broadening access to advanced

education and reinforcing the ideal of mobility through academic success, Hyanggyo might have strengthened educational demand through the perception of meritocratic values. While both mechanisms can foster positive attitudes toward human capital accumulation, a key distinction lies between cultural attitudes toward human capital itself and values tied to social achievements beyond education. In the empirical analysis using contemporary survey data, we test which channel better explains the human capital legacy of Hyanggyo.

For empirical analysis, we compile a comprehensive list of Hyanggyo locations from historical records, based on which we construct a township-level index of historical exposure to Hyanggyo. Specifically, Hyanggyo exposure is measured as an inverse-distance-weighted average of their operations around each township, reflecting both spatial proximity and duration. While our analysis relies on standard ordinary least squares estimation due to data limitations, our measure of Hyanggyo exposure is plausibly exogenous for three reasons. First, the educational role of Hyanggyo declined sharply from the 17th century and was supplanted by the rise of private academies, which followed a different spatial distribution.[1] Second, we exploit within-county variation, where each county is relatively compact—typically one-third the size of a U.S. county—and exhibits homogeneous institutional conditions as well as similar socioeconomic, geographic, and historical characteristics. Third, in addition to the above considerations, we apply the methods proposed by Oster (2019) and Diegert et al. (2022) to show that our results are unlikely to be driven by selection on unobservables.

To test the persistent effects of Hyanggyo, we match the township-level index of Hyanggyo exposure to human capital outcomes from the 1930s to the 2010s. The results support our hypothesis: areas with greater historical exposure to Hyanggyo show higher educational attainment. This pattern remains robust across radical institutional transformations in Korea—through Japanese colonial rule, postwar authoritarianism, and contemporary democratization. Given that the placement of Hyanggyo reflected historical state priorities up to the 16th century, rather than anticipated future educational investment or human capital accumulation, we interpret this finding as evidence of the enduring legacy of the Hyanggyo.

Guided by our hypothesis, we further examine whether the long-term effects of Hyanggyo are attributable o changes in preferences or attitudes toward education. We explore the mechanisms in two contexts: (i) the centralized rollout of schools during the Japanese colonial period and (ii) survey-based measures of contemporary cultural attitudes. First, to test whether historical Hyanggyo exposure enhanced local absorptive capacity for educational provision, we analyze community responses to the Japanese colonial school expansion. The

[1] Unlike Hyanggyo, which were strictly managed by the central government, these private academies were established by the local elite. Therefore, they tended to be more exclusive toward non-elite groups. For further details, see Section 2.

centralized implementation of this policy constituted a plausibly exogenous shock to the local populations. In this context, the development of Japanese literacy—absent in the pre-colonial period—effectively captures the extent to which individuals engaged with the imposed educational content. Our results show that school construction facilitated increases in Japanese literacy, but these effects were stronger in areas with greater exposure to Hyanggyo in the past. Moreover, this relationship is not explained by contemporaneous development status. These results suggest that Hyanggyo shaped community responsiveness to modern educational investments, potentially reflecting increased pro-education attitudes.

Second, we use data from the Korean General Social Survey (KGSS), which captures modern-day attitudes toward education and other cultural values. We test whether townships with higher historical exposure to Hyanggyo exhibit stronger pro-education attitudes today. The results show that individuals in these areas do express more favorable attitudes toward education. They place a higher value on education as a significant life accomplishment and a greater emphasis on education as a desirable determinant of earnings, a pattern that is robust to the educational and socioeconomic background of respondents. Moreover, we find that this relationship does not extend to alternative cultural dimensions—such as Confucianism, meritocracy, filial piety, patriarchy, family ties, or social trust—confirming the unique effects on education-related attitudes. Importantly, Hyanggyo exposure exhibits no significant relationship with individuals' belief whether success depends on luck or effort, which are commonly employed as proxies for meritocratic attitudes in the literature (Cappelen et al., 2022; Jia et al., 2025). This suggests that the human capital legacy of Hyanggyo likely reflects the cultivation of pro-education attitudes rather than a meritocratic legacy of the exam-based social system.

To complement our mechanism, we also document indirect evidence based on demographic response: areas with higher exposure to Hyanggyo in the past exhibited lower fertility rates in the early 20th century. This pattern is consistent with the quantity–quality tradeoff, where stronger educational preferences led parents to reduce fertility in favor of more investment in child education. Furthermore, we find that the negative association between Hyanggyo exposure and fertility is largely explained by contemporaneous enrollment rates, but remains robust to the inclusion of alternative local characteristics. Together, these findings suggest that pre-modern educational institutions shaped intergenerational preferences over family and human capital investments.

Our findings extend the understanding the persistent effects of pre-modern educational institutions. Existing studies primarily focus on the Western context, such as lasting impacts of medieval universities in Germany on market development (Cantoni and Yuchtman, 2014), the role of secular curricula in industrial development in nineteenth-century France (Squicciarini,

2020), and the long-term influence of public education policies in nineteenth-century Italy (Bozzano et al., 2024). We expand the literature by examining the human capital legacy of educational institutions in pre-modern Korea, which, to our knowledge represents the first study in the Asian context. Beyond its geographical distinctiveness, the early Joseon dynasty provides a setting marked by a sharper discontinuity in educational regimes before and after modernization than in the Western context, offering a compelling environment to isolate the legacy of historical educational institutions.

This paper also contributes to a large literature on the deep roots of cultural and social norms (Nunn and Wantchekon, 2011; Voigtländer and Voth, 2012; Cagé and Rueda, 2016; Giuliano and Nunn, 2021; Fiszbein et al., 2022). In particular, our findings closely relate to the role of historical institutions in cultural formation (Becker et al., 2016; Cagé and Rueda, 2016; Lowes et al., 2017; Bisin and Verdier, 2024). The legacy of Hyanggyo presents a case in which historical exposure to educational institutions produces enduring effects on education-friendly cultural norms, translating into long-term human capital outcomes. In particular, a series of fundamental regime changes in the subsequent period—the Japanese colonization, the establishment of authoritarian government, and democratization—offers a compelling context for examining cultural persistence rooted in historical institutions and its downstream effects on socioeconomic outcomes.

In addition, this study adds to a growing literature examining the legacy of human capital formation in East Asia, with a particular attention to the long-term effects of historical civil service exams (Hong and Paik, 2018; Bai, 2019; Chen et al., 2020). Although Hyanggyo were also closely tied to the civil service examinations in the early Joseon, our approach differs by focusing on the broader population's exposure to local educational institutions rather than on the scale of small elite who finally passed the examinations. Consistent with this perspective, our findings indicate that the cultural legacy of Hyanggyo is evident primarily in pro-education attitudes, with no significant influence on Confucian ideology or meritocratic values. This highlights that, despite close relationship between educational institution and the examination system in East Asia, their long-term effects may have unfolded through distinct pathways.

Lastly, this study builds on the extensive studies on the institutional roots of comparative development (e.g., Acemoglu et al., 2001; Dell, 2010; Michalopoulos and Papaioannou, 2013; De la Croix et al., 2018). Among those, variation in human capital-promoting institutions has been shown to play a crucial role in shaping regional divergence in development outcomes (Cantoni and Yuchtman, 2013; Wantchekon et al., 2015; Dittmar and Meisenzahl, 2022). We add to this body of work by demonstrating that historical exposure to educational institutions could affect modern educational attainment even across highly localized geographic units

and despite fundamental regime changes. Our findings suggest that this persistence operates through shifts in cultural attitudes toward education, with potential implications for the long-term trajectories of local development.

The remainder of the paper is structured as follows. Section 2 provides historical context on Hyanggyo during the Joseon Dynasty. Section 3 outlines our hypothesis regarding the long-term human capital legacy of Hyanggyo. In Section 4, we describe the construction of a township-level index of Hyanggyo exposure and detail the identifying assumptions underlying our empirical strategy. Section 5 introduces the estimating equation and presents evidence on human capital outcomes, spanning from the colonial era to the present day. Section 6 probes the underlying mechanisms through three complementary tests: (i) assessing the effects of school construction on Japanese literacy during the colonial period; (ii) examining contemporary attitudes toward education and cultural values; and (iii) exploring demographic responses through a quantity-quality tradeoff of children. Section 7 concludes.

2 Hyanggyo in the Joseon Dynasty: Contextual Overview

Hyanggyo were state-sponsored educational institutions of the Joseon Dynasty, which governed the Korean Peninsula from 1392 until the onset of Japanese colonial rule in 1910. With Neo-Confucianism replacing Buddhism as the state ideology, the Joseon government sought to promote this new philosophy as a means of establishing a social order rooted in its principles. The establishment of Hyanggyo across the kingdom was a key component of this strategy. This section provides a brief historical background of Hyanggyo, with its implications for our empirical analysis discussed in Section 4.

The Role of Hyanggyo Hyanggyo served as public academies for higher education in the early Joseon Dynasty, with the primary objective of educating and training officials in Confucian ideals. Hyanggyo were particularly instrumental in cultivating new talent uniformly across regions. To prevent the resurgence of indigenous aristocratic power, the early Joseon sought to foster a new body of officials distinct from the established elites of the previous dynasty, where Hyanggyo was a key component of this policy (Lee et al., 2007). In his royal edict, King Taejo—founder of the Joseon Dynasty—states that the government should "*assign more students to local Hyanggyo and promote diligent study to cultivate talent.*"

Education at Hyanggyo was tied to *Gwageo*, the civil service examinations (Choi et al., 2006). The Gwageo system consisted of a two-stage process. Passing the first stage, known as *Sogwa*, granted eligibility to take the final stage, *Daegwa*. Even those who did not proceed to become government officials, successful *Sogwa* candidates were granted titles such as *Saengwon*

or *Jinsa* upon passing the first stage. These titles were comparable to academic degrees in contemporary terms and provided significant prestige as local elites and scholar-gentry in their communities (The Academy of Korean Studies, 2025).

The Hyanggyo curriculum primarily focused on preparing students for the first stage of Gwageo. Admission required basic understanding of Confucian classics, and Government-appointed instructors delivered advanced training in Confucian texts that extended beyond classical scholarship to specifically prepare students for the examination. This practical orientation is evidenced in records of the administrative regulations for Hyanggyo operation, which systematically prescribed student performance monitoring, examination administration, and standardized evaluation protocols (Kim, 2010).

Hyanggyo also served as a direct gateway to Gwageo eligibility. Attendance at Hyanggyo for a prescribed duration was a prerequisite for sitting the examination during the early Joseon Dynasty, and regional top performers were even exempted from the first round of the examinations. Aside from this, the examination did not require additional qualifications. In accordance with the policy of evenly cultivating talent throughout the monarchy, admission was not restricted by social class and tuition was free.[2] Given that Gwageo was the sole official channel of recruiting high-ranking government officials, education at Hyanggyo contributed to shaping socioeconomic mobility, or at least the attitudes toward it, particularly among the non-elite population (Ch'oe, 1974).[3]

In addition to their function in higher education, Hyanggyo played a role in social regulation and moral instruction, given their foundation in Confucian ideology. They served as a nexus place where Government officials and community elders collaborated to enforce Confucian behavioral standards, while also functioning as ceremonial centers that conducted biannual rites in honor of Confucius. Through the integration of administrative, ceremonial, and communal activities, Hyanggyo effectively propagated state-sponsored values and strengthened local social cohesion (Palais, 2014). In our empirical analysis, we test whether this cultural aspect confounds our findings on the human capital legacy of Hyanggyo.

Top-Down Initiatives The founding of the Joseon Dynasty marked a sweeping effort to institutionalize Confucian education across the country. Hyanggyo were among the key instruments employed by the new regime, effectively "*bringing Confucian teachings into the*

[2]Similar to modern civil service examinations, Gwageo also imposed disqualifying conditions. Individuals who had committed serious crimes or were incumbent government officials were barred from taking the exam. In addition, in line with the Neo-Confucian moral code at the time, sons of remarried women and those of secondary status were prohibited from participating in the examination.

[3]Gwageo in the Joseon Dynasty was divided into the literary examination, the military examination, and the technical examination. Among these, students of Hyanggyo were granted eligibility to take the first stage of the literary examination, known as the Sogwa.

grassroots level of society (The Academy of Korean Studies, 2025)." As a matter of royal policy, Hyanggyo was gradually established during the early Joseon period in nearly every administrative unit (*GunHyeon*), corresponding to counties in modern Korea.

From their inception, Hyanggyo was conceived as an extension of state authority: local officials managed their operations, and the central government provided significant resources for their operations. For example, Kings Taejong and Sejong—the third and fourth monarchs of the Joseon Dynasty— allocated land (*hakjeon*) and servitudes (*haknobi*) to each Hyanggyo, demonstrating early royal commitment to their establishment and sustainability. While such support was initially informal, the 1492 ordinance formally codified this arrangement, affirming the status of Hyanggyo as a fully state-sponsored network of schools (Shin, 2024b).

This top-down initiative indicates that the establishment of Hyanggyo was centrally mandated, rather than driven by local communities or authorities. Following the principle of constructing one Hyanggyo in each county, the state aimed to distribute them uniformly across regions.[4] Therefore, administrative considerations—rather than local demand or scholastic tradition—typically guided the selection of specific sites. By ensuring relatively uniform access to Confucian education across the kingdom, this policy reflected a commitment to providing educational opportunities independent of regional variations in existing scholarly activity. A more detailed discussion of the potential determinants of Hyanggyo locations is provided in Section 4.2.

Decline of Hyanggyo Education Despite their crucial role in higher education during the early Joseon period, the educational function of Hyanggyo declined significantly from the late 16th century. This shift was primarily driven by changes in the political environment, particularly the rise of the *Sarim*—a political faction marginalized during the founding of the dynasty—which had largely remained in seclusion in rural areas (Choi et al., 2006; Jang, 2014).

As the Sarim gained political power in the late 16th century, they began to establish their own private academies, known as *Seowon*. Higher education increasingly shifted to these institutions, which were operated by local elites and scholarly networks, independently of central government support or supervision.[5] The Imjin War, the Japanese invasion of

[4]The principle of constructing one Hyanggyo in each administrative unit was legitimized in *Gyeongguk Daejeon*, a foundational legal text of the Joseon Dynasty.

[5]By the mid to late Joseon period, certain Seowon gained central government support—including land grants, texts, tax exemptions, and military service waivers—following the increasing political power of the Sarim faction. However, due to the systematic abuse of these benefits that undermined the educational function of Seowon, official patronage was terminated in the 18th century. Following the consolidation of Sarim's political power, Seowon had effectively supplanted Hyanggyo as the primary venue for higher learning by the end of the century.

1592–1598, further accelerated this transition (The Academy of Korean Studies, 2025). Many Hyanggyo were destroyed, and the social order necessary to sustain scholarly communities was shattered. The suspension of civil service examinations during the war disrupted the institutional routines that underpinned the academic community, leaving the Hyanggyo network in disarray. As the influence of the Sarim continued to grow, Seowon naturally filled the educational roles formerly held by Hyanggyo. The system that granted eligibility for the Gwageo based on Hyanggyo attendance was also abolished.

Having lost their functions as institutions of higher education, Hyanggyo were repurposed by the central government and local elites largely as ceremonial and community institutions dedicated to upholding Confucian traditions. Their ideological and ritual roles came to the forefront, and this function persisted through the late Joseon period (Park, 2019). While the educational function of the Hyanggyo had remained in a nominal capacity, it was officially nullified with the introduction of a relatively modern education system under the reforms implemented in 1894.

3 Hypothesis: Human Capital Legacy of Hyanggyo

We argue that local exposure to Hyanggyo in the early Joseon Dynasty has had lasting effects on human capital today, even though Hyanggyo ceased to function effectively as educational institutions by the late 16th century. We propose that this persistence operated through shifts in cultural attitudes toward education. This section discusses two potential channels: pro-education norms and meritocratic values. Based on this discussion, our empirical analysis examines contemporary cultural attitudes related to these channels.

Pro-Education Norms As discussed in Section 2, Hyanggyo were the only national institutions of higher education established throughout the country at the time, with curricula and trained faculty managed by the state. Their visibility likely encouraged individuals and households to increase educational investments. While data on educational investment in the early Joseon Dynasty are unavailable, evidence from comparable contemporary settings indicates that proximity to high-quality educational institutions consistently promotes human capital accumulation (Card, 1993; Dobbie and Fryer Jr, 2011; Fryer Jr and Katz, 2013).

Hyanggyo's role in promoting human capital accumulation may have extended into cultural norms and attitudes through social learning. A large body of literature highlights the significant influence of proximate, tangible role models within local communities on shaping aspirations and behavior (Wilson, 1997; Ainsworth, 2002; Wodtke et al., 2011). Empirical studies support this view. For instance, Wantchekon et al. (2015) show that local exposure

to colonial schools in Benin had long-term positive impacts on human capital accumulation, with increased educational aspirations in villages where schools were established serving as a key channel.

In this context, the positive externalities of Hyanggyo exposure likely fostered stronger attitudes toward human capital investment. Moreover, Hyanggyo served a communal function as hubs for the local exchange of educational information, likely amplifying the effects of cultural spillovers in a pre-modern society where access to information was largely local and relational. Once a community updated its beliefs about education, these could be transmitted across generations and influence human capital outcomes in the long run, as predicted by theoretical models of intergenerational cultural transmission (Bisin and Verdier, 2001; Doepke and Zilibotti, 2008; Fouka and Schläpfer, 2020; Giuliano and Nunn, 2021).[6]

Taken together, local exposure to Hyanggyo could have contributed to the persistent formation of positive attitudes toward human capital accumulation. Where Hyanggyo operated, scholars were not distant ideals but peers and relatives, making educational investment and perseverance ordinary, commendable choices that promoted educational aspirations. Pro-education norms could have accumulated through cultural transmission across generations, reinforcing Hyanggyo's influence on regional divergence in human capital structures—effects that persisted long after direct exposure had faded.

Meritocratic Values Unlike many European systems, where nobility and high-ranking positions were typically inherited (Dewald, 1996; Crouch, 2015), the Joseon Dynasty in principle allowed commoners to attain elite status through merit (Song et al., 2019). With the exception of the servitude class, non-elite individuals in Joseon were permitted to take Gwageo, the civil service examination.[7]

This meritocratic principle could have fostered an ideal within society: academic success could enable even those from humble backgrounds to rise and elevate their families to prominence. The high perceived returns to education may have contributed to increased investment in educational pursuits. Hendrik Hamel, a Dutch sailor shipwrecked in Joseon in the 17th century, described the educational culture of the time: "*Elites and commoners alike endeavor to provide their children with the best possible education. Day and night, the*

[6]This interpretation is consistent with findings from other strands of literature, including studies on neighborhood effects on educational decisions (Bobonis and Finan, 2009; Lalive and Cattaneo, 2009) and those on the long-term impact of university exposure on local human capital across generations (Currie and Moretti, 2003; Valero and Van Reenen, 2019; Russell et al., 2024).

[7]*The Veritable Records of the Joseon Dynasty (Joseon Wangjo Sillok)* even document cases in which individuals of servitude status, having concealed their identities, successfully passed the civil service examination and were appointed to central posts—despite their backgrounds being uncovered.

children study classical texts (Goh, 2022)."[8]

Moreover, Hyanggyo underpinned this meritocratic system in two ways. First, it was the primary gateway to Gwageo: attendance at Hyanggyo guaranteed eligibility, candidates were managed through Hyanggyo registers, administrative procedures related to Gwageo were communicated via the Hyanggyo network; and the curriculum focused on the Confucian classics that formed the core of the examination (Park, 2023). Second, Hyanggyo significantly lowered financial barriers for non-elite class: tuition was free, and the state supplied texts via printing blocks or distribution through Hyanggyo (Shin, 2024a). Enrolled students also received the privilege of military exemption, further reducing the opportunity costs for commoners relative to the elite class, who were already exempt from military obligations (Ch'oe, 1974).

To summarize, Hyanggyo significantly enhanced the returns to education by creating education-based pathways for social mobility while reducing its costs. In light of the extensive literature on the effects of socioeconomic incentives on the formation of cultures and preferences (e.g., Bisin and Verdier, 1998; Palacios-Huerta and Santos, 2004; Alger and Weibull, 2019), local exposure to Hyanggyo may have cultivated proactive educational attitudes by shaping meritocratic values through a relative increase in the perceived importance of education as a pathway to class mobility.

The two potential mechanisms discussed above are complementary: both suggest that local exposure to Hyanggyo fostered pro-education norms that influenced long-run human capital accumulation. However, a key distinction lies in that the meritocracy-based explanation involves values related to broader social achievements beyond education. To assess the relative importance of these two channels, Section 6.2 examines the long-term effects of Hyanggyo exposure on contemporary attitudes toward education and meritocracy.

4 Measuring Exposure to Hyanggyo

Our empirical analysis examines the long-term effects of local exposure to Hyanggyo at the township level. This section describes the data collection process and the construction of a township-level index of Hyanggyo exposure. Based on this, we outline the identifying assumptions for estimation.

[8]However, it is debatable whether this potential for social mobility was realized in practice. According to Han (2013), 24.3% of those who passed Gwageo during early Joseon came from non-elite classes. In contrast, Park and Wang (2024) suggest that the likelihood of passing the civil service examination was substantially higher for individuals from exam-passer family than for those from non-passer families.

4.1 Data and Measurement

There are no comprehensive historical records documenting individual Hyanggyo throughout the Joseon Dynasty. To address this gap, we compile the list of all Hyanggyo documented in the *Encyclopedia of Korean Culture*, published by the Academy of Korean Studies.[9] We search encyclopedia entries using keywords related to Hyanggyo, collecting relevant entries to compile a comprehensive list. Each entry provides information based on local historical accounts, including details such as addresses and years of establishment. Additionally, if a Hyanggyo was relocated, the encyclopedia records the period and new location of the move.

The compiled list includes 328 Hyanggyo. According to the *Veritable Records of King Sejong: Treatise on Geography (Sejong Sillok Jiriji)*, an official record of the Joseon Dynasty from 1454, there were 329 Hyanggyo across the Korean peninsula at that time. This close alignment confirms the accuracy of our dataset in representing the historical distribution of Hyanggyo. However, several Hyanggyo, particularly those in present-day North Korea, lack detailed location information due to limited access to their historical records. Consequently, after excluding these cases, we use 320 Hyanggyo to construct the index.[10] Nevertheless, unless this measurement error is systematically correlated with local determinants of human capital, it is unlikely to bias our results. In Appendix A.2, we show that our baseline findings are robust to excluding the present-day North Korean areas from the sample.

Based on the above dataset, we identify the number of Hyanggyos that existed in each township during the Joseon Dynasty, along with their respective periods of operation. Township is the lowest administrative subdivision in Korea, averaging around 90 km^2 in area and situated below the county level in the administrative hierarchy.[11] Among the 2,347 townships included in the analysis, 13.6% had a Hyanggyo at least once. Given that the majority of townships never had a Hyanggyo, an indicator of Hyanggyo presence—representing the extensive margin—would not be suitable for analyzing regional divergence in human capital, as it masks variations in the intensive margin in local exposure. In this context, we construct a township-level index of Hyanggyo exposure as follows:

[9] This encyclopedia was compiled as part of a long-term Korean studies research project initiated in 1980 with government support, involving contributions from approximately 3,800 scholars.

[10] Concerns regarding bias due to measurement errors are mitigated in two aspects. First, as shown in Section 5, the results for the colonial period, which covers both North and South Korean regions, are consistent with the estimates from the post-colonial period, focused exclusively on South Korea. Second, we test the robustness of our results from the colonial period to excluding North Korean regions, as detailed in Appendix A.

[11] For consistency, we use 1935 township boundaries, harmonizing variables from other periods to match these spatial units. For years where a shapefile for township boundaries does not exist (1960, 1966), we match townships manually by tracking official records of administrative boundary changes. For other years, we use area-based harmonization.

$$Hyanggyo_i = \sum_k \sum_j Duration_{k,j} \times \frac{1}{Dist_{i,j}} \tag{1}$$

This index relies on two sources of variation: (i) the proximity to Hyanggyo and (ii) the duration of their operation. For each Hyanggyo k located in township j, $Duration_{k,j}$ represents the total number of years it was in operation, and $Dist_{i,j}$ denotes its distance from township i in kilometers.[12] Because a large number of Hyanggyo in our sample lack locational information beyond the township level, we use the distance between the centroids of townships i and j. For Hyanggyo that existed within township i, we assign a distance value of 1, noting that the minimum distance between different townships is greater than 1. In Appendix A.1, we show that our estimates are robust to alternative measures of $Hyanggyo_i$, including those based on exponential distance decay, the introduction of upper bounds for $Dist_{i,j}$ (e.g., 10 km), and proximity to the nearest Hyanggyo.

To summarize, $Hyanggyo_i$ is the inverse-distance-weighted average duration of Hyanggyo operations around township i. A higher value of this index indicates greater exposure to Hyanggyo during the Joseon Dynasty, reflecting the combined influence of proximity to Hyanggyo and the length of their operation. Figure 1 shows the township-level distribution of the index of Hyanggyo exposure. The left panel displays the raw values of the index, which suggest higher concentrations of Hyanggyo exposure around Seoul and the southern region—historically prosperous areas with fertile plains. While this pattern could raise endogeneity concerns, our specification controls for county fixed effects, with 220 counties each comprising an average of 10.7 townships. By leveraging within-county variation, we mitigate potential endogeneity stemming from persistent regional differences in local development or human capital accumulation.[13] The right panel displays the index values after subtracting the county-level mean, capturing the variation used in our analysis. Contrary to the raw index values, this adjusted measure shows no regional concentration and approximates a plausibly random spatial distribution.

[12] The operational period of Hyanggyo is calculated up to the year 1592. As discussed in Section 2, following the outbreak of the Imjin War in 1592, the higher education function of Hyanggyo was largely transferred to Seowon, while Hyanggyo shifted its focus to ancestral rites for sages and the moral education of the local population. Hence, the cutoff at 1592 is appropriate for capturing the educational role of Hyanggyo while excluding exposure to the later period, during which they functioned primarily as ritual institutions. However, relaxing this restriction in the calculation of the index does not alter our findings (see Appendix A.1).

[13] In addition, Appendix A.2 shows that our results remain robust when dropping townships with extreme values of Hyanggyo exposure and those in the five largest cities in Korea, further mitigating concerns about geographical selection.

4.2 Identifying Assumption

Our empirical analysis relies on the assumption that local exposure to Hyanggyo is not confounded by other township characteristics that independently influenced long-term human capital outcomes. Although Hyanggyo exposure does not constitute a natural experiment, several factors alleviate potential endogeneity concerns.

First, the location of Hyanggyo was not determined by the existing level or potential of local human capital. As discussed in Section 2, equal investment in human capital across regions was a consistently pursued policy in early Joseon. For example, among the six stages of the civil service examination, all stages except for the final two—which were limited to a small number of candidates—were conducted in each province to minimize disadvantages in accessibility, and the number of successful candidates was evenly allocated across regions (The Academy of Korean Studies, 2025). The uniform cultivation of local talent was a key initiative of the Joseon Dynasty from its foundation, which led to a centrally mandated policy requiring the establishment of one Hyanggyo per county-level administrative unit (*Gunhyeon*). This suggests that the establishment of Hyanggyo was unlikely to have been promoted by the specific human capital conditions of each locality. Rather, if the central government established Hyanggyo in areas that initially lacked favorable conditions for human capital—as part of an effort to promote regional equality in human capital formation—then our analysis may rather represent a conservative estimate of the legacy of Hyanggyo.

Even if the distribution of Hyanggyo was not directly tied to local human capital at the time, other locational determinants might also confound our results. For instance, if Hyanggyo were established in administrative or transportation hubs—to facilitate bureaucratic oversight or resource procurement—or were preferentially built in economic centers, these regional traits might have independently influenced human capital formation, resulting in omitted variable bias.[14]

However, we argue that endogeneity concerns are unlikely to cause a significant bias in our results for four key reasons. First, we control for the proximity to post stations. Post stations (*Yeokcham*) were transportation and communication hubs in the Joseon Dynasty, used for public duties such as delivering official documents and transporting public goods. Moreover, their role extended further: as key nodes in transportation and logistics networks, post stations facilitated commercial activity and often functioned as local economic centers (Kim, 2000; Yang, 2022). Therefore, robustness to proximity to post stations suggest that

[14]Hyanggyo were not necessarily established near or far from central areas of local regions. Historical records provide numerous examples of Hyanggyo situated both inside and outside walled towns (*Eupseong*) (Government, 1481). Relocation of Hyanggyo was also common. For instance, *Gwangju Hyanggyo* was initially built within the town walls but was later relocated due to concerns that commercial activity disrupted the academic environment (Kim, 2025).

our results are not driven by accessibility, administrative convenience, or the developmental status of the locality at the time.

Second, we leverage within-county variation. With the inclusion of county fixed effects, the results can be given a causal interpretation if local exposure to Hyanggyo was effectively random within counties. This assumption is plausible given the compact administrative geography: our sample counties are typically one-third the size of a U.S. county. This suggests that townships within the same county would share homogeneous institutional conditions as well as similar socioeconomic, geographic, and historical characteristics, which might jointly influence both historical Hyanggyo exposure and human capital accumulation. Moreover, Appendix B shows that our estimation results are unlikely driven by selection on unobservables, based on the approaches proposed by Oster (2019) and Diegert et al. (2022).

Third, the institutional landscape related to human capital experienced significant changes even after the period of measuring Hyanggyo exposure. Importantly, the educational function of Hyanggyo significantly declined from the late 17th century. As outlined in Section 2, this decline resulted from several factors, including the political rise of the Sarim faction, which favored private academies, and the disruption caused by the Imjin War (1592–1598), which destroyed many Hyanggyo and led to the suspension of civil service examinations. In the aftermath, private academies (Seowon), which operated independently of central oversight, became the dominant educational institutions with a different spatial distribution compared to Hyanggyo.[15] This institutional shift and resulting discontinuity further weaken any persistent, systematic association between historical Hyanggyo presence and present-day human capital outcomes.

Lastly, our method of measuring Hyanggyo exposure helps mitigate concerns about omitted variable bias. By using an inverse-distance-weighted average of Hyanggyo operations, the exposure index moves beyond a simple binary indicator and captures a more nuanced, geographically graded measure of exposure. This spatial smoothing, inherent in distance-weighting, would average out unobserved township-specific characteristics that may correlate with both Hyanggyo presence and outcome variables, thereby reducing concerns about their confounding effects.[16]

[15]Unlike Hyanggyo, Seowon was privately operated by local elites and consequently exhibited stronger class-based exclusivity. Moreover, they did not provide benefits such as military service exemptions or tuition waivers. This suggests that while Seowon replaced the higher education provided by Hyanggyo, they were unlikely to be relevant to our proposed mechanism based on the perceived value of education.

[16]For example, consider an extreme case: two townships that had Hyanggyo due to local economic prosperity, and a township located between them that is significantly underdeveloped and lacks a Hyanggyo. If we use the presence of Hyanggyo as an indicator, the estimates would be confounded by initial local development. In contrast, our index mitigates such endogeneity by capturing the distribution of Hyanggyo in the surrounding area.

5 Persistent Effects on Human Capital

This section investigates the long-term effects of Hyanggyo exposure on regional divergence in human capital accumulation. Section 5.1 presents our estimating equation. The subsequent sections examine human capital outcomes from the colonial period (early 20th century) to contemporary measures.

5.1 Estimating Equation

To investigate the persistent effects of historical Hyanggyo exposure on human capital outcomes, we estimate the following cross-sectional specification:

$$Y_i = \alpha + \beta Hyanggyo_i + X'_{i,geo}\gamma + X'_{i,se}\lambda + \delta_c + \epsilon_i \tag{2}$$

where Y_i denotes a human capital outcome in township i, such as enrollment or literacy rates measured at different points in time. Hyanggyo_i indicates historical exposure to Hyanggyo during the Joseon Dynasty, as in Equation 1. The coefficient β captures the association between historical exposure and later human capital outcomes. $X_{i,geo}$ is a vector of geoclimatic controls that might influence both Hyanggyo exposure and local human capital, including caloric suitability, distance to the nearest river, distance to the nearest coast, distance to Seoul, terrain elevation and slope.[17] $X_{i,se}$ includes four key geographic proxies for pre-modern local socioeconomic conditions. First, we control for the distance to the nearest post station, as a measure of proximity to local economic centers (See Section 4.2). Additionally, we include the nearest distances to major *Jangsi* (marketplaces); *Jochang* (government grain storage that served as domestic trade hubs); and major ports at the time.[18] Lastly, we include county fixed effects δ_c to absorb unobserved heterogeneity across larger administrative units.

This specification builds on the considerations for identification discussed in Section 4.2. The key assumption is that, conditional on geographic features, baseline socioeconomic conditions, and county-level unobservables, historical Hyanggyo exposure is exogenous to unobserved determinants of contemporary educational outcomes. In other words, we assume that Hyanggyo placement reflects historical state priorities rather than anticipated future

[17] The caloric suitability index is included as a proxy for the initial agricultural endowment of each township. We also control for distance to the coast, rivers, and Seoul, given their potential correlation with historical local development. Terrain elevation and slope are included to account for their possible influence on the decision to establish Hyanggyo.

[18] The locations of major *Jangsi*, *Jochang*, and ports at the time are sourced from *Mangi Yoram*, an official document concerning fiscal administration during the Joseon Dynasty. The locations of post stations are obtained from the Historical Geographic Information System: https://www.hisgeo.info.

educational investment or human capital accumulation. As argued in Section 3, Hyanggyo exposure is plausibly orthogonal to modern-day educational quality conditional on our controls, since the educational role of Hyanggyo declined significantly from the 17th century and became officially obsolete with the end of the dynasty. What remains is a persistent cultural legacy, not a continued institutional presence. Thus, the coefficient β is expected to capture the effect of historical educational institutions on later human capital formation.

5.2 The Colonial Period Outcomes

Our main analysis focuses on educational outcomes during the Japanese colonial period. The colonial government introduced an entirely new educational system, including the mandatory implementation of Japanese language education. This created a distinct set of conditions that fundamentally altered the pre-existing educational landscape. Therefore, any regional differences in educational outcomes during this period would provide insights into the enduring legacy of Hyanggyo on local attitudes toward human capital.[19]

Table 1 presents the long-term associations between Hyanggyo exposure and educational outcomes in 1930, the earliest period for which the township-level data are available from the National Census of Colonial Korea. We use two outcome variables: school enrollment and Japanese literacy.[20] According to Columns 1 and 2, a one-standard-deviation increase in Hyanggyo exposure is associated with a 0.76–0.77 standard deviation increase in school enrollment rates. In percentile terms, this suggests that the gap in Hyanggyo exposure between the median and the 90th percentile townships results in an enrollment rate difference equivalent to the gap between the median to the 75th percentile. These results show little difference with and without controlling for historical socioeconomic indicators, mitigating concerns about the direct effects of the locational determinants of Hyanggyo.

The positive effects on Japanese literacy in Columns 3 and 4 are particularly noteworthy, given that Japanese language education was first implemented during the colonial period, with no prior regional variation. Combined with the results on enrollment rates—based on the modern education system also introduced by the colonial state–this suggests that historical exposure to Hyanggyo shaped the absorptive capacity of communities in responding to the educational push imposed by an external force.

[19]Following its colonization of Korea in 1910, Japan established the colonial education system via the "Joseon Educational Ordinance" in 1911. However, this educational system was subject to subsequent shifts in colonial policies. For instance, after the March First Movement in 1919, the 1922 Ordinance extended common and high school programs as part of an appeasement policy. Nevertheless, schools remained segregated against Koreans, with the exception of vocational and professional schools.

[20]The school enrollment rate is defined as the number of elementary school students divided by the population aged 6 to 13. Literacy rate is measured as the share of the population aged 6 and above who can read and write in Korean or Japanese, respectively. Data for other age groups are not available.

A potential concern regarding the above interpretation is that the higher rates of Japanese literacy and school enrollment may be an extension of existing human capital, rather than a greater absorptive capacity for new educational environments. To address this, Table 2 tests whether the positive correlation between Hyanggyo exposure and the colonial educational outcomes is attributable the level of Korean literacy, which was predetermined independent of the Japanese education system.[21] The results show that while the school enrollment and Japanese literacy rates were higher in townships with higher Korean literacy, this does not fully account for the legacy of Hyanggyo.[22] In Section 6.1, we further investigate the role of local absorptive capacity in this relationship.

5.3 Post-Colonial Outcomes

Taking our focus on the outcomes during the Japanese occupation further, this section examines whether the human capital advantages associated with Hyanggyo persisted beyond the colonial era. Following liberation (1945) and the establishment of the Republic of Korea (1948), the Korean government implemented comprehensive reforms of its educational institutions and curricula (Yoon, 2014).[23] These reforms promoted rapid educational expansion; for example, adult literacy rates increased from 22% in 1945 to over 90% by 1970. This institutional discontinuity and explosive educational growth present a natural test of the enduring legacy of Hyanggyo.

As shown in Table 3, the results are consistent with evidence from colonial education. Columns 1 and 2 present a positive link between Hyanggyo exposure and 1960 adult literacy rates. Columns 3 and 4 further show that Hyanggyo exposure led to higher primary school enrollment rates in 1960, suggesting continued educational investments in areas with greater Hyanggyo exposure despite institutional transformations.[24] Columns 5 and 6 examine the link between Hyanggyo exposure and college attainment, measured in 1966 as the share of adults aged 20 and above enrolled in or graduated from college. Higher education remained extremely limited in Korea immediately after liberation, but expanded rapidly during the 1960s, as

[21]The 1911 Ordinance designated Japanese as the "national language" and significantly reduced the instructional hours for the Korean language. By the 1922 Ordinance, Korean was even relegated to an optional subject. With the 1938 Ordinance, Korean language education was officially abolished.

[22]In addition to existing human capital, it is possible that colonial education was more intense in more developed regions due to the convenience of policy implementation or the greater availability of local resources. In this view, Appendix A.3 demonstrates the robustness of our results to additional contemporaneous controls.

[23]The U.S. Army Military Government in Korea (1945–1948) initiated educational reforms aimed at eradicating Japanese colonial influences and introducing American pedagogical approaches, including the reinstatement of Korean language and history in school curricula. These changes were formally institutionalized in 1949 with the enactment of the Education Law, marking a decisive break from colonial systems.

[24]Data for Columns 1–4 are from the 1960 Census. The primary enrollment rate is defined as the proportion of enrolled students within the population under the age of 13.

part of a series of five-year economic development plans initiated in 1962 (Lee, 1989).[25] Our results suggest that historical exposure to Hyanggyo led to stronger responsiveness to these new educational opportunities.

The long-term effects of Hyanggyo are also observed in contemporary educational outcomes. Table 4 reports the results using the proportion of the population aged 25 and above who graduated from high school, had at least one year of college education, and graduated from college, respectively, as measured using the 2010 complete-count census data. The coefficients are positive in all specifications, suggesting the legacy of Hyanggyo continues to shape human capital in modern South Korea. Taken together, our findings point to a remarkably persistent legacy of historical educational institutions—a phenomenon we investigate further in the following section by examining potential mechanisms.

6 Mechanism: Attitudes toward Human Capital

The results in Section 5 show the long-lasting effects of Hyanggyo exposure on modern human capital outcomes. To interpret these findings, we test our hypothesis that the human capital legacy of Hyanggyo can be attributed to the cultivation of stronger preferences for education. Specifically, we test the proposed mechanism with three complementary exercises. First, we examine the government-driven expansion of schools during the Japanese colonial period—an exogenous shock to educational supply—and ask whether its effects on human capital accumulation varied with Hyanggyo exposure. Second, using survey data on contemporary attitudes toward education, we test whether historical Hyanggyo exposure is positively associated with pro-education attitudes and other cultural values today. Specifically, we test whether Hyanggyo exposure is associated with positive attitudes toward alternative cultural values, such as meritocracy or Confucian values like filial piety, patriarchy, family ties, or social trust. Third, we test whether the higher demand for or positive attitude toward education is accompanied by lower fertility, as predicted by the quantity-quality tradeoff (Becker and Lewis, 1973).

6.1 Heterogeneous Responses to Colonial School Construction

The preceding results suggest that the legacy of Hyanggyo has lasted for centuries. To examine whether this persistence reflects a greater local capacity to absorb subsequent investments in human capital, we test whether areas with higher historical exposure to Hyanggyo responded more strongly to a major school expansion initiative implemented during the Japanese colonial

[25] There were only 19 institutions of higher education in Korea immediately after liberation (Kim and Choi, 2017).

period. This expansion introduced a new curriculum and emphasized instruction in the Japanese language, thereby offering a sharp contrast with traditional education.

This setting is particularly well-suited for testing our hypothesis for two main reasons. First, as documented by Izumi and Park (2024), the school construction program was a large-scale, centrally directed policy implemented with minimal regard for local demand conditions. Schools were allocated according to administrative targets rather than pre-existing educational infrastructure, mitigating concerns about endogenous placement.[26] Second, Japanese literacy represents a conceptually rich outcome variable. Because the colonial curriculum focused primarily on Japanese language and culture, literacy in Japanese reflects not only cognitive achievement but also the degree to which individuals internalized and engaged with the imposed educational content. Moreover, given that education for the Japanese language did not exist in the pre-colonial period, it serves as a meaningful proxy for local absorptive capacity.

$$Literacy_{it} = \alpha + \beta Hyanggyo_i \times School_{it} + \gamma School_{it} + \delta_i + \delta_{ct} + \epsilon_{it} \tag{3}$$

We estimate Equation 3 to examine the relationship between historical exposure to Hyanggyo and local responses to colonial schooling. The outcome variable $Literacy_{it}$ represents the Japanese literacy rate in township i in period t. Our sample period consists of two periods: pre- and post-introduction of colonial education. For the post-period, we use Japanese literacy measured in 1930, as in Section 5.2. While township-level Japanese literacy data are unavailable prior to Japanese colonialism, we assign a baseline value of zero literacy for a *hypothetical* pre-period—a natural assumption given the historical context.[27] $School_{it}$ denotes the number of colonial schools in period t. For the colonial period, we use the number of schools that existed during the 1920s, based on the data compiled by Izumi and Park (2024). Similar to the outcome variable, the number of colonial schools is assumed to be zero for the pre-period. $Hyanggyo_i$ is the index of Hyanggyo exposure constructed in Section 4.1.

Our variable of interest is $Hyanggyo_i \times School_{it}$, an interaction term between historical Hyanggyo exposure and colonial school construction. Its coefficient β captures township-level differences in the effects of colonial school construction on the development of Japanese literacy, in relation to local exposure to Hyanggyo during the Joseon Dynasty. Our pseudo-

[26] Izumi and Park (2024) particularly exploits "one school for every three townships" policy implemented after a mass protest against Japanese colonial rule in Korea in 1919 (the March First Movement). We are not able to use this specific variation because our outcome variable of interest, Japanese literacy, is only available in 1930 and assumed to be close to zero before the occupation in 1910.

[27] According to the 1930 Census, the national average Japanese literacy rate was only 7%, despite two decades of colonial education. Given the absence of compulsory Japanese education prior to the colonial period, it would be reasonable to assume that the township-level Japanese literacy rate was effectively zero.

panel specification allows us to control for township fixed effects δ_i, which further alleviates concerns about the potential endogeneity of Hyanggyo exposure. We also include county-by-period fixed effects δ_{ct}, which absorb any county-level temporal shocks, including cross-county differences in colonial policies.

Table 5 shows that the effect of school establishment on Japanese literacy rates was significantly larger in townships with higher exposure to Hyanggyo. As shown in Column 1, the coefficient on school construction is significantly positive, indicating that colonial school construction contributed to increased Japanese literacy. Moreover, the positive coefficient on the interaction term suggests that this effect was stronger in areas with higher historical exposure to Hyanggyo.

Although our findings are conditional on township fixed effects, there could be concerns that the effects of school construction varied with other local characteristics, potentially correlated with Hyanggyo exposure. To alleviate this issue, Column 2 shows the estimates after controlling for interaction terms between $School_{it}$ and the historical socioeconomic indicators used in Section 5: distance to the nearest post station, marketplace, domestic trade hub, and port. Additionally, we include interactions between $School_{it}$ and both the population share of local elites and the share of manufacturing employment measured in 1909 to account for the possibility that variation in local economic conditions at the onset of colonization, which could influence the demand for human capital, affects our results.[28] Even with the inclusion of these additional controls, the coefficient of $Hyanggyo_i \times School_{it}$ remains significant and positive. This suggest that the observed heterogeneity in responses to educational supply is not attributable to alternative local characteristics, supporting the interpretation that pro-education attitudes rooted in Hyanggyo exposure underlie these effects.

Adding to the extensive margin based on school construction, Table 6 demonstrates that the same pattern of complementarity holds along the intensive margin. Specifically, we restrict the sample exclusively to townships that had experienced school construction by the 1920s, and analyze the effects of the variation in the amount of educational resources (log school expenditure and log number of teachers) and their interaction with historical exposure to Hyanggyo. The results indicate that higher school expenditures and an increased number of teachers had more pronounced effects on literacy in areas with greater exposure to Hyanggyo. This suggests that regions with deeper historical roots in education were not merely passive recipients of external educational investments but were instead more effective at leveraging newly available educational resources.

[28]The population share of local elites and the share of manufacturing employment are from *Minjeok Tonggye Pyo*, which was compiled by the Japanese colonial government.

Taken together, we find that regions with stronger Hyanggyo legacies exhibited a more pronounced responsiveness to exogenous increases in educational supply. As discussed in Section 3, we hypothesize that this complementarity reflects the persistent influence of pro-education norms and attitudes shaped by historical exposure to Hyanggyo. The following sections examine this mechanism in greater detail.

6.2 Survey-Based Evidence

So far, we have focused on the effects of Hyanggyo exposure on observed human capital outcomes, such as enrollment or literacy rates. What drives this relationship? We hypothesize that cultural attitudes towards education were a key factor. This section provides evidence that townships with greater historical exposure to Hyanggyo exhibit more positive attitudes toward education even today. Furthermore, we find that there is no significant relationship between Hyanggyo exposure and attitudes toward meritocracy, or broader adherence to traditional cultural values.

Attitudes Toward Education We examine contemporary attitudes toward education using the Korean General Social Survey (KGSS). Survey-based measures have been widely employed to study the perception and prevalence of cultural traits and values. For instance, Alesina and Giuliano (2010) uses questions on the role of the family from the World Value Survey to measure the strength of family ties across countries. Closer to our study, Van Hoorn (2019) uses the European Social Survey to investigate cultural differences in individuals' attitudes toward human capital accumulation.

The KGSS is modeled after the U.S. General Social Survey and the European Social Survey, closely replicating their design and methodology. Conducted annually, the KGSS provides a nationally representative sample of men and women aged 18 and over, collected via in-person interviews. Among other topics, the KGSS surveys respondents' attitudes toward various values, including family, education, and society in general. We use the pooled KGSS sample from 2003 to 2021, yielding a total of 20,841 observations. Although not all questions are consistently asked every year, each wave includes more than 1,000 respondents. The survey also collects respondents' socioeconomic background information, which we include as control variables in our analysis.

We estimate the following equation to examine the relationship between Hyanggyo exposure and contemporary cultural attitude:

$$Y_{ij} = \alpha + \beta Hyanggyo_j + X_i'\gamma + \delta_c + \delta_w + \epsilon_{ij} \tag{4}$$

where Y_{ij} represents survey-based measures of cultural attitudes for respondent i in township j. Most KGSS questions employ a Likert scale, asking respondents to indicate their level of agreement/satisfaction or disagreement/dissatisfaction with a statement or question, ranging from the lowest number (strongly disagree/dissatisfied) to the highest number (strongly agree/satisfied). We convert these scales into binary outcomes, treating responses above the midpoint (e.g., "neither agree nor disagree") as 1, and 0 otherwise. X_i is a vector of individual characteristics, including age, age squared, gender, marital status, educational attainment, father's educational attainment, mother's educational attainment, and household income. Compared to the township-level regressions, this setting allows us to examine the effects of Hyanggyo conditional on educational and economic background of individuals, further mitigating concerns that the cultural legacy of Hyanggyo is merely a byproduct of socioeconomic conditions. δ_c indicates county fixed effects, and δ_w denotes survey-wave fixed effects. Standard errors are clustered at the county level.

We first investigate the linke between historical exposure to Hyanggyo and contemporary attitudes toward education. Specifically, we use two survey questions directly addressing the importance and value of education. The first question asks respondents to rate their agreement with the statement: "People should learn to resolve problems for themselves and should not lean on others." This item reflects a broader value placed on self-reliance through learning, which we interpret as an indirect proxy for attitudes toward human capital accumulation. More directly related to our hypothesis, the second question asks: "How important is educational attainment in your life?," capturing the perceived importance of formal education.

Table 7 summarizes the results, supporting the persistent effects of Hyanggyo on attitudes toward education. Townships with greater historical exposure to Hyanggyo place greater importance on learning (Columns 1 and 2) and exhibit a stronger belief that education is a significant life accomplishment (Columns 3 and 4). The results are robust to the inclusion of individual controls, such as educational background and income level, confirming that the observed effects do not capture different attitudes across socioeconomic statuses. Despite the difference in measurement periods, these findings point toward a potential mechanism underlying the larger literacy gains in townships with higher exposure to Hyanggyo in response to colonial school construction (Section 6.1). If Hyanggyo exposure fostered pro-education attitudes or social norms, higher educational aspirations driven by these attitudes could have increased the effectiveness of subsequent school supply policies.

Table 8 further supports this interpretation by examining perceptions of the socioeconomic significance of educational attainment. The KGSS asks respondents to evaluate the factors that should ideally determine income, which can be used to measure the relative importance

placed on education compared to other socioeconomic factors. Specifically, respondents are asked to assess the subjective importance of the following: the number of years spent in education and training (*education*), the amount of responsibility that comes with the job (*duties*), the resources needed to support a family (*family*), how well the person performs tasks (*performance*), and how hard the person works at the job (*effort*).

Leveraging this part of the survey, we investigate whether positive attitudes toward education translate into greater emphasis on education as a determinant of career progression. Importantly, all determinants listed by the survey are plausible: for instance, it is reasonable to expect that respondents would recognize effort as important for higher earnings. However, if Hyanggyo's effect specifically operates through perceptions about the value of education, higher exposure to Hyanggyo should exclusively influence attitudes regarding education's role in income determination, rather than other factors.

The results support our prediction. Respondents in townships with higher historical exposure to Hyanggyo tend to place greater emphasis on education as a desirable determinant of earnings. Interestingly, Hyanggyo exposure is not associated with greater emphasis on on-the-job performance as a determinant of earnings, even though it is likely correlated with educational attainment. However, performance may also reflect innate characteristics, influencing educational outcomes but not necessarily fostered by education itself. Through the lens of our hypothesis, these results support the distinct effects of Hyanggyo exposure on proactive attitudes toward education, as opposed to attitudes toward general ability. A more detailed analysis of this aspect follows.

Attitude Toward Meritocracy Our evidence may reflect not only an intrinsic appreciation of education but also a broader adherence to meritocracy. Several studies argue that Confucianism and the civil service examination system fostered meritocratic beliefs in East Asia, whereby individual outcomes were determined by effort and ability rather than inherited privilege or luck.[29] Given that Hyanggyo served as the primary gateway to the civil service examinations, the positive attitudes toward learning that we observe might simply reflect an emphasis on meritocracy. If so, our findings would capture the persistence of meritocratic values rather than a preference toward education itself.

We test this possibility by leveraging survey questions in the KGSS related to meritocratic beliefs. Specifically, the KGSS asks whether respondents attribute income and success to "hard work" or "effort" rather than "luck," and whether they believe that hard work or effort eventually leads to rewards in life. We employ these items as proxies for belief in meritocracy (Almås et al., 2020; Cappelen et al., 2022; Jia and Kung, 2025). Using them as dependent

[29] Jia and Kung (2025) provides a review of the literature.

variables in Equation 4, we investigate whether higher exposure to Hyanggyo predicts stronger meritocratic beliefs today.

Table 9 reports the results. Across multiple measures, Hyanggyo exposure shows no significant relationship with meritocratic attitudes. For example, individuals in historically high-exposure regions are no more likely to agree that hard work, rather than luck, determines income or success, or that effort is essential for achieving life rewards. These null results contrast with our earlier findings that Hyanggyo exposure predicts stronger pro-education attitudes, suggesting that the observed cultural persistence is not driven by broader meritocratic values.

At a first glance, these results appear to contrast with the literature on the long-run effects of civil service examinations (Hong and Paik, 2018; Chen et al., 2020), which documents that regions with more exam passers exhibit higher levels of human capital. However, we interpret our findings as consistent with the institutional context. While Hyanggyo served as gateways to the civil service exams, their local presence extended beyond the small number of exam passers. In fact, many Hyanggyo in our sample likely produced few exam passers. Only 15,150 people passed the civil service exams over the entire Joseon Dynasty (Hong and Paik, 2018), and with around 40 students on average in each Hyanggyo at any given time (Gehlmann and Glomb, 2024), the number of exam passers was far smaller than the number of students. Moreover, Park and Wang (2024) estimate that a son from a non-passer family was roughly 2,000 times less likely to pass the highest civil service exam than a son from a passer family, suggesting that realized mobility may have been limited. Given these considerations, the positive attitudes toward education are not likely to result from the mobility experiences of those who studied in Hyanggyo, but rather reflect a general cultural shift in the value placed on education. Our results complement prior work that focuses on exam passers as the outcome variables, showing that the reach of these institutions was broader and shaped community-level preferences toward education even in the absence of direct meritocratic outcomes.

Attitude Toward Alternative Cultural Values In East Asian culture, Confucianism is widely recognized for its emphasis on respect for learning. Given that Hyanggyo primarily served as an educational institution teaching Confucian principles, greater exposure to Hyanggyo could have facilitated the diffusion of Confucian values, subsequently promoting more favorable attitudes toward education (Chen et al., 2020). If this were the primary channel, our proposed mechanism based on the role of education in socioeconomic mobility may lose its validity. To investigate this possibility, we examine the relationship between Hyanggyo exposure and attitudes toward other cultural values that are central to Confucianism

but not directly linked to education. Additionally, we explore whether Hyanggyo exposure is associated with other cultural traits commonly emphasized in the context of economic development, such as family ties or social trust.

Table 10 summarizes the results related to Confucian values. Column 1 reports the association between Hyanggyo exposure and adherence to Confucian discipline. Specifically, respondents were asked how important compliance with Confucian discipline is to being truly South Korean. The remaining columns examine additional cultural values strongly emphasized by Confucianism: filial piety (Column 2), patriarchy (Column 3), family ties (Column 4), and trustworthiness (Columns 5 and 6). These measures are based on survey questions that ask respondents whether children should strive to bring honor to their parents (filial piety), whether there should be clearly distinguished roles for husbands and wives in family life (patriarchy), whether family should be put over self (family ties), and whether individuals trust the others or the society as a whole (social trust).

The results show that historical exposure to Hyanggyo does not have a significant effect on attitudes toward Confucianism or other non-education-related cultural values emphasized by it. Several studies have highlighted the importance of the *content* or *curriculum* of pre-modern educational institutions, how the nature of instruction shaped attitudes toward modern education or scientific knowledge, thereby influencing economic development (Cantoni and Yuchtman, 2013; Yuchtman, 2017; Bai, 2019; Dittmar and Meisenzahl, 2022). In contrast, our findings suggest that the cultural influence of the pre-modern educational institutions is also important, as it fosters a general education-friendly culture regardless of the content being taught. Such influence may be especially important when mass education expands, as it helps raise the educational attainment of the general public, as demonstrated in Section 6.1.

6.3 Fertility Decline

The survey-based results support the enduring effects of Hyanggyo exposure on cultural attitudes toward human capital accumulation. As supplementary evidence, this section examines the long-term implications of Hyanggyo for fertility, offering insights into preferences for education through the lens of child quantity to quality (e.g., Becker and Lewis, 1973; Rosenzweig and Wolpin, 1980). Specifically, we test the relationship between Hyanggyo exposure and fertility rates, with the latter measured as the number of newborn children per 1,000 women aged 15-44. Fertility is observed in 1930, corresponding to the baseline outcomes discussed in Section 5.

Table 11 reports a robust negative association between the historical presence of Hyanggyo and the crude fertility rate in 1930. This relationship holds after controlling for a rich set of

geoclimatic and socioeconomic variables, as well as county fixed effects. This suggests that the reinforcement of pro-education cultural values and the resulting increase in educational investment translated into lower fertility rates through the channel of child quantity-quality tradeoff.

While we suggest the child quantity-quality tradeoff as a potential interpretation, historical exposure to Hyanggyo could have influenced fertility through alternative channels. For instance, if Hyanggyo exposure had long-term effects on local development, it could have indirectly affected fertility outcomes. Alternatively, Hyanggyo exposure may have reinforced Confucian values within the locality, thereby influencing fertility behavior.

However, these alternative explanations do not account for the observed patterns. Table 12 replicates the analysis while controlling for additional township characteristics measured between 1909 and 1930. As shown in Columns 1-4, the negative correlation between Hyanggyo exposure and fertility rate is robust to contemporaneous local economic characteristics and Confucian backgrounds.[30] Crucially, Columns 5–7 reinforce the role of the child quantity-quality tradeoff as a potential mechanism. Once school enrollment is accounted for, the coefficient on Hyanggyo exposure becomes smaller and less precisely estimated, suggesting that increased educational investment mediates the decline in fertility rates. This pattern becomes more evident when we control for enrollment rates for girls. This is a reasonable outcome, given that girls' enrollment rates were significantly lower in 1930, implying that decisions regarding girls' schooling may more effectively reflect variations in parental attitudes toward child education.

While the cross-sectional results does not establish whether the decline in fertility was driven by increased educational preferences, the finding that the relationship between Hyanggyo exposure and fertility is specifically correlated with enrollment rates, rather than other local characteristics, reinforces the interpretation based on attitudes toward child education. Together with the survey-based evidence, these results support long-term shifts in pro-education norms.

7 Conclusion

We study the long-term impact of historical educational institutions on modern human capital formation, with a focus on the role of educational culture. Our analysis centers on Hyanggyo, state-run schools established during Korea's Joseon Dynasty. By assembling

[30] Share of traditional elites refers to the proportion of the *Yangban* elite population measured in 1909, based on data from *Minjeok Tonggye Pyo*. Share of lineage-based villages measures the proportion of lineage-based households among all households within a township. The other control variables are calculated from the 1930 Census data.

a novel township-level dataset, we link historical exposure to Hyanggyo with educational outcomes across multiple time periods. The evidence shows that areas with greater Hyanggyo exposure exhibit significantly higher levels of schooling and literacy throughout the 20th and 21st centuries.

To further explore the validity of our mechanism, we examine the effects of Hyanggyo on educational attitudes in three contexts: First, we show that regions with greater exposure to Hyanggyo exhibited stronger gains in Japanese literacy during the colonial school expansion, indicating greater educational receptiveness. Second, survey-based evidence suggests that individuals in these areas place a higher value on education. Third, historical exposure to Hyanggyo predicts lower fertility in the long run, consistent with an explanation based on the quantity–quality tradeoff.

Our findings point to a remarkably enduring legacy of historical institutions. The persistence of these outcomes across distinct institutional regimes—such as colonial (1910-1945), authoritarian (1945-1987), and democratic (post-1987) regimes— suggests that early investments in educational infrastructure and the associated cultural norms may shape community-level preferences and capacities in enduring ways. Comparative studies across different historical and cultural contexts may further illuminate the conditions under which educational institutions produce long-lasting effects.

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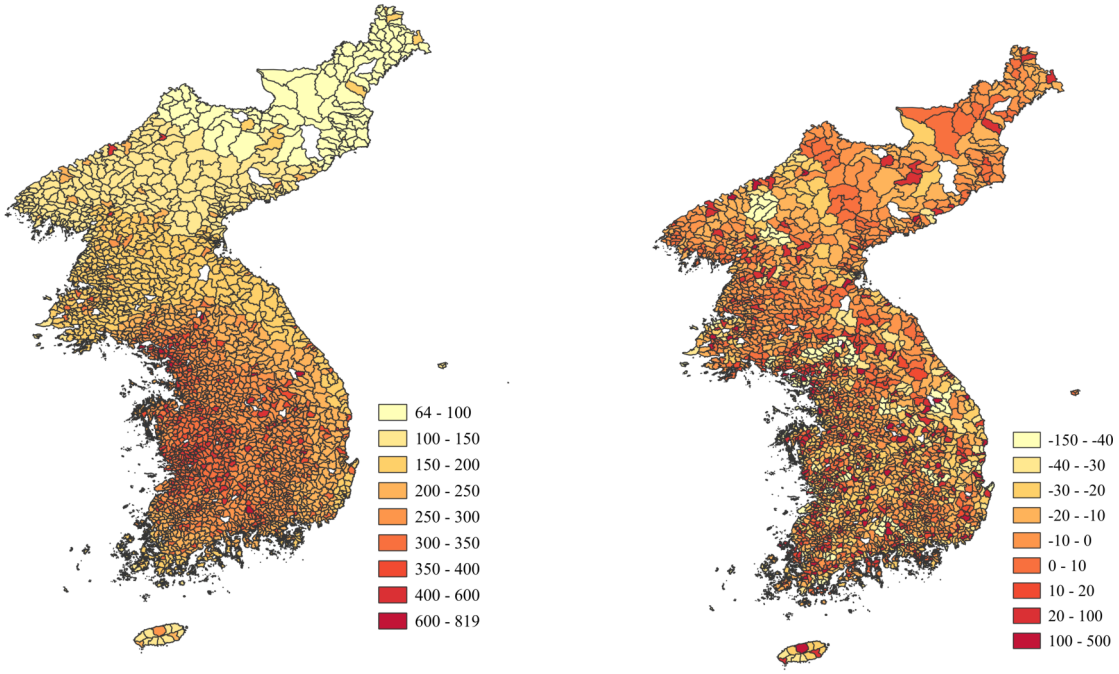
Figure 1: Township-level exposure to Hyanggyo



(a) Raw exposure

(b) Deviations from county-level means

Notes: The map shows the township-level distribution of exposure to Hyanggyo. Panel (b) displays the difference between the index of exposure to Hyanggyo and its county-average. We use 2,347 townships in 220 counties in the analysis. White areas indicate missing townships because of data availability.

Table 1: Persistent effects of Hyanggyo on colonial-period education

Dep. var.: Educational outcomes in 1930				
	(1)	(2)	(3)	(4)
	School enrollment		Japanese literacy	
Hyanggyo exposure	0.767***	0.774***	0.659***	0.676***
	(0.064)	(0.065)	(0.060)	(0.062)
R squared	0.24	0.24	0.38	0.39
Observations	2347	2347	2273	2273
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. Standard errors clustered at the county-level are shown in parentheses. The school enrollment rate is defined as the number of elementary school students divided by the population aged 6 to 13. Japanese literacy is measured as the share of the population aged six and above who can read and write Japanese. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2: Hyanggyo exposure and colonial educational outcomes: robustness to Korean literacy

	(1)	(2)	(3)	(4)
Dep. var.:	School enrollment		Japanese literacy	
Hyanggyo exposure	0.756***	0.536***	0.653***	0.370***
	(0.065)	(0.062)	(0.061)	(0.043)
Korean literacy		0.566***		0.731***
		(0.040)		(0.048)
R squared	0.25	0.37	0.40	0.60
Observations	2347	2347	2273	2273
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. Standard errors clustered at the county-level are shown in parentheses. The school enrollment rate is defined as the number of elementary school students divided by the population aged 6 to 13. Japanese literacy is measured as the share of the population aged six and above who can read and write Japanese. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 3: Hyanggyo exposures and post-colonial period education: 1960s outcomes

Dep. var.: Educational outcomes in the 1960s				
	(1)	(2)	(3)	(4)
	Primary enrollment		College education	
Hyanggyo exposure	0.253***	0.247***	0.267***	0.250***
	(0.047)	(0.049)	(0.057)	(0.060)
R squared	0.62	0.62	0.47	0.47
Observations	1480	1480	1480	1480
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. Standard errors clustered at the county-level are shown in parentheses. Primary enrollment is obtained from the 1960 Census data. College education is measured using the 1966 Census data as the share of adults aged 20 and above enrolled in or graduated from college. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 4: Hyanggyo exposures and post-colonial period education: 2010 outcomes

Dep. var.: Graduation rate for adults aged 25 and over in 2010						
	(1)	(2)	(3)	(4)	(5)	(6)
	High school		Some college		College	
Hyanggyo exposure	0.216***	0.216***	0.194***	0.194***	0.170***	0.168***
	(0.033)	(0.034)	(0.033)	(0.034)	(0.032)	(0.033)
R squared	0.64	0.64	0.56	0.57	0.55	0.56
Observations	1557	1557	1557	1557	1557	1557
Geoclimatic controls	Y	Y	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y	N	Y
County fixed effects	Y	Y	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. Standard errors clustered at the county-level are shown in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 5: Heterogeneous effects of school construction by Hyanggyo exposure

Dep. var.: Japanese literacy rate		
	(1)	(2)
School	0.680***	-0.062
	(0.038)	(0.096)
School × Hyanggyo	0.346***	0.530***
	(0.041)	(0.057)
Within R-squared	0.19	0.27
Observations	4546	4432
Township fixed effects	Y	Y
County-period fixed effects	Y	Y
School × Township characteristics	N	Y

Notes: The table reports the estimates from Equation 3. Coefficients are standardized for ease of comparison. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 6: Heterogeneous effects of school inputs by Hyanggyo exposure

Dep. var.: Japanese literacy rate				
	(1)	(2)	(3)	(4)
School expenditure	0.628***	0.462***		
	(0.038)	(0.048)		
School expenditure × Hyanggyo	0.015***	0.017***		
	(0.005)	(0.005)		
Teachers			0.533***	0.343***
			(0.030)	(0.051)
Teachers × Hyanggyo			0.061***	0.074***
			(0.014)	(0.013)
Within R-squared	0.43	0.46	0.39	0.43
Observations	2796	2718	2796	2718
Town fixed effects	Y	Y	Y	Y
County-period fixed effects	Y	Y	Y	Y
School × Township characteristics	N	Y	N	Y

Notes: The table reports standardized coefficients for ease of comparison. The school input variables—school expenditure and teachers—indicate the log of school expenditure and the log number of teachers, respectively. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 7: Contemporary attitudes toward education

Dep. var.: Survey-based measure of personal importance				
	(1)	(2)	(3)	(4)
	Learning		Education	
Hyanggyo exposure	0.049***	0.044**	0.044**	0.047**
	(0.015)	(0.017)	(0.017)	(0.019)
R squared	0.07	0.11	0.09	0.11
Observations	1494	1494	1270	1263
Township-level controls	Y	Y	Y	Y
Individual-level controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y
Survey-wave fixed effects	Y	Y	Y	Y

Notes: The dependent variable is an indicator taking a value of 0 or 1. Standard errors clustered at the county level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 8: Perceptions of desirable determinants of income

Dep. var.: Income should be determined by					
	(1)	(2)	(3)	(4)	(5)
	Education	Job duties	Family support	Performance	Effort
Hyanggyo exposure	0.012**	-0.007	0.001	0.006	-0.005
	(0.005)	(0.012)	(0.007)	(0.011)	(0.009)
R squared	0.02	0.03	0.04	0.04	0.05
Observations	4101	4101	4101	4101	4101
Township-level controls	Y	Y	Y	Y	Y
Individual-level controls	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y
Survey-wave fixed effects	Y	Y	Y	Y	Y

Notes: The dependent variable is an indicator taking a value of 0 or 1. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 9: Attitutde toward Meritocracy

Dep. var.: Agree to the following statements	(1)	(2)	(3)	(4)	(5)
	Effort for rewarding life	Effort for Income	Hard work than luck	Hard work to succeed	Hard work for income
Hyanggyo exposure	-0.008	-0.007	-0.006	0.005	0.004
	(0.014)	(0.015)	(0.007)	(0.014)	(0.008)
R squared	0.08	0.07	0.08	0.06	0.05
Observations	1234	2805	3521	2854	4115
Township-level controls	Y	Y	Y	Y	Y
Individual-level controls	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y
Survey-wave fixed effects	Y	Y	Y	Y	Y

Notes: The dependent variable is an indicator taking a value of 0 or 1. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 10: Alternative cultural values

Dep. var.: Survey-based measure of	(1)	(2)	(3)	(4)	(5)	(6)
	Confucianism	Honoring Parents	Obey to Husband	Family over Self	Trust Society	Trust People
Hyanggyo exposure	-0.004	-0.015	0.029	0.000	0.005	0.005
	(0.020)	(0.013)	(0.029)	(0.012)	(0.004)	(0.017)
R squared	0.16	0.12	0.17	0.18	0.04	0.06
Observations	2490	3485	971	3488	15023	1507
Township-level controls	Y	Y	Y	Y	Y	Y
Individual-level controls	Y	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y	Y
Survey-wave fixed effects	Y	Y	Y	Y	Y	Y

Notes: The dependent variable is an indicator taking a value of 0 or 1. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 11: Effects of Hyanggyo exposure on fertility decline

Dep. var.: Crude fertility rate in 1930		
	(1)	(2)
Hyanggyo exposure	-0.135***	-0.138***
	(0.031)	(0.031)
R squared	0.54	0.54
Observations	2347	2347
Geoclimatic controls	Y	Y
Initial socioeconomic controls	N	Y
County fixed effects	Y	Y

Notes: The table reports standardized coefficients for ease of comparison, with standard errors clustered at the county-level shown in parentheses. The dependent variable is the number of newborn children per 1,000 women aged 15-44. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

Table 12: Hyanggyo exposure and fertility decline: the quantity-quality tradeoff

Dep. var.: Crude fertility rate in 1930							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Hyanggyo exposure	-0.125***	-0.116***	-0.146***	-0.143***	-0.071**	-0.083**	-0.039
	(0.030)	(0.031)	(0.031)	(0.031)	(0.034)	(0.033)	(0.034)
Share of manufacturing employment	-0.111***						
	(0.025)						
Market transaction value per capita		-0.077***					
		(0.027)					
Share of traditional elites			0.021				
			(0.027)				
Share of lineage-based villages				-0.029			
				(0.019)			
School enrollment rate					-0.088***		
					(0.017)		
School enrollment rate, boys						-0.077***	
						(0.017)	
School enrollment rate, girls							-0.114***
							(0.017)
R squared	0.55	0.55	0.55	0.54	0.55	0.55	0.55
Observations	2345	2347	2286	2347	2347	2347	2347
Geoclimatic controls	Y	Y	Y	Y	Y	Y	Y
Initial socioeconomic controls	Y	Y	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison, with standard errors clustered at the county-level shown in parentheses. The dependent variable is the number of newborn children per 1,000 women aged 15-44. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 13: Effects of Hyanggyo exposure on colonial-period school enrollment by gender

Dep. var.: School enrollment rate in 1930			
	(1)	(2)	(3)
	Boys	Girls	Girls-Boys
Hyanggyo exposure	0.718***	0.874***	0.156***
	(0.061)	(0.083)	(0.052)
R squared	0.22	0.28	0.13
Observations	2347	2347	2347
Geoclimatic controls	Y	Y	Y
Initial socioeconomic controls	Y	Y	Y
County fixed effects	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. Standard errors clustered at the county-level are shown in parentheses. Column 1 and 2 use the school enrollment rate calculated for boys and girls as outcome variables, respectively. Column 3 uses the difference between these two variables. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

ONLINE APPENDIX

A Robustness

A.1 Alternative Measures of Hyanggyo Exposure

Our baseline specification measures Hyanggyo exposure using the inverse-distance-weighted average of the duration of Hyanggyo operation. This section shows that our results are not sensitive to the assumptions underlying the construction of the baseline index. All tables are based on 1930 educational outcomes, but similar patterns hold when alternative dependent variables are used.

Table A.I reports the results using an index of Hyanggyo exposure calculated with exponential distance decay (i.e., $1/e^{Dist_{i,j}}$) instead of the inverse-distance weighting ($1/Dist_{i,j}$). Table A.II tests the sensitivity of the results to distance cutoffs: Panel 1 excludes Hyanggyo located more than 50 km from each county centroid, and Panel 2 applies a stricter 10 km cutoff. In all cases, the results show minimal change compared to the baseline estimates, In addition, Table A.III shows that using distance to the nearest Hyanggyo from each township yields similar results: the farther a township is from a Hyanggyo, the lower its educational outcomes. Overall, the results confirm that our findings are robust to alternative definitions of local exposure to Hyanggyo.

Table A.I: Hyanggyo exposure with exponential decay

Dep. var.: Educational outcomes in 1930				
	(1)	(2)	(3)	(4)
	School enrollment		Japanese literacy	
Hyanggyo exposure	0.427***	0.427***	0.361***	0.360***
	(0.036)	(0.036)	(0.034)	(0.034)
R squared	0.25	0.25	0.39	0.39
Observations	2347	2347	2273	2273
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients, with the index of Hyanggyo exposure calculated using an exponential decay function of distance. Standard errors clustered at the county-level are shown in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

Table A.II: Hyanggyo exposure with distance cutoffs

Dep. var.: Educational outcomes in 1930				
	(1)	(2)	(3)	(4)
	School enrollment		Japanese literacy	
	Panel 1: Hyanggyo exposure within $50km$			
Hyanggyo exposure	0.548***	0.549***	0.476***	0.478***
	(0.046)	(0.046)	(0.043)	(0.044)
R squared	0.24	0.24	0.38	0.39
Observations	2347	2347	2273	2273
	Panel 2: Hyanggyo exposure within $10km$			
Hyanggyo exposure	0.419***	0.419***	0.371***	0.370***
	(0.036)	(0.036)	(0.034)	(0.034)
R squared	0.23	0.23	0.38	0.39
Observations	2347	2347	2273	2273
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients, with the index of Hyanggyo exposure calculated using an different distance cutoffs. Standard errors clustered at the county-level are shown in parentheses. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$

Table A.III: Estimates based on the nearest distance to Hyanggyo

Dep. var.: Educational outcomes in 1930				
	(1)	(2)	(3)	(4)
	School enrollment		Japanese literacy	
Distance to nearest Hyanggyo	-0.533***	-0.528***	-0.495***	-0.479***
	(0.047)	(0.045)	(0.045)	(0.045)
R squared	0.22	0.22	0.38	0.38
Observations	2347	2347	2273	2273
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients, using distance to the nearest Hyanggyo as the explanatory variable. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

A.2 Alternative Sample Compositions

This section shows that our baseline findings are not sensitive to variations across specific observations. Table A.IV demonstrates robustness to excluding townships with Hyanggyo exposure above the 90th percentile or below the 10th percentile, confirming that the legacy of Hyanggyo is not driven by extreme observations. In Table A.V, we replicate the estimation using only townships in current South Korean regions, given that historical records of Hyanggyo in North Korean region are relatively less comprehensive. The results show little change, mitigating concerns about measurement errors. Table A.VI shows that the results are robust to dropping townships that are located within the 2010 administrative boundaries of the five largest cities in Korea (Seoul, Incheon, Daejeon, Daegu, and Busan). This substantiates that the observed effects of Hyanggyo are not confounded by the path dependence of developmental status in persistently large cities.

Table A.IV: Persistent effects of Hyanggyo exposure: excluding extreme values

Dep. var.: Educational outcomes in 1930				
	(1)	(2)	(3)	(4)
	School enrollment		Japanese literacy	
Hyanggyo exposure	0.792***	0.869***	0.760***	0.879***
	(0.096)	(0.100)	(0.101)	(0.105)
R squared	0.19	0.19	0.41	0.43
Observations	1867	1867	1795	1795
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table shows the standardized coefficients, estimated using only townships with Hyanggyo exposure within the 90th percentile. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.V: Effects of Hyanggyo on colonial-period education: excluding North Korean regions

Dep. var.: Educational outcomes in 1930				
	(1)	(2)	(3)	(4)
	School enrollment		Japanese literacy	
Hyanggyo exposure	0.610***	0.616***	0.542***	0.557***
	(0.056)	(0.057)	(0.056)	(0.059)
R squared	0.24	0.24	0.32	0.33
Observations	1820	1820	1751	1751
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. The sample consists exclusively of present-day South Korean townships. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A.VI: Effects of Hyanggyo on colonial-period education: excluding large cities

Dep. var.: Educational outcomes in 1930				
	(1)	(2)	(3)	(4)
	School enrollment		Japanese literacy	
Hyanggyo exposure	0.787***	0.770***	0.721***	0.698***
	(0.072)	(0.072)	(0.062)	(0.062)
R squared	0.24	0.24	0.40	0.41
Observations	2196	2196	2127	2127
Geoclimatic controls	Y	Y	Y	Y
Initial socioeconomic controls	N	Y	N	Y
County fixed effects	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. The sample excludes townships located within the 2010 administrative boundaries of the five largest cities in Korea (Seoul, Incheon, Daejeon, Daegu, and Busan). Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

A.3 Contemporaneous Controls

Evidence from Section 5.2 supports the long-term association between Hyanggyo exposure and the colonial educational outcomes, a relationship not attributable to the level of Korean literacy at the time. While we interpret this result as a consequence of differences in absorptive capacity, it may also reflect consequences of local development status. For instance, the Colonial government could have constructed more schools in more developed areas, or parents in these areas might have been better able to afford educational expenditures.

Table A.VII: Hyanggyo exposure and colonial-period outcomes: robustness to contemporary controls

	(1)	(2)	(3)	(4)	(5)
Panel 1	Dep. var.: School enrollment rate				
Hyanggyo exposure	0.706***	0.757***	0.684***	0.765***	0.621***
	(0.066)	(0.064)	(0.062)	(0.067)	(0.063)
R squared	0.29	0.25	0.33	0.24	0.36
Observations	2347	2345	2347	2286	2285
Panel 2	Dep. var.: Japanese literacy				
Hyanggyo exposure	0.544***	0.639***	0.596***	0.680***	0.480***
	(0.052)	(0.056)	(0.058)	(0.063)	(0.046)
R squared	0.58	0.44	0.46	0.40	0.63
Observations	2273	2271	2273	2216	2215
Contemporaneous controls					
Population density	Y				Y
Manufacturing employment share		Y			Y
Market trade volume			Y		Y
Share of traditional elites				Y	Y
Geoclimatic controls	Y	Y	Y	Y	Y
Initial socioeconomic controls	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. The sample consists exclusively of present-day South Korean townships. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

To address this concern, Table A.VII tests the robustness of the baseline results to

the inclusion of four additional controls: population density, manufacturing employment share, commerical market development, and the population share of traditional elite families (*Yangban*). The share of traditional elite families is calculated from the 1909 *Minjeok Tonggye Pyo*, while the other variables are derived from the 1930 National Census of Colonial Korea. The local extent of commercial market development is measured by the log of market trade volume per households. In all specifications, the coefficients are significantly positive, confirming that the legacy of Hyanggyo is not a byproduct of local economic development.

B Selection on Unobservables

The discussion in Section 4.2 suggests that the historical background of Hyanggyo mitigates the potential for unobserved confounders to drive our findings. Nevertheless, even with an extensive set of controls including county fixed effects, the OLS specification raises concerns about omitted variable bias.

To address this, Table B.I reproduces the results from Section 5, along with two measures of selection on unobservables. The first is Oster's δ, which quantifies the selection on unobserved factors, relative to observed controls, required for the unobservables to fully explain the estimates. The absolute values of δ suggest that unobserved township characteristics would need to be 1.38 to 7.49 times as influential as the included controls to explain away our findings. According to Oster (2019), $|\delta|$ greater than 1 can be interpreted as a lack of evidence that unobservables drive the results.

Table B.I: Measures of selection on unobservables from Oster (2019) and Diegert et al. (2022)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	1930		1960s		2010		
Dep. var:	Enrollment	Literacy	Enrollment	College	High school	Some College	College
Hyanggyo exposure	0.756***	0.653***	0.247***	0.250***	0.267***	0.243***	0.211***
	(0.068)	(0.065)	(0.051)	(0.063)	(0.045)	(0.045)	(0.043)
R squared	0.25	0.40	0.62	0.47	0.64	0.57	0.56
Observations	2347	2273	1482	1480	1560	1560	1560
Oster's δ	7.49	-1.38	-5.57	2.19	5.22	4.85	2.97
DMP Breakdown point	0.85	0.85	0.60	0.54	0.67	0.60	0.55
Geoclimatic controls	Y	Y	Y	Y	Y	Y	Y
Initial socioeconomic controls	Y	Y	Y	Y	Y	Y	Y
County fixed effects	Y	Y	Y	Y	Y	Y	Y

Notes: The table reports standardized coefficients for ease of comparison. Oster's δ and DMP Breakdown point are the measures of selection on unobservables from Oster (2019) and Diegert et al. (2022), respectively. Standard errors clustered at the county-level are shown in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Although δ of 1 is widely used as a benchmark in the literature, it only indicates how much influence an omitted variable would need to have to nullify the result—not how much would be required to reverse its sign. To address this issue, Diegert et al. (2022) propose the *sign change breakdown point* as an alternative measure of selection on unobservables. The estimated values of the breakdown point (DMP Breakdown point) range from 0.54 to 0.85. This suggest that the effects of Hyanggyo exposure remain positive as long as selection on unobservables is no more than 54–85% as strong as selection on observables. It should be

noted that the breakdown point is a stricter and more conservative measure, given that it imposes no restrictions on the impact of unobserved factors on the outcomes. In this view, the breakdown point values of 0.54–0.85 provide strong evidence that the positive effects of Hyanggyo exposure are substantially robust to selection on unobservables (Diegert et al., 2022).