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**Asian Growth Research Institute**

# Sex Ratio and Religion in Vietnam

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## Abstract

We examine whether the probability of having a boy aged below 5 years in households and communes is associated with religious individuals in Vietnam using data from the 1999 Population and Housing Census (on 76 million people) and 2007 Establishment Census (on religious establishments). Our results show low probability of having a boy aged below 5 years among religious households. Moreover, using Vietnam's 1955–1974 North-South division that resulted in different religious developments, we apply a commune-level instrumental-variable approach. From this analysis, we find a higher serious follower ratio associated with a lower boy ratio within communes and certain non-believer communities.

**Keywords:** Sex Ratio; Skewed Sex Ratio at Birth; Religion; Son Preference; Vietnam

**JEL classification:** J13, J16, N35, Z1

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## 1. Introduction

The first precept of the five precepts in Buddhism (“Ngũ Giới” in Vietnamese) states,  
*“I observe refraining from killing any living beings.”*

Similarly, the most important of the five precepts in Taoism (“五戒” in Chinese) indicates  
*“No killing.”*

In the Christian Bible, Matthew 5:21 reads,

*“You shall not murder; and whoever shall murder shall be in danger of the judgment.”*

In this study, it is not our intention to compare beliefs or praise one over another, nor do we elevate believers over non-believers in terms of morality. Instead, we investigate whether a code of ethics would transfer from one individual to other household members and, subsequently, to community members via social interaction. More specifically, we examine whether the probability of having a boy under 5 years of age among households having a religious individual as head of household would differ from other households and whether this would affect how their neighbors behave in terms of sex selection of their children. In addition, we test whether loyalty to a code of ethics might result in a lower sex ratio (SR), more specifically, the ratio of boys aged 0-4 to corresponding children in the community.

Our study is motivated by several significant factors. A skewed SR at birth (SSRB) has raised major concern across Asian countries, especially among those with larger populations. Sen (1990) implied that, globally, there exist more than 100 million fewer women than men due to SSRB. While it took decades for the Republic of Korea to return to a normal SR at birth (SRB), other Asian countries are experiencing increasing SSRBs, with little evidence of an anticipated fall (Guilmoto, 2009). Previous studies (Chen et al., 2013; Guilmoto, 2009) have often claimed a son preference and the popularity of ultrasonography as the root of the problem. Researchers and policy makers are struggling to search for effective ways to reduce and avoid an imbalanced SR, such as legal bans on revealing prenatal fetal sex, financial incentives, and laws on gender equality (Das Gupta, 2019).

The SR may have regional specifics. For example, if examining regional-level data for the case of Vietnam, as shown in Graph 1, the SR (as well as religions) would differ in

terms of distribution and characteristics. Thus, we argue that relevant research and policies should start by tackling issues at the micro level.

[Insert Graph 1 here]

However, to the best of our knowledge, no studies have empirically examined the connection between religion and SR, especially at the regional and micro levels. The most relevant piece of research investigating the correlations between son preference, religion, and induced abortion is Chung (2007). Yet, one important issue that remains to be solved is the endogeneity of religious characteristics. In addition, the distribution of religions and their followers is not random, but rather conducted through paths of historical development. Without considering these two important factors, estimations would be biased and difficult to claim for a causal relationship.

We overcome the above issues by using Vietnam's census data with a unique shock that can possibly identify a causal relationship. More specifically, we combine the 1999 Vietnam Population and Housing Census (hereafter Population Census; representing over 76 million people) and the 2007 Establishment Census to extract the information on any existing religious establishments. We first analyze data at the household level with commune fixed effects to identify the differences across religious households, nearby non-believer households, and other non-believer households in the same commune. Then, we examine data at the commune level (each analysis unit is a commune). We propose three instrumental variables (IVs) for the follower density and the ratio of serious followers among all followers. Our analyses are based on the natural experiment event, the 1954 Geneva Accords that divided Vietnam into two parts, North and South, for 20 years. This division separated the development of religions in North and South Vietnam during 1955-1974. Both North and South Vietnam had different policies toward religion, and both had religious policies that differed from the past.

Our study reveals some important evidence. At the household level, we found that the probability of having a boy under 5 is lower among religious households. The results hold even after accounting for commune fixed effects, any combination of sex composition of children aged 5-9, the proportion of public workers within the households, variable choices for religious households, and even the specifics of each religion. At the commune level, using the IV approach, we found that when the serious follower ratio is higher, the corresponding probability of having a boy aged 0-4 in the commune is lower. This connection holds true

even when the outcome is the probability of non-believer households located in the commune.

Our study also makes several important contributions to the existing body of literature. First, to the best of our knowledge, this is the first study on the connections between religion and SR using census data. The census data enable us to “zoom in” on the regional and micro levels without losing statistical predicting power. Second, our study provides a comprehensive analysis at both the household and commune levels and suggests a causal mechanism via social interaction between the religious community and the local commune. This is possible thanks to our third contribution, the IV approach. Our unique IV approach based on the historical development path provides evidence using a rare shock that divided a country and its religions. This approach improves the quality of estimation and validates the results.

The remainder of our study is organized as follows. We review the existing literature and historical development of religions in Vietnam in Section 2. We describe the data used and the main variables in Section 3. We propose and explain our identification strategy in Section 4. Then, our results, robustness checks, and interpretation of the mechanisms are presented in Section 5. Finally, Section 6 concludes our study.

## **2. Religion, son preference, and sex ratio**

### *2.1 Sex ratio and son preference*

The United Nations (1958) defines SR as the “ratio of number of one sex to that of the other.” In practice, the ratio of males to females is commonly used. However, the reverse for children aged 0-6 has also been used in several studies conducted in India. Similarly, the SRB is often referred to as the number of boys per 100 girls born in the same cohort collected within a period of time in a population. Ideally, the SRB should cover every birth event and corresponding child. However, in practice, either small samples or samples counted a long time after the date of childbirth are commonly used for calculating the SRB. The former is sensitive to location choice, while the latter counts only those children that have survived. Therefore, the SR of the latter has become a common proxy for the SRB, assuming that the crude death rate should not be statistically different between sexes. The most accurate way to find the ideal SRB is probably from a country population census. The least accurate results

are derived from cases that use a small sample survey and where no girl was born in the cohort. In addition, estimations using survey data for the SR often lack statistical power to predict and infer the results of the wider population.

Meanwhile, due to both economic and social reasons, parents may prefer to have a son over a daughter. Prior studies have reviewed possible motives for son preference, such as kinship institutions, Confucianism, and income mechanisms (dowries, old age support, wage differences, and even land reforms; see Das Gupta et al., 2003; Guilmoto, 2009; Almond et al., 2018). Jayachandran (2017) also suggested that a skewed SR (SSR) may be a consequence of son preference combined with a low fertility rate.

The assertion that son preference causes a high SRB conditionally holds if parents can identify the sex of the fetus and want a small family size at the same time. If not, the sex of the fetus is random for each parity (especially the first; Den Boer & Hudson, 2017), and a normal SRB is maintained at the country level. If son-targeting parents can afford an unlimited number of children, they will continue to have additional children until they have a son. Thus, with each parity, especially at higher levels, the SRB would be skewed. However, the aggregated SRB is not skewed as Altindag (2016: p. 544) theoretically proved.

Son preference can also cause SSR. If parents cannot identify the sex of the fetus, they might engage in postnatal sex selection by committing infanticide or neglecting their daughters (i.e., by allocating more resources to sons). As a result, daughters would have a lower survival rate. For example, Guilmoto (2009) recorded the few countries in the world, namely Nepal, Pakistan, and India, where the mortality rate of girls under the age of 5 far exceeded that of boys during 2000-2005. If the sex of the fetus can be revealed, parents may even choose prenatal sex selection. However, this is conditional upon their knowledge, access to ultrasound devices, cost of detecting sex, abortion, whether parents want to keep the family size small (Kashyap & Villavicencio, 2016), and even religion (Guilmoto, 2009). A SSR would be accelerated by the availability of ultrasound devices to predict fetal sex (Chen et al., 2013).

In practice, the pressure to have a son within a limited number of children and/or within a certain period will cause SSR. When the cap on the number of children is small (i.e., equal to or less than two), son-targeting individuals have an incentive to manipulate the SRB, even at first parity, and cause SSR. The SRB is more skewed if the cost of sex selection is

low. In addition, in cultures where it is considered an acceptable norm, polygamy might be another way to have a son.

Various studies have examined whether SSR occurred before the availability of ultrasound devices used to predict the sex of the fetus. Using the 1901 Census of India for Punjab, West Bengal, and Madras, Chakraborty and Kim (2010) found that the SR varied by region, caste, and religion, and they emphasized that SSRB had been occurring for a century. Babiarz et al. (2019) examined the SR in China for 1960-1987 and found that it was skewed even in the absence of ultrasound devices, which suggests postnatal sex selection. The SSR might be worse under the following additional conditions: a) number of children is limited; b) ultrasound devices are available and at low-cost; and c) abortion is possible at a low cost.

Empirical analysis is often challenged by underreported preferences with respect to sex (Norling, 2018) and underreported numbers of children/daughters. China during the One Child Policy (OCP) period (1978-2015) is a typical example. Goodkind (2011) found that Chinese parents underreported their daughters for public data sources, meaning that the actual SRB would be different from what was reported. Similarly, Huang et al. (2016) found an abnormally high probability of having twins in the Chinese population census, as parents registered falsified twins to avoid OCP fines. Sex-selective abortions may also be underreported as it is difficult to identify the actual reason for abortions.

Policy makers focus more at the country level rather than the regional level. However, the SR may vary over time. For example, the SR/SRB may vary in Vietnam depending on if it is an auspicious year for males/females, as determined by cultural superstitions (Do & Phung, 2010). However, calculations at the micro level were less likely considered within the previous literature. This is because the population census is not widely available at lower divisions of country administration in high frequency.

Das Gupta (2019) discussed measures to limit SSR and found that bans on revealing fetal sex during ultrasound tests are not as effective as other measures. Das Gupta (2019) argued that they can defer access to safe reproductive health services. People may take the risk of seeking lower quality, but higher cost, illegal services, as seen in Romania, where maternal mortality skyrocketed after the bans were implemented (Das Gupta, 2019). In addition, despite the bans in China in 1994 and the Republic of Korea in 1987, the SRB continued to be skewed (Das Gupta, 2019). Similarly, the financial incentives from public funds are also costly and might not work (Anukriti, 2018). Das Gupta (2019) suggested

promoting gender equality in a cost-effective way, for example, via media and legislation. Das Gupta (2019) also urged policy makers to not wait until society realizes the return value of missing women, as in the case of South Korea.

## *2.2 Religion, son preference, and sex ratio in Vietnam*

### 2.2.1 Brief history on the development of religions in Vietnam

Before present-day religions such as Buddhism, Catholicism, Protestantism, Caodaism, and Hoahaoism became popular in Vietnam, Vietnamese people maintained a strong tradition of worshipping ancestors and those whose services were of merit to their commune/country (Dang, 1995). Appearing later, three religions/doctrines—Buddhism, Taoism, and Confucianism—co-existed well with their traditional religion. Confucianism also promoted ancestor veneration, but in the late 19<sup>th</sup> century, Confucianism lost its power along with the fall of the feudal regime (Dang, 1995). The custom of ancestor worship exists together with the abovementioned religions. For example, although the Catholic Church prohibited this custom, three quarters of Catholics interviewed in Hanoi in 1992 respected ancestor worship (Dang, 1995). The Chinese culture has also been absorbed into Vietnam through history. For example, having a son to worship the family's ancestors became important since daughters do not remain in the same family after marriage; the paternal line is important. Thus, son preference became a part of the common belief system, rather than based on an original religious ideology.

To the best of our knowledge, Buddhism may have come into Vietnam earlier than any other current popular religion. It has had a strong historical influence over Vietnamese culture. For example, the Dinh Dynasty (968-980) and the Ly Dynasty (1009-1225) recognized Buddhism as the state's religion. Buddhism was absorbed into Vietnamese society starting in the north, and it spread with the development of the Vietnamese territory. Meanwhile, Islam is more likely linked to the Cham ethnic groups in the south of Vietnam.

The first arrival of a Christian mission in central Vietnam occurred in 1624, and De Rhodes, a French Jesuit, opened a church in Hanoi in 1627 (Vaupot, 2019). Meanwhile, Protestants settled in Da Nang in 1911 as part of a mission of the Christian and Missionary Alliance (an American organization; Willaime, 2010). In its early days, Catholic

development fluctuated, depending on the preferences of Vietnamese emperors<sup>1</sup> and support from the Paris Foreign Missions Society (in French: “Société des Missions étrangères de Paris”) initiated by De Rhodes.

Formed by a combination of Buddhism, Taoism, and Confucianism, Caodaism was initiated around 1925. Caodaism is located mainly in Tay Ninh province, which shares a border with Cambodia (Smith, 1970). Since the first Caodaism followers pursued nationalism to remove the French colony’s influence, the religion was restrained in central and northern Vietnam (Tran, 1996). These first followers had supported Cuong De, a former Vietnamese prince, and were pro-Japan (Tran, 1996). At its peak, the religion even had its own armed forces. Thus, its development was not likely to be welcomed due to its potential to endanger any later administration once in power.

Similarly, Hoa Hao (commonly known as Hoa Hao Buddhism) appeared in 1939. Its followers were mainly located in the Mekong River Delta near the border with Cambodia. After the 1954 Geneva Accords, Hoa Hao was dismantled and was only re-established after the fall of the Ngo Dinh Diem administration in South Vietnam in 1963 (Bourdeaux, 2010). Illustrations of the development can be found in Appendices 1-5.

#### 2.2.2 Son preference in Vietnam and religions’ views on abortions

Haughton and Haughton (1995), Guilmoto (2012), and Vu (2014) have all demonstrated that son preference is persistent in Vietnam, with a particular preference for one son. Guilmoto (2012) suggested the seriousness of prenatal sex selection and associated it with the popularity of ultrasonography after 2000. Explanations for Vietnamese son preference are not very different from those in other East Asian countries (Das Gupta et al., 2003; Vu, 2014).

Vietnamese laws and policies consistently promote family planning. The Vietnamese government promoted family planning and legalized abortion in Decision 162 of the Council of Ministers 1988. Abortion is legal nationwide, presumably under Article 44 of the Laws for Protecting People’s Health in 1989<sup>2</sup>. The SSRB and SSR were not observed at the country level prior to 2003 (Bélanger et al., 2003), but they were later emphasized by Guilmoto (2009,

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<sup>1</sup> The emperor of a Confucian state would have viewed Christianity as a threat to power because Christians did not accept absolute power, which is the core value of the emperor (Vaupot, 2019). Vaupot (2019) suggested that the rejection of Christianity led Napoleon III to execute a military invasion to colonize Vietnam in 1858.

<sup>2</sup> Den Boer and Hudson (2017) recorded that North Vietnam had legalized abortion since 1973. Meanwhile, South Vietnam considered it illegal until the reunification.

2012). The Vietnamese SSRB received significant public concern, and policy recommendations were developed to tackle the issue (Den Boer & Huston, 2017).

The common value (precept) across the major religions in Vietnam is that killing is a sin. Historic canon laws of the Catholic Church (such as Canons 1398 and 1983) are strictly against abortion and punish violators with excommunication. Similarly, Buddhism is strongly against abortion. Lecso (1987) and Florida (1991) noted that the human being, under the concepts of Buddhism, starts when sperm, egg, and consciousness are combined, and thus the first precept applies to the fetus. Additionally, to the best of our knowledge, the Vietnamese commonly count the number of years of being alive based on the appearance of the fetus for the sake of worship.

Despite rich literature on son preference, SR, SSR, and religion, to the best of our knowledge, no study examined the differences among the religious population and the non-believer population in an interdisciplinary manner, especially with respect to identifying possible interactions between the two groups.

### **3. Data**

We used two important sources of data. The first is the 1999 Population Census, which was conducted on April 1, 1999 by the General Statistics Office of Vietnam (GSO) and covered a census population of 76,323,173 people. The second is the 2007 Establishment Census, also by GSO, from which we extracted information from the section on religious establishments (hereafter Religious Establishment). GSO collected information at the commune level for all 28,066 religious establishments represented as of June 2007. Religious Establishment has information on communes based on location, years of establishment, and names. We linked Religious Establishment to Population Census data using the same commune identity. We were able to identify a number of religious establishments by specific religion and year of establishment for each historical period of time for each commune.

From the Population Census, we prepared household-level and commune-level data. The commune is the third tier of the Vietnamese national administrative division after province (61 units) and district (614 units). There were 10,474 communes in 1999. At the

household level, from a census of 5,756,416 households having 7,172,242 children aged 0-4<sup>3</sup> in 1999, we removed households in which a child aged 0-4 was coded as the household head<sup>4</sup> or their relationship to the household head was missing (5,053 households). We also removed those with missing information on education (244,850 households). Finally, we had 5,506,513 households with a total of 6,817,728 children in 10,474 communes for our analysis. At the commune level, we used 7,834 communes for analysis after removing 136 communes from Quang Tri province<sup>5</sup>, 1,391 communes with no population observing the six main religions mentioned in detail later, and 1,113 communes<sup>6</sup> where the religious population had no children aged 0-4 in 1999. The statistic descriptions for the two levels of data can be found in Appendices 6 and 7.

We selected all children aged 0-4 and their sexes to calculate some outcomes of interest, at either the household or commune level. We calculated the probability of having a boy among children aged 0-4 at the commune/household level as the outcome,  $Prob(b)$ <sup>7</sup>. We also extracted the denominator and numerator from children of religious households to calculate the probability of having a boy among non-believer households in the commune,  $Prob(b2)$ . The age range of 0-4 helps to reduce the issue of the SR varying over time, such as due to beliefs about auspicious years for males/females, as suggested by Do and Phung (2010). Although  $Prob(b)$  cannot distinguish between prenatal and postnatal sex selection, the probability captures behaviors on sex selection and can be a proxy for the realized SR.

In addition, we aggregated years of schooling of people aged 18 and above who were residing in the commune/household and computed the mean as a control variable (*education*). For household-level data analyses, we used their corresponding families' characteristics, such as number of generations residing in the household, ratio of public workers to total working members, and probability of having a boy aged 5-9.

The Population Census has important information on the religion of each individual. It questions whether an individual follows a specific religion (one of the six main religions).

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<sup>3</sup> This age cohort most likely lives with their parents. This selection would balance the time trend with respect to SR. Focusing on 0-4 years of age also helps to capture differences in tendencies of parents toward and related outcomes for each sex, such as different survival rates between males and females.

<sup>4</sup> The children most likely did not have parents/adults living with them or they were orphans.

<sup>5</sup> Quang Tri province lies on the 17<sup>th</sup> parallel north circle of latitude that divided Vietnam into North and South during 1955-1975. We removed the province for the identification strategy using IVs and will provide further explanation in the next section.

<sup>6</sup> We applied the same rule when dealing with specific religions.

<sup>7</sup>  $Prob(\text{boy}/\text{children}) = \text{number of boys}/(\text{number of boys} + \text{number of girls})$ . Boys and girls resided in the same household/commune. This calculation is better than SR because it can deal with no-girl cases.

Then, it asks if the follower actually passed a corresponding formal ritual to be recognized as an official follower. For example, in Buddhism, this is represented by “taking refuge” (worded “lễ quy y” in Vietnamese in the questionnaires); in Catholicism, it is baptism (“lễ rửa tội” in Vietnamese). We used this concept to construct two important variables: *follower* (if an individual followed a religion) and *serious follower* (if they passed such religious rituals)<sup>8</sup>. The word “*serious*” has an appropriate meaning because, after the ritual, followers had to dedicate themselves to the religion and its precepts. These followers are more likely to frequent religious establishments and practice the relevant codes of ethics<sup>9</sup>. In contrast, followers who did not pass through official rituals are more likely to engage in the above than those who do worship/believe but have less access to explanations of codes of ethics, which are often provided by monks and priests.

At the commune level, we classified (*serious*) *follower density* as the ratio of (*serious*) *followers* over the commune population. *Serious follower ratio* is the ratio of serious followers to the corresponding total number of followers in each commune. We specified this for each of the six main religions (available in the Population Census) in Vietnam: Buddhism, Catholicism, Protestantism, Islam, Caodaism, and Hoahaoism. At the household level, we used the corresponding information of the household head’s religion to be representative of the households. We noted that among households with a religious individual, only 10.14% of the household heads were non-believers. Additionally, there was just one religion followed in each religious household.

#### 4. Methods

As noted above, we based our analysis at both the household and commune levels. The household level analysis is to depict the statistical differences between families with a follower as a household head and those headed by a non-believer. We estimated the following reduced form equation using commune fixed effects and clustered robust standard errors at the commune level.

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<sup>8</sup> We defined those who did not declare themselves as a follower of the six most popular religions as non-believers. However, we acknowledge that they may follow a minor religion not listed in the Population Census.

<sup>9</sup> We noted that “serious” followers are not necessarily monks/priests. For example, the refuge in Buddhism has different levels, and the majority of followers do not reach a level as high as a Buddhist monk. For Catholics, obviously, most followers do not reach priesthood.

$$(1) \text{Prob}(b) = \text{Prob}(\text{boy/children})_{ij} = \beta_1 \cdot \text{religion}_i + \beta_2 \cdot \text{nearby}_i + \beta_3 \cdot \text{education}_i + \beta_4 \cdot \text{education}_i^2 + \beta_j \cdot \text{commune}_j + \varepsilon_{ij}$$

The *religion* dummy variable equals 1 if the head is a follower. The *nearby* dummy variable becomes 1 if the household is located near a household with a follower as a household head in a subdivision of the commune (in Vietnamese: “tổ dân phố”/ “cụm”/ “thôn”/ “xóm”/ “ấp”/ “khóm”) and if none of the household members are religious individuals. *Nearby* indicates the proximity difference to that of the household with a religious head. We also use specific religions by constructing six dummies corresponding to the six popular religions found in Population Census.

The estimation of Equation (1) can control for all time-invariant factors within a commune (average area is about 31.62 km<sup>2</sup>), including access to health care, infrastructure, quality of education system, and availability of religious services. However, the downside of Equation (1) is that religion is an endogenous variable. Religion might be associated with some specific characteristics of the households that also determine whether parents engaged in sex selective measures. The location distribution of followers’ residence is also endogenous. Followers may have flocked to a certain area (shown in Appendices 3-5) rather than randomly moving to different parts of the country. Therefore, we used a commune level analysis with an IV approach.

In an IV approach, similar to Equation (1), we estimated the following equation at the commune level in the second stage:

$$(2) \text{Prob}(b) = \text{Prob}(\text{boy/children})_k = \alpha_{1m} \cdot \text{religion}_{km} + \alpha_2 \cdot \text{education}_k + \alpha_3 \cdot \text{education}_k^2 + \epsilon_k$$

We used the proportion of the commune population to the country population to derive a weight (p-weight) for each commune in any estimation at the commune level. We used two specifications: A and B<sup>10</sup> for *religion<sub>km</sub>*. We used *follower density* and *serious follower density* at the commune level for specification A (*Spec. A*, hereafter). Meanwhile, we used *serious follower ratio* for specification B (*Spec. B*, hereafter). *Follower density* suggests a scaled association, while *serious follower density* and

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<sup>10</sup> In addition, we used *Prob(b2)* to validate the presence of an existing association between *religion* and the outcomes of the non-believer group.

*serious follower ratio* denote the quality/seriousness of practicing the religious code of ethics.

Since  $religion_{km}$  is endogenous, we used IVs in the first stage for the following reduced form equation:

$$(3) Religion_{km} = \gamma_{1m} \cdot old_{km} + \gamma_{2m} \cdot north17_{km} + \gamma_{3m} \cdot south17_{km} + \theta_k.$$

$Old_{km}$  is the density of religious establishments set up prior to 1955 per 1,000 people of commune  $k$  based on the population in 1999. Similarly,  $north17/south17$  is the density of religious establishments built between 1955 and 1974 in North/South Vietnam per 1,000 people of the commune. We noted that whenever  $north17_k$  takes any value other than zero,  $south17_k$  is zero for the observed commune, and vice versa. This is because every commune is located in either North or South Vietnam.

We have several arguments to support the choice of IVs. First, religions can influence the probability of having a boy through their religious establishments and symbols. They can also influence broader household behaviors through their followers and social activities. The religious establishments existed before the birth of any children aged 0-4, and parents have no influence over their existence. This is because all establishments were built before 1975. In 1974, in order for parents to have influence over a newly built religious establishment, they would have had to be over 18 years old. Those who met this condition would be over 44 years of age by 1999. However, 95% of parents<sup>11</sup> with children aged 0-4 were 44 years of age or younger in 1999. It is less likely that an existing commune characteristic decided both the probability of having a boy and the existence of a religious establishment. Therefore, the reverse causality, that is, from the parents to the religious establishment, is extremely unlikely. From the head of the household (or the religious member), the influence of religion transmits to the parents through interactions with the head of the household (religious member) thanks to their bargaining power based on economic status and family relations. However, we acknowledge that a religious head/member whose age was above 44 in 1999 might have had an impact on the decisions to both select the sex of the child via their parents and to build a religious establishment during 1955-1974.

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<sup>11</sup> We calculated the age of the household heads who had a child aged 0-4 in the Population Census. Only 5% of them were over 42, if counting only females.

Second, the event of the 17<sup>th</sup> parallel north to divide Vietnam into North and South based on the 1954 Geneva Accords is a (natural experiment) shock. The decision was made in Geneva, Switzerland, based on negotiations that took place from April 26 to July 20, 1954; the decision was outside the control of the majority of Vietnamese commoners who were great-grandparents, grandparents, or parents of children aged 0-4 in 1999. Before the Accords, the religions may have developed at similar paces in northern and southern Vietnam, although closer to 1954, the number of religious establishments accelerated in the south (see Appendix 1). After the Geneva Accords, the country witnessed a mass flow (about 600,000 or 65%) of North Vietnam's Catholic followers moving to South Vietnam (Vaupot, 2019)<sup>12</sup>. The difference between North and South also caused chaos at the grassroots level among followers. In North Vietnam, in general, land belonged to the state in 1959, while private ownership of land was maintained in South Vietnam. Therefore, having a new establishment would have become more difficult in the North. Meanwhile, with the influx of followers, the demand for religious establishments would have increased, as shown in Graph 2 (or in Appendix 1).

[Insert Graph 2 here]

In North Vietnam, the National Front, a main wing of the Communist Party, united all kinds of religions under their aim “for national salvation”. For example, Willaime (2010) noted that the North Protestant Mission statutes read, “[The] Protestant mission is to teach believers in patriotism...in respect to people's authorities and under the laws of the Democratic Republic of Vietnam.” The North also promoted atheism and loyalty to communism. For example, to be a communist, the person had to swear to be loyal to communist ideologies. Therefore, the differences between old religious establishments and other newly established ones during 1955-1974 would be material. Meanwhile, in South Vietnam, during 1955-1963, under the Ngo Dinh Diem's administration, the Catholic community developed quickly and absorbed people who wanted to be loyal to the administration (SNIE, 1963). Meanwhile, other religions (e.g. Buddhism, Caodaiism, and Hoahaoism) were oppressed and faced challenges such as the Buddhist crisis in 1963 (Willaime, 2010). Therefore, the religious establishments (including their locations) built during 1955-1974 might also differ from older religious establishments. More importantly,

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<sup>12</sup> Pope Pius XII issued a decree in 1949 that prohibited Catholics from following communism (Vaupot, 2019).

these establishments historically recorded what happened in the commune in the corresponding time and reflected the differences among religions.

As the 17<sup>th</sup> parallel north overlapped with the present day Quang Tri province, we followed Miguel and Roland (2011) and excluded all communes of Quang Tri to validate the results using IVs. The statistical figures support our arguments. The correlations among the three IVs are small—0.0837 between *old* and *north17*; 0.0327 between *old* and *south17*; and -0.0565 between *north17* and *south17*. Other evidence can be clearly observed in Graph 2 and Appendices 3-5.

Finally, for robustness checks, we examine specific religions and household characteristics, such as the proportion of household members working for the public sector and whether households included any children aged 5-9, in further detail. The analysis by specific religion supports the validity of the use of IVs, major influences, and meaningful interpretations. Meanwhile, Decision 162 of the Vietnamese Council of Ministers pertaining to the two-child limit was still valid in 1999 for all communists, civil servants, military staff, and residents in urban areas and some specific regions (Den Boer & Hudson, 2017). This was an important motive for parents to target a son within the two-child limit. However, Bélanger et al. (2003) reported a normal Vietnamese SR for the first parity before 2003. Therefore, the probability might be conditional to the probability of having a boy among elder children.

## 5. Results

### *5.1 Probability of having a boy at the household level and neighborhood differences*

As seen in Table 1, we found that the probability of having a boy among children aged 0-4 is lower among households whose head is a religious individual. This result holds true even after controlling for all time-invariant factors related to the commune. The time-invariant factors include availability and (perhaps) access to health care, infrastructure, and commune customs. The difference is robust, about 0.2 percentage points lower in probability, even when we compared households where a member is a follower with a non-believer household within the same commune. When delving into specific religions, we found the difference varied by religion and was most statistically significant for Catholic and Protestant households. In addition, the sign of coefficients is consistent regardless of the definition of a

religious household and the scale of followers within the household (either by religion of the head/member or the ratio of followers to household members).

[Insert Table 1 here]

We found a negative sign for *nearby non – believer household*, representing those located nearby within the same subdivision of the commune. These variables are statistically insignificant; however, we noted that the corresponding p-values were 0.14-0.15. One might argue that a religious household’s residential location might coincide with where the probability of having a boy is low. We acknowledge that the difference in characteristics between religious and non-believer households might lead to both the decision to become a follower and the decision to pursue a son(s). We further test this when using IVs for *religion*.

We attempted to divide the population of households with children aged 0-4 according to two important characteristics: having public workers as household members and having children aged 5-9. Parents working in the public sector would face harsh punishment for violating the two-children limit (Decision 162 of the Council of Ministers in 1988). Thus, they have greater incentive to engage in sex selection. They may also have had more access to information and health care compared with other parents.

However, even when selecting only households with at least one public worker, the difference is still 0.29 percentage points lower, slightly lower than that of the full sample estimations, for households with a religious head (see Appendix 11). The signs are negative for each religion-specific specification, but they are statistically insignificant. In addition, the difference is minor if the households did not have children aged 5-9 (Appendix 12). This result agrees with previous literature that reflected a SSR at the first birth (Bélanger et al., 2003) was least likely. However, the difference nearly doubles with the presence of at least one child aged 5-9 (Appendix 13).

In addition, the differences found among households with no members working in the public sector match the previous population selection (see Appendix 8). We note that this sample selection represented 84.78% of households. The difference between nearby non-believer households and other non-believer households located farther away from the religious household became statistically significant, as shown in Column 3 of Appendix 8. The results are consistent even when we further divide the households into those with children aged 5-9 and those without (Appendices 9-10).

## 5.2 Probability of having a boy across communes

We applied a simple OLS estimation for communes and used ratios of commune population over country population as weights. The results indicate consistent and negative signs for *serious follower density* (except for *Catholicism*), as shown in Table 2. However, we acknowledge that the two variables for religion are endogenous.

[Insert Table 2 here]

Therefore, we used the IV approach to instrument the endogenous variables using the number of religious establishments (in three cases) divided into the 1999 commune population. These figures include those established by the 1954 Geneva Accords and those set up during 1955-1974 for North and South Vietnam, separately. The second stage is shown in Table 3, while the first stage results can be found in Appendix 14. In addition to analyzing all communes as a group, we can apply the IV approach for communes with Buddhist and Catholic communities. Buddhism and Catholicism were the largest and most popular religions in Vietnam in 1999. Muslim, Cao Dai, and Hoa Hao communities only developed in specific communes in the South, making a similar IV approach impossible. Similarly, Protestant establishments did not have enough variation in the North after the Geneva Accords. In addition, post-IV estimation tests strongly support the statistical validity of the IVs used, as shown in Table 3.

In the first stage, the positive correlation is straightforwardly interpretable. The density of current followers was high where there were many religious establishments. The negative (and insignificant) coefficient of *During 1955 – 74 (North)* in Columns (1), (3), and (7) of Appendix 14 can be explained as follows. Hanoi attempted to put all religions into a solidarity block for national salvation and was very likely successful with Buddhism. There may be state-backed Buddhist establishments in the North, and thus it is not necessary to have a positive correlation with follower density. It can even lead to a statistically lower follower density. However, those residing in these communes might be the “survival” followers or, more likely, serious Buddhism followers. This did not happen with Catholic followers because the communities were loyal to the Vatican. In addition, *During 1955 – 74 (South)* showed a negative sign and was statistically significant in Columns (4), (7), and (8) of Appendix 14. We note that the Buddhist community in the South was rooted in the Unified Buddhist Sangha of Vietnam (in Vietnamese: “Giáo hội Phật giáo Việt Nam Thống nhất,” established in 1963), while those in the North belonged to the Buddhist Sangha of

Vietnam (in Vietnamese: “Giáo hội Phật giáo Việt Nam,” the uniquely-recognized-by-concurrent-government association, established in 1981). Where the number of southern Buddhist establishments increased during 1955-1974, their followers were likely loyal to the Unified Buddhist Sangha of Vietnam. Buddhists may have remained divided after the reunification in 1975. The existing followers in 1974 may also resist or be reluctant to accept official rituals by the Buddhist Sangha of Vietnam. In addition, we acknowledge that serious followers might have migrated during 1975-1999 either within the country or abroad, which would have caused different signs of the coefficients. However, since the establishments remain where they were historically, they would have accommodated such correlations.

[Insert Table 3 here]

Table 3 illustrates the outcomes for the communes. The results for *Spec. A* showed that a 1% increase in *serious follower density* is associated with a 0.0981 percentage point lower probability of having a boy among households with children aged 0-4 in the commune. The sign of *follower density* is positive and statistically significant; however, the two variables of religion have high statistical correlation and may have caused multicollinearity. Therefore, we had to rely on *Spec. B* for the most reliable statistical results.

The results for *Spec. B* (Table 3) clearly indicate a negative correlation between *serious follower ratio* and the probability of having a boy among households with children aged 0-4 in the commune. If *follower density* were approximately 1, the results in Table 3 would be considered self-explanatory and straightforward. For example, if followers are the least likely to engage in sex selection, the more likely they are to flock to the commune, and the lower the commune SR becomes. However, we note that the average serious follower density was under 12% in 1999 (see Appendix 7). Therefore, we extended the analyses to the probability of having a son among non-believer households, as shown in Table 4.

[Insert Table 4 here]

The results in Table 4 indicate a strong association between religion and the probability of having a boy among non-believer households located in the commune in *Spec. B*. A 1% increase in the serious follower ratio is associated with a 0.0177 percentage point lower probability of having a boy among non-believer households residing in the same commune (Column 8, Table 4). The results are consistent between the overall results (Column 8) and Buddhism (Column 10). However, we could not find a reliable and

statistically significant association with Catholicism. We speculate that this is perhaps due to the specific characteristics of the religion. More precisely, the ratio of serious Catholic followers was always high and close to 1 and probably holds the least variation across the communes.

### 5.3 Robustness checks, possible mechanisms, and discussions

#### 5.3.1 Are both follower density and serious follower ratio important?

We acknowledge that separating *follower density* and “seriousness” is important but practically difficult to accomplish<sup>13</sup>. Although *Spec. B* is statistically more reliable than *Spec. A*, *Spec. B* fails to account for the scale of the follower community. Therefore, we tried to examine two cases, “low” and “high” *follower density*<sup>14</sup>, according to the distribution shown in Table 5.

[Insert Table 5 here]

We found *serious follower ratio* to be important and consistent with the full sample selection (see Table 5) for both outcomes used (i.e., *Prob(b)* and *Prob(b2)*). The answer for the question 5.3.1 would be yes. In the general case (Columns 1, 2, 7, and 8), *serious follower ratio* is more pronounced among low follower density communes. Meanwhile, in the case of Buddhism (Columns 3, 4, 9, and 10), the ratio is more pronounced for high Buddhism follower density communes.

#### 5.3.2 Can understanding and pursuing codes of ethics transfer to the local community?

We have shown that in a household with either a religious household head or member, the probability of having a boy aged 0-4 in 1999 is lower than that in non-believer households. The results suggest that the exercise of ethics would transfer from one individual to another within a household. We also found that non-believer households located in geographic proximity to a religious household have a slightly lower boy ratio, with only a 0.14-0.15 error probability. Using an IV approach, after statistically adjusting for the endogenous religion variable(s) by the number of establishments in different historical periods divided by the 1999 commune population, *serious follower ratio* would be

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<sup>13</sup> Ideally, this is possible if there is a natural experiment shock that holds one factor constant while letting another factor fluctuate. However, such a shock would be rare.

<sup>14</sup> We chose half of the number of communes based on follower density distribution (50% lowest and 50% highest, separately) and repeated the IV-approach estimations.

associated with a lower boy ratio for the commune, even with non-believer households residing in the commune. *Serious follower ratio* implies the proportion of followers who had learnt and met certain conditions or passed ethics code tests. This variable holds its importance even among communes with a low follower density. Therefore, this evidence might suggest a transfer from religious precepts to followers, from followers to members within the same family, and from followers to the local community.

### 5.3.3 Is it just the transmission of ethics codes?

In the original data, the 28,066 religious establishments included religious charity organizations, orphanages, and organizations supporting the disabled, homeless, and elderly. Thus, the transfer mechanism might not be just codes of ethics but also other social interaction activities in the local community, although the number of these kinds of activities is limited.

## 6. Conclusions

In this study, we examined whether the difference in the probability of having a boy aged 0-4 in a household/commune could be associated with religious factors. We found that religious households have a lower probability of having a boy compared with non-believer households. A high serious follower ratio in a commune is linked with a lower probability of having a boy in the commune, including non-believer households in certain cases. Our results suggest that the codes of ethics would transfer from person to person within the household, from household members to outsiders, and perhaps further to the local non-believer community.

However, we also acknowledge several drawbacks of this study, which provide directions for future research. First, we were only able to analyze two specific religions, Buddhism and Catholicism, and were unable to have a similarly viable approach for the others. We were also unable to deal with unrecognized and unrecorded religions (i.e., Confucianism) in the Population Census, as well as those that never existed in Vietnam. Thus, our findings may be country bound. Second, we did not identify an ideal identification strategy to distinguish between the scale effect (*density of follower*) and quality effect (*serious follower ratio*). Third, we had to assume only minor internal/international

migration between 1975 and 1999, in line with Miguel and Roland (2011). Finally, we were unable to measure superstition and distinguish it from more formal religious followership.

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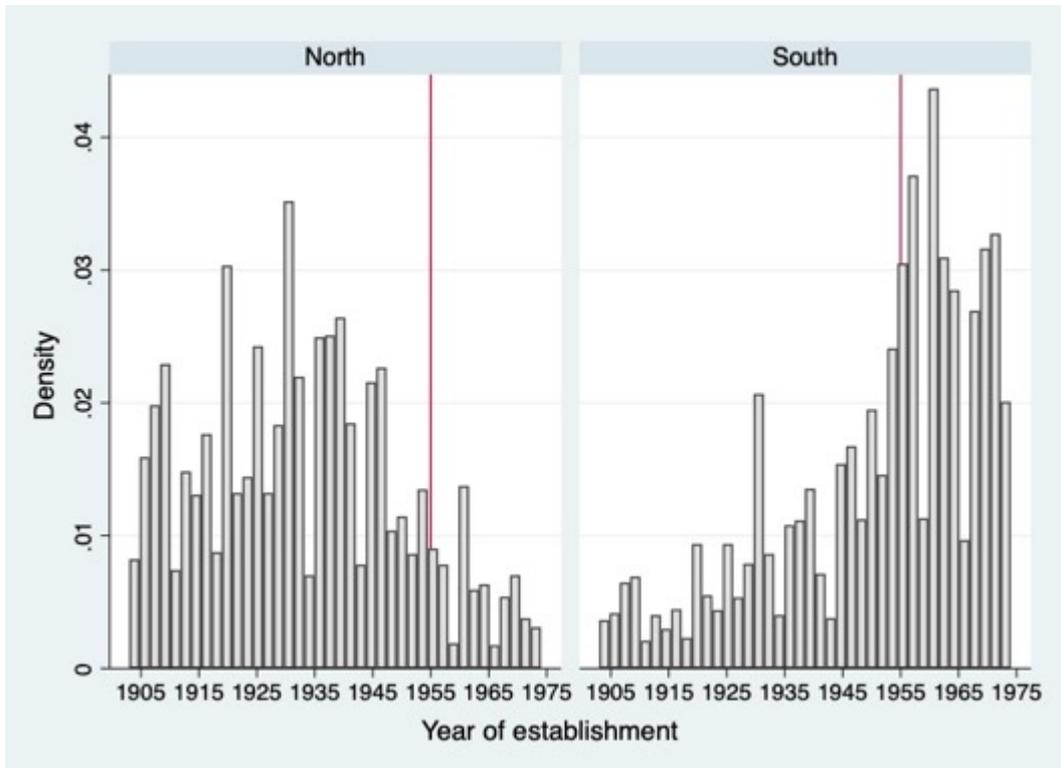
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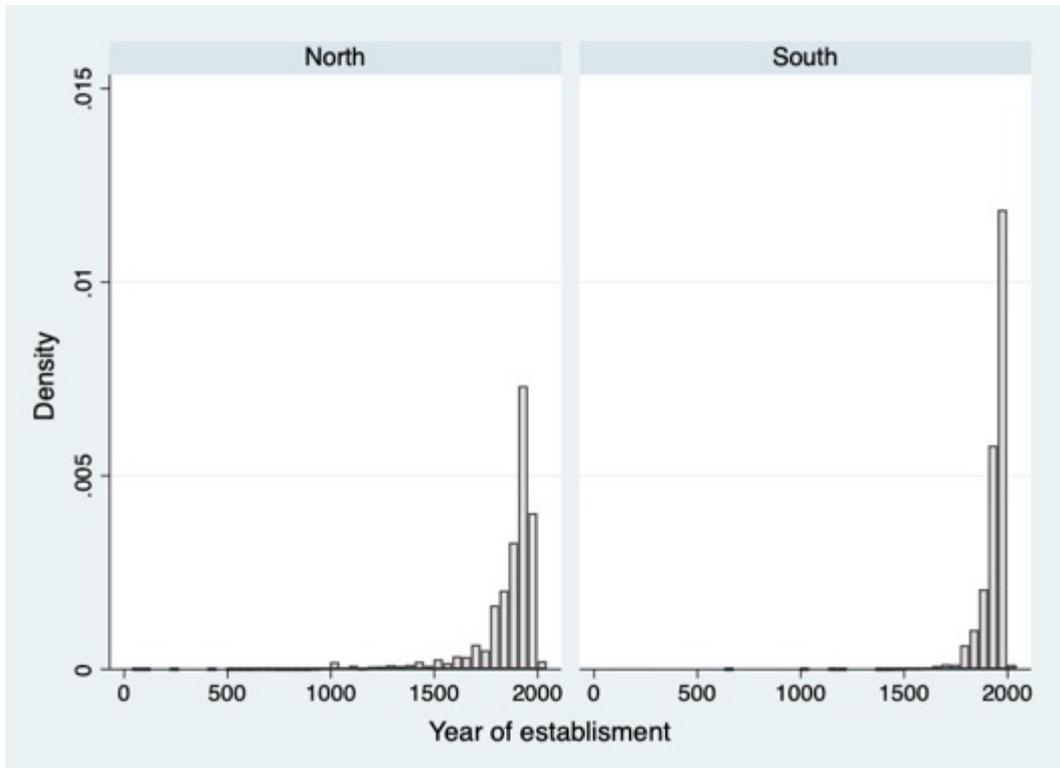
APPENDIX 1. DISTRIBUTION BY YEAR OF RELIGIOUS ESTABLISHMENT  
(1904-1974)

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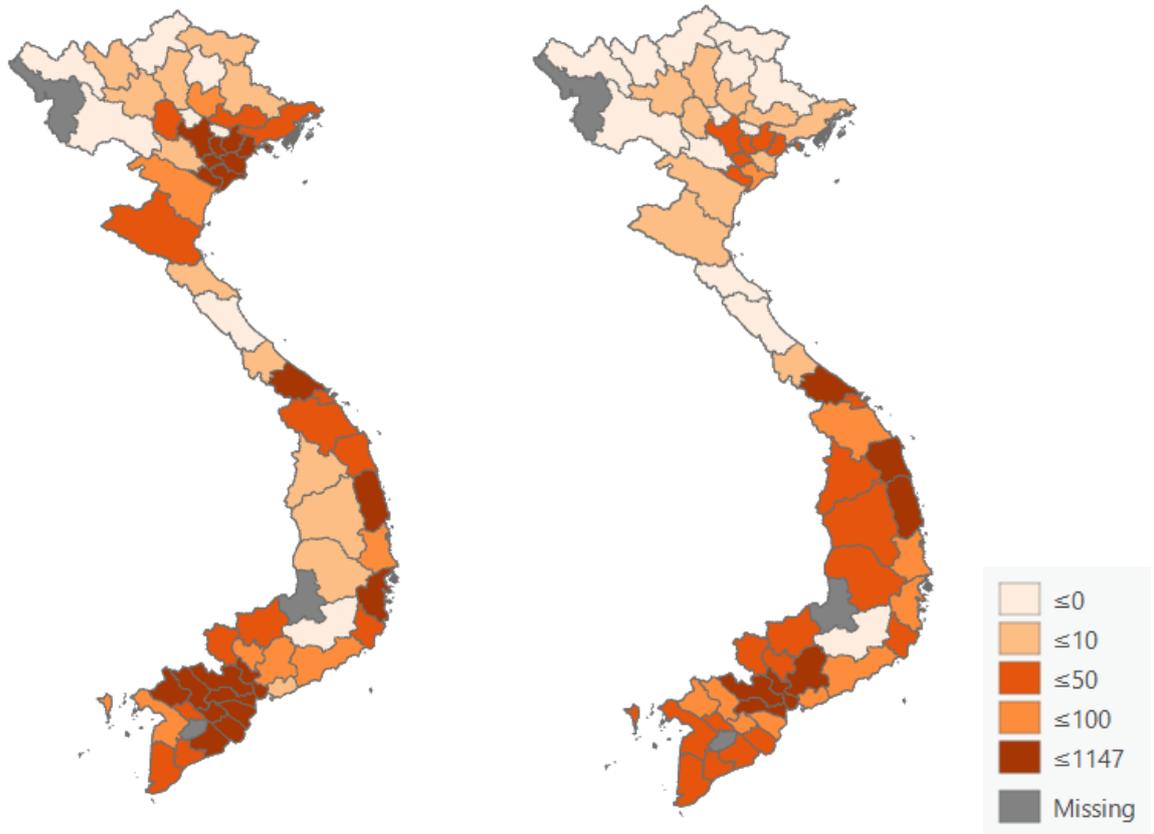
APPENDIX 2. DISTRIBUTION BY YEAR OF RELIGIOUS ESTABLISHMENT  
PRIOR TO 2007

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APPENDIX 3. NUMBER OF BUDDHIST ESTABLISHMENTS BY SET-UP TIMELINE

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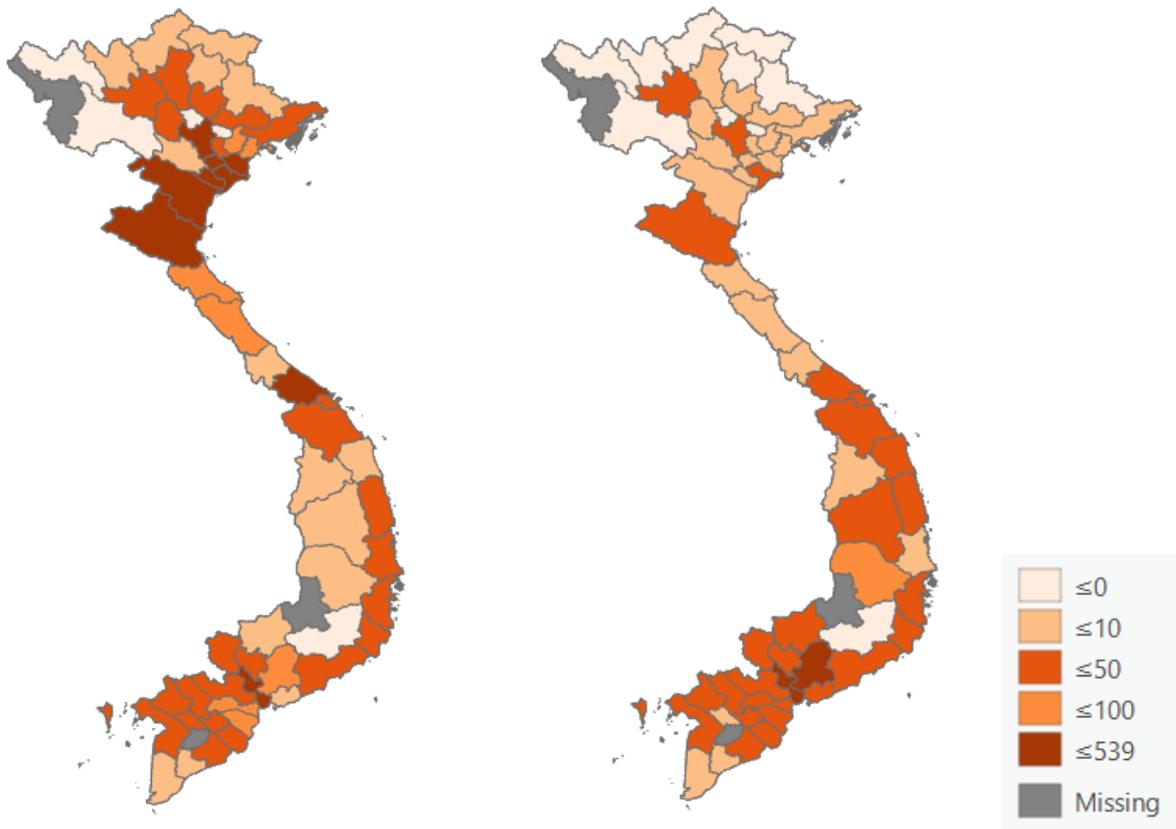


Prior to Geneva Accords

After Geneva Accords until 1974

## APPENDIX 4. NUMBER OF CATHOLIC ESTABLISHMENTS BY SET-UP TIMELINE

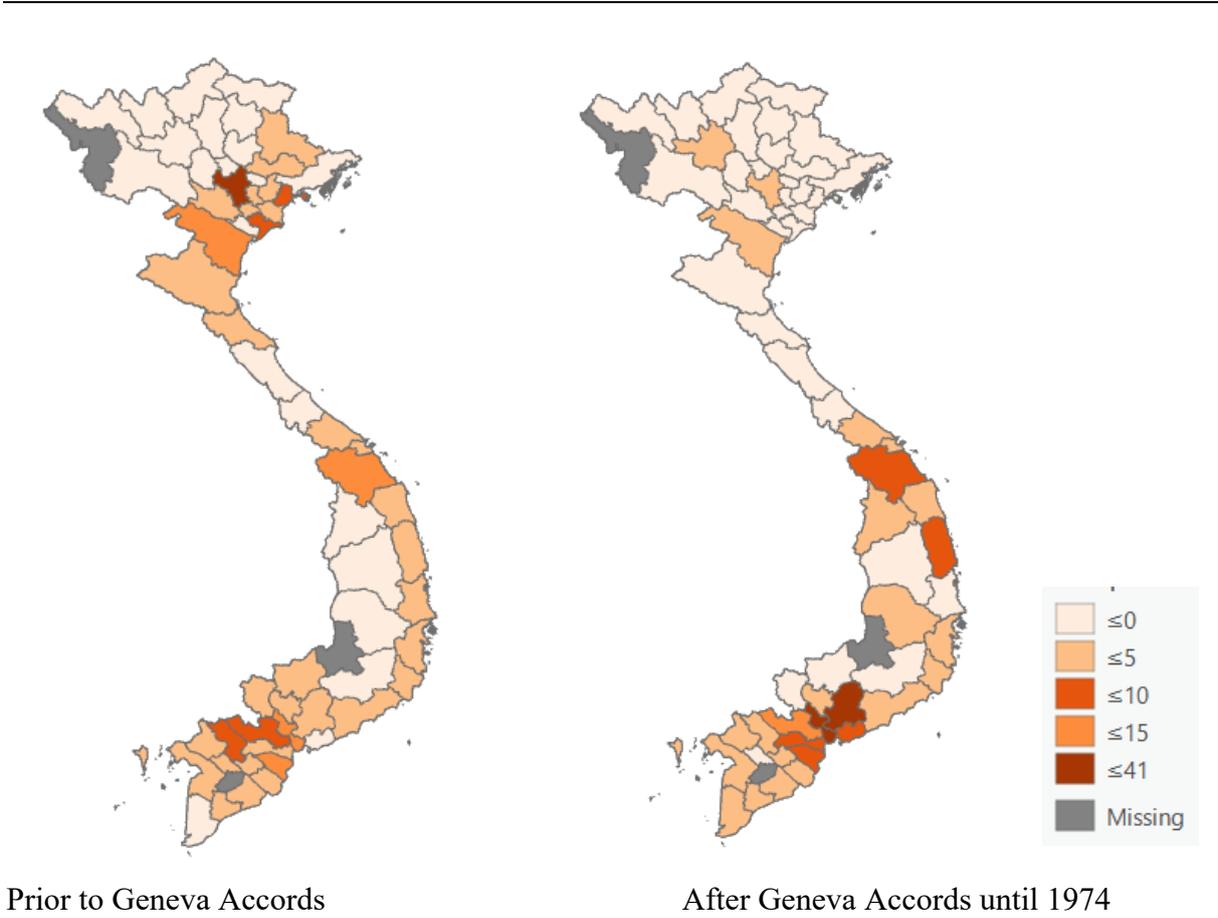
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Prior to Geneva Accords

After Geneva Accords until 1974

APPENDIX 5. NUMBER OF PROTESTANT ESTABLISHMENTS BY SET-UP  
TIMELINE



APPENDIX 6. DESCRIPTIVE STATISTICS AMONG HOUSEHOLDS HAVING  
CHILDREN AGED 0-4 BY RELIGIOUS STATUS OF HOUSEHOLD HEAD

	Head as non-believer				Head as religious follower			
	Mean	SD	Min	Max	Mean	SD	Min	Max
<i>A-All households</i>								
Prob(b)	0.5204	0.4720	0	1	0.5185	0.4681	0	1
Two-generation household	0.6201	0.4854	0	1	0.5648	0.4958	0	1
Three-generation household	0.3371	0.4727	0	1	0.3987	0.4896	0	1
More than three-generation household	0.0428	0.2023	0	1	0.0365	0.1876	0	1
Household size	5.0990	1.9970	2	41	5.6568	2.3309	2	40
Household education	7.3847	2.6132	0	20	6.4493	2.4887	0	20
Number of households	4,390,890				1,115,623			
<i>B-Household with public worker</i>								
Prob(b)	0.5203	0.4811	0	1	0.5192	0.4731	0	1
Two-generation household	0.4424	0.4967	0	1	0.2875	0.4526	0	1
Three-generation household	0.4964	0.5000	0	1	0.6510	0.4766	0	1
More than three-generation household	0.0612	0.2396	0	1	0.0615	0.2402	0	1
Household size	5.2182	2.2460	2	41	6.3885	2.8841	2	40
Household education	9.7110	2.6218	1	20	8.5553	2.5089	1	20
Ratio of members working for public sector over total working members	0.6456	0.3015	0.0370	1	0.5561	0.2915	0.04	1
Number of households	698,128				139,843			
<i>C-Among B-households having children aged 5-9</i>								
Prob(b)	0.5205	0.4837	0	1	0.5176	0.4729	0	1
Two-generation household	0.4536	0.4978	0	1	0.2917	0.4545	0	1
Three-generation household	0.4865	0.4998	0	1	0.6506	0.4768	0	1
More than three-generation household	0.0599	0.2373	0	1	0.0577	0.2332	0	1
Household size	5.8990	2.4283	3	41	7.3128	3.1406	3	40
Household education	9.5028	2.6592	1	20	8.3163	2.5162	1	18
Ratio of members working for public sector over total working members	0.6181	0.2981	0.0370	1	0.5365	0.2874	0.0526	1
Ratio of boys over total number of children aged 5-9	0.4777	0.4792	0	1	0.4979	0.4678	0	1
Number of households	276,396				58,351			

APPENDIX 7. DESCRIPTIVE STATISTICS FOR COMMUNES FOR IV ANALYSIS

	North				South			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Prob(b)	0.5120	0.0233	0.3600	0.5980	0.5150	0.0199	0.4046	0.6090
Follower density	0.1035	0.1655	0.0001	0.9933	0.2673	0.2656	0.0004	0.9916
Serious follower density	0.0854	0.1436	0	0.9923	0.1145	0.1616	0	0.9780
Serious follower ratio	0.7926	0.2537	0	1	0.4374	0.2475	0	1
Household education	7.9160	1.0343	3.1861	11.0853	6.3696	1.1636	3.1991	10.0796
Density of religious establishments per 1,000 people								
Before 1955 ( <i>Old</i> )	0.2800	0.4802	0	6.3425	0.1453	0.2314	0	1.7509
During 1955-1974 ( <i>North17</i> )	0.0171	0.0798	0	1.42225				
During 1955-1974 ( <i>South17</i> )					0.1008	0.1735	0	2.2733
Number of communes	4,151				3,683			

*Note:* All communes had at least one child aged 0-4 and a follower; Quang Tri province is excluded.

APPENDIX 8. HOUSEHOLDS WITH NO PUBLIC WORKERS

VARIABLES	(1) Prob(b)	(2) Prob(b)	(3) Prob(b)	(4) Prob(b)	(5) Prob(b)
Head as religious follower	-0.0024*** (0.0007)	-0.0022*** (0.0007)			
Any member as follower			-0.0019*** (0.0007)		
Nearby non-believer household	-0.0011 (0.0007)	-0.0011 (0.0007)	-0.0011* (0.0007)	-0.0010 (0.0007)	-0.0011 (0.0007)
Buddhism				-0.0006 (0.0009)	-0.0003 (0.0011)
Catholicism				-0.0044*** (0.0010)	-0.0043*** (0.0011)
Protestantism				-0.0082*** (0.0030)	-0.0102*** (0.0032)
Islam				0.0031 (0.0069)	0.0058 (0.0074)
Caodaism				0.0016 (0.0023)	0.0030 (0.0030)
Hoahaoism				0.0022 (0.0028)	0.0031 (0.0029)
Dummies for generations	Yes	Yes	Yes	Yes	Yes
Education variables	No	Yes	Yes	Yes	Yes
Commune fixed effect	Yes	Yes	Yes	Yes	Yes
Number of communes	10,474	10,474	10,474	10,474	10,474
Observations	4,668,542	4,668,542	4,668,542	4,668,542	4,668,542
R-squared	0.002	0.002	0.002	0.002	0.002

Note: Same as Table 1.

APPENDIX 9. HOUSEHOLDS WITH NO PUBLIC WORKERS AND NO CHILDREN  
AGED 5-9

VARIABLES	(1)	(2)	(3)	(4)	(5)
	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)
Head as religious follower	-0.0019*	-0.0018*			
	(0.0010)	(0.0010)			
Any member as follower			-0.0020**		
			(0.0009)		
Nearby non-believer household	-0.0011	-0.0011	-0.0011	-0.0011	-0.0011
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0009)
Buddhism				-0.0006	-0.0010
				(0.0013)	(0.0015)
Catholicism				-0.0037**	-0.0037**
				(0.0014)	(0.0015)
Protestantism				-0.0196***	-0.0218***
				(0.0047)	(0.0050)
Islam				0.0180*	0.0213**
				(0.0100)	(0.0101)
Caodaism				0.0043	0.0067
				(0.0032)	(0.0043)
Hoahaoism				0.0024	0.0021
				(0.0039)	(0.0042)
Dummies for generations	Yes	Yes	Yes	Yes	Yes
Education variables	No	Yes	Yes	Yes	Yes
Commune fixed effect	Yes	Yes	Yes	Yes	Yes
Number of communes	10,474	10,474	10,474	10,474	10,474
Observations	2,407,199	2,407,199	2,407,199	2,407,199	2,407,199
R-squared	0.004	0.004	0.004	0.004	0.004

*Note:* Same as Table 1.

APPENDIX 10. HOUSEHOLDS WITH NO PUBLIC WORKERS BUT WITH CHILDREN  
AGED 5-9

VARIABLES	(1) Prob(b)	(2) Prob(b)	(3) Prob(b)	(4) Prob(b)	(5) Prob(b)
Head as religious follower	-0.0027*** (0.0011)	-0.0025** (0.0011)			
Any member as follower			-0.0017* (0.0010)		
Nearby non-believer household	-0.0010 (0.0010)	-0.0010 (0.0010)	-0.0011 (0.0010)	-0.0009 (0.0010)	-0.0010 (0.0010)
Buddhism				-0.0007 (0.0014)	0.0005 (0.0016)
Catholicism				-0.0048*** (0.0015)	-0.0046*** (0.0015)
Protestantism				-0.0010 (0.0038)	-0.0031 (0.0042)
Islam				-0.0035 (0.0087)	-0.0005 (0.0090)
Caodaism				-0.0021 (0.0035)	-0.0018 (0.0045)
Hoahaoism				0.0014 (0.0043)	0.0040 (0.0045)
Ratio boy aged 5-9/ Children aged 5-9	-0.0164*** (0.0007)	-0.0164*** (0.0007)	-0.0164*** (0.0007)	-0.0164*** (0.0007)	-0.0164*** (0.0007)
Dummies for generations	Yes	Yes	Yes	Yes	Yes
Education variables	No	Yes	Yes	Yes	Yes
Commune fixed effect	Yes	Yes	Yes	Yes	Yes
Number of communes	10,473	10,473	10,473	10,473	10,473
Observations	2,261,343	2,261,343	2,261,343	2,261,343	2,261,343
R-squared	0.005	0.005	0.005	0.005	0.005

*Note:* Same as Table 1.

APPENDIX 11. HOUSEHOLDS WITH PUBLIC WORKERS

VARIABLES	(1) Prob(b)	(2) Prob(b)	(3) Prob(b)	(4) Prob(b)	(5) Prob(b)
Head as religious follower	-0.0029* (0.0017)	-0.0029* (0.0018)			
Any member as follower			-0.0027 (0.0016)		
Nearby non-believer household	0.0012 (0.0016)	0.0012 (0.0016)	0.0012 (0.0016)	0.0012 (0.0016)	0.0011 (0.0016)
Buddhism				-0.0026 (0.0021)	-0.0028 (0.0025)
Catholicism				-0.0040 (0.0029)	-0.0039 (0.0031)
Protestantism				-0.0111 (0.0079)	-0.0060 (0.0089)
Islam				-0.0017 (0.0298)	0.0003 (0.0332)
Caodaism				0.0048 (0.0067)	0.0045 (0.0098)
Hoahaoism				0.0030 (0.0095)	0.0112 (0.0111)
Ratio of public workers/ Working members	0.0002 (0.0022)	0.0011 (0.0022)	0.0011 (0.0022)	0.0010 (0.0022)	0.0011 (0.0022)
Dummies for generations	Yes	Yes	Yes	Yes	Yes
Education variables	No	Yes	Yes	Yes	Yes
Commune fixed effect	Yes	Yes	Yes	Yes	Yes
Number of communes	10,471	10,471	10,471	10,471	10,471
Observations	837,971	837,971	837,971	837,971	837,971
R-squared	0.013	0.013	0.013	0.013	0.013

Note: Same as Table 1.

APPENDIX 12. HOUSEHOLDS WITH PUBLIC WORKERS AND NO CHILDREN  
AGED 5-9

VARIABLES	(1)	(2)	(3)	(4)	(5)
	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)
Head as religious follower	-0.0020 (0.0023)	-0.0020 (0.0023)			
Any member as follower			-0.0014 (0.0022)		
Nearby non-believer household	0.0022 (0.0021)	0.0022 (0.0021)	0.0022 (0.0021)	0.0023 (0.0021)	0.0022 (0.0021)
Buddhism				-0.0020 (0.0028)	-0.0018 (0.0033)
Catholicism				-0.0026 (0.0038)	-0.0028 (0.0041)
Protestantism				-0.0095 (0.0121)	-0.0030 (0.0137)
Islam				0.0357 (0.0540)	0.0418 (0.0620)
Caodaism				0.0028 (0.0086)	0.0045 (0.0125)
Hoahaoism				0.0045 (0.0114)	0.0143 (0.0133)
Ratio of public workers/ Working members	0.0015 (0.0027)	0.0021 (0.0028)	0.0021 (0.0028)	0.0021 (0.0028)	0.0021 (0.0028)
Dummies for generations	Yes	Yes	Yes	Yes	Yes
Education variables	No	Yes	Yes	Yes	Yes
Commune fixed effect	Yes	Yes	Yes	Yes	Yes
Number of communes	10,448	10,448	10,448	10,448	10,448
Observations	503,224	503,224	503,224	503,224	503,224
R-squared	0.020	0.020	0.020	0.020	0.020

*Note:* Same as Table 1.

APPENDIX 13. HOUSEHOLDS WITH PUBLIC WORKERS AND CHILDREN AGED 5-9

VARIABLES	(1) Prob(b)	(2) Prob(b)	(3) Prob(b)	(4) Prob(b)	(5) Prob(b)
Head as religious follower	-0.0046*	-0.0046*			
	(0.0027)	(0.0027)			
Any member as follower			-0.0049*		
			(0.0026)		
Nearby non-believer household	-0.0006	-0.0007	-0.0005	-0.0006	-0.0007
	(0.0027)	(0.0027)	(0.0027)	(0.0027)	(0.0027)
Buddhism				-0.0038	-0.0049
				(0.0034)	(0.0040)
Catholicism				-0.0061	-0.0062
				(0.0042)	(0.0046)
Protestantism				-0.0132	-0.0093
				(0.0104)	(0.0125)
Islam				-0.0194	-0.0192
				(0.0375)	(0.0397)
Caodaism				0.0057	0.0019
				(0.0108)	(0.0155)
Hoahaoism				-0.0006	0.0047
				(0.0167)	(0.0195)
Ratio of boys aged 5-9/ Children aged 5-9	-0.0066***	-0.0066***	-0.0066***	-0.0066***	-0.0066***
	(0.0018)	(0.0018)	(0.0018)	(0.0018)	(0.0018)
Ratio of public workers/ Working members	-0.0024	-0.0011	-0.0011	-0.0011	-0.0011
	(0.0036)	(0.0037)	(0.0037)	(0.0037)	(0.0037)
Dummies for generations	Yes	Yes	Yes	Yes	Yes
Education variables	No	Yes	Yes	Yes	Yes
Commune fixed effect	Yes	Yes	Yes	Yes	Yes
Number of communes	10,446	10,446	10,446	10,446	10,446
Observations	334,747	334,747	334,747	334,747	334,747
R-squared	0.031	0.031	0.031	0.031	0.031

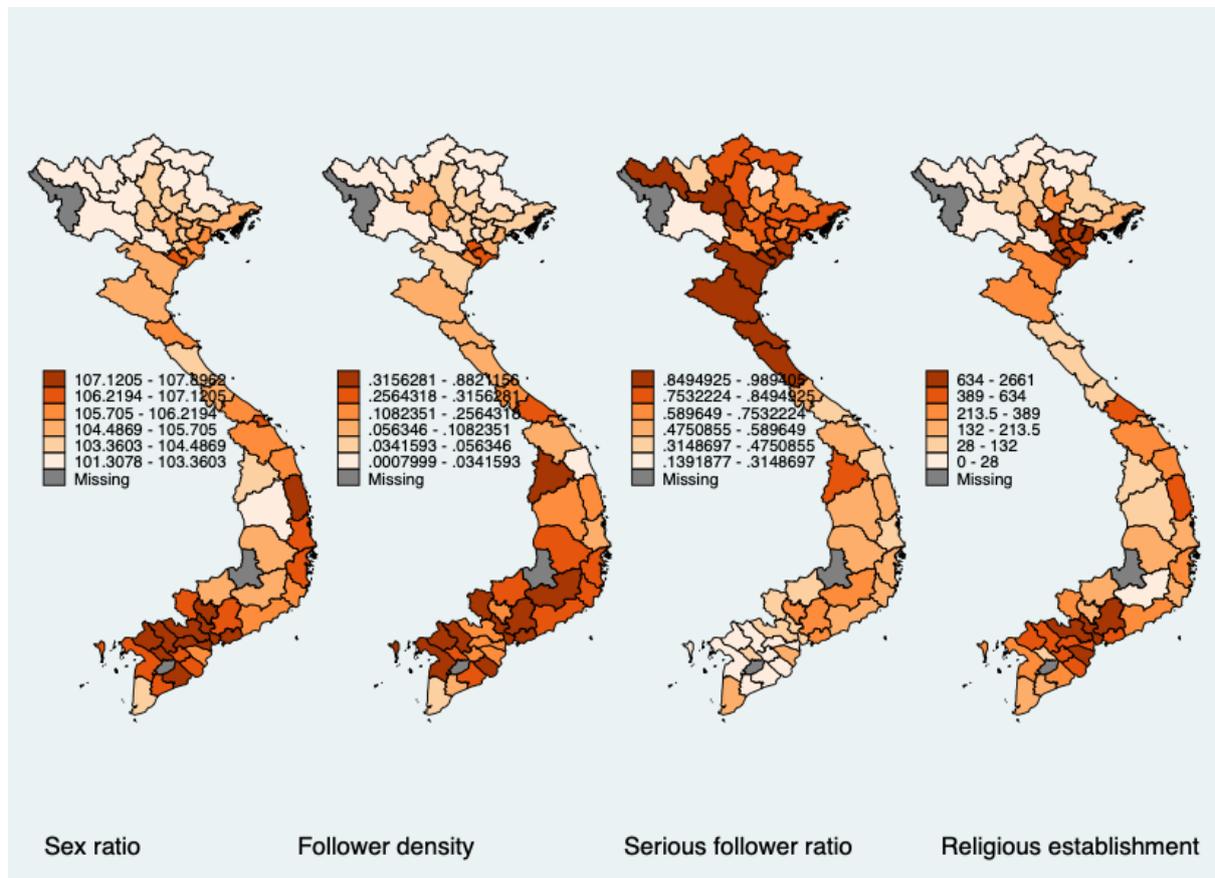
Note: Same as Table 1.

APPENDIX 14. FIRST STAGES OF IV ANALYSIS

VARIABLES	<i>Spec. A</i>				<i>Spec. B</i>				
	All	Buddhism	Catholicism		All	Buddhism	Catholicism		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Follower density	Serious follower density	Follower density	Serious follower density	Follower density	Serious follower density	Serious follower ratio	Serious follower ratio	Serious follower ratio
Religious establishment density									
Before 1955 ( <i>Old</i> )	0.0365*** (0.0082)	0.0224*** (0.0060)	0.0764*** (0.0140)	0.0227*** (0.0022)	0.4000*** (0.0191)	0.4023*** (0.0095)	0.0598*** (0.0084)	0.2832*** (0.0211)	0.1592*** (0.0095)
During 1955-74 ( <i>North17</i> )	-0.0541 (0.0406)	0.0662*** (0.0412)	-0.2214*** (0.0277)	0.0194*** (0.0090)	0.6044*** (0.1163)	0.6073*** (0.1162)	0.4299*** (0.0500)	0.9948*** (0.1132)	0.2271*** (0.0290)
During 1955-74 ( <i>South17</i> )	0.3230*** (0.0304)	0.1220*** (0.0199)	0.3202*** (0.0590)	-0.0435*** (0.0065)	0.9335*** (0.0803)	0.9293*** (0.0801)	-0.4024*** (0.0330)	-0.6563*** (0.0504)	0.2303*** (0.0197)
Observations	7,834	7,834	6,547	6,547	6,481	6,481	7,834	6,547	6,481
Centered R2	0.1072	0.0296	0.0791	0.0902	0.2267	0.2308	0.2504	0.1647	0.0626
Uncentered R2	0.4848	0.3424	0.4076	0.4309	0.4168	0.4143	0.8446	0.6455	0.9798
Test for excluded instruments									
Prob>F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

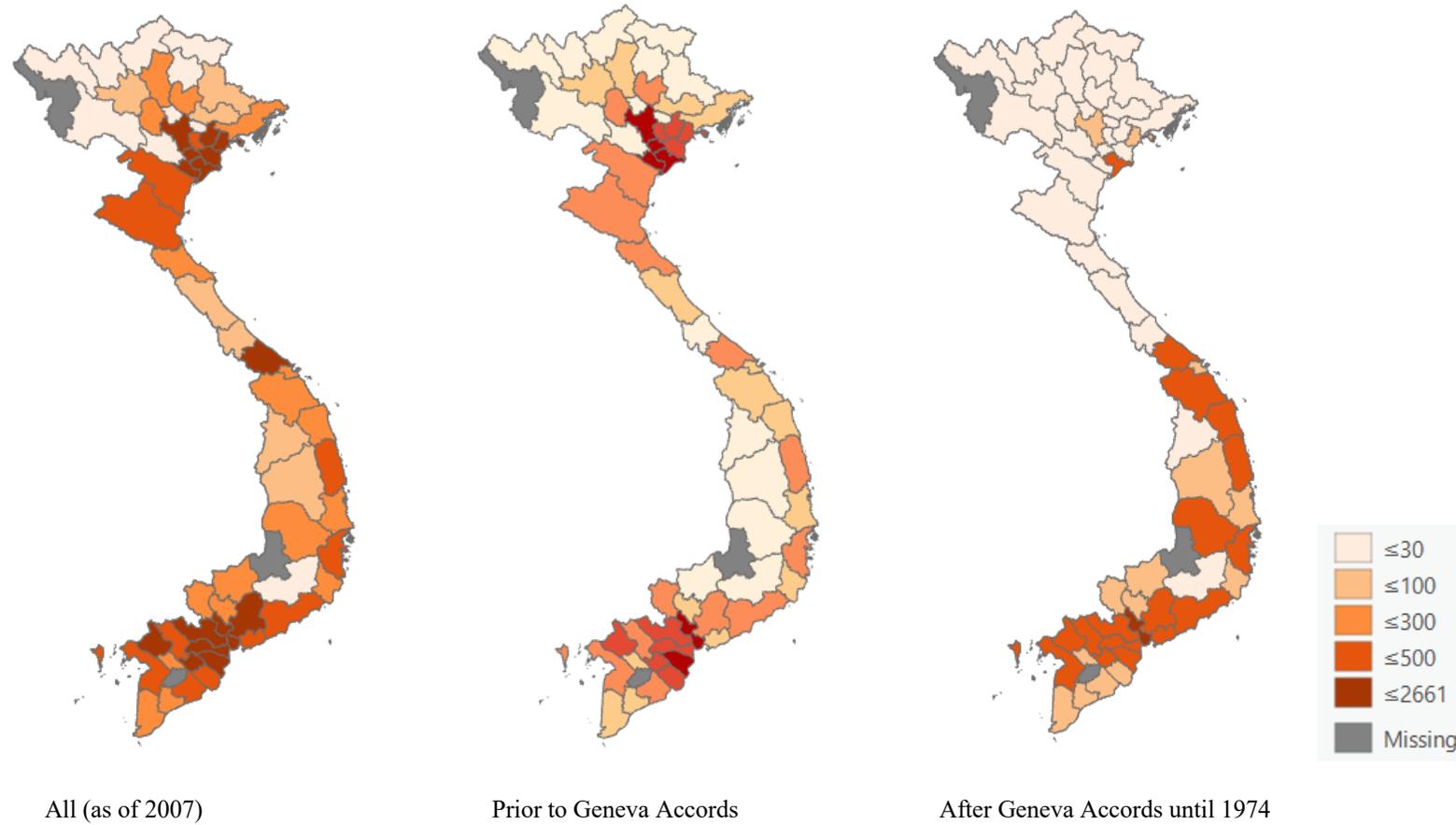
Note: Educational variables are included in all estimations.

GRAPH 1. SEX RATIO, FOLLOWER DENSITY, SERIOUS FOLLOWER RATIO, AND RELIGIOUS ESTABLISHMENT



*Note:* All country shape files used in this study are from the GADM database (<https://gadm.org>) for the current administration division of 63 provinces, while there were only 61 provinces in 1999. Therefore, the maps display some “missing” data.

GRAPH 2. NUMBER OF RELIGIOUS ESTABLISHMENTS IN 2007



*Note:* The figure does not reflect establishments that were no longer in existence by 2007.

TABLE 1. PROBABILITY OF HAVING A BOY AMONG HOUSEHOLDS

VARIABLES	(1) Prob(b)	(2) Prob(b)	(3) Prob(b)	(4) Prob(b)	(5) Prob(b)
Head as religious follower	-0.0026*** (0.0007)	-0.0025*** (0.0007)			
Any member as follower			-0.0021*** (0.0006)		
Nearby non-believer household	-0.0009 (0.0006)	-0.0009 (0.0006)	-0.0009 (0.0006)	-0.0008 (0.0006)	-0.0009 (0.0006)
Buddhism				-0.0011 (0.0009)	-0.0008 (0.0010)
Catholicism				-0.0046*** (0.0010)	-0.0044*** (0.0010)
Protestantism				-0.0088*** (0.0027)	-0.0099*** (0.0030)
Islam				0.0031 (0.0072)	0.0056 (0.0077)
Caodaism				0.0019 (0.0021)	0.0029 (0.0029)
Hoahaoism				0.0018 (0.0027)	0.0032 (0.0029)
Dummies for generations	Yes	Yes	Yes	Yes	Yes
Education variables		Yes	Yes	Yes	Yes
Commune fixed effect	Yes	Yes	Yes	Yes	Yes
Number of communes	10,474	10,474	10,474	10,474	10,474
Observations	5,506,513	5,506,513	5,506,513	5,506,513	5,506,513
R-squared	0.002	0.002	0.002	0.002	0.002

*Notes:* In (3), the specific religious dummies pertain to the household heads. In (4), the dummies pertain to the density of specific religious individuals within the same household. Education variables include average household education among those aged 18 and above and its squared value.

TABLE 2. ORDINARY LEAST SQUARE ESTIMATIONS AMONG COMMUNES

	All	Buddhism	Catholicism	Protestantism	Islam	Caodaism	Hoahaoism
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)
<i>Spec. A</i>							
Follower density	0.0060*** (0.0016)	0.0076*** (0.0019)	-0.0661*** (0.0174)	-0.0216 (0.0140)	0.0614 (0.0475)	0.0232 (0.0247)	0.0039 (0.0089)
Serious follower density	-0.0022 (0.0023)	-0.0103 (0.0096)	0.0700*** (0.0176)	-0.0274 (0.0345)	-0.0869 (0.0807)	-0.0494 (0.0453)	-0.0029 (0.0144)
R-squared	0.006	0.006	0.002	0.016	0.002	0.001	0.002
<i>Spec. B</i>							
Serious follower ratio	-0.0027*** (0.0008)	-0.0041*** (0.0008)	0.0039** (0.0019)	0.0030** (0.0012)	0.0010 (0.0018)	0.0003 (0.0013)	0.0002 (0.0018)
R-squared	0.002	0.005	0.002	0.010	0.001	0.001	0.001
Number of communes	7,834	6,547	6,481	2,821	460	3,098	797

*Note:* Education and Education<sup>2</sup> are included in all estimations and correspond to the sample selection. For example, they are all eligible people within the commune for (1) but are of followers of Buddhism for (2).

TABLE 3. INSTRUMENTAL VARIABLE (IV) ESTIMATIONS AMONG COMMUNES

VARIABLES	<i>Spec. A</i>			<i>Spec. B</i>		
	All	Buddhism	Catholicism	All	Buddhism	Catholicism
	(1)	(2)	(3)	(4)	(5)	(6)
	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)
Follower density	0.0589*** (0.0181)	0.0510*** (0.0162)	2.3059*** (0.7244)			
Serious follower density	-0.0981** (0.0436)	-0.1923** (0.0932)	-2.2988*** (0.7232)			
Serious follower ratio				-0.0176*** (0.0036)	-0.0095*** (0.0027)	0.0031 (0.0096)
Number of communes	7,834	6,547	6,481	7,834	6,547	6,481
R-squared	-0.257	-0.112	-1.439	-0.043	-0.003	0.002
<i>Under-identification test</i>						
Kleibergen-Paap rk LM statistic	16.276	47.818	57.492	347.599	450.985	452.204
Chi-sq(2) P-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<i>Weak identification test</i>						
Kleibergen-Paap rk Wald F statistic	5.210	22.911	17.964	102.241	152.6999	132.041
Stock-Yogo weak ID test critical values: 10% maximal IV size	13.43	13.43	13.43	22.30	22.30	22.30
Hansen J Statistic	0.382	0.082	1.005	0.969	3.624	14.236
Chi-sq(1) P-value	0.5363	0.7745	0.3160	0.6160	0.1633	0.0008

Notes: All communes of Quang Tri province were excluded. Two-step generalized method of moments and robust district clustered variance are used; the first step results are shown in Appendix 14. Similar to Table 2, Education and Education<sup>2</sup> are included in all estimations. LM=Lagrange multiplier; ID=identification.

TABLE 4. PROBABILITY OF NON-BELIEVER HOUSEHOLDS HAVING A BOY  
AMONG COMMUNES

	Six religions		Buddhism		Catholicism	
	OLS (1) Prob(b2)	IV (2) Prob(b2)	OLS (3) Prob(b2)	IV (4) Prob(b2)	OLS (5) Prob(b2)	IV (6) Prob(b2)
<i>Spec. A</i>						
Follower density	0.0103** (0.0040)	0.0456 (0.0419)	0.0102*** (0.0035)	0.0476*** (0.0167)	-0.0953 (0.0624)	3.5797*** (1.2254)
Serious follower density	-0.0078 (0.0096)	-0.0633 (0.1025)	-0.0245* (0.0137)	-0.1751* (0.1036)	0.1097* (0.0636)	-3.5656*** (1.2251)
Number of communes	7,831	7,831	6,547	6,547	6,480	6,480
R-squared	0.003	-0.032	0.005	-0.063	0.011	-2.306
<i>Under-identification test</i>						
Kleibergen-Paap rk LM statistic		15.567		47.818		57.468
Chi-sq(2) P-Value		0.0004		0.0000		0.0000
<i>Weak identification test</i>						
Kleibergen-Paap rk Wald F statistic		5.021		22.911		17.950
Stock-Yogo weak ID test critical values: 10% maximal IV size		13.43		13.43		13.43
<i>Hansen J Statistic</i>		1.625		0.013		0.788
Chi-sq(1) P-value		0.0203		0.9109		0.3748
	(7) Prob(b2)	(8) Prob(b2)	(9) Prob(b2)	(10) Prob(b2)	(11) Prob(b2)	(12) Prob(b2)
<i>Spec. B</i>						
Serious follower ratio	-0.0043** (0.0017)	-0.0177*** (0.0061)	-0.0044*** (0.0008)	-0.0100*** (0.0032)	0.0052** (0.0020)	0.0227 (0.0187)
Number of communes	7,831	7,831	6,547	6,547	6,480	6,480
R-squared	0.001	-0.012	0.004	-0.002	0.001	-0.009
<i>Under-identification test</i>						
Kleibergen-Paap rk LM statistic		346.953		450.985		451.616
Chi-sq(2) P-Value		0.0000		0.0000		0.0000
<i>Weak identification test</i>						
Kleibergen-Paap rk Wald F statistic		102.248		152.699		131.873
Stock-Yogo weak ID test critical values: 10% maximal IV size		22.30		22.30		22.30
<i>Hansen J Statistic</i>		1.434		2.031		12.791
Chi-sq(1) P-value		0.4882		0.3622		0.0017

Note: OLS=ordinary least squares; IV=instrumental variable. The rest is the same as Table 3.

TABLE 5. INSTRUMENTAL VARIABLE (IV) APPROACH CONDITIONAL UPON FOLLOWER DENSITY (HIGH/LOW)

	Six religions		Buddhism		Catholicism	
	High	Low	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)
	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)	Prob(b)
Serious follower ratio	-0.0155***	-0.0187**	-0.0130***	-0.0005	-0.0108	-0.0173
	(0.0044)	(0.0091)	(0.0046)	(0.0041)	(0.0239)	(0.0237)
Number of communes	3,917	3,917	3,274	3,273	3,244	3,237
R-squared	-0.038	-0.047	-0.007	0.001	-0.005	-0.023
<i>Under-identification test</i>						
Kleibergen-Paap rk LM statistic	219.316	94.279	174.122	244.051	211.536	44.617
Chi-sq(2) P-Value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
<i>Weak identification test</i>						
Kleibergen-Paap rk Wald F statistic	73.179	25.064	78.597	124.394	63.106	24.323
Stock-Yogo weak ID test critical values: 10% maximal IV size	22.30	22.30	22.30	22.30	22.30	22.30
<i>Hansen J Statistic</i>						
Chi-sq(1) P-value	0.018	2.267	0.161	4.146	6.110	8.101
	0.9911	0.3219	0.9227	0.1258	0.0471	0.0174
	(7)	(8)	(9)	(10)	(11)	(12)
	Prob(b2)	Prob(b2)	Prob(b2)	Prob(b2)	Prob(b2)	Prob(b2)
Serious follower ratio	-0.0136	-0.0184**	-0.0118**	-0.0011	0.0110	-0.0150
	(0.0090)	(0.0092)	(0.0056)	(0.0041)	(0.0490)	(0.0236)
Number of communes	3,914	3,917	3,274	3,273	3,243	3,237
R-squared	-0.002	-0.043	-0.002	0.002	0.003	-0.017
<i>Under-identification test</i>						
Kleibergen-Paap rk LM statistic	218.595	94.279	174.122	244.051	211.219	44.617
Chi-sq(2) P-Value	0.0000	0.000	0.0000	0.0000	0.0000	0.0000
<i>Weak identification test</i>						
Kleibergen-Paap rk Wald F statistic	73.297	25.064	78.597	124.394	63.026	24.323
Stock-Yogo weak ID test critical values: 10% maximal IV size	22.30	22.30	22.30	22.30	22.30	22.30
<i>Hansen J Statistic</i>						
Chi-sq(1) P-value	1.233	1.670	0.038	4.146	8.339	8.794
	0.5399	0.4338	0.9811	0.1258	0.0155	0.0123

Notes: Low level is where the follower density is equal to or below 0.0765, 0.0386, and 0.0232 for the six religions, Buddhism, and Catholicism, respectively; this represents 50% of the total commune number. The rest is the same as Table 3.