

Protestant Missions in Korea —

Examining Long-Run Impacts of Comity Agreements on Education and Income

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Abstract

What long-run impacts do religious based development charities have on economic and cultural outcomes? I explore this question by using the differences in education aid by Presbyterian and Methodist missions in 20th century Korea, where Presbyterian missions established 85% of all mission schools and required conversion for attendance. Using variation in an agreement defining boundaries on Presbyterian and Methodist mission operations, I find no differences in educational attainment, household income, or Protestant affiliation across comity agreement borders when looking at the South Korean Population. However, among South Korean Protestants, I find that Protestants living in historically Presbyterian areas earn approximately 300,000 won a month more than Protestant households on the Methodist side of the comity agreement border. The difference in income is not caused by differing levels of education, as I find no difference in Protestant educational attainment across the comity agreement border in either age groups born before compulsory education or those born afterwards.

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1 Introduction and Literature Review

Modern philanthropy in the United States is largely tied to religious institutions. Giving USA (2017) estimates that 75% of all donation dollars go to religiously affiliated organizations. Scheitle (2010) reports that the second largest non-church religiously affiliated charity type are relief and development organizations. However, it is unclear what the economic and cultural long-term impacts of religiously affiliated aid organizations are, especially when the cultural intervention is successful in creating a long-term sizable population of converts. While economists such as Bryan et al. (forthcoming) explore short-term impacts through a field experiment, answering this question on a longer term horizon is complicated by several factors including location selection concerns when organizations have financial incentive to make their programs look as successful as possible. I provide a solution to these problems by examining a natural experiment in the Protestant missions to Korea. Throughout the late 19th and early 20th century, Protestant denominations sent missionaries around the world to spread Christianity and to provide aid through medical and educational interventions. Two of the main Protestant denominations, Presbyterians and Methodists both operated schools and hospitals in Korea from 1884-1940 (Matsutani, 2012). Importantly, the Presbyterians and Methodists divided Korea into non-competitive areas through a comity agreement. In examining geographic factors correlated with economic growth, I am able to demonstrate that the exact placement of the comity agreement borders are plausibly exogenous and thus am able to control for area selection concerns through a spatial regression discontinuity design.

While the mission schools schools represented some of the first formalized education systems in South Korea, The Presbyterian and Methodist missions had differing focuses on educational philosophy and magnitude of mission aid (Lee, 1989). The Presbyterians focused on extending access to education, as they established approximately 85% of all mission schools in Korea (World Missionary Conference, 1910). ¹ Classes were taught in Korean, but as a condition of attendance, required conversion to the denomination (at least in name). Given the focus on teaching in Korean, the Presbyterian schools can be viewed as expanding basic literacy and numeracy. In contrast the

¹Data available in Appendix C.

Methodists focused on providing high quality education, teaching a variety of secular subjects such as mathematics and science in English and Chinese. Importantly, Methodist schools did not require conversion to receive education (Lee 1989; Matsutani, 2012).

After years of pressure from the imperial Japanese Government, the era of missions ended in 1940, culminating in a closure of the mission schools (Matsutani, 2012; Lee, 2013). Following WWII, the United States Military Government reopened all schools and elementary education became universal through compulsory schooling (Republic of Korea Ministry of Education, 2019). This would be enshrined into law through the 1949 Education Law (Seth, 1998).

These differences pose a natural question as to what the impacts on education, income and Protestant affiliation the Presbyterian and Methodist missions had on Koreans. Specifically, did the difference in number of mission schools established lead to differential levels of household income, education, or Protestant affiliation? Furthermore, are there any differences in household income or educational attainment among South Korean Protestants?

The persistence effects from mission schools and hospitals has been extensively studied in economics. Economic historians have been able to identify several positive long-run outcomes from the presence of missionary schools and hospitals, in several regions throughout the world.² The presence of mission schools has been linked to increased the long-run education (Woodberry, 2004; Becker and Woessmann, 2009; Gallego and Woodberry, 2010; Nunn et al., 2014, Meier zu Selhausen, 2014; Catello-Climent et al., 2017; Waldinger, 2017; Valencia Caicedo, 2018). Additionally, mission presence is linked to increased urbanization and health outcomes (Bia and Kung, 2015; Calvi and Mantovanelli, 2018). Missions have also been linked to cultural changes (Nunn, 2010; Rink, 2018). Some evidence shows that missionary presence helped establish institutions for democracy in Sub-Saharan Africa; however, this evidence is subject to the specific measure of

²Interestingly, one of the most successful missions, in terms of long-term cultural impact, were the Protestant, specifically Presbyterian and Methodist, missions in Korea at the turn of the 20th century (Lee, 2009). By 1910, the Methodist and Presbyterian missions were teaching approximately 41,000 students from primary schools to colleges, at 796 schools throughout the peninsula (McCleary, 2013), representing 25% of the entirety of schools in Korea at the time (Lee, 1989). While these numbers would decline as an imperial Japanese government increasingly put pressure on mission schools (Ryu, 2007), the mission schools in Korea have left a legacy on Korean education today, as three of the top five educational institutions in Korea were founded by Protestant missionaries (Grayson, 2002).

democracy used (Woodberry, 2011; Woodberry, 2012; Cage and Rueda, 2017; Nikolova and Polansky, 2019; Henn et al., 2019). As a note of caution, Fourie and Swanepoel (2015) and Jedwab et al. (2018) both show that these effects can be overstated if the research is done based on examining locations of mission stations due to selection bias. This is because they find evidence that missions endogenously selected locations that were safer, healthier and more accessible, which overstates the benefits that missions had to a specific area.

My research responds to these selection concerns these selection concerns in using variation in a comity agreement border establishing non-competitive mission areas for Presbyterians and Methodists (Byun, 2004).³ I show that the comity agreement borders are plausibly exogenously drawn with respect to geographic factors correlated with economic growth, presenting me a natural experiment to examine the long-run impacts of the differing access to education in South Korea in a regression discontinuity approach similar to Dell (2010), Cogneau and Moradi (2014), and Dupraz (2019). In doing so, this paper provides the first mission persistence paper that uses variation generated by comity agreement borders used by a variety of 19th and 20th century missions. Additionally, this paper provides the first examination in the long-run economic impact of the Protestant missions in Korea.

Examining the South Korean population as a whole, I find no difference in educational attainment across the comity agreement border across all age cohorts, nor do I find a differential rate in Protestant affiliation. However, due to conversion requirements required to attend Presbyterian schools, it is possible that differences in Protestant household income and educational attainment persist, even when there are no differences at the national level. I find some evidence of this, with Protestants living in historically Presbyterian areas earning 300,000 won more per month compared to Protestants living in historically Methodist areas, an increase of 8.7% in average income at the mean. However, I find no difference in Protestant educational attainment across the comity agreement border in either the age cohort of individuals born prior to 1946, or those born in 1946 onward.

³Maps of the final comity agreement, along with mission station locations are available in Appendix A.

While I find evidence that modern Protestants have cultural ties back to the Christian missions, as Protestants are approximately 4% more likely to identify the United States as the nation they feel South Korea is closest to, I also find no statistical difference in likelihood of identifying as close to the United States in Protestants across the historical comity agreement border. Thus, it does not appear that cultural differences are causing a differential level in household income. Furthermore, I find no evidence that Protestants across the comity agreement border are selecting into different occupations, have differing levels of respondent income, nor do their spouses have differing levels of educational attainment or income.

In sum, my results demonstrate that long-run cultural impacts and economic outcome differences can persist from religious philanthropy, even when economic differences do not in the full population. These results contribute to the prior literature examining the persistent effects of religious mission interventions and in doing so, contribute to the literature on religious philanthropy. My results differ from much of the literature on persistence as I do not find differences in economic outcomes within the general population itself, but instead find differences in economic outcomes fully in the cultural group that grew from the mission intervention. In doing so, my research both provides a new method for examining persistence effects from religious missions and contributes to the literature exploring the impacts of culture on economic outcomes.

2 Comity in the Protestant Korean Missions

Prior to the Protestant missions arrived to Korea, Catholicism came to Korea through a convert at the Beijing mission in 1783, Yi Sung-hun (Matsutani, 2012).⁴ While efforts continued throughout the late 1700s and 1800s, by the time the first Shufeldt Treaty was written in 1882 opening the country to Americans, the Catholic presence in Korea was reduced to two mission stations in Busan and Seoul (Streit, 1913). As such, the original Presbyterian mission had to come to Korea

⁴This section provides a brief history of the Protestant Missions in Korea, focused primarily on the creation and operations of the comity agreements, as well as the difference in operational philosophy for Korean mission schools. For a more complete and thorough time line of Korean Protestant Mission events, compiled from Byun (2004), Matsutani (2012), and Lee (2013) see Appendix B.

as a "benevolent society from America" bringing hospital workers and aid instead of a religious mission due to the Korea's anti-Christian policies at the time (Matsutani, 2012; McCleary, 2013).

The first two missions that arrived were the Northern Presbyterians in 1884 and Northern Methodists in 1885. These two groups both began operations in Seoul and agreed to a principle of assisting one another while remaining independent organizations. This philosophy was largely based on the comity agreement preventing mission competition used previously in Mexican missions (Byun, 2004). By 1892, two other Presbyterian denominations arrived in Korea, creating further potential for competition between the missions. This potential for competition was squelched via the first Korean comity agreement between missions, assigning different areas to different denominations (Lee, 2013).⁵ These agreements excluded Seoul, due to its importance in establishing a mission base because of Seoul's infrastructure compared to the rest of the country (Matsutani, 2012). However, the agreement quickly became informal due to a rejection from a Methodist bishop in 1893 (Byun, 2004).

By 1906, it was clear that a true allocation of territory was necessary, so comity agreement discussions began at the General Council of Korean Missions (Byun, 2004). The final allocation of territory via comity agreement came in 1911 (Lee, 2013)⁶. It is important to note agreements were made strictly between the missions and without any thought placed into those who were being evangelized to. The Korean people were for the most part fine with the changing of religious denominations and did not fight the abrupt changes after some initial opposition (Matsutani, 2012). Even with external political events such as the annexation of Korea by Japan in 1910 and the March for Independence in 1919, the Korean missions continued operating with the comity agreement into the late 1930s, when the comity agreement was abandoned (Matsutani, 2012). The era of missions officially ended in 1940, with the Japanese government forcing the missionaries to leave (Matsutani, 2012). However, Protestantism lived on and grew, particularly in South Korea where

⁵This agreement operated under the following rules: joint occupation of open ports and cities, field operations available to only one society, new societies go to unoccupied territory, no "stealing of sheep," which translated to no accepting Korean members of other mission societies, mutual respect of denomination discipline, books sold at the same price, only one general hospital established per city (Byun, 2004).

⁶This map can be found in Figure 10 in Appendix A.

the proportion of South Koreans identifying as Protestant increased from 2% in 1945 to over 18% by 2000 (Baker, 2006; The Economist, 2014).

3 Schooling in 1880s-1940s South Korea

While nearly all missions from the 1880s onward came to Korea and set up some form of school, the school quality and type varied across denominations (Matsutani, 2012). Presbyterian schools were founded on the principles of providing “the gospel for heathens and educations for Christians” (William Baird quoted in Matsutani, 2012). This philosophy resulted in Presbyterian schools requiring conversion to receive schooling and a policy to limit teaching primarily to Bible study in the student’s native language. Doing so potentially limited economic opportunities for high ability students. In Seoul, where students had multiple options for schooling, top students actively avoided Presbyterian mission schools (Matsutani, 2012). Conversely, the Methodist mission schools were opened to be educational institutions and provide high quality education to the Korean people (Matsutani, 2012). These schools admitted anyone, not just professed Christians. The Methodist schools, in addition to Bible study, taught English, Chinese and other secular education topics such as math and science (Matsutani, 2012).

Despite their differences in priority, these schools represent some of the earliest formal schooling in Korea (Matsutani, 2012). At the time, Korea had no formal education system, with non-mission school opportunities consisting primarily of *seodangs* (village schools) and some Korean government schools (Lee, 1989; Kittich, 2014). By 1910, mission schools represented 25% of all schools in Korea, and some of the only Western quality schools in the country (Lee, 1989). The majority of these schools were Presbyterian, as Presbyterian missions established approximately 85% of the 796 schools created by missions (World Missionary Conference, 1910; McCleary, 2013). However, as time continued onward and the Korean government became controlled by the Japanese, this exclusivity and number of schools began to diminish (Ryu, 2007). By the 1910s, the Japanese government had set up public schools throughout Korea. However, a fully universal

school system would not be set up until the 1940s, started by the United States Military Government and enshrined through the Education Law of 1949 (Kim, 1982; Seth, 1998; Lee, 2006; Republic of Korea Ministry of Education, 2019). Furthermore, the 1911 Educational Ordinance banned the teaching of religion to be taught in grades higher than middle school, giving the mission schools 10 years to comply (Matsutani, 2012). By 1920, the Japanese government reversed their stance on religious teachings in schools; however, the government remained hostile towards the presence of mission schools. This resulted in Presbyterian missions closing all their mission schools in 1937 (Lee, 2013). The Methodist schools were not far behind, as they closed in 1940 with the removal of Protestant missions by the Korean government (Matsutani, 2012).

The mission schools were not closed for long in South Korea. After defeating Japan in late 1945, the United States Military Government assumed control of Korea south of the 38th parallel, where they immediately reopened all schools in South Korea and instituted compulsory elementary education (Kim, 1982; Lee, 2006). Additionally, the United States offered large sums of foreign aid to help the process of reopening the school system in South Korea, in attempts to help plant the seeds of an American style democracy (Lee, 2006). After the United States Military Government exited South Korea in 1948, the country established a centralized education system, controlled by the Ministry of Education in the Education Law of 1949 (Seth, 1998). The education law maintained universal access to elementary education, even through the Korean War (Republic of Korea Ministry of Education, 2019). Through governmental change, the South Korean government has only increased the levels of compulsory education through ninth grade (Mani, 2018), and has increasingly centralized the school system's curriculum (Republic of Korea Ministry of Education, 2019). The centralization efforts has gone to the extent that religious schools are nearly identical to public schools today (Ryu, 2007).

4 Data

4.1 Historical Mission Data

To understand the long-run impacts of Protestant missions on household income, educational attainment and religious affiliation, I draw from a variety of sources. The final comity agreement map comes from the Presbyterian reference book "History of the Korea Mission" (Rhodes and Campbell, 1934).⁷ Additionally, I use two different sources to plot mission stations. For Protestant missions, I use the Statistical Atlas of Christian Missions (World Missionary Conference, 1910), while for Catholic mission stations, I use the Atlas Hierarchicus (Streit, 1913).⁸ While important to note from a historical perspective, many mission schools existed outside of the mission station (Matsutani, 2012; Lee, 2013). So while they are useful proxies to see where each denominational and sub denominational effort existed at the time, the mission station itself does not identify whether or not a school existed in the province or municipal district.

I highlight the 1911 comity agreement borders with the presence of Catholic and Protestant mission stations in Figure 1. My respondent data is completely from South Korea. As the education and overall mission philosophies of the sub-denominations of both the Methodist and Presbyterian missions are quite similar (Matsutani, 2012), I only consider the borders separating Methodist and Presbyterian denominations as reflected in Figures 2 and 3. Figure 2 demonstrates assignment into Presbyterian and Methodist districts by geographic center.⁹ Conversely, Figure 3 highlights the districts and provinces separated by the comity agreement border between Methodist and Presbyterian missions.

4.2 Geographic Data

Due to limited availability of historic data from Korea, I use geographic and topographical data to assess the exogeneity of the comity agreement boundary. The data from this exercise come

⁷This base map is included in Figure 10 in Appendix A

⁸These base maps are included in Figures 11 and 12 in Appendix A

⁹Additionally, assignment by province geographic center is included for robustness analysis.

from the following sources. First, administrative municipal district level location data comes from GADM (2019). Inland water data comes from the Digital Chart of the World (1992). Land coverage data comes from the Global Land Cover 2000 project (2019). Finally, crop suitability data for white potatoes and cereal grains come from the Food and Agriculture Organization (FAO) (2019) Global Agro-Ecological Zones project.¹⁰ The index chosen for both crops were high input, rain fed grains to best reflect a nation that was a lower technology nation with a high portion of their labor force in agriculture. White potatoes and cereal grains were chosen as rice and potatoes are the two most prevalent crops in South Korea according to the FAO (2019).

4.3 Population Data

Due to lack of population data access at the time of the Protestant missions, I use a contemporary dataset, the Korean General Social Survey (KGSS) to examine contemporary household income, as well as educational attainment and Protestant affiliation by comity agreement area over age cohorts. This approach cannot determine if individuals move over time; however, it does give me an advantage in terms of looking at changes in educational attainment in South Korea over time. I use the 2006-2012 waves of the KGSS (Kim, 2006-2012), as this is the entirety of the data available through ICPSR with unbinned income data and educational data separating masters and doctoral degrees.

In all cases, data not reported are coded as missing. Additionally, all observations from Seoul are dropped due to its exclusion from the comity agreement, leaving 8,616 observations. A final data change occurred in the level educational attainment. Of the 8,613 individuals who chose to respond to the educational attainment question, 27 of those respondents chose "other," which KGSS specifically lists Seodang¹¹ schools as an example. These individuals are dropped from my analysis. The above changes leaves me with 8,589 observations for analysis. Location data is reported at the municipal district level. Approximately three quarters of my observations live in

¹⁰Nunn and Qian (2011) similarly use FAO crop suitability data as a proxy for economic activity.

¹¹Historically, these were village elementary schools focused on providing studying of Chinese classics, and in present are low-level academies or something done in addition to traditional schooling (Park et al., 2002).

historically Presbyterian areas. Because the KGSS only collects data as to whether or not an individual is Protestant and not the specific denomination, I cannot separate Protestants respondents by denomination.

As the KGSS educational attainment data is categorical data, I construct a measure for years of education to better represent educational attainment. I do so by mapping the years of education following the Korean education system. The system originated under Japanese rule, and was formally adopted formally by the formal Korean education system in 1946 as a “6-3-3” system with six years of primary school, three years of middle school and three years of high school (Seth, 1998; Ryu, 2007). This system is maintained today, along with two years post secondary education for associate degree work, four years for undergraduate work, and an additional two years for masters level work and five years (from undergrad) for doctoral level work (Republic of Korea Ministry of Education, 2019; National Center on Education and the Economy, 2019).¹² As such, I assign corresponding years based on the number required to complete the highest level of degree attained. Since the KGSS does collect information about whether or not a respondent graduated, I lower the educational attainment of those individuals who do not graduate by one category to ensure that my results are not driven by any type of systematic attendance and non-competition of degree.

KGSS summary statistics are listed in Table 1. Household income, home population and age are taken directly from the KGSS. The variables protestant, married, and female are all binaries generated from respondents answering as such. When comparing respondents across the comity agreement border, the only demographic differences are respondents in Methodist areas 4.8% more likely to be Protestant, and respondents in Presbyterian areas are 2.2% more likely to be female. All other demographic characteristics are balanced across the full sample.

¹²The entire system is demonstrated in Figure 4

5 Exogeneity of the Comity Agreement Border

Based on the comity agreement process described in Byun (2004) and Matsutani (2012), it appears from a historical perspective, the assignment of comity agreement borders were done with endogenous selection from the perspective of the missions themselves. However, based on the historical record, it also appears that these borders were drawn in such a manner that they were exogenous shocks to the Koreans they affected.

Comity agreement borders are displayed in Figures 1 - 3. Examining Figures 2 and 3 reveal that the Methodist and Presbyterian areas in the comity agreement cut across the majority of the northern provinces and metropolitan districts of South Korea. As such, it can be hard to cleanly identify which Protestant affiliation a Province should be assigned to. For the purposes of this paper, I assign affiliation based upon the geographic center of respondent municipal district.¹³ Therefore, I use municipal district level variation. As Seoul was excluded from the comity agreement, those districts are excluded in my analysis (Rhodes and Campbell, 1934; Byun, 2004; Matsutani, 2012; Lee, 2013).

Table 2 examines geographic characteristics. The data was constructed as follows: river mileage, water area, and inland water perimeter not associated with rivers are all based on aggregates from within a municipal district. Conversely, elevation, land coverage, as well as potato and cereal grain suitability indices are based upon averages within the district. For the purposes of comparing Presbyterian and Methodist areas, I utilize difference in means testing similar to Dinkelman (2011). The first three columns in Table 2 compare across all of South Korea, while the second three columns examine only those border districts intersecting the comity agreement border, highlighted in Figure 3.

Comparing across the entirety of South Korea, and Presbyterians set up their missions in areas with less access to rivers, at a lower altitude, and with greater land coverage. Given the economic literature on importance to river access, as well as potential differences in crop suitability, it is pos-

¹³A dataset used for robustness uses Province level variation, and subjects are assigned based on geographic center of respondent province.

sible for some selection upon observables to be going on at a national level. Thus, I turn to comparisons at the mean in border districts. Here, I find no significant differences in any geographic variable, with the exception of land coverage. While arguments that economic differences stemming from land coverage difference can still be made, this environment provides a much stronger case that Methodist and Presbyterian areas are not significantly different at their comity agreement borders, in terms of geographic factors that could impact growth and the demand for skills.¹⁴

There are two final unobservables that I must assume is consistent across the comity agreement border. These are the movement of individuals between the end of the mission comity agreement and in access to non-mission school substitutes for education at the time of the intervention. A systematic imbalance of either of these threats that happen to align with the comity agreement border would render all analysis meaningless. I find no historical evidence that substitutes from mission school education were more prevalent to any denomination within the comity agreement. Additionally, while migration within the country did take place during the Korean War (CIA, 1954; Trewartha and Zelinsky, 1955), it appears many individuals end up settling near Seoul, which is dropped from my analysis (Kwon et al., 1975). I have found no evidence indicating a permanent out-migration from Seoul or the surrounding areas, including Korean War movement. Therefore, thus far, I have found no economic or historical evidence contradicting these assumptions; however, these potential problems do remain as threats to my analysis.

¹⁴Even with these variables controlled for and examined, a skeptical reader may wonder if either economic or population variables were systematically different near the comity agreement border at the time of passage. However, the historical record shows that this likely was not the case. While cities such as Busan have grown, Seoul was and still is the major metropolitan city in the Southern Korea at the time of the comity agreement. Additionally, the Korean economy at the time of the comity agreement signing was largely a Malthusian agricultural economy (Cha, 2019) and largely closed off from the rest of the world outside of China and Japan prior to Japan forcing Korea to end its tributary relationship with China in 1876 (Cho and Kim, 1991; Lin, 2009; Patterson and Choi, 2009). While Korea did begin receiving more international interest, the country's main international focus remained on the power struggle of influence in the nation between China and Japan (Patterson and Choi, 2009). This is not to say no outside economic activity occurred, as trilateral trade between China, Korea and Japan did occur in the late 1800s (Sun-min, 2011). Additionally, some mineral and precious metal deposits including gold, iron ore and coal had been discovered by this time period. Unfortunately, the Korean people did not have access to the economic benefits of these natural resources as government policy did not allow citizens to mine for private benefit (Longford, 1911). Given these restrictions and recognizing that the comity agreement borders are either surrounding Seoul, or in more rural areas, it appears likely that the underlying characteristics of provinces, municipal districts, and people were similar across the comity border.

6 Regression Discontinuity in Distance to Comity Border

The establishment of plausibly exogenous variation in the comity agreement border is essential, as simple OLS regression estimates on my outcome variables of interest are potentially biased due to underlying selection effects drawing respondents to Presbyterian or Methodist areas independent of their mission work. Therefore, in order to use the plausibly exogenous variation in areas separated by the comity agreement border, I propose a regression discontinuity design, similar to Dell (2010), Cogneau and Moradi (2014) and Dupraz (2019). However, unlike Dell (2010), I use a straight line distance to the comity border, rather than longitudinal and latitudinal variation. This is due to both the stark contrast in the magnitude of educational aid, as well as the nature of the missionaries trying to spread evangelizing across South Korea as rapidly as possible (Byun, 2004; Matsutani, 2012; Lee, 1989). As such, my regression discontinuity takes the following form:

$$y_{i,d} = \alpha_{i,d} + \beta presbyterian_d + f(dist_d) + X_i\Lambda + X_d\Gamma + \epsilon_{i,d}$$

Here, $y_{i,d}$ represent the outcomes of interest in household income, years of education and an indicator variable for protestant affiliation for individual i in municipal district d , $presbyterian_d$ represents an indicator for respondents in districts within historically Presbyterian comity areas, and $f(dist_d)$ represents a function of distance from the municipal district geographic center to the nearest intersection of the comity agreement border. Additionally, X_i represents a matrix of individual characteristics controls including binaries for female respondents and married respondents, along with respondent age and home population. Similarly, X_d represent district geographic characteristics including latitude and longitude of district geographic center, total river mileage, inland water area and perimeter, along with average elevation, land coverage, cereal grain and potato suitability indices. Finally, $\epsilon_{i,d}$ represent standard errors robust to heteroskedasticity and clustered at the municipal district level. Across all outcomes, the coefficient of interest is β , identifying the difference in average household income, average educational attainment and rate of protestant affiliation between historically Presbyterian districts from Methodist districts.

Depending upon the outcome variable examined, I either pool all observations of the KGSS together or separate them based upon age of the respondent. Given the age of mission treated individuals and the fact that income is a flow variable, I do not partition household income results, but rather use the entirety of the data available. However, years of schooling is a stock variable, allowing me the opportunity to look at Korean the years of schooling attained by Koreans born prior to the introduction of compulsory elementary education in 1946. As such, for years of schooling, I partition the data into individuals who were born prior to 1946 compared to those born in all following years. Additionally, while religious affiliation is not a traditional stock variable, research has shown it is also not particularly fluid, especially as an individual ages (Pew Research Center, 2011). Therefore, I use the same partitioning for measuring rates of Christian affiliation to those born either under the comity agreement or one generation after abandonment compared to those who grew up well after the comity agreement was abandoned.

My identification strategy rests on the following assumptions. The first is that unobservable characteristics that could influence outcome variables vary smoothly across the comity agreement border. As discussed in the previous section, I do not have data to test this variation from the time of the comity agreement; however, I can use geographic data to demonstrate that observable characteristics predictive of growth and output do vary smoothly in districts that intersect the comity agreement border. Additionally, there is no historical evidence that the borders were drawn in such a way to have selection on individual Korean characteristics. The second assumption rests on the functional form of the discontinuity. Due to the small number of observations within the KGSS, and the lack of exact geographic location data due to using municipal district geographic centers rather than exact addresses of respondents, I use a global parametric regression discontinuity with linear, quadratic and cubic measures of distance to the comity agreement border. For robustness, I include measures using a local linear regression with a uniform kernel, the same functions of distance, and cutoffs at 100 KM, 50 KM, 25 KM and an mean square error estimated optimal distance cutoff (Calonico et al., 2014).

With my regression discontinuity design, I have to assume that once the agreement's borders

were drawn, there was no sorting by individual Koreans into missions across the comity agreement border. I again must turn to the historical record, where the comity agreements were founded upon the principle of "no stealing of sheep" and would not provide missionary services to Koreans who had membership roles at another mission (Byun, 2004). Therefore, while I cannot test this assumption with the data, the historical record does not present evidence showing a violation of this assumption. As a final assumption note, for my main results, I report assuming the same slope in distance assigned to either side of the comity agreement border; however, I do relax this assumption in the robustness section.

7 Results

The results of my global regression discontinuity design are listed in Tables 3 - 5, with robustness plots of designs with distance cutoffs included in Figures 5 - 7. Beginning with household income results in Table 3, there does not appear to be any difference in household income between Koreans living on the Presbyterian side of the comity agreement border compared to Koreans living on the Methodist side of the comity agreement border. Examining the distance cutoffs in Figure 5, results restricted to 100 km cutoff indicate an approximate 200,000 won monthly higher income in historically Presbyterian districts; however, this relationship does not hold across any other distance specification. As such, there is little evidence to support differential household incomes between districts in historically Methodist comity areas compared to historically Presbyterian comity areas.

Turning to years of education in Table 4, I again find no statistical difference in years of education between districts in historically Methodist areas compared to historically Presbyterian areas. This lack of a difference holds in the partitioned samples born prior to 1946, as well as those individuals who were born in 1946 onward. Furthermore, Figure 6 demonstrates that no difference in educational attainment exists between the two districts regardless of distance cutoff.

Finally, examining rates of Protestant affiliation for South Korea as a whole in Table 5, I find

no differential rate of Protestant affiliation between the historical comity areas for individuals born before 1946 or individuals born in 1946 onward. According to Figure 7, this holds true regardless of distance specification for Koreans born prior to 1946. Thus, while raw data from the missions themselves show that Presbyterians converted Koreans at a higher rate than Methodists, I do not find that to be the case looking strictly at South Korea. For Koreans born after 1946, Figure 7 does demonstrate that there is an approximate 5-7% higher likelihood of being Protestant if an individual is living in district that was in a historically Methodist comity area within 25 km to the comity agreement border; however, this result does not hold expanding any further out from this distance cutoff.

8 Protestant Income and Educational Attainment

Due to Protestant missions of all denominations using education as a tool for either explicit or implicit evangelizing, a reasonable question is whether or not Protestant affiliated individuals have higher levels of education than their non-Protestant affiliated counterparts, and, if so, whether or not this difference in education translates into higher levels of income. Given the fact that Presbyterian missions required conversion before admission into their schools and that Presbyterians established far more mission schools than Methodists, a reasonable hypothesis is that Protestants were more likely to have a higher level of educational attainment than their non-Protestant counterparts, at least those on the Presbyterian side of the comity agreement border. It is unclear how universal education would impact the relationship between affiliation and education, and it is also unclear whether or not this relationship would hold as the Protestant population increased over time.

To test these relationships, I modify my regression discontinuity strategy to the following form:

$$y_{i,d} = \alpha_{i,d} + \beta \text{presbyterian}_d + \phi \text{protestant}_{i,d} + \theta (\text{presbyterian}_d * \text{protestant}_{i,d}) + f(\text{dist}_d) + X_i \Lambda + X_d \Gamma + \epsilon_{i,d}$$

Here, $y_{i,d}$ will only be household income and years of education, $\text{protestant}_{i,d}$ represents an

indicator variable for Protestant respondents and $(presbyterian_d * protestant_{i,d})$ represents an interaction between historically Presbyterian municipal districts and Protestant respondents. All other variables and specifications are the same as in my RD. As with the baseline analysis, I include robustness plots for distance restrictions.

Additionally, for further robustness, I run analysis using OLS over two differing specifications. The first mirrors my regression discontinuity strategy with the exception of removing the function of distance to the comity agreement border, while the second replaces the geographic characteristics used in the regression discontinuity with municipal district fixed effects. For this second equation, I will not have estimation results for the Protestant districts. The coefficient of interest for these regressions is θ identifying the difference in outcomes between Protestant respondents across the comity agreement border.

8.1 Results

Results on analysis over Protestants by comity area are reported in Tables 6 - 8. Additionally, results with distance cutoffs are reported in Figures 8 and 9. Beginning with household income in Table 6, I find that Protestants in historically Presbyterian areas earn approximately 300,000 won more per month compared to Protestants in historically Methodist areas, representing an 8.77% higher household income at the mean. The graphs in Figure 8 show that these results are robust to distance cutoffs.

Turning to years of education for individuals born prior to compulsory education in Table 7, despite Presbyterians establishing 85% of mission schools and requiring conversion to receive education, I find no difference in educational attainment for Protestants respondents across the comity agreement border. The lack of difference extends to today. Looking at respondents born in 1946 onward in Table 8, I find no difference in educational attainment across the comity agreement border for either Protestants or non-Protestants. Figure 9 plots each of these results across a variety of distance restrictions, revealing that the results do not change with distance restrictions.

8.2 Mechanisms

My results indicate that Protestants have a differential level of household income across the comity agreement border. However, I find no differences in levels of education between Protestants across the comity agreement border. Table 9 presents several potential candidates to explain why this could be the case using my regression discontinuity approach. All results reported are those from a first order polynomial in distance; however, second and third order polynomials produce similar results.

The first mechanism establishes a cultural tie from Protestants today back to the cultural mission through a question on the KGSS asking respondents to identify the nation that they felt South Korea is closest to, with the United States representing the only nation sending Protestant missions available for selection.¹⁵ I find was no difference between non-Protestants in historically Presbyterian and historically Methodist areas; however, Protestants overall were Presbyterian areas were 4.4% more likely to respond that they felt closest to the United States, with a nationwide average of 59.8% of respondents selecting the US. As such, I find evidence that Protestants in Korea today have cultural ties back to the early churches established by the Protestant missions, but this cultural tie does not explain the differences in household income levels.

Next, I examine types of occupation held by Protestant and non-Protestant respondents. I construct binaries for professional occupations and office jobs.¹⁶ Respondent monthly income show that these occupations earn on average 1.399 million won more per month than non-office jobs for professional occupations and 220,000 won more per month than non-office jobs for office workers. For either classification of job, there is no difference between likelihood of holding an office job or professional job for non-Protestant respondents on either side of the comity agreement border.

I then break down spousal and respondent income to determine if these individual components are driving the difference in household income. It is important to note that the observations for respondent income variable are about half the size of those used throughout this paper, so there

¹⁵The other options include: Japan, North Korea, China and Russia.

¹⁶I construct these indicators for jobs with occupation codes from the KGSS between 1000 and 4000 for professional occupations and 1000 and 5000 for office jobs.

is potential selection biases in reporting. However, based on the observations in the KGSS, I find no difference in either spousal income or respondent income across the comity agreement border. Finally, I examine the spousal education levels to see if there are any differentials here that could potentially explain a lower level of household income; however, I find no difference in spousal educational attainment across the comity agreement border for either age cohort.

9 Robustness

9.1 Variation in Comity Agreement Area Slope

To ensure that my results are not driven by the assumption that the distance slope across the Methodist and Presbyterian comity areas are the same, I relax this assumption allowing for variability in comity area slope. The results are listed in Appendix D in Figures 15 through 19. None of my results change by relaxing this assumption, indicating that my results are not driven by the assumption of equal comity area slopes.

9.2 KLoSA Data

As the KGSS data used in this paper was collected 60 years after mission interventions ended and was collected to be a representative sample of the adult population in Korea, I am left with approximately 1,500 respondents old enough to have been possibly treated by the missions. In order to expand this age group, I use the the 2006 wave of the Korean Longitudinal Study of Aging (KLoSA), conducted by the Korean Employment Information Service. The data allow me to analyze a broader population of individuals growing up in the era of mission schools, along with the first generations educated under universal elementary education. Of the 10,254 original respondents, I drop all individuals from Seoul, as well as five respondents who report their educational background as “other” bringing my dataset down to 8,486 observations. In all cases where data is not reported, it is treated as missing. Given the age group of these respondents, many of this

sample are not working due to retirement and do not report an income. As such, I do not examine modern household income variables in the KLoSA data.

Summary statistics and results are reported in Appendix E. Table 11 lists summary statistics from the KLoSA. The educational attainment variable is constructed in a similar manner to the KGSS by assigning years of education to the categorical response. Unlike the KGSS, I do not have data on who graduated and who did not, so all respondents are treated as if they graduated from the level of education indicated in the KLoSA. Protestant, married, female, and working variables are all binary variables generated from survey responses. The number of children and age of the respondent both come directly from the KLoSA. Location data is reported at the province level, rather than the district level in the KGSS, and respondents are assigned into Methodist and Presbyterian provinces based upon Province geographic center. In the raw data, educational attainment is approximately two fifths of a year higher in historically Presbyterian areas, and the population is approximately half a year older in historically Methodist areas. All other variables are balanced across the historical comity areas.

I follow the same global parametric regression discontinuity strategy as outlined for the KGSS data by first comparing educational attainment and Protestant affiliation rates of respondents in Presbyterian and Methodist areas as a whole, before adding indicator variables for Protestants in Presbyterian provinces and Protestants in Methodist provinces to the education analysis. This includes partitioning the data for my results of interest in years of educational attainment and Protestant affiliation. The only change is in using province level geographic data and clustering. As this only leaves me with 14 clusters, I only use the global strategy and do not include local linear restrictions. Additionally, I use wild boot-strapped standard errors to correct for the small number of clusters (Roodman et al., 2019).

Results for educational attainment and Protestant affiliation are listed across Tables 12 - 15 in Appendix E. Examining the comparisons of all respondents in a given Province in Tables 12 and 13, the results mirror the results from the KGSS, showing no difference in levels of educational attainment or Protestant affiliation across the comity agreement border for respondents either born

before or after the creation of South Korea in 1946. Turning to analysis separating Protestants with respondents born prior to 1946 in Table 14, despite having a larger sub sample to analyze, I find no differential level of education between Protestants across the comity agreement border. This extends into examining respondents born in 1946 Table 15, where I again find no difference in level of educational attainment by Protestants across the comity agreement border.

9.3 Spatial Autocorrelation

Kelly (2019) demonstrates the importance in testing for and controlling for spatial autocorrelation. Table 10 contains Moran's I estimates for the presence of spatial autocorrelation in my main results separating Protestant respondents. Every result significantly rejects the null hypothesis for no spatial autocorrelation with a Z-Score between 4.424 and 11.624. To ensure that my results are not driven by this spatial autocorrelation, I re-run my analysis using standard errors robust to arbitrary spatial correlation with a 15 km cutoff (Colella et al., 2019)¹⁷ These results are listed in Appendix F in Table 16 and demonstrate that my results are robust to arbitrary autocorrelation. Additionally, as suggested by Kelly (2019) I fit my models to spatial noise and add in latitude and longitudinal noise to my results. Table 17 demonstrates that there is no differential treatment effect for Protestants across the comity agreement border in terms of spatial noise. Furthermore, Tables 18 - 20 demonstrate that none of my results change with the inclusion of spatial noise.

10 Discussion

My results indicate that the larger presence of Presbyterian educational and health missions did not result in long-run increased earnings in historically Presbyterian comity areas. Nor did the higher mission presence result in higher levels of education, nor a higher amount of Protestants in either the age cohort closest to mission treatment or in the age cohort following. As such, I find no evidence that the magnitude of activities by the missionaries significantly impacted the

¹⁷I additionally run standard errors with a 30 km cutoff which does not change my results.

education, income and percent of the country identifying as Protestant as a whole. However, this lack of a result could stem from a variety of reasons all caused by the 60 year gap between the end of missions and collection of my data. These reasons include widespread displacement through the Korean War, a systematic governmental effort to invest in a national education system, and the explosion of growth in Protestant Christianity in Korea after the Korean War. This work on the transition time between the missions to today is left for future research.

The lack of nation wide results do not mean that the missions did not have an impact on Korean education or culture as demonstrated by Korean Protestants being over 4% more likely to identify as that South Korea as a country was closest to the United States, the nation that provided the largest number of missions and mission aid, as well as the only Protestant missionary country available for selection by the KGSS. Therefore, I find evidence that Protestant Christianity in Korea can culturally trace its roots back to the Protestant missions. However, I find no difference in likelihood to identify the United States as close to South Korea across comity agreement borders when looking at the Protestant population. Thus, these cultural roots do not explain the differences in economic outcomes when separating Protestants from the rest of the South Korean population.

I find that despite having no differential in likelihood of selecting a higher paying occupation, nor differences in levels of education, Protestants in historically Presbyterian areas earn 300,000 won more per month as a household than Protestants in historically Methodist areas. This despite respondent income, along with spousal income and education having no statistical difference in magnitude across the comity agreement border. Additionally, as mentioned in the previous paragraph, cultural differences also do not appear to explain the difference in household income levels. Further research is needed to explain the persistence of difference in household incomes across the comity agreement border when it is not present within the general population.

The Protestant missions to Korea demonstrate important lessons in examining religious based philanthropy today. As shown in Bryan et al. (forthcoming), conversionary missions offering education and health interventions continue into present day. Furthermore, Scheitle (2010) reports that development charities are the second largest type of religious charity excluding churches, and

Giving USA (2017) reports that combining direct and indirect religious giving in the United States represent 75% of all charitable giving. Through analyzing the long-run impact of Protestant missions in South Korea, I demonstrate that changes in access to educational aid initiated by missions can result in lasting impacts on economic outcomes.

11 Conclusion

This paper analyzes the long-run impact that Protestant mission schools had on South Korean household income, rates of Protestant affiliation, and years of education. The Protestant missions provide a useful historical example of a group of organizations using charitable aid in schooling and hospitals as a mechanism to help provide cultural changes in the form of converting individuals to Protestant Christianity, a practice that still persists in the charity world today (Bryan et al., forthcoming). Thus, the missions provide a unique opportunity to examine the long-run economic and cultural impacts that stem from tying charitable aid and cultural institutions together. In using plausibly exogenous borders drawn between Methodist and Presbyterian missions, I am able to determine if the higher magnitude of aid provided by Presbyterian missions translated into a wealthier, more educated, more Protestant populous in historically Presbyterian comity areas. Additionally, this variation allows me to determine what cultural effects persist in Korean Protestants today and how that persistence translates into economic outcomes.

When examining South Korea as a whole, I find little evidence to suggest that household income levels differ on either side of the comity agreement border. Additionally, when partitioning my sample into respondents born prior to compulsory education and those born in the era of compulsory education, I find no differences in education levels or rates of Protestant affiliation between historically Methodist comity areas and historically Presbyterian comity areas. While I cannot rule out that this lack of effect is caused by societal changes between the end of Protestant missions and the date of data collection, I can definitively say that the magnitude of difference in mission size between Presbyterian and Methodist missions did not translate into persistent differential outcomes

in South Korea among the general population.

This is not the case in examining Protestants, as Protestant households in historically Presbyterian areas earn 300,000 won more per month than Protestant households in historically Methodist areas. Conversely, I find no difference in the educational attainment in Protestants on either side of the comity agreement border, in either age cohort. There is evidence that modern Protestantism in South Korea today stems culturally from the missions as Korean Protestants are approximately 4% more likely than non-Protestants to identify the United States as the country South Korea is most like, with this answer being selected 59.8% of the time at the mean; however, I find no differential rate in identification among Protestants across the comity agreement border, meaning this cultural difference does not explain the differences in household income levels among Protestants. Furthermore, occupation selection, respondent income and spousal education and income do not explain for the differences in household income among Protestants.

In sum, I find that charitable aid tied to cultural institutions can lead to lasting cultural and economic impacts, even if the economic outcomes of the nation as a whole are not impacted. This finding is crucial in understanding the impact that religious relief and development organizations have long after leaving their philanthropic work has been completed, especially given the size and scope of religious philanthropy in the United States. Relief and development organizations are the second largest type of religious non-church charity, and nearly 75% of all charitable giving dollars in the United States goes to a religiously affiliated charitable organization (Shietle, 2010; Giving USA, 2017). My paper highlights the potential cultural impacts from the magnitude of this level of public good provided by religious institutions. Finally, this paper also raises questions about transitory effects the missions had on economic and cultural outcomes between 1940 and 2006, as well as digging deeper into the cultural mechanisms driving the behaviors of Korean Protestants, which I look forward to exploring in future research.

References

- [1] Baker, D. Chapter 13: Sibling Rivalry in Twentieth-Century Korea. Comparing Growth Rates of Catholic and Protestant Communities, in: Buswell, R. E., & Lee, T. S. (2006). Christianity in Korea. Honolulu: University of Hawaii Press.
- [2] Bryan, G. T., Choi, J. J., & Karlan, D. (Forthcoming). Randomizing Religion: The Impact of Protestant Evangelism on Economic Outcomes. *The Quarterly Journal of Economics*
- [3] Becker, S. O., & Woessmann, L. (2009). Was Weber wrong? A human capital theory of Protestant economic history. *The Quarterly Journal of Economics*, 124(2), 531-596.
- [4] Bai, Y., & Kung, J. K. S. (2015). Diffusing knowledge while spreading God's message: Protestantism and economic prosperity in China, 1840–1920. *Journal of the European Economic Association*, 13(4), 669-698.
- [5] Byun, C. U. (2004). Comity agreements between missions in Korea from 1884 to 1910: The ambiguities of ecumenicity and denominationalism.
- [6] Cagé, J., & Rueda, V. The devil is in the detail: Christian missions' heterogeneous effects on development in sub-Saharan Africa. *The Long Economic and Political Shadow of History*, Volume 2. VOX.
- [7] Calvi, R., & Mantovanelli, F. G. (2018). Long-term effects of access to health care: Medical missions in colonial India. *Journal of Development Economics*, 135, 285-303.
- [8] Calonico, S., Cattaneo, M. D., & Titiunik, R. (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica*, 82(6), 2295-2326.
- [9] Castelló-Climent, A., Chaudhary, L., & Mukhopadhyay, A. (2017). Higher Education and Prosperity: From Catholic Missionaries to Luminosity in India. *The Economic Journal*.
- [10] Cha, M. S. (2019). The Economic History of Korea. Hosted by Economic History.net, by the Economic History Association.

- [11] Cho, L. J., & Kim, Y. H. (1991). Economic development in the Republic of Korea: a policy perspective. Honolulu, Hawaii: East-West Center.
- [12] Choi, H., Kim, K. H., Park, J. (2006). Korean Longitudinal Study of Aging. Korea Employment Information Service.
- [13] Central Intelligence Agency. (1954). Population and Manpower of Korea. Report Issued: September 13, 1954.
- [14] Cogneau, D., & Moradi, A. (2014). Borders that divide: Education and religion in Ghana and Togo since colonial times. *The Journal of Economic History*, 74(3), 694-729.
- [15] Connor, P. (2014). "6 Facts about South Korea's Growing Christian Population." Pew Research Center. Publish date: August 12, 2014.
- [16] Colella, F., Lalivé, R., Sakalli, S. O., & Thoenig, M. (2019). Inference with arbitrary clustering.
- [17] Conley, Timothy G. "GMM estimation with cross sectional dependence." *Journal of econometrics* 92, no. 1 (1999): 1-45.
- [18] Consortium for Spatial Information. (2019). STRM Elevation Data.
- [19] Dell, M. (2010). The persistent effects of Peru's mining mita. *Econometrica*, 78(6), 1863-1903.
- [20] Digital Chart of the World. (1992). Road, Rail, Inland Water and River GIS Data for South Korea.
- [21] Dinkelman, T. (2011). The effects of rural electrification on employment: New evidence from South Africa. *American Economic Review*, 101(7), 3078-3108.
- [22] Dupraz, Y. (2019). French and british colonial legacies in education: Evidence from the partition of cameroon. *The Journal of Economic History*, 79(3), 628-668.

- [23] The Economist. (2014). Why South Korea is so distinctively Christian. *The Economist Explains*, August 13th, 2014 Issue. The Economist Magazine.
- [24] Food and Agriculture Organization of the United Nations. (2019). Republic of Korea: Geography, Climate and Population.
- [25] Food and Agriculture Organization of the United Nations. (2019). Global Agro-Ecological Zones.
- [26] Fourie, J., & Swanepoel, C. (2015). When selection trumps persistence: The lasting effect of missionary education in South Africa.
- [27] GADM Database. (2019). South Korea Administrative Data. Hosted by University of California, Davis.
- [28] Gallego, F. A., & Woodberry, R. (2010). Christian missionaries and education in former African colonies: How competition mattered. *Journal of African Economies*, 19(3), 294-329.
- [29] Giving USA, (2017). See the numbers - Giving USA 2017 Infographic. The Giving Institute.
- [30] Grayson, J. (2002). *Korea - A Religious History*. London: Routledge
- [31] Henn, S., Larreguy, H. & Schmidt-Padilla, C. (2019). Missionary Competition, Education and Long-run Political Development: Evidence from Africa. Harvard University Working Papers.
- [32] Hsiang, S. M. (2010). Temperatures and cyclones strongly associated with economic production in the Caribbean and Central America. *Proceedings of the National Academy of Sciences*, 107(35), 15367-15372.

- [33] Jedwab, R., zu Selhausen, F. M., & Moradi, A. (2018). The Economics of Missionary Expansion: Evidence from Africa and Implications for Development. CSAE Working Paper WPS/2018-07.
- [34] Joint Research Center. (2019). Global Land Cover 2000. The European Commission's Science and Knowledge Service.
- [35] Kelly, M. (2019). The standard errors of persistence.
- [36] Kim, H. C. (1982). American Influence on Korean Education. *Educational Perspectives*, 21(4), 27-32.
- [37] Kim, S. W. Korean General Social Survey (KGSS), (2003 - 2012) . Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]
- [38] Kwon, T. H., Lee, H. Y., Chang, Y., & Yu, E., (1975). The Population of Korea. The Population and Development Studies Center, Seoul National University.
- [39] Lee, J. (2013). American Southern Presbyterians and the formation of Presbyterianism in Honam, Korea, 1892-1940: traditions, missionary encounters, and transformations. (Doctoral dissertation, University of Edinburgh)
- [40] Lee, J. K. (2006). Korean Higher Education under the United States Military Government: 1945-1948. Radical Pedagogy.
- [41] Lee, S. (1989). The emergence of the modern university in Korea. *Higher Education*, 18:87-116.
- [42] Lee, T. S. (2009). What should Christians do about a shaman-progenitor?: evangelicals and ethnic nationalism in South Korea. *Church History*, 78(1), 66-98.
- [43] Lin, H. T. (2009). The Tributary System in China's Historical Imagination: China and Hunza, ca. 1760–1960. *Journal of the Royal Asiatic Society*, 19(4), 489-507.

- [44] Longford, J. H. (1911). The Story of Korea. Moeffett Korea Collection. Princeton Theological Seminary Library.
- [45] Mani, D. (2018). Education In South Korea. World Education News and Reviews.
- [46] Matsutani, M. (2012). Church over nation: Christian missionaries and Korean Christians in colonial Korea (Doctoral dissertation, Harvard University).
- [47] McCleary, R. M. 2013. Protestantism and Human Capital in Guatemala and the Republic of Korea. Asian Development Bank Economics Working Paper Series, No. 332. 2013
- [48] Meehan, C. (2010). Touched by Devotion in South Korea. Christian Reformed Church, United States of America.
- [49] Meier zu Selhausen, F. (2014). Missionaries and female empowerment in colonial Uganda: new evidence from Protestant marriage registers, 1880–1945. Economic History of Developing Regions, 29(1), 74-112.
- [50] National Center on Education and the Economy. (2018). South Korea Overview.
- [51] Nikolova, E., & Polansky, J. (2019). Conversionary Protestants Do Not Cause Democracy. Available at SSRN 3314001.
- [52] Nunn, N. (2010). Religious conversion in colonial Africa. American Economic Review, 100(2), 147-52.
- [53] Nunn, N., Akyeampong, E., Bates, R., & Robinson, J. A. (2014). Gender and missionary influence in colonial Africa. African development in historical perspective.
- [54] Nunn, N., & Qian, N. (2011). The potato's contribution to population and urbanization: evidence from a historical experiment. The quarterly journal of economics, 126(2), 593-650.

- [55] Oster, E. (2019). Unobservable selection and coefficient stability: Theory and evidence. *Journal of Business & Economic Statistics*, 37(2), 187-204.
- [56] Park E., Kang S., Jeong Y., & Kang S. (2002). *Gyoyugui yeoksawa cheolhak*, History and philosophy of education. Seoul: Dongmunsa. ISBN 89-8251-161-
- [57] Patterson, D., & Choi, J. (2018). Diplomacy, trade, and South Korea's rise to international influence. *International Area Studies Review*, 21(1), 9-27.
- [58] Pew Research Center. (2011). Faith in Flux. Pew Research Center Polling and Analysis.
- [59] Rhodes, H. A., & Campbell, A. (Eds.). (1934). *History of the Korea mission: Presbyterian church USA, 1884-1934*. Chosen mission Presbyterian church USA.
- [60] Rink, A. (2018). Do Protestant Missionaries Undermine Political Authority? Evidence From Peru. *Comparative Political Studies*, 51(4), 477-513.
- [61] Roodman, D., Nielsen, M. Ø., MacKinnon, J. G., & Webb, M. D. (2019). Fast and wild: Bootstrap inference in Stata using boottest. *The Stata Journal*, 19(1), 4-60.
- [62] Republic of Korea Ministry of Education. (2019). Education System Overview.
- [63] Ryu, J. S. (2007). A philosophical basis for the new Christian School Movement in Korea (South) (Doctoral dissertation, North-West University).
- [64] Scheitle, C. P. (2010). Beyond the congregation: The world of Christian nonprofits. Oxford University Press.
- [65] Seth, M. J. (1998). Choosing Between Two Models: The Creation of The South Korean Educational system, 1945-1951. 제 5 차 조선학 국제 학술 토론회, 2, 240.
- [66] Streit, K., (1913). *Atlas Hierarchicus*.
- [67] Sun-min, L. (2011, August 2) Talking Past: The Art of Ancient Trade. *KOREA Magazine*. Hosted by Korea.net

- [68] World Missionary Conference. (1910). Statistical Atlas of Christian Missions. Presented at World Missionary Conference, Edinburgh, June 14-23, 1910.
- [69] Trewartha, G. T., & Zelinsky, W. (1955). Population Distribution and Change in Korea 1925-1949. *Geographical Review*, 45(1), 1-26.
- [70] Valencia Caicedo, F. (2018). The Mission: Human capital transmission, economic persistence, and culture in South America. *The Quarterly Journal of Economics*, 134(1), 507-556.
- [71] Waldinger, M. (2017). The long-run effects of missionary orders in Mexico. *Journal of Development Economics*, 127, 355-378.
- [72] Woodberry, R. D. (2004). The shadow of empire: Christian missions, colonial policy, and democracy in postcolonial societies (Doctoral dissertation, University of North Carolina at Chapel Hill).
- [73] Woodberry, R. D. (2011). Religion and the spread of human capital and political institutions. In *The Oxford Handbook of the Economics of Religion*.
- [74] Woodberry, R. D. (2012). The missionary roots of liberal democracy. *American Political Science Review*, 106(2), 244-274.

12 Figures

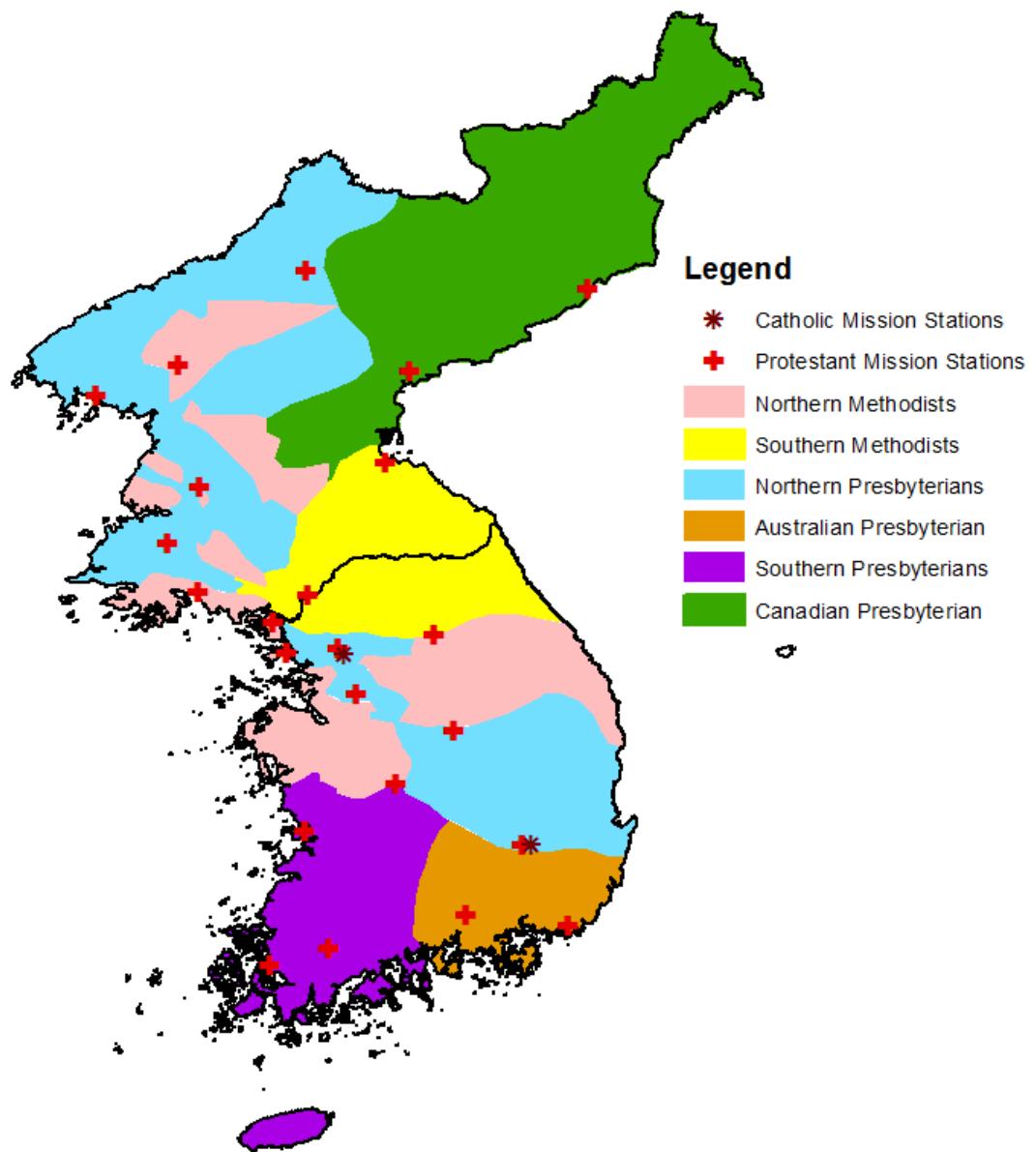


Figure 1: Comity Agreement Areas and Mission Station Locations

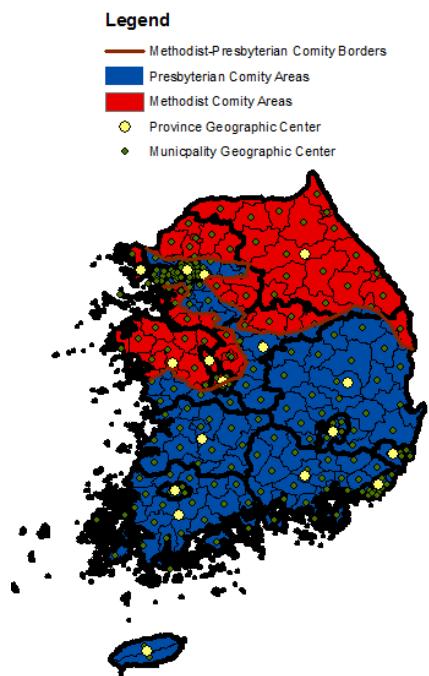


Figure 2: Methodist and Presbyterian Comity Areas with Geographic Centers of Municipal Districts and Provinces

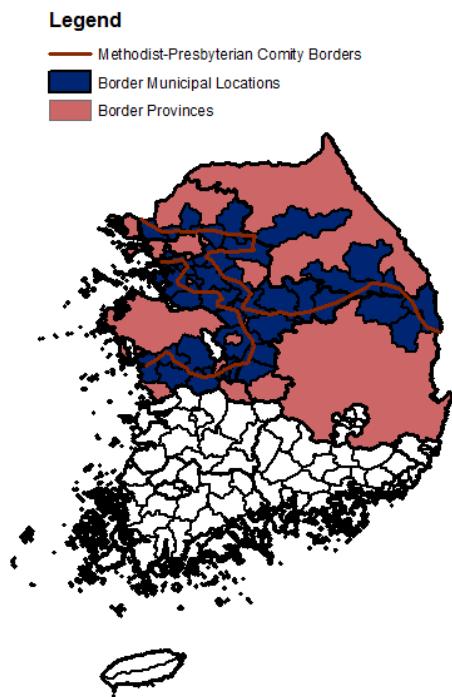


Figure 3: Methodist-Presbyterian Comity Border Highlighting Intersecting Municipal Districts and Provinces

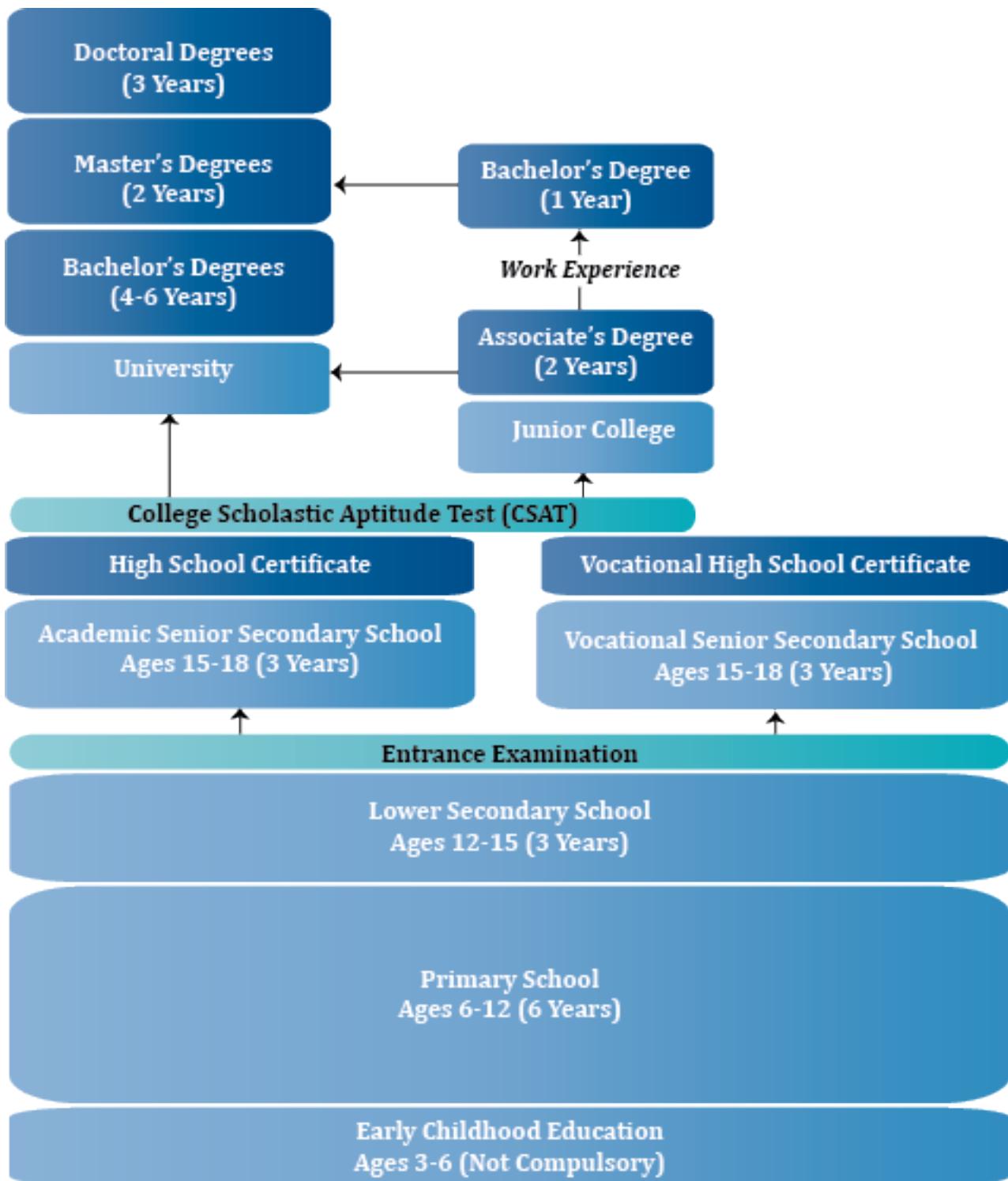


Figure 4: Korean Education System — National Center on Education and the Economy (2019)

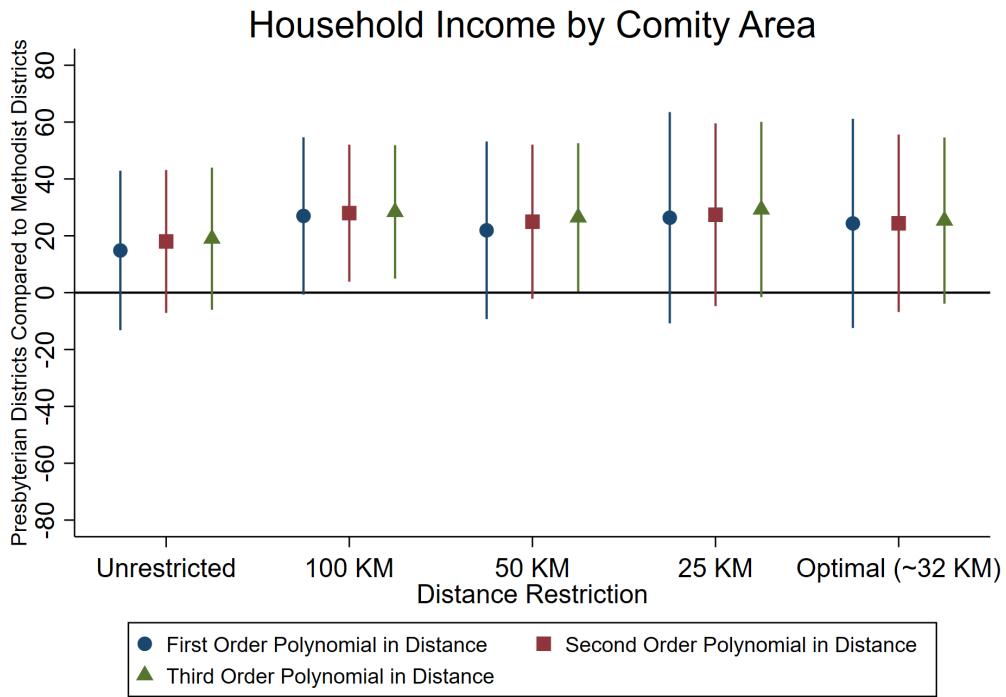


Figure 5: Household Income by Comity Area

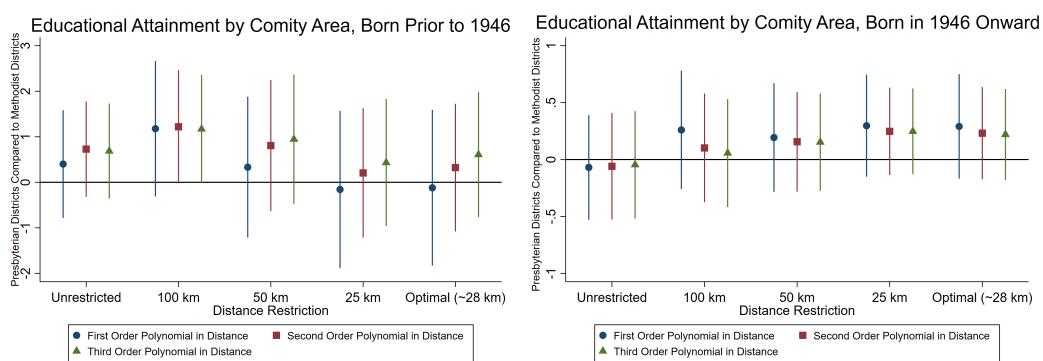


Figure 6: Educational Attainment by Comity Area

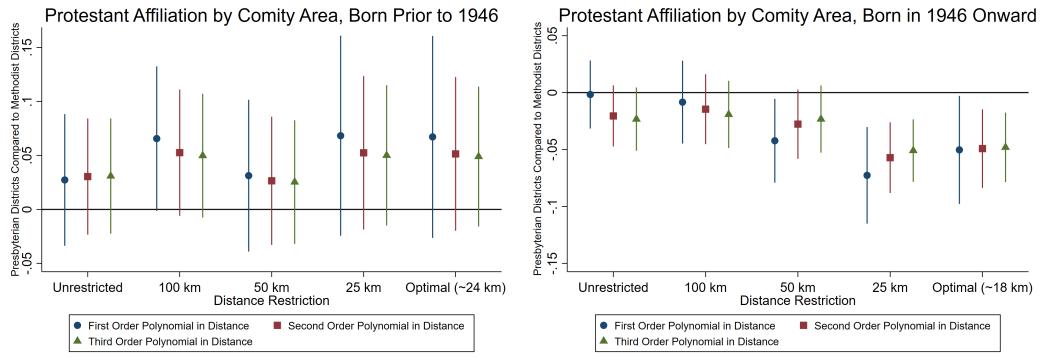


Figure 7: Protestant Affiliation by Comity Area

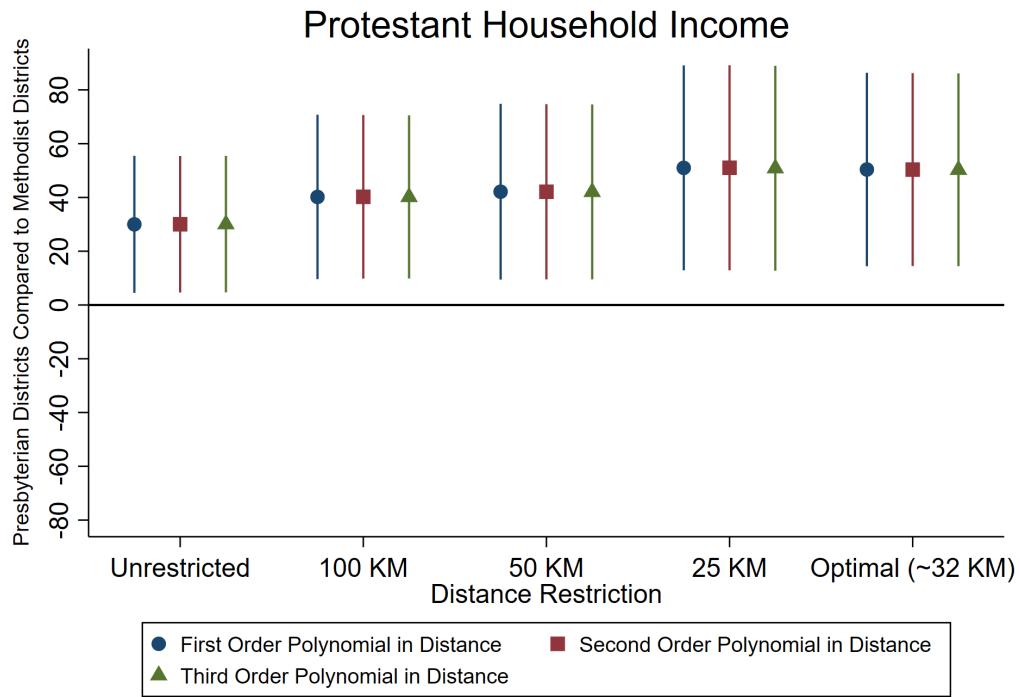


Figure 8: Protestant Household Income by Comity Area

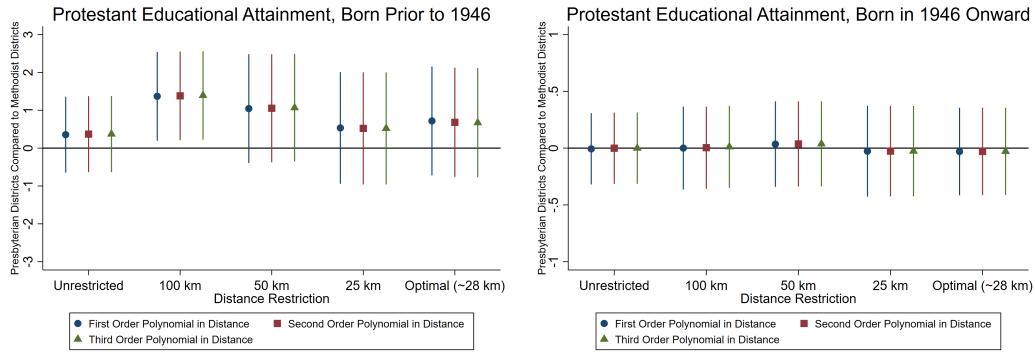


Figure 9: Protestant Educational Attainment by Comity Area

13 Tables

Table 1: KGSS 2006-2012 Summary Statistics

Variable	Total Sample	Presbyterian Areas	Methodist Areas	Difference
Income (10,000 Won) †	342.168 (333.322)	341.153 (311.433)	345.527 (397.360)	-4.374 (8.733)
Educational Attainment †	11.604 (4.622)	11.602 (4.565)	11.611 (4.622)	-0.009 (0.117)
Protestant	0.221 (0.415)	0.210 (0.408)	0.259 (0.438)	-0.048*** (0.011)
Married	0.650 (0.477)	0.651 (0.477)	0.649 (0.477)	0.002 (0.012)
Female	0.541 (0.498)	0.546 (0.498)	0.525 (0.500)	0.022* (0.128)
Home Population	2.936 (1.310)	2.925 (1.290)	2.974 (1.373)	-0.049 (0.336)
Age †	45.616 (16.582)	45.705 (16.484)	45.319 (16.904)	0.386 (0.425)
<i>N</i>	8,589	6,610	1,979	8,589

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Columns 1-3 standard deviations in parentheses. Columns 4 standard errors in parentheses.

† N differs in the following ways due to missing data: Education, Total $N = 8,589$ Presbyterian Areas $N = 6,610$; Income, Total $N = 7,965$, Presbyterian Areas $N = 6,281$, Methodist Areas $N = 1,897$. Age, Total $N = 8,580$, Presbyterian Areas: $N = 6,604$, Methodist Areas: $1,976$

Table 2: Baseline Geographic Variables by Municipal District

Characteristics	All of South Korea			Districts Intersecting Comity border		
	Presbyterian Areas	Methodist Areas	Difference	Presbyterian Areas	Methodist Areas	Difference
River Miles	37.664 (39.476)	50.776 (44.858)	-13.112 (6.768)*	41.841 (42.341)	55.012 (49.102)	-13.171 (13.343)
Water Area	9.650 (17.470)	9.711 (16.344)	-0.061 [2.701]	14.998 (19.207)	9.429 (15.535)	5.569 (5.177)
Water Perimeter	45.977 (86.612)	39.444 (67.307)	6.533 [11.948]	60.782 (85.686)	37.099 (65.510)	23.684 (22.661)
Elevation	175.046 (130.791)	255.292 (205.313)	-80.245 [29.192]***	174.429 (126.882)	252.671 (217.185)	-78.241 (50.838)
Land Cover	11.958 (2.478)	9.100 (2.384)	2.480 [31.739]**	10.877 (2.071)	9.132 (2.197)	1.745 [48.758]
Cereal Grain Suitability	2995.473 (1831.736)	2798.705 (1979.354)	196.768 [302.347]	3275.613 (2159.811)	2814.345 (2038.660)	461.269 (617.650)
Potato Suitability†	3059.386 (1181.749)	2990.456 (849.372)	68.930 [155.822]	2964.488 (995.242)	3010.499 (895.004)	46.011 [294.680]
N Clusters	145	57	202	21	26	47

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Columns 1-2, 4-5 standard deviations in parentheses. Columns 3, 6 standard errors clustered by municipal districts in parentheses.

Conley (1999) SE with a 15 KM cutoff in brackets. † N for Potato Suitability is 183 (130 Presbyterian areas and 53 Methodist areas) across South Korea due to missing data.

Additionally, N for Potato Suitability in comity agreement border intersecting is 42 (19 in Presbyterian areas and 23 in Methodist areas) due to missing data.

Table 3: RD: Income by Comity Area

2006-2012 Household Income in 10,000 Korean Won			
1st Order Polynomial in Distance to Comity Border			
Historically Presbyterian Districts	21.340 (21.392)	20.338 (15.513)	14.842 (16.910)
2nd Order Polynomial in Distance to Comity Border			
Historically Presbyterian Districts	2.547 (18.315)	7.320 (13.279)	18.012 (15.155)
3rd Order Polynomial in Distance to Comity Border			
Historically Presbyterian Districts	-3.383 (16.736)	2.383 (12.161)	18.983 (15.077)
Demographic Controls		✓	✓
Year Fixed Effects		✓	✓
Geographic Controls			✓
Mean (Income)	342.168	342.168	342.168
N	8,178	8,175	7,642
Clusters	127	127	114

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses. Demographic controls refer to age, marital status, gender, and home population. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Table 4: RD: Educational Attainment by Comity Area

	Years of Education			
	Born Before 1946		Born in 1946 or Later	
1st Order Polynomial in Distance to Comity Border				
Historically Presbyterian Districts	0.806 (0.626)	0.755 (0.527)	0.401 (0.713)	0.145 (0.300)
				0.194 (0.224)
2nd Order Polynomial in Distance to Comity Border				
Historically Presbyterian Districts	0.059 (0.525)	0.123 (0.434)	0.686 (0.629)	-0.001 (0.256)
				0.101 (0.197)
3rd Order Polynomial in Distance to Comity Border				
Historically Presbyterian Districts	-0.188 (0.481)	-0.088 (0.396)	0.729 (0.632)	-0.050 (0.238)
				0.075 (0.187)
Demographic Controls				
Year Fixed Effects	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
Mean (Educational Attainment)	5.762	5.762	5.762	12.798
N	1,455	1,455	1,367	7,122
Clusters	122	122	110	127
				6,652
				114

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses. Demographic controls refer to age, marital status, gender, and home population. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Table 5: RD: Protestant Affiliation by Comity Area

	Rate of Protestant Affiliation			
	Born Before 1946		Born in 1946 or Later	
1st Order Polynomial in Distance to Comity Border				
Historically Presbyterian Districts	0.005 (0.031)	0.004 (0.032)	0.027 (0.038)	0.017 (0.021)
Historically Presbyterian Districts	-0.021 (0.026)	-0.022 (0.028)	0.030 (0.032)	-0.017 (0.020)
2nd Order Polynomial in Distance to Comity Border				
Historically Presbyterian Districts	-0.031 (0.024)	-0.032 (0.025)	0.031 (0.032)	-0.036* (0.019)
3rd Order Polynomial in Distance to Comity Border				
Historically Presbyterian Districts	-0.036** (0.018)	-0.037*** (0.017)	-0.037*** (0.017)	-0.023 (0.017)
Demographic Controls	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
Geographic Controls		✓		✓
Mean (Protestant Affiliation)	0.208	0.208	0.208	0.224
N	1,455	1,455	1,367	7,125
Clusters	122	122	110	127
				6,655
				114

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses. Demographic controls refer to age, marital status, gender, and home population. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Table 6: Income by Comity Area Separating Protestants from General Population

	2006-2012 Household Income in 10,000 Korean Won			
	Regression Discontinuity Estimates			Fixed Effects Estimates
	Linear Dist	Quadratic Dist	Cubic Dist	
Protestants in Historically Presbyterian Districts	29.991* (15.367)	30.029* (15.317)	30.068* (15.305)	29.426* (15.252)
Demographic Controls	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
District Fixed Effects				✓
Mean (Income)	342,168	342,168	342,168	342,168
N	7,642	7,642	7,642	7,642
Clusters	114	114	114	114
				127

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses. Demographic controls refer to age, marital status, gender, and home population. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Table 7: Educational Attainment by Comity Area, Separating Protestants, Respondents Born Before 1946

	Years of Education			Fixed Effects Estimates
	Regression	Discontinuity	Estimates	
	Linear Dist	Quadratic Dist	Cubic Dist	
Protestants in Historically Presbyterian Districts	0.355 (0.605)	0.370 (0.606)	0.372 (0.607)	0.352 (0.607) 0.160 (0.663)
Demographic Controls	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
District Fixed Effects				✓
Mean (Education)	5.762	5.762	5.762	5.762 5.762
N	1,367	1,367	1,367	1,367 1,455
Clusters	110	110	110	110 122

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses. Demographic controls refer to age, marital status, gender, and home population. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Table 8: Educational Attainment by Comity Area, Separating Protestants, Respondents Born in 1946 or Later

	Years of Education				Fixed Effects Estimates
	Regression	Discontinuity	Estimates		
	Linear Dist	Quadratic Dist	Cubic Dist		
Protestants in Historically Presbyterian Districts	-0.006 (0.189)	-0.001 (0.190)	-0.001 (0.189)	-0.001 (0.187)	-0.011 (0.187) 0.063 (0.175)
Demographic Controls	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓
District Fixed Effects					✓
Mean (Education)	12.798	12.798	12.798	12.798	12.798
N	6,652	6,652	6,652	6,652	7,122
Clusters	114	114	114	114	127

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses. Demographic controls refer to age, marital status, gender, and home population. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Table 9: Potential Mechanisms for Income and Education Differences in Protestant Respondents

	RD with a 1st Order Polynomial						Spousal Education
	Closeness to USA	Professional Jobs	Office Jobs	Respondent Income	Spousal Income	Born Prior to 1946	Born in 1946 or Later
Protestants in Historically Presbyterian Districts	0.004 (0.030)	0.002 (0.028)	-0.027 (0.027)	15.397 (24.838)	17.206 (13.891)	0.400 (0.941)	-0.001 (0.219)
Demographic Controls	✓	✓	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓	✓	✓
N	8,022	8,022	8,022	4,591	3,379	740	4,480
Clusters	114	114	114	114	113	106	113

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Standard errors robust to arbitrary spatial autocorrelation in parentheses. Demographic controls refer to age, marital status, gender, and home population. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, as well as the Longitude and Latitude of district geographic center.

Table 10: Moran's I for Outcome Variables Separating Protestants

Outcome Variable	Model Specification					
	RD 1st Order	RD 2nd Order	RD 3rd Order	Characteristics	FE	FE District FEs
Household Income	0.193*** (10.195)	0.196*** (10.374)	0.196*** (10.339)	0.188*** (9.941)	0.075*** (4.424)	
Years of Education (Born Before 1946)	0.221*** (11.624)	0.218*** (11.496)	0.214*** (11.289)	0.205*** (10.837)	0.072*** (4.238)	
Years of Education (Born in 1946 On)	0.111*** (6.046)	0.117*** (6.344)	0.117*** (6.367)	0.108*** (5.939)	0.075*** (4.442)	
Demographic Controls	✓	✓	✓	✓	✓	
Year Fixed Effects	✓	✓	✓	✓	✓	
Geographic Controls	✓	✓	✓	✓	✓	
District Fixed Effects			✓			

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: z value in parentheses, as suggested by Kelly (2019)

14 Appendix

14.1 Appendix A — Maps Used for GIS



Figure 10: Comity Agreements by 1925 — History of the Korea Mission, Presbyterian Church USA



Figure 11: Locations of Protestant Missions in Korea circa 1910 — Statistical Atlas of Christian Missions



Figure 12: Location of Catholic Missions in Korea circa 1911 — Atlas Hierarchicus

14.2 Appendix B — Full Mission Timeline

■ 1882

■ Korean

Shufeldt Treaty Written

■ 1884

■ Korean

Japanese Backed Progressives Start Coup to Oust Chinese Backed Conservatives

Shufeldt Treaty Signed

■ Missions

Northern Presbyterians Arrive

■ Presbyterian

First Permit for Northern Presbyterian Hospital in Seoul

■ 1885

■ Missions

Northern Methodists Arrive

■ 1886

■ Methodist

First Mission School Opens - Paejae School

■ Missions

First Cooperation Agreement In Seoul

■ Presbyterian

First Presbyterian Orphan School Opens

■ 1888

■ Missions

Anti-Christian Decree Made by Conservative Party Government

Baby Riots in Seoul

First Meeting of Inter-Missionary Conference on Territorial Division

Initial Comity Agreement Discussions Begin and Loosely Adopted

1889

Missions

Australians Presbyterians Arrive

1890

Methodist

Methodist General Assembly Created

Presbyterian

School Bars the Teaching of English

1891

Missions

Proposal of Division of Field

1892

Missions

Southern Presbyterians Arrive

Presbyterian

Southern Presbyterian Mission Arrives

1893

Missions

Initial Comity Agreement Rejected by Visiting Bishop

Presbyterian

Presbyterian Council of Missions Established

1894

Korean

Japan Defeats China Leading to Collapse of Conservative Party Government

Ponghak War in Southern Presbyterian Provinces

1895

Methodist

Korean Government Dispatches 200 Students to Paejae School

1896

Korean

Independence Club Formed

Missions

Southern Methodists Arrive

1897

Presbyterian

Presbyterians Have Opened 2 Boarding Schools and 10 Day Schools

Resolution for Day Schools

1898

Missions

Canadian Presbyterians Arrive

Presbyterian

Presbyterian and Catholic Conflict

1899

Missions

Meeting Evidence Showing Comity Followed After Bishop Rejection

1900

Missions

Methodist Cooperation Resolution Established

Presbyterian

Presbyterian and Catholic Conflict (Part Two)

1901

Missions

Wonson Station is First Station Transferred Via Agreement

Presbyterian

First Southern Presbyterian Boys School Created

Mission Council of Presbyterians Issue Policy on Avoiding Politics

Presbyterian Seoul High School Reopens

□ **1902**

□ **Methodist**

Korean Government Stops Paying Tuition to Paejae School

□ **Presbyterian**

Creation of United Presbyterian Independent Korean Church

First Southern Presbyterian Girls School Created

□ **1903**

□ **Methodist**

First Student Strike at Paejae School

□ **Missions**

First YMCA Established

□ **1904**

□ **Methodist**

American Methodism Used as One Body at Annual Meetings

□ **Presbyterian**

Southern Presbyterian Schools in Each Mission Station

□ **1905**

□ **Korean**

Protective Treaty Signed with Japan, Korea Semi-Colonized

Skirmishes Between Japan and Korean Guerillas in Rural Areas

□ **Missions**

Discussion of creating United Korean Church and Unifying Missions

Genearal Council of Evangelical Missions of Korea Formed

Mission Friction Cause First Comity Agreement in Field

□ **1906**

□ **Missions**

Comity Map Negotiations Begin at General Council

■ 1907

■ Korean

Korean Army Disbands

■ Missions

"The Great Revival" Occurs in Pyongyan

Missionaries Settle Property Dispute With Korean Christians In Court

Osom School Founded - Independent Korean Christian School

Student Strike at Union College

■ 1908

■ Missions

Southern Presbyterians and Northern Methodists Transfer Areas

Taesing School Founded - Independent Korean Christian School

■ 1909

■ Methodist

Second Paejae Student Strike

■ Missions

Comity Map Negotiations Completed

■ 1910

■ Korean

Japanese Anexation of Korea

■ Missions

United Korean Discussion Talks Disbanded due to Mission Success

Youngbon Christians Leave Seoul Mission due to Discrimination

■ Presbyterian

3 Southern Presbyterian Korean Christian Leaders Rebel and Join Japanese Church

542 Total Schools in Operation

First Southern Presbyterian Middle Schools Created

Two Independent Korean Schools Fall Under Northern Presbyterian Control

1911

Korean

- Conspiracy Case Trial
- Japanese Government Issues Educational Ordinance

Missions

- General Council Reorganized as Federal Council

1919

Korean

- March First Movement

1920

Korean

- Mission Schools Given Right to Teach Religion Again
- Missionaries Lose Extra-Territorial Status

1922

Korean

- Christians Nationalists Establish First Secular University in Korea

1923

Korean

- Government Proclaims Private Schools Designated Equal to Government Schools

1926

Presbyterian

- Creation of Cooperation Board of Southern Presbyterian Schools

1934

Presbyterian

- 50th Anniversary of Presbyterian Mission Celebrated

1935

Korean

- Japan Threatens Mission School Closure Unless Attend Shinto Shrine

1936

Missions

- General Council of Missions Lift Comity Agreement

1937

Presbyterian

- Presbyterian Schools Refuse Shinto Shrine Attendance, Ordered to Close

1940

Korean

- Japan Orders Closure of All Missions

1941

Korean

- US Counsel General Orders Seven Remaining Missions to Leave

Timeline Compiled From the Following Sources: Byun (2004), Matsutani (2012), and Lee (2013)

14.3 Appendix C: 1910 Historic Mission Data, Statistical Atlas of Christian Missions

STATISTICAL TABLES
EDUCATIONAL

77

Original from
UNIVERSITY OF MINNESOTA

Figure 13: Mission School Statistics by 1910 — Statistical Atlas of Christian Missions

MEDICAL

COUNTRIES AND SOCIETIES	HOSPITALS, DISPENSARIES, AND PATIENTS							SURGICAL OPERATIONS DURING THE YEAR			MEDICAL SCHOOLS AND CLASSES			SCHOOLS AND CLASSES FOR NURSES			
	Hospitals	Dispensaries	Hospital In-Patients Received during Year	Dispensary Treatments during Year	Outside Patients Visited during Year	Total Individual Patients	Total Treatments	Minor	Major	Number of Institutions and Classes	STUDENTS			Number of Schools and Classes	Males	Females	
											Males	Females	Total				
JAPAN (With Formosa)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
American and Canadian Societies																	
American Board of Commissioners for For. Miss.	1	1	350	4 500	—	4 850	20 350	100	10	—	—	—	—	—	—	—	—
Dom. and For. Miss. Soc., Protestant Episcopal Ch.	2	2	1 911	70 511	6 781	79 203	79 203	—	—	—	—	—	—	—	—	—	—
Foreign Mission Com., Presbyterian Church in Canada.	1	—	200	3 606	112	3 919	13 662	—	—	—	—	—	—	—	—	—	—
Seventh-Day Adventist Mission Board	1	1	306	809	—	1 000	1 000	—	—	—	—	—	—	—	—	—	—
Totals, 4 American Societies	5	4	2 662	79 417	6 893	88 972	114 215	100	10	1	9	—	9	—	—	—	24
British Societies																	23
For. Miss. Com., Presbyterian Church of England	3	3	2 914	14 365	740	17 951	35 375	1 503	528	3	17	—	17	—	—	—	—
Church Missionary Society	1	—	57	600	—	663	2 407	30	2	—	—	—	—	—	—	—	—
Totals, 2 British Societies	4	4	2 971	14 971	740	18 614	37 782	1 533	530	3	17	—	17	—	—	—	—
Independent Society																	—
Akasaka Hospital	1	1	—	—	—	—	15 000	—	—	—	—	—	—	—	—	—	—
Grand Totals, 7 Societies*	10	9	5 633	94 388	7 633	107 586	166 997	1 633	540	4	26	—	26	1	—	—	26
KOREA																	
American and Canadian Societies																	
Board of For. Miss., Methodist Episcopal Church	3	4	237	12 192	683	13 064	22 158	669	—	2	—	3	—	—	—	5	5
Board of For. Miss., Methodist Episcopal Church in U. S. A.	6	7	1 832	54 273	2 174	36 706	64 320	1 565	599	4	45	—	45	1	—	6	6
Board of Miss. Methodist, Episcopal Church, South	—	—	—	2 063	329	2 392	3 729	—	—	—	—	—	—	—	—	—	—
Diocese of For. Miss., Presbyterian Church (South)	2	5	—	16 833	—	16 833	16 833	382	200	—	—	—	—	—	—	—	—
For. Miss. Com., Presbyterian Church in Canada	1	—	—	—	—	—	1 000	—	—	—	—	—	—	—	—	—	—
Seventh-Day Adventist Mission Board	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Totals, 6 American Societies	12	18	2 069	85 361	3 186	68 995	108 040	2 616	799	6	45	3	48	2	—	11	11
British Society																	—
Society for the Propagation of the Gospel	1	—	117	1 856	—	1 973	5 743	—	121	—	—	—	—	—	—	—	—
Grand Totals, 7 Societies	13	18	2 186	87 217	3 186	70 968	113 783	2 616	920	6	45	3	48	2	—	11	11

Figure 14: Mission Hospital Statistics by 1910 — Statistical Atlas of Christian Missions

14.4 Appendix D — Regression Discontinuity Plots with Area Specific Slopes

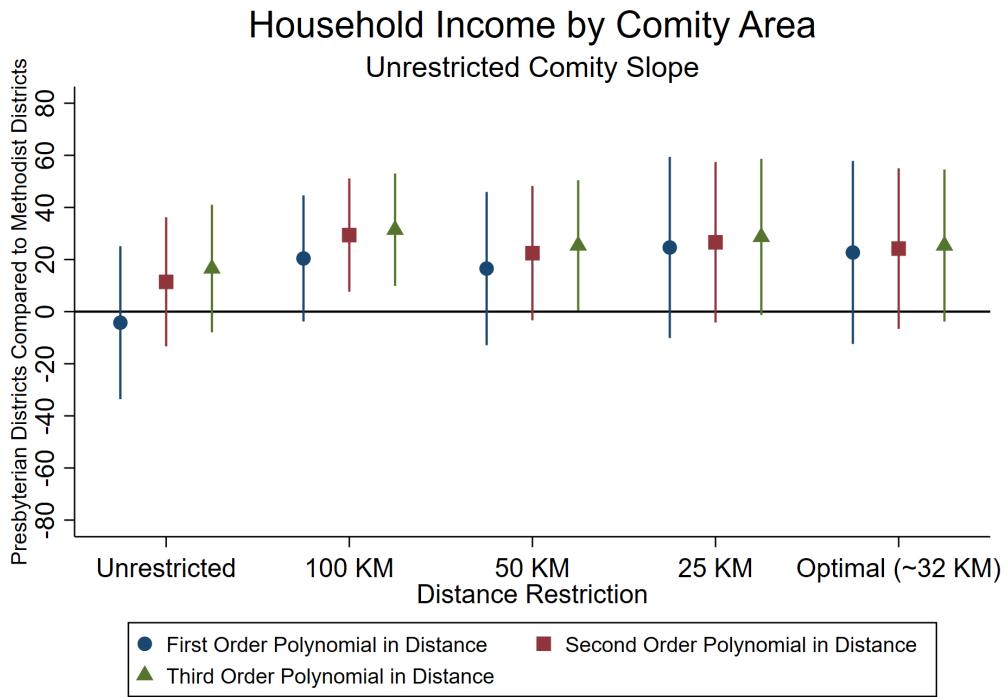


Figure 15: Household Income by Comity Area, Differing Area Slopes

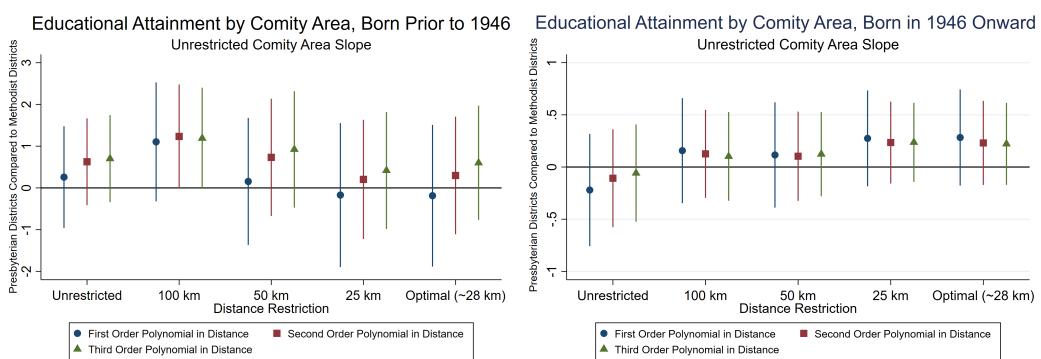


Figure 16: Educational Attainment by Comity Area, Differing Area Slopes

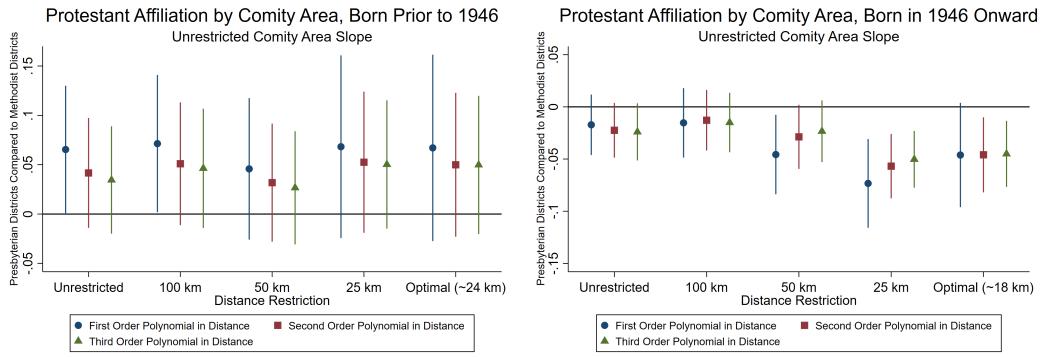


Figure 17: Protestant Affiliation by Comity Area, Differing Area Slopes

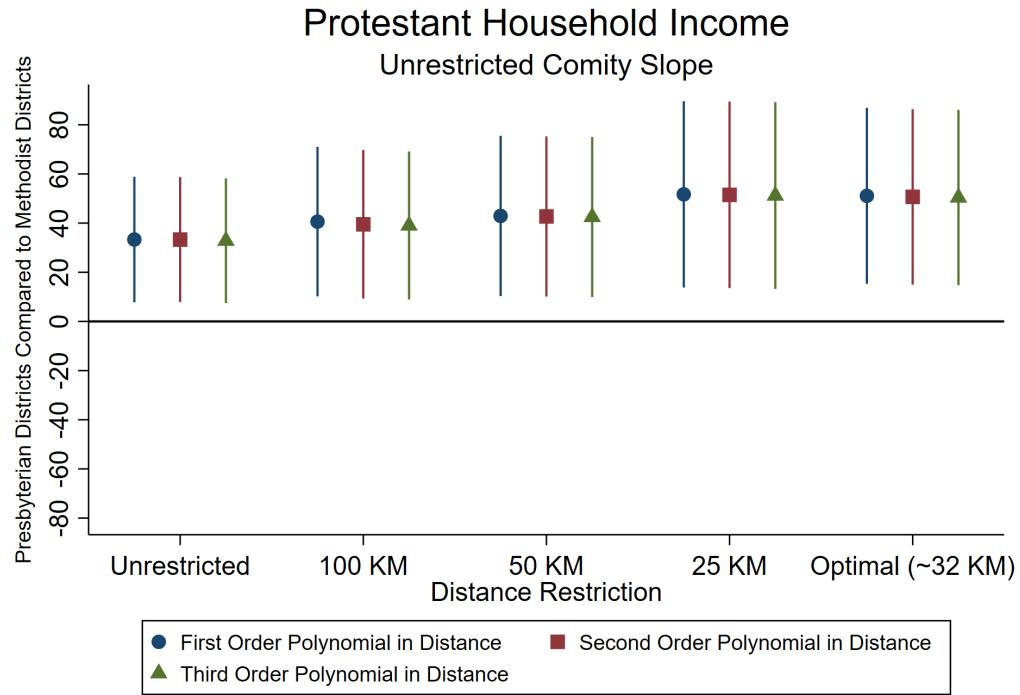


Figure 18: Protestant Household Income by Comity Area, Differing Area Slopes

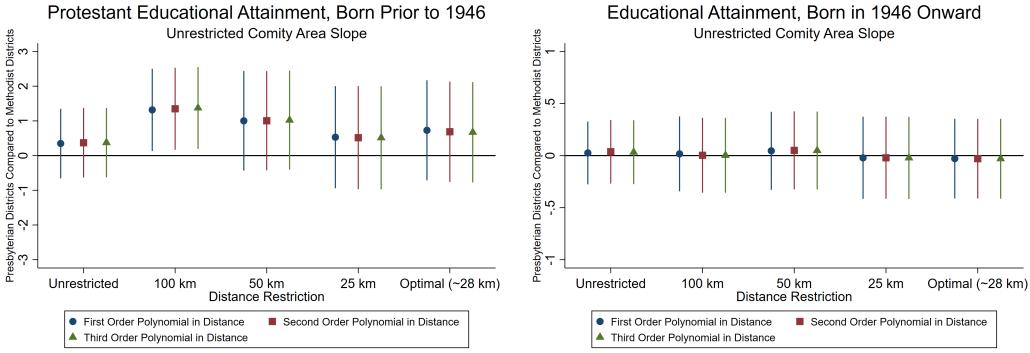


Figure 19: Protestant Educational Attainment by Comity Area, Differing Area Slopes

14.5 Appendix E — KLoSA Analysis for Education and Protestant Affiliation

Table 11: KLoSA 2006 Summary Statistics

Variable	Total Sample	Presbyterian Areas	Methodist Areas	Difference
Educational Attainment	7.876 (4.922)	7.958 (4.914)	7.591 (4.940)	0.367*** (0.128)
Protestant	0.187 (0.390)	0.184 (0.387)	0.200 (0.400)	-0.017 (0.005)
Married	0.781 (0.414)	0.780 (0.414)	0.783 (0.412)	0.004 (0.005)
Female	0.562 (0.496)	0.562 (0.496)	0.562 (0.496)	0.000 (0.006)
Number of Children †	3.070 (1.552)	3.073 (1.552)	3.058 (1.552)	0.015 (0.018)
Age	61.606 (11.093)	61.482 (11.014)	62.042 (11.353)	-0.560* (0.129)
N	8,486	6,593	1,893	8,486

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: † notes where N differs due to missing data. For education, N = 8,480 in total, N = 1,893 in Methodist Provinces and N = 6,593 in Presbyterian Provinces. For number of children, N = 8,485 in total and N = 8,652 for Presbyterian Provinces

Table 12: RD: Educational Attainment by Comity Area — KLoSA Data

	Years of Education				
	Born Before 1946		Born in 1946 or Later		
Historically Presbyterian Provinces	1.233 (0.759) [-1.474, 2.500]	1.054 (0.629) [-1.067, 2.203]	0.512 (0.541) [-7.971, 4.686]	0.528 (0.526) [-1.251, 1.359]	0.506 (0.382) [-0.533, 1.268] 0.781 (0.217)*** [-2.615, 1.392]
Historically Presbyterian Provinces	0.928 (0.694) [-1.058, 2.232]	0.828 (0.580) [-0.711, 1.991]	0.427 (0.288) [-5.230, 1.941]	0.354 (0.481) [-0.851, 0.156]	0.395 (0.347) [-0.389, 1.053] 0.040 (0.037) [-0.650, 0.141]
Historically Presbyterian Provinces	0.824 (0.667) [-0.949, 2.141]	0.754 (0.560) [-0.619, 1.919]	0.318 (0.285) [-5.191, 3.023]	0.284 (0.467) [-0.788, 1.091]	0.341 (0.341) [-0.407, 1.000] -0.049 (0.042) [-0.536, 0.460]
Demographic Controls			✓	✓	✓
Geographic Controls			✓	✓	✓
Mean (Education)	5.637	5.637	5.637	10.233	10.233
N	4,348	4,348	4,348	4,132	4,131
Clusters	14	14	14	14	14

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Province level clustered standard errors robust to heteroskedasticity in parentheses. Wild bootstrapped 90% confidence intervals in brackets. Demographic controls refer to age, marital status, gender, and number of children. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of province geographic center.

Table 13: RD: Protestant Affiliation by Comity Area — KLoSA Data

	Rate of Protestant Affiliation	
	Born Before 1946	Born in 1946 or Later
Historically Presbyterian Provinces	0.066 (0.068) [-0.177, 0.181]	0.065 (0.065) [-0.170, 0.176]
	-0.051 (0.053) [-0.815, 0.403]	-0.021 (0.055) [-0.208, 0.078]
Historically Presbyterian Provinces	0.043 (0.066) [-0.138, 0.157]	0.043 (0.064) [-0.132, 0.155]
	0.098 (0.040)* [-0.550, 0.342]	0.098 (0.057) [-0.184, 0.065]
Historically Presbyterian Provinces	0.035 (0.065) [-0.132, 0.147]	0.035 (0.062) [-0.128, 0.145]
	0.102 (0.045)** [-0.668, 0.553]	0.102 (0.056) [-0.184, 0.055]
Demographic Controls	✓	✓
Geographic Controls	✓	✓
Mean (Protestant Affiliation)	0.187	0.187
N	4,349 14	4,349 14
Clusters		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Province level clustered standard errors robust to heteroskedasticity in parentheses. Wild bootstrapped 90% confidence intervals in brackets. Demographic controls refer to age, level of urbanization, house type, marital status, gender, and number of children. Geographic controls refer to province average land coverage, potato suitability, population density, miles of road, as well as the Longitude and Latitude of province geographic center.

Table 14: Educational Attainment, Separating Protestants, Respondents Born Prior to 1946 — KLoSA Data

	Regression Discontinuity Estimates			Years of Education	
	Linear Dist	Quadratic Dist	Cubic Dist	Fixed Effects Estimates	
Protestants in Historically Presbyterian Provinces	-0.197 (0.381) [-0.824, 1.611]	-0.189 (0.383) [-0.848, 1.391]	-0.185 (0.384) [-0.843, 1.402]	-0.199 (0.381) [-0.834, 1.390]	-0.204 (0.384) [-0.810, 1.410]
Demographic Controls	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓
Province Fixed Effects					
Mean (Education)	5.637	5.637	5.637	5.637	5.637
N	4,348	4,348	4,348	4,348	4,348
Clusters	14	14	14	14	14

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Province level clustered standard errors robust to heteroskedasticity in parentheses. Wild bootstrapped 90% confidence intervals in brackets. Demographic controls refer to age, marital status, gender, and number of children. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of province geographic center.

Table 15: Educational Attainment, Separating Protestants, Respondents Born in 1946 or Later — KLoSA Data

	Regression Discontinuity Estimates			Years of Education	
	Linear Dist	Quadratic Dist	Cubic Dist		Fixed Effects Estimates
Protestants in Historically Presbyterian Provinces	-0.572 (0.370)	-0.574 (0.369)	-0.572 (0.369)	-0.565 (0.369)	-0.554 (0.368)
	[-1.512, 0.096]	[-1.512, 0.093]	[-1.507, 0.095]	[-1.505, 0.105]	[-1.482, 0.117]
Demographic Controls	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓
Province Fixed Effects					
Mean (Education)	10.233	10.233	10.233	10.233	10.233
N	4,131	4,131	4,131	4,131	4,131
Clusters	14	14	14	14	14

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Province level clustered standard errors robust to heteroskedasticity in parentheses. Wild bootstrapped 90% confidence intervals in brackets. Demographic controls refer to age, marital status, gender, and number of children. Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of province geographic center.

14.6 Appendix F — Robustness to Spatial Autocorrelation

Table 16: Results of Interest Robust to Spatial Autocorrelation

	Household Income	Education (Born Before 1946)	Education (Born in 1946 On)
Protestants in Historically Presbyterian Districts	29.991** (15.241)	0.355 (0.567)	-0.006 (0.169)
Demographic Controls	✓	✓	✓
Year Fixed Effects	✓	✓	✓
Geographic Controls	✓	✓	✓
N	7,642	1,367	6,652

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Standard errors robust to arbitrary spatial autocorrelation within 15 km in parentheses.

Demographic controls refer to age, marital status, gender, and home population.

Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Table 17: Fitting KGSS Data to Spatial Noise — Full Data

	Regression Discontinuity Estimates			Spatial Noise	
	Linear Dist	Quadratic Dist	Cubic Dist		Fixed Effects Estimates
Protestants in Historically Presbyterian Districts	326.266 (405.069)	325.727 (406.327)	325.033 (405.785)	318.954 (405.319)	-41.784 (502.065)
Demographic Controls	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	✓
District Fixed Effects				✓	
N	8,022	8,022	8,022	8,022	8,580
Clusters	114	114	114	114	127

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses.

Demographic controls refer to age, marital status, gender, and home population.

Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Spatial noise created by adding respondent's municipal district latitude and longitude together and dividing by one plus a normally distributed random number between zero and one.

Table 18: Income by Comity Area, Separating Protestants — Including Spatial Noise

	2006-2012 Household Income in 10,000 Korean Won			
	Regression	Discontinuity	Estimates	Fixed Effects Estimates
	Linear Dist	Quadratic Dist	Cubic Dist	
Protestants in Historically Presbyterian Districts	29.518* (15.431)	29.562* (15.379)	29.603* (15.367)	28.959* (15.314)
Demographic Controls	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
District Fixed Effects				✓
Mean (Income)	342.168	342.168	342.168	342.168
N	7,479	7,479	7,479	7,479
Clusters	110	110	110	110
				122

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses.

Demographic controls refer to age, marital status, gender, and home population.

Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude, river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Spatial noise included by multiplying subject municipal district latitude and longitude by normally distributed random number generator between zero and one.

Table 19: Educational Attainment by Comity Area, Separating Protestants, Born Before 1946 — Including Spatial Noise

	Years of Education			Fixed Effects Estimates
	Regression	Discontinuity	Estimates	
	Linear Dist	Quadratic Dist	Cubic Dist	
Protestants in Historically Presbyterian Districts	0.351 (0.604)	0.364 (0.605)	0.367 (0.606)	0.348 (0.606) 0.158 (0.663)
Demographic Controls	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓
District Fixed Effects				✓
Mean (Education)	5.762	5.762	5.762	5.762 5.762
N	1,367	1,367	1,367	1,367 1,455
Clusters	110	110	110	110 122

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses.

Demographic controls refer to age, marital status, gender, and home population.

Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude,

river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Spatial noise included by multiplying subject municipal district latitude and longitude by normally distributed random number generator between zero and one.

Table 20: Educational Attainment by Comity Area, Separating Protestants, Respondents Born in 1946 or Later — Including Spatial Noise

	Years of Education					
	Regression Discontinuity Estimates			Fixed Effects Estimates		
	Linear Dist	Quadratic Dist	Cubic Dist			
Protestants in Historically Presbyterian Districts	-0.005 (0.189)	0.000 (0.189)	0.000 (0.189)		-0.010 (0.187)	0.063 (0.175)
Demographic Controls	✓	✓	✓		✓	✓
Year Fixed Effects	✓	✓	✓		✓	✓
Geographic Controls	✓	✓	✓		✓	✓
District Fixed Effects				✓		✓
Mean (Education)	12.798	12.798	12.798		12.798	12.798
N	6,652	6,652	6,652		6,652	7,122
Clusters	114	114	114		114	127

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Notes: Municipal district level clustered standard errors robust to heteroskedasticity in parentheses.

Demographic controls refer to age, marital status, gender, and home population.

Geographic controls refer to province average land coverage, potato suitability, cereal grain suitability, altitude,

river mileage, inland water area, inland water perimeter, as well as the Longitude and Latitude of district geographic center.

Spatial noise included by multiplying subject municipal district latitude and longitude by normally distributed random number generator between zero and one.

14.7 Appendix G — Oster (2017) | δ | Coefficients for Regression Tables

14.7.1 KGSS Results

Table 21: Oster (2017) | δ | Income by Comity Area

2006-2012 Household Income in 10,000 Korean Won			
1st Order Polynomial in Distance to Comity Border			
Historically Presbyterian Districts	0.000	0.104	0.076
2nd Order Polynomial in Distance to Comity Border			
Historically Presbyterian Districts	0.000	0.080	0.089
3rd Order Polynomial in Distance to Comity Border			
Historically Presbyterian Districts	0.000	0.045	0.091
Demographic Controls		✓	✓
Year Fixed Effects		✓	✓
Geographic Controls			✓

Table 22: Oster (2017) | δ | Educational Attainment by Comity Area

Years of Education						
Born Prior to 1946			Born in 1946 or Later			
1st Order Polynomial in Distance to Comity Border						
Historically Presbyterian Districts	0.005	0.267	0.193	0.001	0.220	0.731
2nd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Districts	0.001	0.114	0.290	0.000	0.191	0.783
3rd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Districts	0.002	0.173	0.297	0.000	0.175	0.388
Demographic Controls		✓	✓		✓	✓
Year Fixed Effects		✓	✓		✓	✓
Geographic Controls			✓			✓

Table 23: Oster (2017) | δ | Protestant Affiliation by Comity Area

Rate of Protestant Affiliation						
	Born Prior to 1946			Born in 1946 or Later		
1st Order Polynomial in Distance to Comity Border						
Historically Presbyterian Districts	0.000	0.001	0.013	0.003	0.005	0.006
2nd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Districts	0.002	0.025	0.017	0.004	0.009	0.011
3rd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Districts	0.002	0.138	0.017	0.012	0.033	0.013
Demographic Controls		✓	✓		✓	✓
Year Fixed Effects		✓	✓		✓	✓
Geographic Controls			✓			✓

Table 24: Oster (2017) | δ | Income by Comity Area, Separating Protestants

2006-2012 Household Income in 10,000 Korean Won					
	Regression Discontinuity Estimates			Fixed Effects Estimates	
	Linear Dist	Quadratic Dist	Cubic Dist		
Protestants in Presbyterian Areas	0.077	0.077	0.077	0.076	0.181
Demographic Controls	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	
District Fixed Effects					✓

Table 25: Oster (2017) | δ | Educational Attainment, Separating Protestants, Respondents Born Before 1946

	Years of Education				
	Regression Discontinuity Estimates			Fixed Effects Estimates	
	Linear Dist	Quadratic Dist	Cubic Dist		
Protestants in Presbyterian Areas	0.294	0.313	0.316	0.288	0.151
Demographic Controls	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	
District Fixed Effects					✓

Table 26: Oster (2017) | δ | Educational Attainment, Separating Protestants, Respondents Born in 1946 or Later

	Years of Education			Fixed Effects Estimates	
	Regression Discontinuity Estimates				
	Linear Dist	Quadratic Dist	Cubic Dist		
Protestants in Presbyterian Areas	0.002	0.000	0.000	0.003	0.018
Demographic Controls	✓	✓	✓	✓	✓
Year Fixed Effects	✓	✓	✓	✓	✓
Geographic Controls	✓	✓	✓	✓	
District Fixed Effects					✓

14.7.2 KLoSA Results

Table 27: Oster (2017) | δ | Educational Attainment by Comity Area

	Years of Education					
	Born Prior to 1946			Born in 1946 or Later		
1st Order Polynomial in Distance to Comity Border						
Historically Presbyterian Provinces	0.004	1.904	0.033	0.004	0.280	0.239
2nd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Provinces	0.006	2.086	0.233	0.004	0.281	0.143
3rd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Provinces	0.006	2.329	0.135	0.005	0.281	1.662
Demographic Controls		✓	✓		✓	✓
Geographic Controls			✓			✓

Table 28: Oster (2017) | δ | Protestant Affiliation by Comity Area

Rate of Protestant Affiliation						
	Born Prior to 1946			Born in 1946 or Later		
1st Order Polynomial in Distance to Comity Border						
Historically Presbyterian Provinces	0.003	0.016	0.006	0.002	0.004	0.002
2nd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Provinces	0.002	0.021	0.090	0.004	0.011	0.007
3rd Order Polynomial in Distance to Comity Border						
Historically Presbyterian Provinces	0.002	0.027	0.098	0.006	0.017	0.005
Demographic Controls		✓	✓		✓	✓
Geographic Controls			✓			✓

Table 29: Oster (2017) | δ | Educational Attainment, Separating Protestants, Respondents Born Before 1946

	Years of Education					
	Regression Discontinuity Estimates			Fixed Effects Estimates		
	Linear Dist	Quadratic Dist	Cubic Dist			
Protestants in Presbyterian Areas	0.020	0.020	0.019	0.021	0.021	
Demographic Controls	✓	✓	✓	✓	✓	
Geographic Controls	✓	✓	✓	✓		
Province Fixed Effects						✓

Table 30: Oster (2017) | δ | Educational Attainment, Separating Protestants, Respondents Born in 1946 or Later

	Years of Education					
	Regression Discontinuity Estimates			Fixed Effects Estimates		
	Linear Dist	Quadratic Dist	Cubic Dist			
Protestants in Presbyterian Areas	0.081	0.081	0.081	0.080	0.079	
Demographic Controls	✓	✓	✓	✓	✓	
Geographic Controls	✓	✓	✓	✓		
Province Fixed Effects						✓