Conquering Korea for Jesus:

Protestant Missionaries, Local Churches, and Literacy in Colonial Korea

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Abstract

We study the effect of Protestantism on human capital acquisition using novel data on 234 counties and 2,478 towns in the Korean peninsula in 1930. We show that towns with a higher share of native Protestants have higher literacy rates. To establish causality, we employ the location of foreign Protestant missionaries as an instrumental variable for the number of native Protestant churches. To study the differential effects of different missionary societies, we use a spatial regression discontinuity design, exploiting the Comity Agreement of 1909 which geographically divided Korea between missionary societies. Our results suggest that Protestantism played a crucial role in the accumulation of human capital, and that the activity of native Protestants was a key factor in the accumulation of human capital.

Keywords: Literacy, Religion, Missionaries, Local Priests, Gender gap, South Korea, North Korea.

JEL Classification: I21; N35; Z12; J16.

1. Introduction

In this paper, we focus on the effect of Protestantism on human capital acquisition in Korea. Religious activities in the past often have long-lasting effects on economic development (see Becker, Rubin and Woessmann (2021) for a survey). Christianity did not only affect European development.[1] Christian missionaries around the world also influenced development in other continents. Nunn (2014) argues that during Africa's colonial period Protestant missions had a positive long-run impact on educational attainment. Furthermore, Valencia (2019a, 2019b) shows long-run effects of Jesuit presence in South America, demonstrating that beneficial effects are not limited to Protestantism. In China, Protestant missionaries contributed to urbanization and the diffusion of modern knowledge (Bai and Kung 2015, Ma 2021). By no means are the effects of missionary activity always positive. Jedwab et al. (2022) caution that the effects of Christian activity in Africa may have been over-estimated because Atlases of historic Christian missions often only covered the main European missions nearer the African coast, or along major trade routes, thus ignoring smaller missions further inland that may have little effect on development. Thus, selection into more promising locations may explain a big part of the association between Christian missions and economic outcomes. In some cases, such as in Ghana, Christianity may not have brought *any* development benefits (see Jedwab et al. 2021). Furthermore, even when overall economic benefits accrue, there can be *negative* effects on some important outcomes. For instance, Cagé and Rueda (2020) qualify the overall positive image of missionaries: while they were the first to invest in modern African healthcare, Christianity influenced sexual beliefs and behaviours that affected the risk of HIV contagion.

Our study aims to show a causal relationship between Protestantism and the accumulation of human capital in Korea. While the Christian missionary activity in many countries has been extensively studied, there is comparatively less work on Korea. Before 1884, there were no Protestant missionaries in Korea because the ruling Joseon dynasty had closed the country to the outside world. From 1884 onwards, Christian missionaries visited Korea, particularly Protestants from the USA. Neither did Korea have a similar religious background to the Western world, nor was Korea ever a colony of a Western country. That makes it an interesting case to study. The historic roots of prosperity in modern-day (South) Korea are often traced to colonial times: many studies emphasize the role of Japanese colonial governments and the institutions they introduced at the time (Cha 2014,

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[1] Religion has been shown to influence human capital acquisition (e.g. Becker and Woessmann, 2008, 2009), occupational choice (e.g. Botticini and Eckstein, 2005, 2007), cultural norms (e.g. Akçomak, Webbink and ter Weel (2016), Andersen, Bentzen, Dalgaard and Sharp, 2017), and various other factors linked with economic development.

Kimura 1993). However, since Western Christian missionaries and the Japanese colonial government were both present in Korea at the same time, over many decades during the first half of the 20th century, it is conceivable that *also* Protestantism contributed to paving the way to economic growth in Korea during the colonial period.

Previous studies argue that the western missionaries, and native Protestants, contributed to importing Western institutions such as schools, hospitals and knowledge into Korea since the late nineteenth century. However, quantitative work on the role of Protestantism in the colonial period of Korea is very limited. In Becker and Won (2021), we show correlations, but *no* causal relationship, between Christianity and literacy rates in 1930, and we only use *county*-level data. In this paper, not only do we use more disaggregated data —*town*-level data instead of *county*-level data—, but we also use an instrumental variables strategy and a spatial regression discontinuity design to establish a causal link between Protestantism and human capital accumulation in Korea. Izumi, Park and Yang (2023) study the role of Protestants in empowering Korean women via literacy and employment. Oxley (2022) studies the association between Protestant Christianity and *modern-day* educational and economic outcomes. Both papers do *not* explicitly establish causality but try to control for confounding factors in an ordinary regression framework. Oxley (2021, chapter 3), in work developed in parallel to ours, also employs a spatial regression discontinuity design, but looks at modern-day outcomes.

In this paper, we try to establish a causal chain from the presence of missionaries to the existence of local Korean churches, which in turn influence economic outcomes. In the *first* part of our empirical analysis, we exploit an instrumental variable strategy in which we instrument the number of Methodist and Presbyterian churches with the exposure to foreign missionaries.[2] Most of the foreign missionaries were Americans, later joined by Canadians and Australians. Given the huge difference between the Korean and English languages, it was extremely difficult for American missionaries to teach Koreans *in the Korean language*. Thus, it was common to hire Korean translators to support missionary work (Oh, 2014). The foreign missionaries tried to train local ministers who would then be in charge of winning over Koreans for Christianity in their native language. The exclusion restriction for our IV strategy thus amounts to assuming that foreign missionaries affected literacy *in the Korean language* (and ulterior economic outcomes) *only* via the presence of local Korean priests and churches.

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[2] Methodist and Presbyterian missionaries made up nearly 80 percent of all Protestant missionaries between 1884 and 1930.

While our instrumental variables strategy allows us to study the effect of Protestantism on economic development *overall*, the historical record suggests that there were substantial differences between different Protestant denominations. Therefore, in the *second* part of our analysis, we exploit the Comity Agreement signed in 1909 between the two main Protestant denominations, Presbyterians, and Methodists. They agreed on a division of Korea into areas of missionary activity. Although Presbyterians and Methodists had many things in common, they differed in terms of mission strategy. Presbyterians adopted the so-called "Nevius plan", named after John Livingston Nevius (1829–1893), which put a lot of emphasis on making local congregations self-sufficient, both in terms of finances and pastoral care. Thus, Presbyterian pastors were locally appointed. Presbyterian congregations operated (unofficial) schools run by native Koreans. On the other hand, the organisation of the Methodist Church was more hierarchical: Methodist pastors were appointed by the central organisation. Did their emphasis on self-sufficiency make Presbyterian missions *more*, or *less*, successful? Already Max Weber (1904/05), in his "Protestant Ethic", emphasised differences between Protestant denominations, such as Calvinists, Lutherans, and Pietists. More recently, Hanson and Xiang (2013), using data on the foreign operations of US Protestant denominations in 2005 from the World Christian Database, emphasize the different strategies employed by new Protestant groups trying to win adherents abroad. They show that Protestant denominations with a *decentralized* governance structure attract more adherents.[3] While McCleary (2013) discusses differences between Methodists and Presbyterians in the context of Korea in the late 19th and early 20th century, she does not empirically analyze differences in the success of their missionary work. In the broader literature on missionaries, the main emphasis tends to be on the comparison between Protestants and Catholics, without regards to different missionary societies.

The Comity Agreement of 1909, by which areas of missionary activity in Korea were geographically separated, allows us to employ a spatial regression discontinuity (RD) approach. Our finding is that the Presbyterian areas show a higher literacy rate of males *and* females compared to Methodist areas in 1930. In conclusion, Presbyterians had a stronger positive effect on human capital accumulation than Methodists, suggesting that differences in missionary strategies mattered.

The paper is structured as follows. In Section 2, we present data, basic statistics, and OLS results to show an association between Protestantism and human capital accumulation. In Section 3, we use our instrumental variables strategy to study the effect of Protestantism on literacy rates in the

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[3] Looking at pre-Reformation Europe, Rossignoli and Trombetta (2022) show that only Benedictine monasteries experienced a significantly higher growth rate in productive capacity following the Norman Conquest, which they explain by Benedictine's peculiar *governance* structure.

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Korean language, and we study heterogeneous effects of missionary activity by comparing Presbyterian and Methodist areas of missionary activity in a spatial RD approach. Section 4 concludes.

2. Data

2.1 Data Sources

We examine the impact of Protestantism on human capital accumulation by testing whether it affected the literacy rate in the Korean language in 1930. We collect data on literacy rates by gender from the Japanese colonial census (Chōsen Government-General, 1932a), hereafter referred to as census, published by the "Chōsen" Government-General ("Chōsen" is the Japanese name for Korea), which covers all residents in the Korean peninsula and includes *town*-level data on the number of people literate in Korean, Japanese, both languages, or neither language in 1930.

To construct a measure of exposure to Protestantism, we use the number of churches of the two dominant Protestant denominations, Methodists and Presbyterians. The data on churches are taken from the yearbook of Korean Presbyterians published in 1940 (Presbyterian Council of Korea, 1941), and the yearbook of Korean Methodists published in 1931 (Methodist Council of Korea, 1931). Both contain the addresses of all churches of these two denominations during the Japanese colonial era. The yearbook of Korean Presbyterians provides the year of the foundation of churches; the yearbook of Korean Methodists does not. However, in this analysis, we use data on the stock of churches in 1930. Therefore, the missing foundation year does not matter. Furthermore, foreign missionaries are a key variable in our study. The index of foreign missionaries in Korea 1884–1984 (Institute of the History of Christianity in Korea, 1984) provides the names of foreign missionaries but also contains information on when they visited Korea and in which *county* they stayed, year by year. This allows us to construct the number of years of exposure to Protestant missionaries for each county. There is no equivalent source for Catholic missionaries. We use the number of Catholic churches based on the history of Catholicism in Korea (Kyung-sung Catholic Youth Association, 1931) to proxy for the influence of the Catholic Church. There are 1,961 Methodist and Presbyterian churches in our data set, and 99 Catholic churches by 1931, showing that Protestant churches dominated on the Korean peninsula.

In terms of control variables, we employ variables at the *county* and *province*-level previously used by Becker and Won (2021) in their correlational study of missionary activity and literacy, and data from Hong and Paik (2018) on the number of individuals passing the civil service exams during

the *Joseon* dynasty which ruled Korea from 1392 to 1897. Importantly, in this paper, we *expand* this data set by collecting, wherever possible, these variables at the *town*-level. Town-level data is available for the employment share outside agriculture, for population, and for "market size". "Market size" data, shared by Park (2020), provides the total volume of market transactions at the town level in 1928, denominated in Japanese Yen. This refers to transactions in the physical marketplace in town. Lastly, the census provides the population of each town, and Kim (2013) shared geographic area (in km^2) of all towns at the time, allowing us to compute population density.

2.2 Basic Descriptive Statistics

Table 1 shows that the mean number of literate individuals who can read and write Korean per 1,000 people at the town level is 209.16, and the literacy rates of males and females per 1,000 are 344.17 and 70.07, respectively. Jinju has the highest literacy per 1,000 with 459.31, while Nam-Myeon in Ha-dong county has the lowest literacy per 1,000, with 64.56. Hereafter, the term "literacy rate" denotes the proportion of individuals capable of reading and writing Korean and serves as the primary dependent variable throughout the paper.

[Table 1 about here]

Figure 1 illustrates the geographic distribution of Methodist and Presbyterian churches across the Korean peninsula in 1930. Figure 2 displays the literacy rate in the Korean language in 1930. Literacy rates are higher in areas with a stronger presence of Methodist and Presbyterian churches.

[Figure 1 about here]

[Figure 2 about here]

Looking at Methodist and Presbyterian churches separately, Figure 3 shows that Presbyterian churches are mainly in the northern and southern parts of Korea, while Methodist churches are in the central part of Korea in 1930. Only 24 towns out of 2478 had churches of *both* denominations. Yet, two remarks are important: the Comity Agreement of 1909 first and foremost officially applied to foreign *missionaries* (and <u>not</u> local churches) and it was only signed in 1909, more than two decades after Protestant missionaries first entered Korea.

[Figure 3 about here]

The agreement on how to divide Methodist and Presbyterian areas of missionary activity was already discussed in 1892, less than a decade after the first missionaries entered Korea in 1884. Methodists and Presbyterians agreed that both groups could be active in cities and towns with more

than five thousand inhabitants. In contrast, in cities below 5,000 inhabitants, a kind of "first-come first-serve" rule was established: the group that first held meetings in a town would "occupy" it (Rhodes 1934, Min 2007, Oak 2006). These rules were not *officially* adopted because bishop Randolph Sinks Foster – the chairperson of the annual meeting of the Methodist Episcopal Church Korean Mission held in 1893 in Korea to discuss the division of territory – disapproved of this rule. As a result, Methodist and Presbyterian missionaries only *informally*, but still de facto, followed it because of the absence of other rules (Rhodes 1934, Oak 2016). Eventually, Methodists and Presbyterians officially accepted the informal arrangements, by formally signing a Comity Agreement in 1909.[4] Figure 4 displays the location of mission stations in 1909. Methodist missionaries mainly stayed in the central part of the Korean peninsula, while Presbyterian missionaries stayed in the northern or southern areas. This shows two things. First, the Comity Agreement was pretty strictly followed by foreign missionaries. Second, the geographic separation of missionary activity had consequences for the geographical distribution of local (native) Christian churches of the two main Protestant denominations, as can be seen by comparing Figure 3 (churches) and Figure 4 (missionaries).[5] We will exploit this strong link in our empirical analysis, where we will among other things employ a spatial regression-discontinuity design to study the influence of Methodist versus Presbyterian exposure on local educational outcomes.

[Figure 4 about here]

3. Estimation

After starting with simple OLS regressions linking literacy to the presence of Protestant churches, we pursue two empirical strategies that aim to establish causality. First, we use the total exposure to foreign missionaries as an instrumental variable to estimate the impact of Protestantism across the Korean peninsula. Second, we estimate the heterogeneous treatment effect between the two dominant Protestant denominations, Methodists and Presbyterians, by using the Comity Agreement of 1909, dividing the missionary activity in colonial Korea, by means of a spatial regression-discontinuity design.

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[4] On top of the division between Methodists and Presbyterians, there were further *internal* divisions: the Presbyterian council of missions, in 1893, agreed on a division of the Korean peninsula between Presbyterian missionary groups from different origins (Rhodes 1934, Min 2007).

[5] Note that, in a small number of cases (about 2,000 adherents), Presbyterians converted to Methodism in Hwanghae Province in 1909 after the Comity Agreement (Rhodes 1934, Shin 1994). While the total number of Presbyterians in Hwanghae Province was 15,300 and they had 123 church buildings in 1909 (Presbyterian Church in the U.S.A., 1909), the number of Methodist church buildings had increased from 34 to 50 in 1909 (Methodist Episcopal Church Korea Mission 1908, 1909). Thus, 16 church buildings were transferred from the Presbyterians to the Methodists.

Before we try to estimate the causal effect of the number of Protestant churches on the literacy rate of the Korean population, we explore their correlation. While Becker and Won (2021) used only *county*-level data, in this paper, we exploit the *town-level* variation. Furthermore, in this paper we look at differences between Methodists and Presbyterians, the two dominant Christian denominations in Korea during the colonial period. We estimate OLS regressions using the following regression equation:

$$Literacy\_Rate_i = a + \beta Number\ of\ Protestant\ Churches_i + \gamma X_i + \varphi Z_c + \varepsilon_i$$

In this regression, we are interested in the sign and size of β, capturing the effect of the number of (Methodist and Presbyterian) Protestant churches on literacy. Town-level controls (X_i) are population density, the employment share outside agriculture, market size, the number of Catholic churches, and the distance to Kyung-Sung (Seoul). Z_c designates control variables at the *county level* used by Becker and Won (2021): the number of people passing the civil service exam during the *Joseon* dynasty which ruled Korea from 1392 to 1897, the upper social class share, the land tenancy ratio, soil acidity and the number of public primary schools for Koreans.[6]

[Table 2 about here]

Table 2 shows that the literacy rate is higher when the number of Methodist and Presbyterian churches is larger, which each additional church associated with 7.4 more literate adults per 1,000 inhabitants. This is the case conditional on the control variables just mentioned, such as population density as a way to capture differences between urban and rural areas, or historic civil exam passers as a proxy for upper-tail human capital. Looking separately at the two denominations, literacy rates have a stronger association with the number of Presbyterian churches than with the number of Methodist churches. In particular, the association between the number of Methodist churches and female literacy rates is statistically insignificant while the coefficient on the number of Presbyterian churches is not only larger, but it also statistically significant at 1% level. However, Table 2 shows only conditional correlations between literacy rates and Protestantism. In the next sub-section, we discuss our strategy to try and establish causality.

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[6] There were also Japanese primary schools, primarily for families of Japanese colonizers.

3.1 Our instrumental variables strategy

From 1884, foreign missionaries were able to enter Korea. Table 3 reports the number of foreign missionaries by denomination from 1884 to 1930. Presbyterian and Methodist missionaries from the US, Canada, and Australia, made up nearly 80% of all missionaries. Interestingly, Presbyterians made up 47.57% of all missionaries, but Presbyterian *believers* in 1930 constituted more than 70% of all Protestant believers, suggesting that Presbyterian missionaries were more successful than Methodist missionaries at "fishing for souls". In what follows, we will focus on Methodists and Presbyterians as the two dominant Protestant denominations in colonial Korea. Ignoring other flavours of Protestantism should not have any major influence on our results. The reason why we focus on Methodists and Presbyterians is that we were able to trace down every single church building of these two denominations, allowing us to measure their local presence with high precision. Furthermore, the Comity Agreement of 1909, which we use to study heterogeneous treatment effects, covered these two major denominations.

[Table 3 about here]

Missionaries engaged not only in evangelism but also in education.[7] Foreign missionaries brought "modern knowledge" to the formerly Hermit Kingdom, but were severely constrained by their insufficient knowledge about Korean culture and language. They had to hire translators to help them evangelize Korean people.

A. Korean Language

Presbyterian missionaries focused on educating local Christians as church leaders and as the next generation of teachers. The huge difference between African countries and Korea was that Korea was not a colony of the western world, so missionaries could not benefit from the support of colonial authorities. Furthermore, Koreans had their own alphabet system. Most of the missionaries who came to Korea complained about the difficulty of the Korean language. For instance, Samuel A. Moffett, who was among the first generation of (United States) Northern Presbyterian missionaries and stayed in Pyongyang, stated in a letter that he anticipated that it would take 2 to 3 years to reach a native level, but he still could not reach that level after he had stayed in Korea for 3 years, even though he spent most of his time with native Koreans (Oak, 2020). Given such difficulties, when missionaries came to Korea, they typically hired native Koreans to assist them and to translate Korean to English and vice versa.

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[7] Missionaries also engaged in medical work, as discuss in more detail below.

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Many missionaries, including Horace Grant Underwood, the founder of Yonsei University, still one of South Korea's top private universities today, gave credit to the importance of their Korean teachers (Lee 2019).

Despite the difficulty of the Korean language, some missionaries did succeed in reaching the native level of the Korean language, and participated in publishing the Korean bible, textbooks, and hymns (Park 2020). However, foreign missionaries clearly did not learn Korean in order to become Korean teachers in Korean schools. The only reason they tried to learn the Korean language was that they wanted to become more effective at preaching and at converting Koreans to Christianity, and to train local Christian leaders. Even though missionaries engaged in establishing a limited number of mission schools in the late 19th century, it was native Korean Protestants who established schools in a large number of local communities (Ryu 1995, Im 2019). Furthermore, according to Han (1997), there were about 800 night-study gatherings managed by Protestant churches across the Korean peninsula in 1928, which taught students to read and write in Korean, some also in Japanese, as well as mathematics. Clearly, given the limited number of foreign missionaries, even if their mastery of Korean had been perfect, and it surely was not, they simply did not have the numbers to be missionaries *and* teachers at the same time. This is a key argument behind our instrumental variables strategy: foreign missionaries converted Koreans to Christianity, they appointed local priests, and helped set up mission schools, but literacy was the result of *Koreans teaching Koreans*. Therefore, the exclusion restriction seems plausible: foreign missionaries affected literacy only to the extent that they facilitated the establishment of formal schools and night-study gatherings, but not by being Korean language teachers themselves.

B. Mission strategy

The first Protestant missionary who took an active interest in Korea was John Ross when he realized there were no Protestants in a population of about 10.5 million in Korea in the 1870s. Ross was a proponent of the 'three-self' mission method, also called the "Nevius plan" after its inventor John Livingston Nevius. According to this strategy for church planting, new churches should aim for self-governance, self-support (i.e., financial independence from foreigners), and self-propagation (i.e., indigenous missionary work), as early as possible (Kim and Kim 2015). Therefore, he emphasized the importance of connecting the local population with local priests rather than with foreign missionaries. The role of foreign missionaries should be limited to training and guiding native Christians (Kim and Kim 2015). Already the first generation of Presbyterian missionaries was strongly influenced by the Nevius plan. In particular, Horace Grant Underwood, a Northern Presbyterian, was an enthusiastic

follower of the Nevius plan. Eventually, the Nevius plan was officially adopted by all Presbyterian missions in 1891. Presbyterians did not have any committees coordinating their efforts across countries of origin before 1891. However, in 1891, the Presbyterian missionary organizations from different countries set up the Presbyterian mission council, officially called the "Council of Missions holding the Presbyterian Form of Government". In the first council meeting, Presbyterians agreed on "Rules and by-laws of the Korea Mission", which regulated their mission work in Korea (Clark 1929, Rhodes 1934). The major achievement of the council was the acceptance of the Nevius plan as a mission strategy as well as the internal comity agreement between various Presbyterian missionary societies (Min 2007).

There was no equivalent *written* missionary strategy on the Methodist side; that is not to say that there was no strategy at all, but that it was not as explicitly spelled out (Min 2007). Methodists tended to focus on general education and medical work rather than on evangelism; consequently, Methodists fell behind in terms of growth in the number of churches throughout their territories compared to Presbyterians (Stokes 1947, Min 2007). Therefore, at an aggregate level, Koreans would have been more likely to encounter Christianity from Presbyterians than Methodists.

In other words, the Nevius plan was a unique characteristic of Presbyterian missionary work at that time. Concretely, the following propositions were adopted. The following eight points are quoted verbatim from Pierson et al. (1893, p. 673):

1. *It is better to aim at the conversion of the working classes than at that of the higher classes.*

2. *The conversion of women and the training up of Christian girls should be an especial aim, since mothers exercise so important an influence over future generations.*

3. *Much could be effected in Christian education by maintaining elementary schools in country towns; therefore we should aim to qualify young men in our boys' school and to send them out as teachers.*

4. *Our hope for an educated native ministry lies in the same quarter, and should be constantly held in view.*

5. *The Word of God converts where man is without resources; therefore, it is most important that we make every effort to place a clear translation of the Bible before the people as soon as possible.*

6. *In all literary work, a pure Korean, free from cynicism, should be our aim.*

7. *An aggressive church must be a self-supporting church, and we must aim to diminish the proportion of dependents among our membership and to increase that of self-supporting, and therefore contribution individuals.*

8. *The mass of Koreans must be led to Christ by their own fellow countrymen; therefore, we shall do well to thoroughly train a few as evangelists rather than to preach to a multitude overserves.*

To the extent that Presbyterians followed the Nevius plan, foreign missionaries did not directly engage in education activities because of the importance of independent *native* churches stressed in clauses 4, 7, and 8. Instead, the *native* church managed official and unofficial educational institutions and is responsible for any increase in the literacy rate.

While 109 Presbyterian missionaries were active in 1909, there were 840 Presbyterian churches built at the same time. This comparison indicates that the Nevius plan greatly impacted the establishment of self-supporting churches operated by local believers. As a result, the influence of foreign missionaries on the active operation of local churches, and schools, was rather limited. While missionaries were ready to give advice to local pastors, the worship and educational activities were managed by local believers (Oak, 2016).

C. Where to go? And why to go?

Finally, why did missionaries choose Korea as a place to preach the gospel? Who decided to dispatch them? Although each person had their own individual faith and conviction to be a foreign missionary, the vast majority of American missionaries who came to Korea at the time had been influenced by the Student Volunteer Movement in the United States (McCleary 2013).

For instance, Horace Grant Underwood and Henry Gerhard Appenzeller, who were to lead the Presbyterian and Methodist missions respectively, chose Korea as their mission place because there were no Protestants in Korea at the time. Not only first-generation missionaries but also other Protestant missionaries who came to Korea up to 1910 were mostly college graduates from Canada and the United States and were influenced by the Student Volunteer Movement (Kim and Kim 2015). As such, they were usually well-educated and committed believers.

How did foreign missionaries decide on specific locations as mission stations *within* Korea? It is hard to find an explicit reference to this in the literature, so we follow a data-driven approach to document what characterizes locations chosen by foreign missionaries and compare them to locations where they did not go. They built their stations in major cities such as Seoul and Pyongyang at the early stage of the mission. However, the mission strategy of Presbyterians was to evangelize as many native people as possible. Thus, Presbyterians also chose rural and less developed towns as mission stations, especially after 1900. According to Table 4, there are no clear differences between counties that had

mission stations and counties that had no mission stations.[8] If anything, non-mission station counties show a *higher* rate of *non-agricultural* jobs in 1930. That is interesting when compared to the finding by Jedwab et al. (2022) who show that missionaries in Africa tended to build mission stations in more developed areas.

[Table 4 about here]

D. Challenges to identification

Pre-existing openness, or opposition, to Western culture could have also affected the location choice of mission stations.[9]

First, when missionaries first came to Korea, only few Koreans knew about Western culture and knowledge, and if at all, only through books from China and Japan. The first Korean bible was translated from the Chinese bible. Only people who were able to read Chinese characters were able to study Western knowledge, indirectly, and might have been more open to Western missionaries once borders opened. While we cannot directly measure openness to Western culture, we can run "t-tests" on the share of the upper social class in the total population and the number of civil exam passers per 1,000 people, as proxies for elite influence and upper-tail human capital, to partially address this concern. Reading and writing Chinese characters was a necessary skill to experience Western culture indirectly at the time. Both of these variables proxy for the ability to read Chinese characters. Relatedly, according to Lee (2019), the first generation of translators was mainly from the ruling or middle class. Thus, the share of the upper social class and the number of civil exam passers per 1,000 people can also be thought of as a proxy variable for the potential of a county to produce translators. Table 4 reports that there was no significant difference in these two variables between counties with or without Presbyterian or Methodist mission stations.

Second, while we are not aware of any systematic research on anti-Western sentiment in Korea during our period of study, even if there was, it did not have severe consequences, as no missionaries were ever killed in Korea. In other words, there were no movements like the Chinese "Boxer movement" that tried to threaten foreigners. Furthermore, unlike in China, Western countries did not request special territorial concessions ("treaty ports") from Korea. If anything, Korea was likely to have more animosity against Japan than against Western countries because Korea went through turmoil, such as the

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[8] Note that this exercise excludes the 14 "city counties", such as Pyongyang and Seoul, which of course were all "occupied" by either Methodists or Presbyterians, or both. Not surprisingly, when we include these 14 city counties in the treated group, the treated group differs from the control group in some dimensions, such as population density, the employment share outside agriculture, and dummy for the existence of railway stations within 10km, respectively.

[9] We thank Chicheng Ma for the suggestion to look at pre-existing openness, or opposition, to Western culture.

assassination of Queen Min and an attack on the palace throughout the process of annexation by Japan. Hence, there is no evidence that missionary activity was hampered by anti-Western sentiment.

Even though the mission locations are not perfectly randomly assigned – in the sense that there is no city of the size of Pyongyang and Seoul which was not "treated" by foreign missionaries –, their arrival is exogenous from the point of view of individual believers. What is more, with respect to our outcome variable (literacy), foreign missionaries as an instrument for native Christian presence is both relevant (as we saw in the maps) and arguably exogenous: foreign missionaries affect Korean literacy only via their effect on facilitating the spread of Christianity among native Koreans. Yet, they did not themselves teach the Korean language due to the several limitations mentioned above. On this basis, we can use the presence of foreign missionaries as an instrumental variable for native Korean Christian churches (and schools). Since we observe when missionaries arrived in Korea, and how many years they spent in different counties during the years 1884 to 1930, we can calculate the "exposure" to foreign missionaries, which we define as the number of person-years that missionaries lived in each county. For example, suppose that missionary X stayed in locations A and B for 3 and 5 years respectively, and Missionary Y stayed in locations A and B for 2 and 7 years until 1930. Then, the exposure level is equal to 5 for location A, and equal to 12 for location B. Yet, missionaries did not only stay in a specific place of residence but ventured into neighbouring areas to evangelize, even if they likely spent substantially less time there. We try to capture *spatial decay* by assuming that missionaries' influence on locations nearby their mission stations falls *linearly* up to a threshold distance beyond which their influence is zero. For example, suppose a town T is located 35 km away from the mission station in Seoul and 56 km away from the mission station in Kea-sung. Assume that the number of missionaries in Seoul and Kea-Sung is 50 and 40, respectively. Then, with a threshold distance of 65 km, the weighted number of missionaries in town T becomes (50*[65-35]/65 + 40*[65-56]/65). Although we do not know how far missionaries' influence reached beyond their *county* of residence, we do know that many missionaries, in particular Presbyterian missionaries, used to travel around the whole province where the station was located (Min 2007, Kim and Kim 2015). To determine a realistic range of threshold distances, we assume that missionaries would at least venture into the neighboring counties, and up to the boundaries of their province of residence. The average area of a province was around 16,900 km^2. For simplicity of calculation, assume provinces are circular and that the mission station is at the centre. Then the radius of the province is sqrt(16,900 km^2/pi)=73.34 km. Adding a bit of buffer, we use 80 km as our upper value for the distance threshold. At the lower end, we use 50 km, as that radius would encompass travel

to neigboring *counties* from the missionary's county of residence.[10] We thus explore a range of threshold distances between 50 km to 80 km. In Table 5, the first three columns correspond to an assumed traveling distance of 80 km from the mission stations. The subsequent two sets of columns represent assumed traveling distances of 65 km and 50 km, respectively. Based on these assumptions, we formulate our regression equations as follows:

First Stage:

$$Number\ of\ churches_i = \omega + \beta_1 \ln(1 + exposure\_missionaries_i) + \gamma_1 X_i + \delta_1 Z_c + \rho_i$$

Second Stage:

$$Literacy\_rate_i = \delta + \beta_2 \overparen{Number\ of\ churches_i} + \gamma_2 X_i + \delta_2 Z_c + \vartheta_i$$

We focus on Methodist and Presbyterian churches and missionaries because disaggregated data is only available for these two denominations. Yet, because the number of members in these two churches amounts to between 80% and 85% of Protestants during the colonial period, their work is highly representative of the work of all missionaries.[11] Since the variable $exposure\_missionaries_i$ is skewed, we use $\ln(1 + exposure\_missionaries_i)$.[12]

As suggested by Figures 3 and 4, the exposure level to missionaries predicts the number of churches because many missionaries were deeply involved in establishing churches and in fostering native pastors. Data on missionary stations is solely obtainable at the county level. However, it is feasible to run regressions at *town* level given the availability of our outcome variable and the number of churches at that level. As an alternative to using missionary exposure at the county level, we can construct a town-level measure of exposure to missionaries (while clustering standard errors at the county level), based on the following idea: missionaries often travelled to other cities and encouraged and supported the construction of churches there. To capture this idea, we compute exposure to missionaries at the town level as a distance-weighted average of the number of missionaries in neighboring counties, as explained in the numerical example of town T on the previous page.

[Table 5 about here]

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[10] The average area of a county is 930km^2, so the radius of one county would be sqrt(930 km^2/pi)=17.2 km for a single county, which we triple and round down to 50 km to proxy for travel from the focal county to the far corner of the neighboring county.
[11] Unfortunately, we do not have data on the number of churches by other denominations. We only have the number of *missionaries* of other denominations (see Table 3). Controlling for their number does not affect our main results.
[12] Note that the impact of missionaries who arrived in Korea in the early years is likely to have diminished over time. Additionally, the marginal effect of adding one more missionary is likely to decrease. The exposure level to missionaries in levels does not capture this effect. In order to account for this, it may be appropriate to consider depreciation factors based on the year of arrival and the number of missionaries. However, selecting a specific depreciation method is potentially arbitrary. Employing a logarithmic transformation may offer a simple way to incorporate these factors.

Our IV results indicate that a larger number of local Protestant churches leads to higher literacy rates across the Korean peninsula. Adding one more local Protestant church leads to an increase in the literacy rate between 3.0% to 3.7%, depending on the threshold distance. The effect size for males is slightly larger than that for females, ranging from 3.0% to 4.3% depending on the threshold distance. In contrast, the effect size for females falls within the range of 3.1% to 3.5%. The IV estimates are positive and statistically significant for both males and females, and larger than the corresponding OLS estimates. Measurement error in the number of churches seems an unlikely explanation for a downward-bias in OLS estimates. A more plausible explanation is based on local average treatment effects in a heterogeneous treatment effects framework. It is conceivable that the literacy returns to the presence of Korean Christian churches is larger where the original presence of missionaries was more influential. In contrast, Korean Christian churches that were founded later, or in more remote locations, came under less influence of foreign missionaries, with a resulting smaller literacy benefit.[13] Since our IV estimates pick up the variation in the number of Korean churches that is driven by missionary presence, the literacy returns are conceivably larger than OLS estimates.[14]

Furthermore, the IV estimates increase more, in relative terms, for females than for males, compared to their OLS counterparts. Consistent with the historical record, females may have benefited more than males, as foreign Protestant missionaries might have also instilled a preference for more gender-equal education, an effect previously shown in the European context (e.g. Becker and Woessmann, 2008).

E. Outcomes beyond literacy

Moreover, the impact of Protestantism on literacy is linked to economic outcomes. To further explore this relationship, we conduct an IV analysis to examine the influence of Protestantism on employment in the public sector (see Table 6).

[Table 6 about here]

The results indicate that an additional Methodist or Presbyterian church leads to 0.04% to 0.05% larger public-sector employment for females. For males, the effect size ranges from -0.16% to 0.01%, though this is statistically insignificant. While there is no town-level data giving us deeper insights into

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[13] This would also be in line with the distinction in Jedwab et al. (2022) of "main mission stations" and sub-ordinate/later Christinization away from the main stations.

[14] It is interesting to note that, also in the IV estimates, the effect of an additional Presbyterian church on literacy is larger (see Table A.3). We explore the denominational differences further in Section 3.2.

which sub-sectors of the public sector drive the result for females, we can learn something by looking at national statistics about the distribution of female employment across sub-sectors of the public sector.

[Table 7 about here]

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Based on the 1930 census data (Chōsen Government-General, 1932a), approximately 41% of females employed in public sector were engaged in religious practitioner occupations. The fact that women whose literacy was triggered by the church, end up working for the church might seem too obvious. Yet, female public sector employment opportunities go well beyond the boundaries of religious institutions. The second and third largest sectors of female employment in the public sector are health and education, accounting for 37% of total female employment in the public sector. The data indicates that the Protestant churches have provided educational opportunities for women, and some of these educated women have subsequently entered health or educational occupations. As these professions typically necessitate literacy skills, it can be argued that the positive influence of churches on literacy rates has contributed to an increased likelihood of women gaining access to public-sector occupations.

3.2 Spatial Regression Discontinuity Design

A. Historical Background

In this section, we utilize the Comity Agreement of 1909 to study differences in treatment effects between Presbyterian and Methodist areas. As discussed before, the two main Protestant denominations agreed on a geographic division of Korea to delineate areas of responsibility (Kim and Kim, 2015; Oxley, 2021). As a result, each denomination had an exclusive territory to perform missionary work, with the exception of the major cities where both were active.

As mentioned in Section 2, Presbyterians emphasized the importance of native churches while Methodists did not. This made an important difference between Presbyterian and Methodists, not only for expansion of their power but also for the education activities by native Presbyterians. Furthermore, Rhodes (1934) argues that the Presbyterian's Nevius plan contributed to evangelizing more people than other denominations in the colonial era, particularly in Hwanghae Province, where he worked and lived as a missionary.

Overall, Korean Presbyterians were able to build more churches without the permission of foreign missionaries, leading to an increase in the number of Presbyterian churches and believers. Presbyterians not only opened schools, but they also used church buildings for night-time bible study gatherings that also imparted literacy.

Since in large parts of Korea, the Comity borders coincide with administrative borders, it is difficult to disentangle the effect of specific missionary groups from other treatments that vary between administrative units (e.g. Japanese colonial policies or historic differences across Korean provinces).[15] Thus, for the spatial RDD, we focus on the Comity border *inside* Hwanghae Province. This province consists of 17 counties and 221 towns and is an excellent example of how well the Nevius plan worked. Table 8 shows the size of both denominations in Hwanghae province in 1921. First, the number of Presbyterian churches was three times bigger than the number Methodist churches. Presbyterians also built more schools, and they had many more believers than Methodists.

[Table 8 about here]

Going beyond the sheer manpower, Presbyterians also focused more on teaching working-class people and women than Methodists. Night-time gatherings teaching literacy in the Korean language for 1 or 2 hours at night, allowed them to reach parts of the Korean population who could not access official schools. Taken together, we expect Presbyterians to be more successful at increasing the literacy rate in Korean compared to Methodists.

Before diving into the regression analysis, we look at Figure 5 which displays the distribution of churches of both denominations.

[Figure 5 about here]

The distribution of Methodist and Presbyterian churches shows that they complied with the agreement because there are only four towns with churches of both denominations. Still, given this partial "non-compliance" with the Comity Agreement, we employ a fuzzy (spatial) RDD.

B. Model setting

First Stage Equation.

$$Treated\_Presbyterian_i = \pi + \omega_1 Presbyterian\_territory_i + f(\text{geographic location}_i) + \lambda_1 X_i + \mu_i$$

Second Stage Equation.

$$LiteracyRate_i = \rho + \omega_2 \widehat{Treated\_Presbyterian_i} + f(\text{geographic location}_i) + \lambda_2 X_i + \varphi_i$$

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[15] See Becker, Mergele and Woessmann (2020) for a discussion of the pitfalls of historical borders in spatial regression discontinuity-designs.

Given the near-perfect separation between Presbyterian and Methodist territories, we expect a strong first stage whereby "Presbyterian territory" predicts whether the town had a Presbyterian church or not ("Treated Presbyterian"). Following Dell (2010), we include f(geographic location$_i$), a low-order polynomial to control for smooth functions of geographic location (latitude and longitude).

The RD approach requires two identifying assumptions. First, all relevant factors except the literacy rate must vary smoothly at the border of the Comity Agreement. We test this for a series of variables: population density, market size, and the employment share outside agriculture.

[Figure 6 about here]

Figure 6 shows that both areas have similar characteristics around the cut-off: there is no significant difference between Presbyterian and Methodist areas in terms of population density, the employment share outside agriculture, and market size. There only is a jump in the literacy rate per 1,000 inhabitants.

We use a semiparametric RD approach limiting the sample to towns within 50 km of the Comity border, but show robustness of our results when using different ranges. We use a quadratic polynomial in latitude and longitude instead of a cubic polynomial, following the advice of Gelman and Imbens (2019) to avoid using higher-order polynomial function which often lead to more noisy estimates. Nevertheless, we will show that cubic polynomials do lead to similar results.

C. Spatial Regression-Discontinuity Design. Results

Table 9 shows the regression result for the spatial RDD. Panel A shows specifications that include a polynomial in latitude and longitude. Panel B uses a polynomial distance to the Comity border. Lastly, Panel C employs a polynomial distance to Seoul. Columns (1) to (3) of Table 9 limit the sample to towns within 75km of the Comity border in Hwanghae Province (but some of those cities might themselves be located outside Hwanghae Province). Columns (4)-(6) restrict the sample to within 50 km of the Comity border, and columns (7)-(9) use only cities strictly located in Hwanghae Province. We include border segment fixed effects to compare observations with close geographic characteristics.

[Table 9 about here]

Columns 1-3 of table 9 show that the presence of Presbyterian churches rises the literacy rate regardless of gender. The literacy rate is about 7.5-10.5% higher in Presbyterian than in Methodist areas, depending on specification. The size of the effect for males is higher than for females: 10.8-14.3% for males versus 3.4%-7.0% for females. Lastly, all coefficients are statistically significant.

These results point to a pronounced Presbyterian lead in fostering literacy among the Korean population.

D. Robustness

So far, we limited our estimation sample to cities in (or nearby) Hwanghae Province only. We did this because only in Hwanghae Province, the Comity border is within province, whereas in the rest of Korea, the Comity border coincides with provincial borders, raising issues of interpretation, as we cannot exclude the possibility that some of the difference ascribed to Presbyterian versus Methodist influence is in fact the result of other differences across provinces. Yet, to probe the robustness of our results we repeat our analysis for Korea as a whole. In this larger sample, we again use different bandwidths following the spirit of the work by Calonico et al. (2014) that there is a trade-off between sample size and localized treatment effect.

Table 10 shows that results are qualitatively similar, albeit smaller in magnitude and less statistically significant, in this larger sample.

[Table 10 about here]

Furthermore, returning to the original sample around the Comity border in Hwanghae province, there were four towns in which both Methodists and Presbyterians had built churches. These towns are relatively larger than other towns, and we want to verify whether these towns influence our results. Thus, we run the same regressions excluding the four towns in which both denominations are active. Table 11 shows that our results are virtually identical.

[Table 11 about here]

Lastly, we explore whether our results are similar when we use higher-order polynomials. Table 12 shows that results are virtually identical to those in Table 9.

[Table 12 about here]

E. Discussion

All our result show that literacy rates were higher in Presbyterian compared to Methodist areas. We argue that the Presbyterian emphasis on self-sufficiency and empowerment of local churches ("Nevius plan") was more successful at spreading Christianity quickly across the Korean Peninsula: it not only contributed to building native churches across the Presbyterian areas but also

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encouraged native people to engage in spreading the gospel by themselves. As a result, the number of Presbyterian believers grew more quickly, allowing them also to provide literacy to more Koreans. Second, native churches had stronger incentives to be financially independent. While churches did not charge school fees, providing education was one way to attract believers who would end up making voluntary contributions to support the church. Given the fact that the Government General of Chōsen was not very active in providing education to the Korean people, the educational service offered by Presbyterian churches was a good alternative option for Korean people at that time.

As a result, thanks to the Nevius plan, Presbyterians were able to build an extensive network of churches across not only the northern Hwanghae areas, but also the other areas under their control. Importantly, the difference between the two areas was determined exogenously by the Comity Agreement. One may speculate that if there had not been the Comity Agreement, and if Presbyterian had been permitted to expand into and manage other areas, probably also other areas of Korea would have benefited from higher literacy rates during the Japanese colonial era.

4. Conclusion

This paper explores the causal relationship between Protestantism and human capital accumulation in colonial Korea. Luther's exhortation that Protestants should read the gospel by themselves made them acquire literacy skills in the western world (e.g. Becker and Woessmann, 2009). Our results show that a stronger presence of Presbyterian churches in Korean towns led to higher literacy rates for males, but also females, which is consistent with earlier findings that Protestantism also led to higher female literacy rates (e.g. Becker and Woessmann, 2008). However, the process of literacy acquisition was different between Western countries and Korea. Neither was Korea a colony of Western countries nor did Protestantism arrive in Korea in the early modern era. Instead, Protestant missionaries first set foot in Korea in 1884, after the "Hermit Kingdom" had opened its doors to foreigners. Presbyterian missionaries adopted the Nevius plan to systematically "conquer" the geographic areas under their control. This plan emphasized the importance of training Korean pastors to run local congregations to reach the hearts and minds of Koreans for the Christian message. In line with the Protestant emphasis on literacy to read God's word, Protestant congregations set up schools and offered evening classes, thereby helping human capital accumulation.

Our work makes three distinct contributions. First, different from most of the earlier work on Protestant missionaries around the world, we explicitly compare different Protestant denominations. We show that different missionary strategies had consequences for the literacy of Koreans in the colonial era.

Second, our results emphasize the agency of the local population in furthering the efforts of foreign missionaries. After all, the number of missionaries was quite small compared to the size of the Korean population and without the "snowball effect" emanating from the work of Korean Christians, the missionary work would not have been as effective. This is particularly true for Presbyterians, who tried to empower local congregations by making them responsible in choosing their own pastors and to be financially self-sustaining. Thus, they had stronger incentives to look after their own congregations than other denominations. This characteristic was also likely a key factor driving them to engage in educational activities in their own towns. In short, native believers were not simply recipients of Western influence, but put a lot of thought into improving local communities, especially by contributing to educating the younger generations. Prosaically, Presbyterian missionaries not only gave Korean people fish, but they also taught them how to fish. Eventually, motivated native believers "fished for souls".

Third, our research implies that there were two different types of institutions in terms of education. Although the Chōsen Government-general provided public schools, our research shows that the presence of Presbyterian churches increased the human capital accumulated above and beyond the number of public schools. In many countries around the world, missionaries and colonizers arrived at the same time and hailed from the same country of origin. Very rarely has their relative influence been studied. An important exception is the work by Wietzke (2015) who exploits local variation in the timing and organization of colonial settlement and missionary education in Madagascar to distinguish long-run effects of colonial institutions and missionary schools. Our results shed new light on the relative contribution of colonizers and missionaries on economic development.

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[Figure 1] The Distribution of Literacy Rates (town-level data)

Literacy Rate per 1,000

- 276.36 - 459.31
- 239.13 - 276.36
- 216.38 - 239.13
- 193.61 - 216.38
- 171.63 - 193.61
- 144.76 - 171.63
- 64.56 - 144.76
- No data
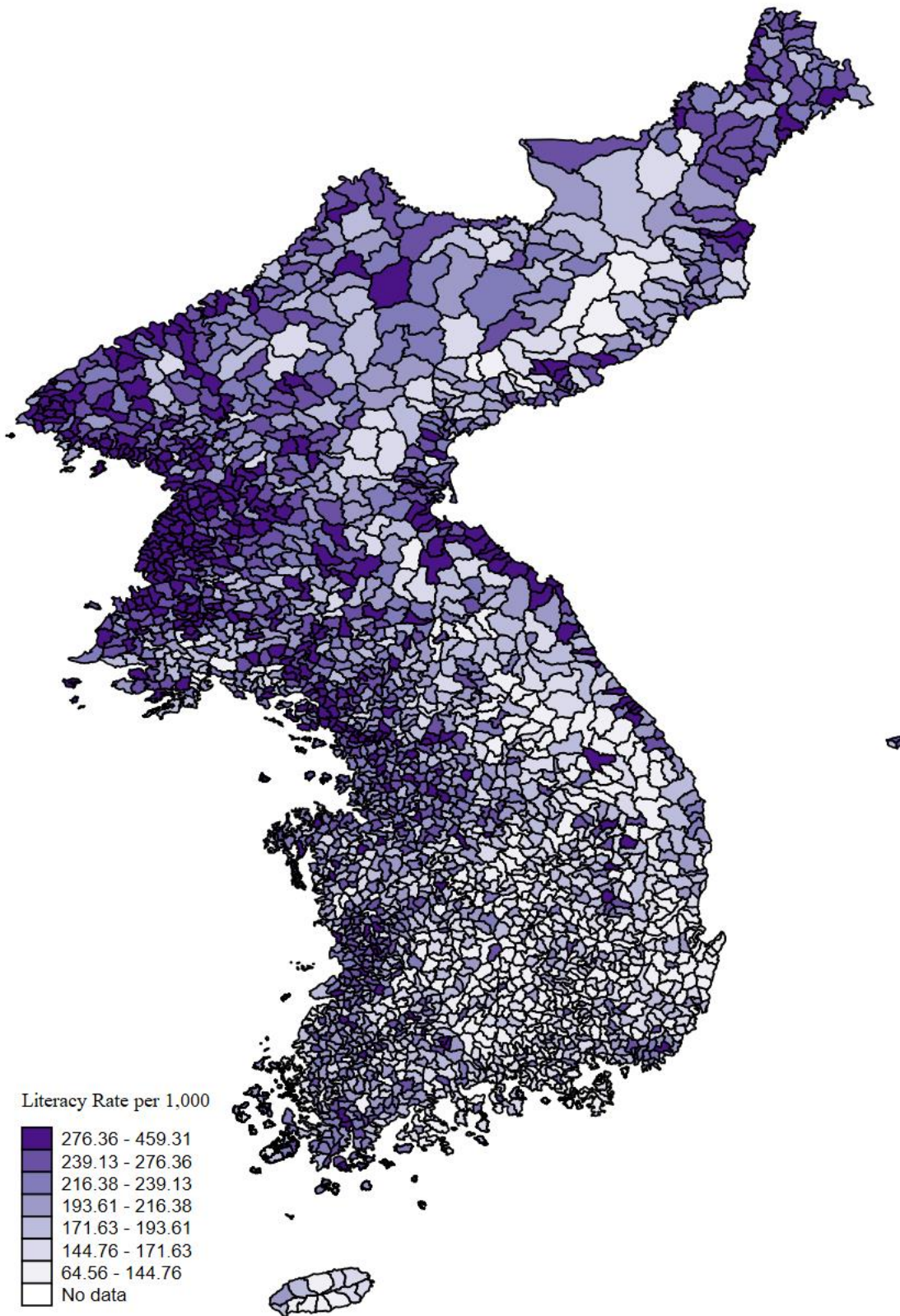
Note: The map displays the literacy rate in the Korean language per 1,000 inhabitants, at the town-level. The shape file was kindly shared by Dr Jonghyuk Kim. Data source: Census of Chōsen (1932).

[Figure 2] The Number of Methodist and Presbyterian Churches in 1930 (town-level data)

Methodist
- 5 - 15
- 3 - 5
- 2 - 3
- 1 - 2
- 0 - 1

Presbyterian
- 5 - 15
- 3 - 5
- 2 - 3
- 1 - 2
- 0 - 1
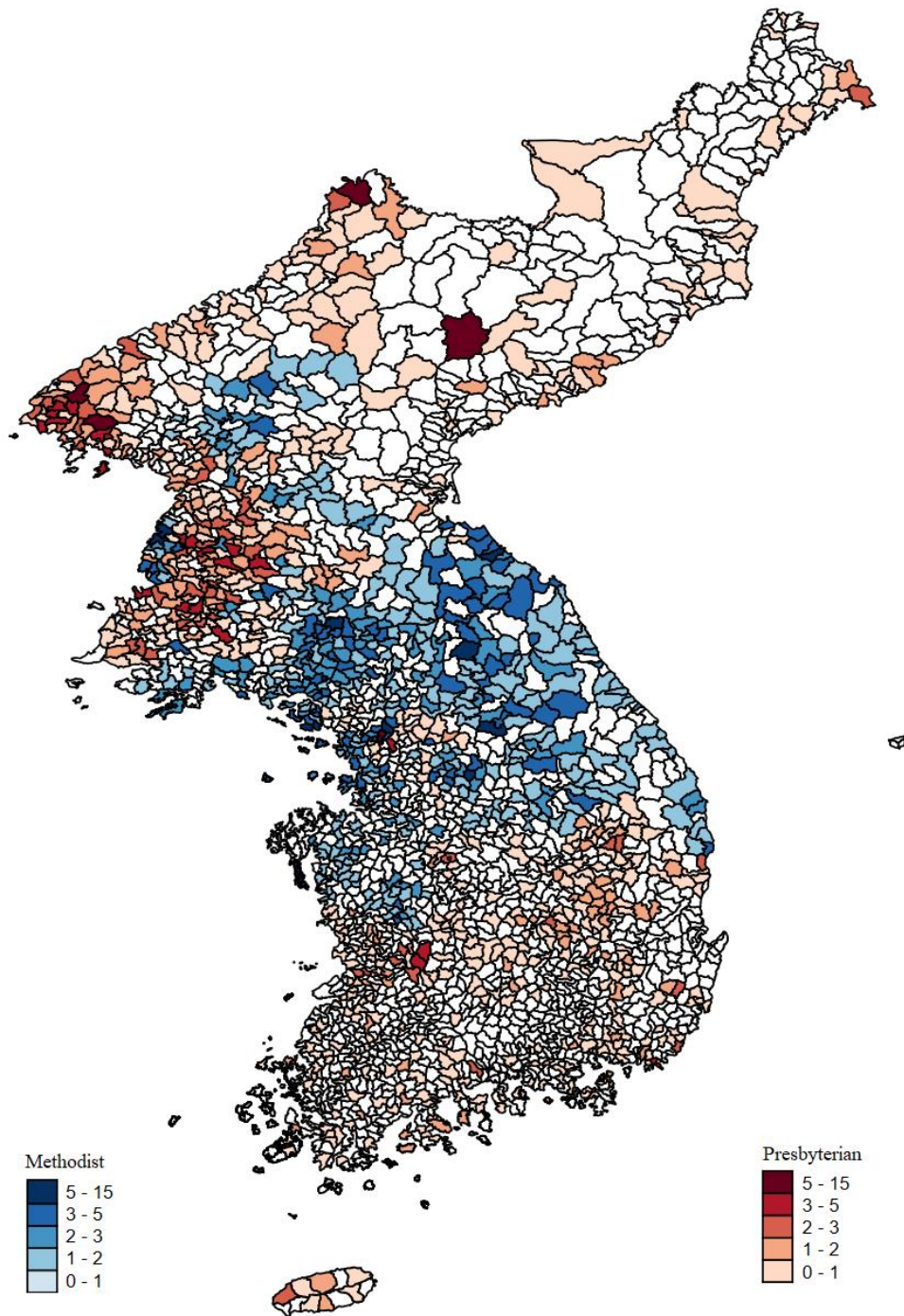
Note: Towns marked in blue indicate the number of Methodist churches. Towns marked in red indicate the number of Presbyterian churches. There are 24 towns out of 2478 towns with a presence of *both* Methodist and Presbyterian churches. See Figure 3. The shape file was kindly shared by Dr Jonghyuk Kim. The sources of the data are the yearbook of Methodists in Korea (1931), and the yearbook of Presbyterians in Korea (1941).

[Figure 3] Towns with only Methodist churches, with only Presbyterian churches, or both, in 1930.
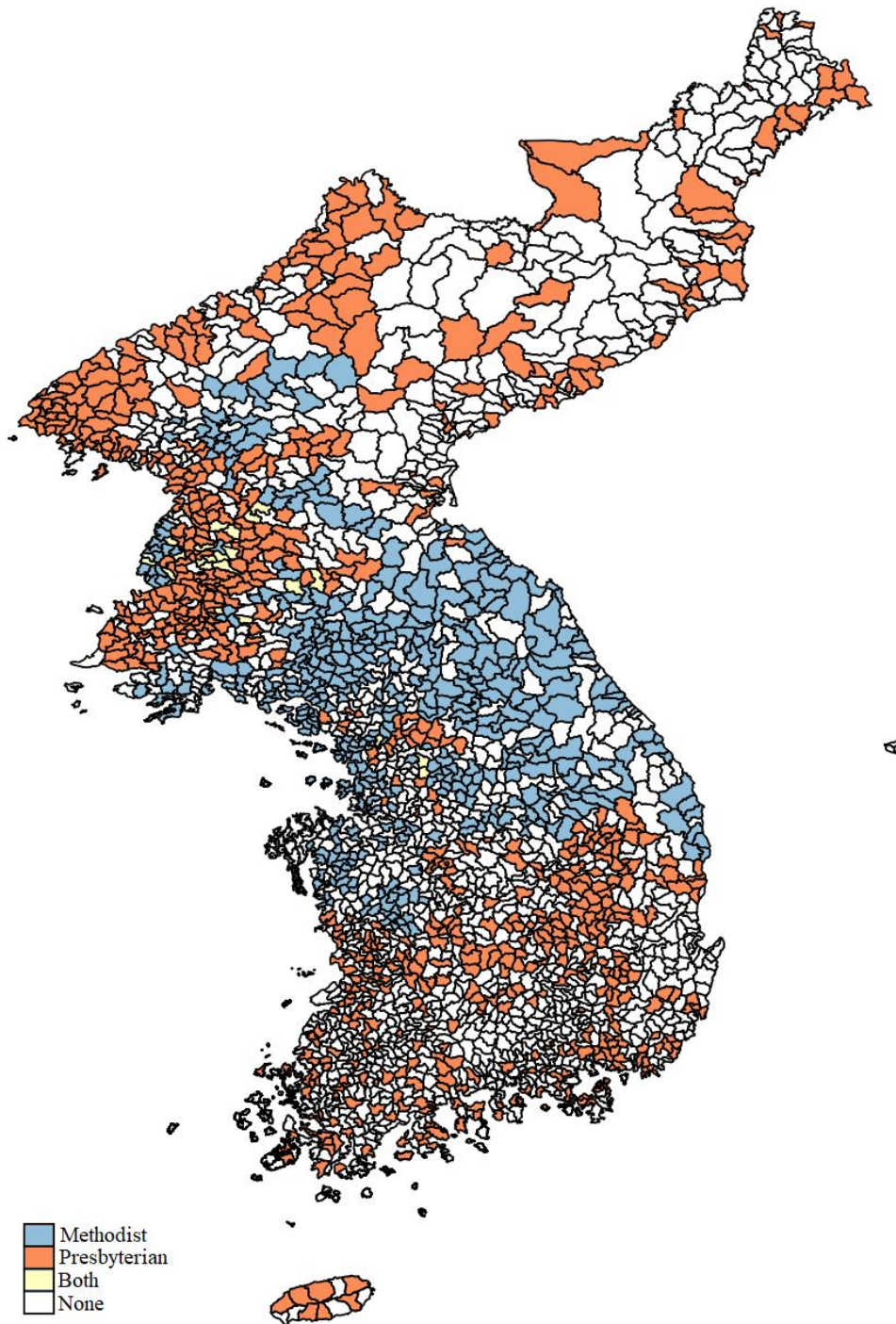
Note: Locations marked in blue are towns with at least one Methodist church. Locations marked in red had at least one Presbyterian church. Locations marked in yellow are towns that had churches of both denominations. The sources of data are the yearbook of Methodists in Korea (1931), and the yearbook of Presbyterians in Korea (1941).

[Figure 4] Methodist and Presbyterian Missionary Visits.

Methodist and Presbyterian visits by 1909   Methodist and Presbyterian visits by 1930

Presbyterian
Both
Methodist
No Visit
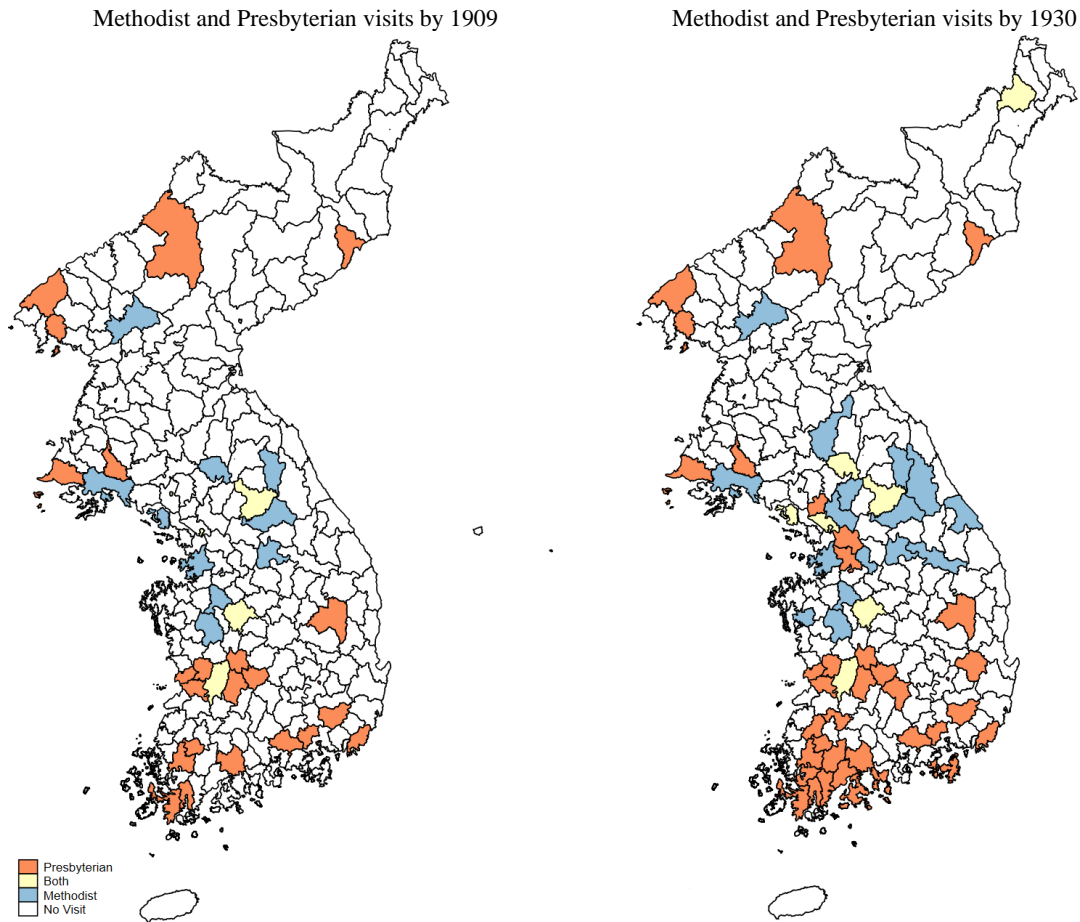
Note: Blue and red are those counties Methodist and Presbyterian missionaries had visited until 1909 and 1930, respectively. Yellow designates counties which both Methodist and Presbyterian missionaries had visited. Although the comity agreement was officially adopted in 1909, the map shows that the territories were already de facto divided before that. The source of data for missionaries is the Institute of the History of Christianity in Korea (1984)

[Figure 5] The Distribution of Methodists and Presbyterians in Hwanghae Province.
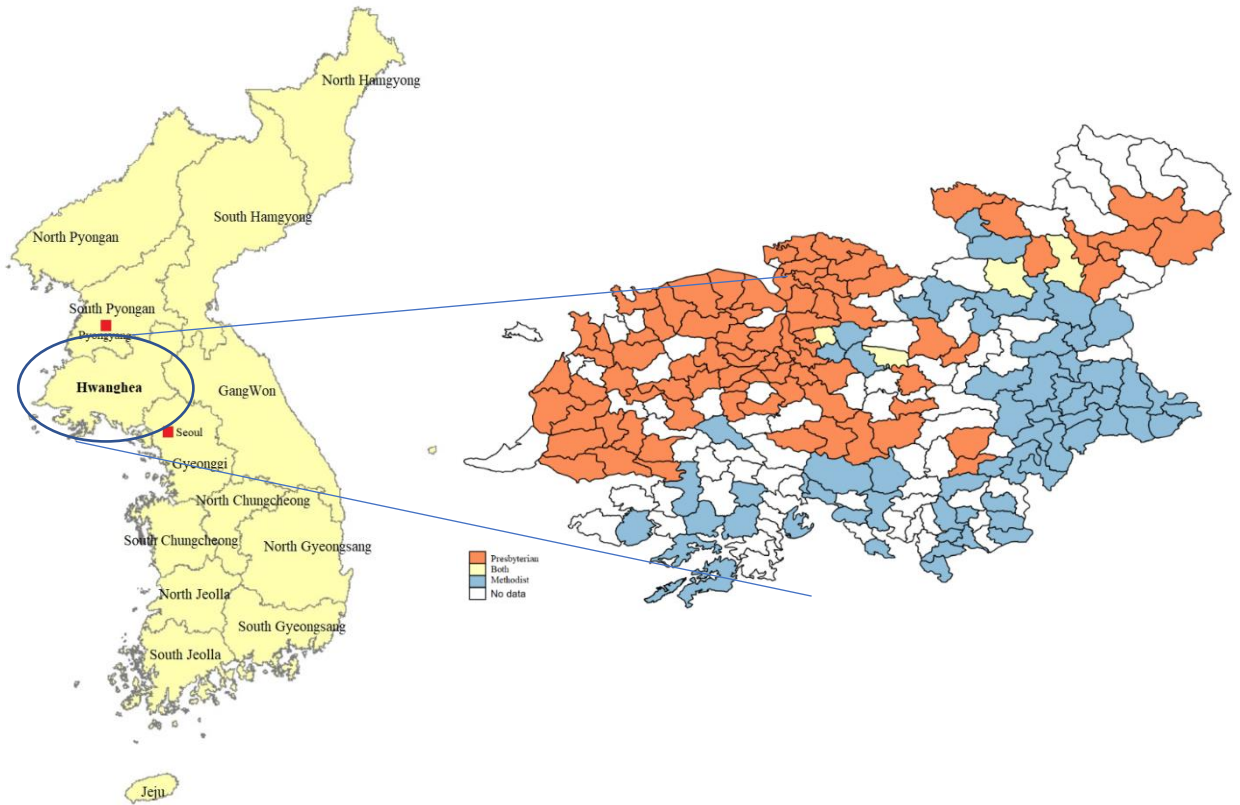
Note: Hwanghae Province is located between South Pyongan and Gyeonggi Province. Kyung-sung (Seoul) and Pyeongyang, the two major Korean cities, belong to Gyeonggi province and South Pyongan province, respectively. In the map on the right-hand side, blue indicates towns with Methodist churches; red indicates towns with Presbyterian churches; yellow indicates towns where Methodist and Presbyterian churches were located at the same time.

[Figure 6-1] Literacy Rate

Literacy Rate
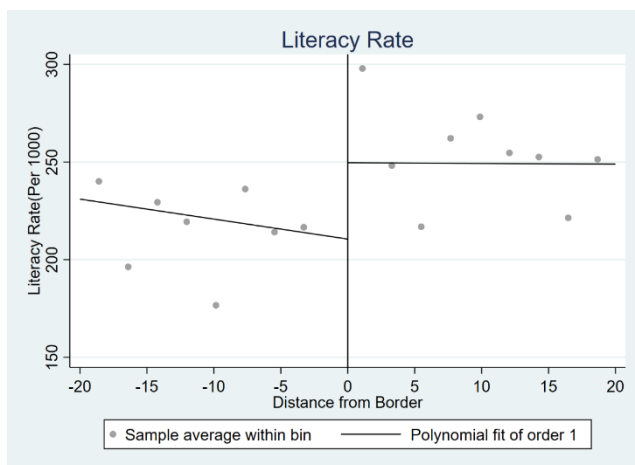
[Figure 6-2] Population Density

Population Density
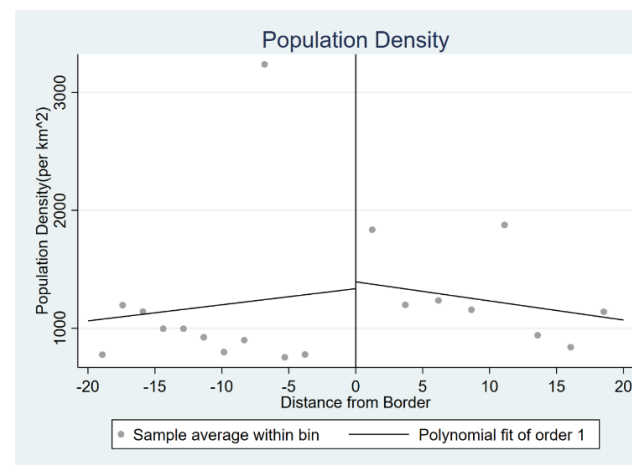
[Figure 6-3] The Employment Share Outside Agriculture

The Employment Share Outside Agriculture
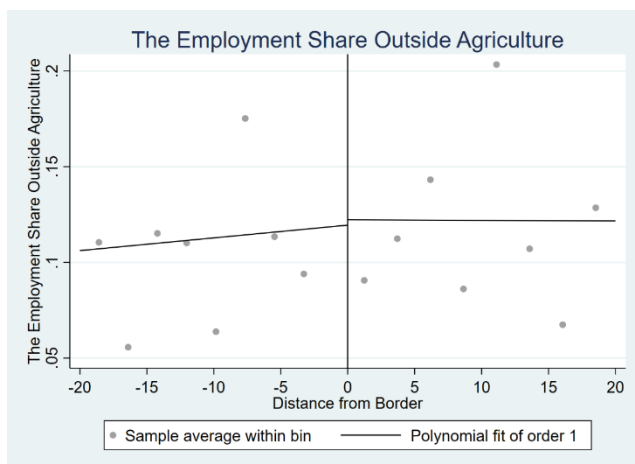
[Figure 6-4] Market size per 1,000

Market Size
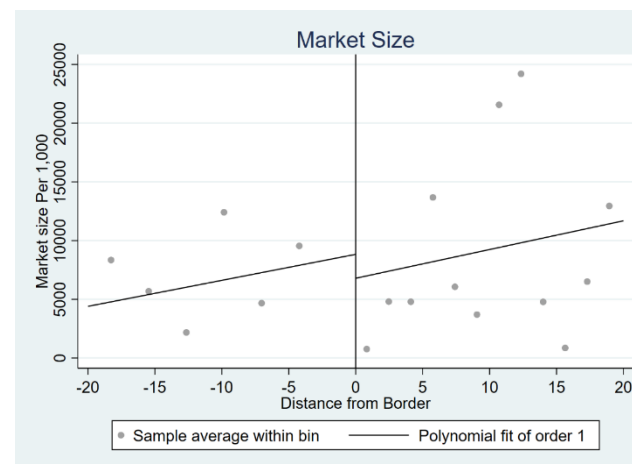
Note: The optimal bandwidth depends on which distance from borderline we choose. If the sample includes towns that are located within 150 km of the Comity border in Hwanghae Province, it gives 24 km (using the Calonico et al (2019) method). Positive values on the X-axis are Presbyterian areas, negative value are Methodist areas. Distances are measured in km.

[Table 1] Basic Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Literacy rate (Korean)	2,478	209.16	61.39	64.56	459.31
Literacy rate (Korean, but not Japanese)	2,478	152.79	44.66	28.59	321.69
Literacy rate male	2,478	344.17	99.26	62.38	743.81
Literacy rate female	2,478	70.07	53.22	2.38	646.84
Population					
Total population	2,478	8493.66	9880.54	2,015	394,240
Total population male	2,478	4345.49	5173.15	1,054	206,566
Total population female	2,478	4165.73	4712.24	447	187,674
Population density (km^2)	2,478	225.13	910.98	1.72	19150.71
Employment share outside agriculture (%)	2,478	5.39	3.25	2	35
Market size (JPN YEN)	2,464	62383	225941	0	5,479,278
Protestantism					
Number of Presbyterian churches	2,478	0.45	0.94	0	15
Number of Methodist churches	2,478	0.34	0.91	0	18
Variable [County Level]					
Number of priests (Christianity) per 1,000	234	0.11	0.18	0	1.68
Number of monks (Buddhism) per 1,000	234	0.35	0.52	0	5.76
Number of Japanese Shin-To per 1,000	234	0.03	0.13	0	1.51
Number of passers (Civil exam) per 1,000	232	0.22	0.69	0	10.10
Size of county (km^2)	234	939.15	796.34	2.19	6147.47
Upper social class share (1909)	223	0.01	0.01	0	0.10
Land tenancy ratio	228	1.10	0.90	0.01	7.81
Soil acidity	211	2.09	0.75	1	5

Note: Literacy rates and population data from the census of Chōsen (1932). Market size data are from Park (2020). Data about Methodists and Presbyterians are from the yearbook of Methodists in Korea and the yearbook of Presbyterians in Korea, respectively. Lastly, Yangban share, land tenancy ratio and soil acidity are from Paik and Hong (2018).

[Table 2] Literacy in Korean: OLS results at the town level.

Variable	(1)	(2) All	(3)	(4)	(5) Male	(6)	(7)	(8) Female	(9)
Number of Methodist & Presbyterian churches	7.491*** (1.312)			10.081*** (1.900)			5.023*** (1.226)		
Number of Methodist churches		3.921** (1.664)			7.168*** (2.502)			0.797 (1.306)	
Number of Presbyterian churches			9.164*** (1.896)			10.587*** (2.673)			7.834*** (1.657)
Control Variables at Town and County Level	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276
R-squared	0.512	0.502	0.511	0.581	0.575	0.578	0.303	0.295	0.306
Mean of dependent variable	206.1	206.1	206.1	338.2	338.2	338.2	70.41	70.41	70.41

Note: The dependent variable in this study is the literacy rate, defined as the number of individuals per 1,000 in the population, disaggregated by gender, who can read and write in the Korean language. The explanatory variable "Number of Methodist & Presbyterian Churches" represents the combined total of Methodist and Presbyterian church congregations present within each town. The variables "Number of Methodist Churches" and "Number of Presbyterian Churches" refer individually to the count of Methodist and Presbyterian church congregations, respectively, within each town. Variables not shown are town and county fixed effects. The town level control variables are population density, the employment share outside agriculture, market size, the number of Catholic churches, and the distance to Kyung-Sung (Seoul). Furthermore, we included all control variables at the county level that were used by Becker and Won (2021): the number of people passing the civil service exam during the *Joseon* dynasty which ruled Korea from 1392 to 1897, the upper social class share, the land tenancy ratio, soil acidity and the number of schools. Standard errors, clustered at the county-level, in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

[Table 3] The Number of Protestant Missionaries by Each Denomination from 1884 to 1930

Name	# Of Missionaries	% Of Missionaries	% Of Believers
Northern Presbyterians (USA)	321	23.67%	
Southern Presbyterians (USA)	176	12.98%	71.01%
Australian Presbyterians	74	5.46%	
Canadian Presbyterians	74	5.46%	
Northern Methodists (USA)	241	17.77%	16.34%
Southern Methodists (USA)	164	12.09%	
Anglican	74	5.46%	2.1%
Oriental Missionary Society	24	1.77%	
Salvation Army	115	8.48%	
Seventh Day Adventist	23	1.70%	10.53%
Young Men's Christian Association	15	1.11%	
Other denominations*	33	2.43%	
Dual denomination*	22	1.62%	N/A
Total	1,356	100%	100%

Note: Denominations that sent less than 10 missionaries to Korea are classified as Other. "Dual Denomination" means missionaries who changed their denominations. The number of missionaries means that sum of each missionary who stayed and had been staying in Korea from 1984 to 1930. The sources of data are Chōsen Government-General (1932), the report of religions in Korea (1932), and the comprehensive survey of missionaries from 1884 to 1984 (see Institute of the History of Christianity in Korea 1984).

[Table 4] Location of missionary stations: Two-sample t-test (County date, excluding counties that are major cities)

	Obs.		Mean		diff	t value	p value
	M.S.	Non-M.S.	M.S.	Non-M.S.			
Methodists + Presbyterian							
Population Density (km^2)	59	161	299.14	120.75	178.38	1.16	0.24
The Employment Share outside Agriculture	59	161	5.71	5.10	0.61	1.33	0.19
Distance from Seoul (Km)	59	161	201.91	231.41	-29.50	-1.61	0.11
Distance from Pyongyang (Km)	59	161	325.14	281.14	44.00	2.06	0.04
Distance from Border (Km)	59	161	434.46	340.41	94.05	3.28	0.00
Distance from Sea (Km)	59	161	35.54	45.62	-10.09	-2.16	0.03
Distance from River (Km)	59	161	6.68	8.12	-1.43	-0.80	0.42
Railway Station within 10km	59	161	0.27	0.20	0.07	1.00	0.32
Log Market Size	59	160	20.01	19.92	0.09	0.59	0.55
Upper social class share	59	157	0.01	0.01	0.00	-0.71	0.48
Civil Service Exam Passers per 1K	59	159	0.22	0.16	0.05	1.53	0.13
All Denominations							
Population Density (km^2)	74	146	262.18	121.15	141.02	1.14	0.25
The Employment Share outside Agriculture	74	146	5.45	5.17	0.28	0.69	0.49
Distance from Seoul (Km)	74	146	194.78	238.06	-43.27	-2.59	0.01
Distance from Pyongyang (Km)	74	146	307.50	285.57	21.93	1.07	0.28
Distance from Border (Km)	74	146	418.25	338.97	79.28	2.88	0.00
Distance from Sea (Km)	74	146	39.73	44.54	-4.81	-1.05	0.29
Distance from River (Km)	74	146	6.05	8.58	-2.53	-1.44	0.15
Railway Station within 10km	74	146	33.98	46.38	-12.40	-2.33	0.02
Log Market Size	74	145	20.05	19.89	0.16	1.14	0.26
Upper social class share	74	142	0.01	0.01	0.00	-0.63	0.53
Civil Service Exam Passers per 1K	74	144	0.22	0.16	0.06	1.94	0.05

Note: Differences in the number of observations stem from missing variables. M.S. designates counties that had a mission station. Korea was made up 13 first-tier administrative divisions (Province) in 1930. These are further subdivided into two of smaller entities, cities (*bu* in Korean) and counties (*Gun* in Korean). All cities were urban areas that were smaller in size than counties, but their population was larger than counties. Therefore, cities had a different characteristic compared to counties. When we try to test our hypotheses, we exclude these cities from our sample to prevent biased result. "All denominations" include Presbyterian, Methodists, Anglican, Oriental Missionary Society, Salvation Army, Seventh Day Adventist, Young Men's Christian Association and individual missionaries. The variables "Log market size," "upper social class share," and "Civil service exam passer per 1K" have a smaller number of observations compared to the other variables due to the presence of missing values in the original datasets of Paik and Hong (2018) and Park (2020).

[Table 5] IV Regression Result [Town level]

VARIABLES	80 km			65 km			50 km		
	ALL	Male	Female	ALL	Male	Female	ALL	Male	Female
Panel A. Second Stage. Dependent variable: Literacy rate per 1,000 residents									
Number of Methodist & Presbyterian churches	31.963***	36.823***	30.880**	30.492***	33.908**	30.933***	36.550***	42.507***	35.212***
	(8.888)	(13.227)	(12.138)	(9.138)	(13.544)	(10.972)	(10.870)	(15.040)	(11.696)
Panel B. First Stage. Dependent variable: Number of Methodist & Presbyterian Churches									
Log exposure level to missionaries (town level)	0.106***	0.106***	0.106***	0.105***	0.105***	0.105***	0.082***	0.082***	0.082***
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)	(0.018)	(0.018)	(0.018)
Control Variable [Town & County Level]	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276
Mean of dependent variable	206.1	338.2	70.41	206.1	338.2	70.41	206.1	338.2	70.41
Kleibergen-Paap rk Wald F statistic	27.05	27.05	27.05	27.90	27.90	27.90	20.09	20.09	20.09

Note: The dependent variable is the literacy rate per 1,000 residents. The number in the top row denotes the distance rule we apply to compute missionary exposure at the town level: 80 km, 65 km, and 50 km is the maximum distance from missionary stations within which we compute the weighted (log) exposure level to missionaries. We include all control variables that are used in OLS in section 2. Population density, market size, and the employment share outside agriculture, and distance from Seoul vary at the town level, all other variables vary at the county level. Standard errors, clustered at the county-level, in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

[Table 6] IV Regression Result – Employment of Public sector [Town level]

VARIABLES	80 km			65 km			50 km		
	ALL	Male	Female	ALL	Male	Female	ALL	Male	Female
Panel A. Second Stage. Dependent variable: Employment share in public sector per 1,000 residents									
Number of Methodist & Presbyterian churches	-0.423	-1.024	0.380*	-0.885	-1.781	0.480**	-0.325	-0.829	0.530**
	(0.751)	(1.272)	(0.231)	(1.222)	(1.956)	(0.222)	(0.985)	(1.614)	(0.226)
Panel B. First Stage. Dependent variable: Number of Methodist & Presbyterian Churches									
Log exposure level to missionaries (town level)	0.102***	0.102***	0.102***	0.102***	0.102***	0.102***	0.084***	0.084***	0.084***
	(0.022)	(0.022)	(0.022)	(0.021)	(0.021)	(0.021)	(0.019)	(0.019)	(0.019)
Control Variable [Town & County Level]	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276	2,276
Mean of dependent variable	5.653	9.813	1.224	5.653	9.813	1.224	5.653	9.813	1.224
Kleibergen-Paap rk Wald F statistic	21	21	21	23.24	23.24	23.24	19.71	19.71	19.71

Note: The dependent variable is the literacy rate per 1,000 residents. The number in the top row denotes the distance rule we apply to compute missionary exposure at the town level: 80 km, 65 km, and 50 km is the maximum distance from missionary stations within which we compute the weighted (log) exposure level to missionaries. We include all control variables that are used in OLS in section 2. Population density, market size, and the employment share outside agriculture, and distance from Seoul vary at the town level, all other variables vary at the county level. Standard errors, clustered at the county-level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1

[Table 7] Share of female labor force in public sector

Name of Occupations	Total	Male	Female	Share of female within Industry	Share of female within gender
Civil servant	61,681	60,886	795	1.29%	4.28%
Defence force	20,623	20,623	0	0.00%	0.00%
Legal professionals	606	606	0	0.00%	0.00%
Education professionals	31,411	28,233	3,178	10.12%	17.10%
Religious practitioner	18,156	10,537	7,619	41.96%	40.99%
Health professions	13,017	9,271	3,746	28.78%	20.15%
Secretary	6,785	6,457	328	4.83%	1.76%
Journalist	4,626	3,943	683	14.76%	3.67%
Professional freelancer	9,318	7,080	2,238	24.02%	12.04%
Total	166,223	147,636	18,587	11.18%	100.00%

Date source: Korean census 1930 (Chōsen Government-General, 1932a)

Note: In the Korean census of 1930, occupations are classified into four distinct levels. Level 1 encompasses ten broad occupational categories, including but not limited to agriculture, fishing, manufacturing, and commerce. Within the public sector category at Level 2, there is a further subdivision into 9 specific sectors.

[Table 8] Basic Statistics for Hwanghae Province in 1921

	Presbyterian	Methodist
Number of Churches	154	58
Number of Elementary School	80	12
Number of Believers	18,845	3,770
Number of Students in Sunday schools	13,775	2,957

Data sources: Presbyterian council of Korea (1921), and Methodist Episcopal Church in Korea (1921).

[Table 9] Spatial Regression Discontinuity. (Hwanghae Province)

	Dependent variable: literacy rate per 1,000 residents								
	Locations < 75 km			Locations < 50 km			Only locations in Hwanghae Province		
VARIABLES	All	Male	Female	All	Male	Female	All	Male	Female
Panel A. Polynomial in Latitude and Longitude									
Presbyterian	105.579***	143.978***	69.196***	76.741***	123.757***	34.963***	75.141***	108.785***	44.202***
	(23.669)	(27.885)	(25.569)	(16.648)	(26.492)	(12.759)	(26.142)	(39.476)	(17.423)
R-squared	0.220	0.235	0.364	0.345	0.247	0.497	0.348	0.277	0.474
Panel B. Polynomial in Distance to Comity Border									
Presbyterian	96.793***	129.442***	65.222***	82.678***	127.862***	42.963***	76.066***	113.689***	42.940***
	(20.425)	(30.857)	(18.402)	(16.580)	(28.469)	(9.293)	(24.719)	(38.137)	(15.213)
R-squared	0.245	0.238	0.398	0.290	0.194	0.462	0.299	0.228	0.445
Mean of dependent variable	249.3	425.5	69.81	245.8	425.9	63.33	241.5	419.3	61.27
Panel C. Polynomial in Distance to Seoul									
Presbyterian	85.499***	114.480***	57.393***	79.657***	124.223***	40.661***	63.684***	94.279***	37.748***
	(15.491)	(24.210)	(15.828)	(15.101)	(26.258)	(8.686)	(21.346)	(32.710)	(14.548)
R-squared	0.344	0.330	0.456	0.338	0.240	0.490	0.380	0.330	0.467
Geo. Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Border FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	396	396	396	276	276	276	196	196	196
Mean of dependent variable	249.3	425.5	69.81	245.8	425.9	63.33	241.5	419.3	61.27

Note: The dependent variable is the literacy rate per 1,000 residents. The unit of observation is a town. All coefficient is statistically significant at 1% level. The dependent variable is literacy rate per 1,000. Presbyterian is an indicator equal to 1 if the presbyterian build churches in towns and is equal to 0 otherwise. Panel A includes a polynomial in the latitude and longitude of each town, panel B includes a polynomial in Euclidean distance from the centre of town to the nearest point on the comity border, and Panel C includes a polynomial in Euclidean distance to Seoul. All regression includes controls for population density, the employment share outside agriculture as well as border segment fixed effect. In Columns 1-3, the sample includes observations that towns are located within 75 km of the comity border, and this threshold is reduced to only Hwanghae Province. Standard errors, clustered at the county-level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[Table 10] Different bandwidths for spatial RDD

VARIABLES	Whole Data			< 250 km		
	All	Male	Female	All	Male	Female
Presbyterian	44.580***	62.830**	47.186***	41.424***	65.206**	25.605*
	(13.719)	(26.320)	(9.443)	(15.965)	(31.093)	(13.661)
Optimal Bandwidth (km)	70.487	79.509	130.5	50.375	45.336	49.771
Number of Obs.	368	417	643	279	260	275
	< 200km			< 150 km		
	ALL	Male	Female	ALL	Male	Female
Presbyterian	50.050**	65.694*	26.209*	49.996**	54.541	32.617*
	(23.949)	(35.960)	(15.655)	(24.563)	(39.078)	(17.535)
Optimal Bandwidth (km)	35.342	35.721	40.332	33.839	29.532	29.847
Number of Obs.	213	213	238	205	194	196

Dependent variable: literacy rate per 1,000 residents

Note: The dependent variable is the literacy rate per 1,000 residents. The sample includes towns located within 250 km, 200km and 150 km of the Comity border, respectively. Initially, the optimal bandwidth is computed for sample utilizing the MSE-optimal bandwidth selector method proposed by Calonico et al. (2014). Subsequently, we use the observations within the chosen bandwidth to estimate the treated effect. It is important to note that "Number of Obs." refers to the number of observations within the optimal bandwidth. Standard errors, clustered at the county-level, in parentheses
*** p<0.01, ** p<0.05, * p<0.1.

[Table 11] RDD excluding towns where both Methodists and Presbyterians are active.

VARIABLES	Dependent variable: literacy rate per 1,000 residents								
	All	Male	Female	All	Male	Female	All	Male	Female
Presbyterian	80.228***	116.692***	46.551**	80.846***	120.758***	45.507***	64.985***	96.335***	38.405**
	(28.850)	(43.708)	(19.696)	(26.709)	(41.081)	(16.980)	(24.234)	(36.955)	(16.945)
Geo. Function	Latitude and Longitude			Distance to Border			Distance to Seoul		
Observations	192	192	192	192	192	192	192	192	192
R-squared	0.323	0.250	0.454	0.275	0.206	0.423	0.369	0.323	0.450
Mean of dependent variable	240.5	418	60.59	240.5	418	60.59	240.5	418	60.59

Note: The dependent variable is the literacy rate per 1,000 residents. The sample consists of towns located within Hwanghae Province. All coefficient is statistically significant at the 1% level. Columns 1 to 3 use a quadratic polynomial in the latitude and longitude of each town; columns 4 to 6 use a quadratic polynomial in Euclidean distance from the centre of town to the nearest point on the comity border; columns 7 to 9 use a quadratic polynomial in Euclidean distance to Seoul. Standard errors, clustered at the county-level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[Table 12] RDD with cubic polynomials

VARIABLES	Dependent variable: literacy rate per 1,000 residents								
	All	Male	Female	All	Male	Female	All	Male	Female
Presbyterian	74.885***	108.714***	43.357**	76.652***	114.386***	43.084***	64.506***	95.723***	37.727**
	(27.407)	(41.154)	(18.467)	(25.707)	(39.444)	(16.100)	(22.213)	(33.780)	(15.420)
Geo. Function	Latitude and Longitude			Distance to Border			Distance to Seoul		
Observations	196	196	196	196	196	196	196	196	196
R-squared	0.345	0.273	0.472	0.294	0.225	0.441	0.374	0.324	0.462
Mean of dependent variable	241.5	419.3	61.27	241.5	419.3	61.27	241.5	419.3	61.27

Note: The dependent variable is the literacy rate per 1,000 residents. The sample consists of towns located within Hwanghae Province. All coefficient is statistically significant at the 1% level. Columns 1 to 3 use a quadratic polynomial in the latitude and longitude of each town; columns 4 to 6 use a quadratic polynomial in Euclidean distance from the centre of town to the nearest point on the comity border; columns 7 to 9 use a quadratic polynomial in Euclidean distance to Seoul. Standard errors, clustered at the county-level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[Table A.1] Spatial Regression Discontinuity Results, Pooling Hwanghae Province and South.

VARIABLES	Dependent variable: literacy rate per 1,000 residents								
	<75Km			<50 km			<25Km		
	All	Male	Female	All	Male	Female	All	Male	Female
Presbyterian	36.762**	45.705*	29.717**	50.091**	77.838**	29.497*	48.517**	94.957***	9.952
	(17.646)	(26.736)	(13.790)	(23.640)	(37.038)	(15.667)	(23.459)	(36.535)	(13.360)
Observations	898	896	897	578	577	577	313	313	313
R-squared	0.552	0.666	0.446	0.510	0.625	0.470	0.508	0.582	0.542
Mean of dependent variable	216.6	350.2	78.53	215.1	353.2	72.77	214.7	358.3	67.23

Note: The dependent variable is the literacy rate per 1,000 residents. Presbyterian is a dummy for the presence of at least one Presbyterian Church in town. We explore all the towns that are located along the border line of Hwanghae Province and the southern part of the Korean peninsula, spanning across Chungcheong, Jeolla, and Kyongsang Provinces. The numbers in the header indicate the respective distances from the border line. Standard errors, clustered at the county-level, in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

[Table A.2] Placebo test – the effect of churches on literacy in the Japanese language

VARIABLES	Dependent variable: literacy rate per 1,000 residents								
	< 75 km			< 50 km			Only locations in Hwanghae Province		
	All	Male	Female	All	Male	Female	All	Male	Female
Presbyterian	4.783***	4.139***	5.470***	4.256***	3.647**	4.905***	1.702	1.622	1.766
	(1.510)	(1.545)	(1.531)	(1.606)	(1.682)	(1.597)	(1.770)	(1.802)	(1.795)
Observations	396	396	396	276	276	276	196	196	196
R-squared	0.534	0.533	0.522	0.603	0.595	0.596	0.651	0.640	0.648
Mean of dependent variable	4.112	4.246	3.966	4.307	4.453	4.154	4.669	4.848	4.486

Note: The dependent variable is the literacy rate in the Japanese language per 1,000 residents. Official/unofficial schools from protestants also taught the Japanese language as well. But they were likely to focus more on teaching the Korean language than the Japanese language. [Table A.2] shows that if we use townships in only Hwanghae province, all effects are not statistically significant. Standard errors, clustered at the county-level, in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

[Table A.3] IV Regression Result – Presbyterian churches and Presbyterian missionaries only [Town level, Clustered Standard Errors]

VARIABLES	80 km			65 km			50 km		
	ALL	Male	Female	ALL	Male	Female	ALL	Male	Female
Panel A. Second Stage. Dependent variable: Literacy rate per 1,000 residents									
Number of Presbyterian Churches	37.130***	45.273***	31.447***	38.663***	46.330***	33.675***	41.957***	51.576***	35.509***
	(9.592)	(13.191)	(9.813)	(10.162)	(14.079)	(9.809)	(10.666)	(14.571)	(9.902)
Panel B. First Stage: Dependent variable: Number of Presbyterian churches									
Log exposure level to Presby. missionaries	0.095***	0.095***	0.095***	0.096***	0.096***	0.096***	0.087***	0.087***	0.087***
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)
Control Variable [Town & County Level]	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,276	2,274	2,275	2,276	2,274	2,275	2,276	2,274	2,275
Mean of dependent variable	206.1	338.2	70.40	206.1	338.2	70.40	206.1	338.2	70.40
Kleibergen-Paap rk Wald F statistic	38.09	38.09	38.09	37.89	37.89	37.89	33.44	33.44	33.44

Note: The dependent variable is literacy rate per 1,000 residents. The number in the top row means the distance rule missionaries, each number (80 km, 65 km, and 50 km) is maximum distance from stations that we assign the weighted (log) exposure level to missionaries. In short, towns located beyond that distance have zero value. We include all control variables that are used in OLS in section 2. Population density, market size, and the employment share outside agriculture, and distance from Seoul have a town level variation, otherwise, these control variables have a county level variation. Standard errors, clustered at the county-level, in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

[Table A.4] OLS & IV Result from County Level Data

	OLS			IV		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	All	Male	Female	All	Male	Female
Panel A. (Second Stage in IV) Dependent variable: Literacy rate per 1,000 residents						
Number of Methodist & Presbyterian Churches	1.069***	1.272***	0.965***	0.772	-0.495	2.005**
	(0.296)	(0.427)	(0.284)	(1.053)	(1.594)	(0.920)
Panel B. First stage: Dependent variable: Number of Methodist & Presbyterian Churches						
Log exposure level to missionaries				1.086***	1.086***	1.086***
				(0.293)	(0.293)	(0.293)
Control Variable	YES	YES	YES	YES	YES	YES
Province Fixed Effect	YES	YES	YES	YES	YES	YES
Observations	201	201	201	201	201	201
R-squared	0.640	0.866	-0.415	0.748	0.828	0.540
Mean of dependent variable	21.08	34.64	6.922	21.08	34.64	6.922
Kleibergen-Paap rk Wald F statistic				13.72	13.72	13.72

Note: Robust standard errors. *** p<0.01, ** p<0.05, * p<0.1. Columns 1-3 of the table display results from an Ordinary Least Squares (OLS) regression analysis, incorporating control variables including population density, market size, the share of employment outside of agriculture, and distance from Seoul. Notably, all of these control variables are characterized by county-level variation. In columns 4-6, the results from a Two-Stage Least Squares (2SLS) regression analysis are presented. In this analysis, the instrumental variable is the natural logarithm of the exposure level to missionaries. This exposure level is calculated by multiplying the number of missionaries by the duration of their stay in each county, and subsequently taking the natural logarithm of the resulting value.

[Table A.5] IV Regression Result – Applying Distance rule from County Level Data

VARIABLES	80 km			65 km			50 km		
	ALL	Male	Female	ALL	Male	Female	ALL	Male	Female
Panel A. Second Stage. Dependent variable: Literacy rate per 1,000 residents									
Number of Methodist & Presbyterian churches	1.874	2.306	1.924	1.421	1.917	1.856**	2.093**	2.385*	2.536***
	(1.893)	(2.613)	(1.640)	(1.016)	(1.510)	(0.850)	(0.977)	(1.340)	(0.876)
Panel B. First Stage. Dependent variable: Number of Methodist & Presbyterian Churches									
Log exposure level to missionaries (town level)	1.109*	1.109*	1.109*	1.309***	1.309***	1.309***	1.084***	1.084***	1.084***
	(0.604)	(0.604)	(0.604)	(0.426)	(0.426)	(0.426)	(0.325)	(0.325)	(0.325)
Control Variable [Town & County Level]	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province Fixed Effect	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	201	201	201	201	201	201	201	201	201
Mean of dependent variable	210.8	346.4	69.22	210.8	346.4	69.22	210.8	346.4	69.22
Kleibergen-Paap rk Wald F statistic	3.373	3.373	3.373	9.432	9.432	9.432	11.12	11.12	11.12

Note: The dependent variable is the literacy rate per 1,000 residents. The number in top row denotes the distance rule we apply to compute missionary exposure at the town level: 80 km, 65 km, and 50 km is the maximum distance from missionary stations within which we compute the weighted (log) exposure level to missionaries. We include all control variables that are used in OLS in section 2. Population density, market size, and the employment share outside agriculture, and distance from Seoul vary at the town level, all other variables vary at the county level. Standard errors, clustered at the county-level, in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$