Club Goods and Group Identity: Evidence from Islamic Resurgence During the Indonesian Financial Crisis

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Abstract

This paper presents a model where group identity in the form of religious intensity represents the degree of social insurance in which people participate and social sanctions facilitate religion's function as ex-post insurance. I exploit relative price shocks induced by the Indonesian financial crisis to demonstrate a causal relationship between economic distress and religious intensity that is weaker for other forms of group identity. Rapid inflation favored growers of staple crops and disfavored those whose wages were particularly sticky. I use pre-crisis wetland hectares and government occupation as instruments and dryland hectares and service occupation as "placebo instruments" to estimate the impact of economic distress on religious intensity. Households who experience a $1 decline in monthly per-capita nonfood expenditures are 2% more likely to increase communal Koran study and 1% more likely to switch a child to Islamic school but are no more likely to increase other communal activities or secular school attendance. The average household suffered a $4.70 decline in monthly per-capita nonfood expenditure. Consistent with predictions derived from the model, credit availability reduces the effect of economic distress on religious intensity by roughly 80%, religious intensity alleviates needing alms or credit to meet basic needs at the peak of the crisis, religious institutions reduce the spread of consumption shocks among villagers during the crisis, and religious institutions reduce the effect of income shocks on consumption shocks. These results provide evidence that religious intensity responds to economic forces and suggest alleviating risk may mitigate fundamentalist tendencies. (*JEL* classification: D71, D74, E21, G22, H41, O17, Z1, Z12; *Keywords* Religion, Insurance, Club Goods, Group Identity, Fundamentalism)

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1 Introduction

Despite an explosion of policy interest in association with recent events, religious intensity appears poorly understood. What causes religious intensity? Does economic distress stimulate religious intensity? Is it economics or distress that stimulates religious intensity? Does religious intensity function as social insurance, distinctive from other insurance mechanisms in that religious groups help people who experience negative shocks after the fact whereas other insurance mechanisms require participation before the fact? How would such an "ex-post" insurance mechanism be self-sustaining and how does it compare with other insurance mechanisms during crisis? These are some of the questions that this paper seeks to address. Social scientists have long speculated on the connection between economic forces and religious intensity; answers to these questions may suggest appropriate policies to address ideological extremism.

This paper uses the Indonesian financial crisis to estimate the causal impact of economic distress on communal Koran study (Pengajian) and Islamic school attendance (for children) and provide evidence consistent with a model of religious intensity functioning as social insurance. Between 1997 and 1998, Indonesia's Rupiah fell dramatically from 2400 to the US dollar to 16000 to the US dollar and the CPI (consumer price index) for food increased from 100 to 261. My empirical strategy exploits the fact that relative prices shocks induced by the crisis favored growers of staples, namely rice, and hurt sticky wage-earners, particularly government employees whose salaries are set by federal law. Because pre-crisis wetland hectares and government occupation are unlikely to be correlated with changes in religious intensity other than through economic distress, an assumption examined below, the interaction of the crisis and wetland hectares and the interaction of the crisis and government occupation creates exogenous variation in economic distress that can be used to estimate the causal impact of economic distress on religious intensity. Dryland hectares and service occupation serve as "placebo instruments" to test whether unobservables common with wetland and dryland hectares and with government and service occupations influence changes in religious intensity.

An analogy sometimes helps to explain the empirical strategy. Suppose a doctor wishes to conduct a clinical trial but is unable to randomly assign treatment and control. All he can do is, if a patient walks through the door wearing a red shirt, he assigns treatment. Wearing a red shirt is not randomly assigned, however. What the doctor must do is to check if wearing a red shirt is "as if" randomly assigned. Are those who wear red shirts different along observable dimensions from those who do not, before they walk in the door? Is the treatment effect similar with and without controlling for observables? In the absence of the experiment, would those who wore red shirts have a different health outcome anyway? Suppose patients who wear red shirts and pink shirts are very similar. Pink shirts serve as a "placebo instrument" for red shirts. Those who wear pink shirts do not receive treatment; do they also display changes in health outcomes like those who wear red shirts? The analogy is that the Indonesian financial crisis serves as a non-random clinical trial to ascertain the causal effect of economic distress on religious intensity. Wetland hectares are "red shirts" while dryland hectares are "pink shirts" and government occupation and service occupation

are "anti-treatment" and its placebo. Much of what follows is verifying how closely does this analogy apply before proceeding to causal estimates and testing of theory.

In the following sections, I present an analysis of data from the Hundred Villages Survey, a panel of 8,140 households followed by the Indonesian Census Bureau before and after the crisis and where religious intensity is measured using Koran study and the sending of one's children to Islamic school. Section 2 presents a model of religious intensity functioning as ex-post social insurance. Experimental evidence documents that induced group identity increases the degree of altruism towards ingroup members (Chen and Li 2008). In my model, agents choose a proportion of income, which represents their religious intensity, to put in Pengajian (communal Koran study), a risk-sharing pool. The pool is divided according to how much agents contribute as a fraction of their income, i.e. their relative religious intensity. The model has the empirical implications that those who are hit harder by economic distress will increase their religious intensity and those who are hit less hard will decrease their religious intensity. The effect should be mitigated when other forms of credit are available. Social sanctions against relative lack of intensity facilitate the stability of ex-post insurance by deterring agents who receive positive shocks from participating less, which in turn encourages agents who receive negative shocks to participate more because they can appropriate more of the positive shocks.

Section 3 establishes wetland hectares and government occupation are indeed related to economic distress during the crisis. The price of rice increased by up to 280% while in comparison, prices of non-staples increased by less or even fell during the crisis (Levinsohn et.al 2003). Therefore, the more wetland a household owns, the smaller the decrease in non-food expenditure. In contrast, real wages fell on the order of 40% (Smith et.al 2002), so households headed by a government employee, whose salaries tend to be inflexible in the short run (Knowles et.al 1999), report larger decreases in non-food expenditure.

The variety of evidence presented in Section 3 establishes that the financial crisis differentially impacted wetland owners and government employees during the crisis. In Section 4, I consider whether households suffering greater economic distress increase religious intensity. Two-stage least squares estimates using this variation suggest that households who suffer more economic distress significantly increase religious intensity while those who suffer less economic distress significantly decrease religious intensity relative to other households. The estimates indicate that households who suffer a $1 decline in monthly non-food per-capita expenditures are roughly 2% more likely to increase Koran study. The average household suffered a $4.70 decline in monthly non-food per-capita expenditures out of a pre-crisis average of $7.34.

I also look at the effect of economic distress on the number of children that households send to Islamic schools. In spite of the fact that Islamic schools in my sample are substantially more expensive than non-Islamic schools (and have lower returns to education (Berman and Stepanyan 2003)), Islamic school attendance of affected households increase relative to the attendance of less affected households. These results suggest that religious intensity increases with economic distress, and perhaps as a consequence, intergenerational religious intensity as well.

I then explore why economic distress stimulates religious intensity. Family deaths, in particular, deaths of infants, do not stimulate religious intensity. Moreover, economic distress does not stimulate participation in other social activities (including rotating savings groups, an alternative insurance mechanism). These results indicate that something particular about economic distress, not distress more generally, stimulates religious intensity and that religious intensity provides something distinctive that other social activities or insurance mechanisms do not provide. To shed further light on whether Koran study is merely a leisure activity and households have more leisure, I investigate the effect of economic distress on labor supply. Households suffering more economic distress work slightly more hours per week. These results are inconsistent with opportunity cost of time models of religion that do not account for social insurance since falling wages do not increase participation in other social activities and households have less time for religious activity.

In Section 5, I turn to the evidence for religious intensity as social insurance. Religious intensity during the peak of the crisis alleviates the need for alms or credit in order to meet basic daily needs: households that increase participation in Koran study during the crisis see a 50% reduction in likelihood to need alms or credit three months later whereas households that decrease participation see a 20% reduction in likelihood to need alms or credit three months later; those who did not participate are only 5% less likely to need alms or credit three months later. Moreover, I find that religious institutions facilitate consumption smoothing among villagers by reducing the spread of consumption shocks among villagers during the crisis. This finding is identified by interacting pre-crisis number of worship buildings with the Gini coefficient of wetland ownership as instrument for the impact of the crisis on the standard deviation of consumption shocks (since wetland ownership cushions households, the Gini coefficient of wetland instruments for the inequality of cushions). Religious institutions also reduce the effect of income shocks on consumption shocks: religious institutions mitigate the relationship between the instruments for economic distress and economic distress.

Importantly, the effect of economic distress on religious intensity essentially disappears in places where credit is available in the form of banks, microfinance institutions, or BRI loan products. The role of religion as a provider of insurance is broadly consistent with club goods theory (Buchanan 1965, Scotchmer 2002, Iannacone 1992, Berman 2000), which posits the existence of local public goods, such as mutual insurance and ingroup altruism that is excluded to non-group members.

Religious intensity provides a particularly apt context to study group identity as it is likely more of a choice than ethnicity. Several authors have found significantly negative impacts of ethnic-religious conflicts on economic outcomes (e.g. Abadie and Gardeazabal (2002) and Alesina, et.al (1999)). The opposite direction of causality has also begun to attract attention and spark debate (e.g. Wolfensohn (2003) vs. Krueger and Maleckova (2003) on whether economic conditions cause terrorism). This paper also contributes to the literature on the determinants of religion, which has received a recent boost with the work of Barro and McCleary (2006), Glaeser and Sacerdote (2001), and Gruber (2004, 2005), and the literature on consumption smoothing (households can smooth through borrowing and lending, through storage, through transfers in family networks, or

through religious participation) and insurance (Townsend 1994). Together with the finding that religious intensity is more strongly linked to social violence in regions that are more economically distressed (Chen 2007), these results suggest to the extent governments, international organizations, and NGOs are concerned about ideological extremism, increasing the provision of social insurance may mitigate fundamentalist tendencies.

2 Religion and Economics

2.1 Indonesia Background

87% of Indonesia's population of 230 million is Muslim, making it the country with the largest (Sunni) Muslim population in the world. The primary measure of religious intensity being studied is Pengajian, which specifically refers to communal Koran study. 61% of households in my sample report participating in Pengajian in August 1998 which increases to 71% in August 1999. The second measure of religous intensity being studied is the sending of one's children to Islamic school. In a nationwide survey, 18% of Muslim households with school-age children sent their children to Islamic school in 1997 (IFLS2) which increases to 30% in 1999 (Wagner 1999).

2.1.1 Pengajian

In most Islamic denominations, the Koran is kept in its strictest form, meaning that it cannot be translated. During Pengajian, a group gathers to read the Koran together in Arabic, discussing both the translation and the meaning. A leader will be responsible for translating and applying the Koran to the real world in a lecture format. Lessons on how to live and perspectives on contemporary events are common material for discussion. The particular interpretation depends on the type of Islam–modern, radical, democratic, liberal, or abangan. Pengajian can become politicized though it usually focuses on general religious and social doctrine. Geertz (1960) observes one Pengajian meeting. During most of two hours, a speaker exhorts on the importance of attending and organizing, ridiculing those who only sit and pray, thinking about the next world and doing nothing else: "The Prophet not only prayed but prayed and acted." In Geertz's view, Pengajian tends to be a kind of rally, where speakers exhort listeners in the most general terms to rouse up and do something. More recent ethnographic observations of a women's Pengajian group suggest a modernizing trend (Kipp 1993). A leader begins the women's meetings with forty minutes of responsive reading, in which she gives a sentence and then the group responds, all in Arabic. The leader reads from Arabic, but most follow her in a book of Latin-script transcriptions. Some simply work from memory. The teacher then talks for thirty to forty minutes, sometimes expounding a verse from the Qur'an, sometimes giving moral instruction. Instruction can be directive and social sanctions against non-group members or non-participants implicit.

Individuals can attend multiple Pengajians. Each mosque has multiple Pengajians. There are local Pengajians and regional Pengajians. Pengajians can meet more often than once per week. According to personal interviews, individuals attend to avoid social sanctions, such as shaming,

from their neighborhood. The typical number of participants depends on village size and number of Muslims and imams. Men and women may attend Pengajian together although there is typically a separation between them. Pengajian for children and teenagers usually number around 25-50 people. Adult Pengajians can have fifty to eighty villagers (Kim 2006). A separate Pengajian exists for children to teach them how to read Koran. Not every Muslim knows how to read Arabic nor does every participant need to be able to read Arabic since participants will be taught Arabic if necessary.

2.1.2 Islamic School

Islamic schools come in a wide variety but one commonality is their being sought by parents who wish their children to become good Muslims. Formal public education in Indonesia is provided by two main national networks: a secular vs. religious. The three levels of public madrasah studied in my sample are called Ibtidaiyah, Tsanawiyah, and Aliyah. These are Islamic madrasah that educate students at the elementary, junior secondary, and senior secondary levels, respectively and are state-certified as meeting the education requirements for degree-granting institutions. The proportion for secular and religious subjects in these madrasah vary, but the Ministry of Religious Affairs sets a standard of 70% for secular and 30% for religious subjects. Returns to schooling at Islamic schools (pesantren or madrasah) are lower than at non-Islamic schools (Berman and Stepanyan 2003).

Madrasah and pesantren are different. Madrasah are considered a complement, not a substitute, for pesantren because of the perception that madrasah are inferior to pesantren in the transmission of religious knowledge, so attendance in madrasah and pesantren may be correlated, although I am unaware of data examining this. Parents with additional means and who are more concerned with bettering their children's religious education prefer to send them to pesantren (Muhaimin 2006). Under the direction of a Muslim scholar, pesantren are attended by young people who are taught a detailed understanding of the Koran, the Arabic language, the Sharia, and Muslim traditions and history. Students can enter and leave any time of the year and the studies are not organized as a progression of courses leading to graduation (LOC 2003, Jay 1969). Geertz (1960) writes of one pesantran, young men ages 6 to 25 spend part of every day chanting the Koran and part of it working in the leader's fields. Attendance is not mandatory and there is no fixed schedule as long as he earns his keep and creates no behavior problems. Private education is typically more organized and more expensive and sometimes for the elite, though traditional pesantren may be free, sponsored by organizations or wealthy individuals (Nelles 2003). In my sample, parents report paying substantially larger fees at Islamic schools than at non-Islamic schools.

2.1.3 Religious Intensity

Pengajian participation is strongly correlated with all measures of religious intensity available in my data. The correlation is strong and positive both unconditionally and conditionally on household characteristics and village fixed effects. Conditional correlations are reported below though unconditional correlations are generally larger. Pengajian participation in August 1998 is correlated with

number of children attending Islamic school at 0.043 with 5% significance; the average number of children attending Islamic school is 0.15. Pengajian is correlated with the number of adults who attended Islamic school as children at 0.071 with 1% significance; the average number of adults who attended Islamic school as children is 0.12. Pengajian is correlated with owning a Koran at 0.126 with 1% significance; the fraction of households who own a Koran is 0.75. Pengajian is correlated with worshipping in December 1998 at 0.192 with 1% significance; the fraction of households that worship is 0.85. In sum, Pengajian explains a large fraction of Islamic school attendance and a substantial fraction of Koran ownership and worshipping.

Sending one's children to Islamic school is correlated with stronger forms of religious belief. Bearing in mind that answers to questions on attitude or belief suffers from cognitive bias with unknown error distribution (Bertrand and Mullainathan 2001, Greenwald et.al. 1995), I correlate Islamic school attendance with indirect measures of beliefs in IFLS2 (Indonesian Family Life Survey). Whether a household has ever sent a child to Islamic school is correlated with religious contraception opposition at 0.089 with 5% significance; the fraction of households with religious contraception opposition is 0.10. Religious contraception opposition is a dummy for answering, without prompting, religious reasons for "Why do you not use contraception?" Whether a household has ever sent a child to Islamic school is correlated with religious fatalism in desired number of sons at 0.051 with 10% significance; the fraction of households with religious fatalism in desired number of sons is 0.26. Religious fatalism in desired number of sons is a dummy for answering, "It is up to God," in response to "What is your ideal number of sons?" This answer is also not prompted by the survey. In sum, sending one's children to Islamic school explains a substantial fraction of observable measures of beliefs, especially those hewing arguably closer to a literal interpretation of a religious text.

Finally, Chen (2007) finds a relationship between these religious intensity measures with communal violence in the Database on Social Violence in Indonesia 1990-2001. Pengajian, worship buildings, religious schools and seminaries together explain almost all of the violence that occurred during the crisis.

2.2 Model Description

A growing body of empirical work by economists document a semi-formal social insurance existing on the basis of religious obligation (Dehejia, DeLeire, and Luttmer (2005), Gruber and Hungerman (2005), Hungerman (2004)). Berman (2000) notes the degree of mutual insurance (in the Ultra-Orthodox sect in Israel) probably exceeds that of traditional Indian villages studied by Townsend (1994). Berman writes, citing Landau (1993), that no sick members are without visitors and that, if members donate time and money, they can receive free services for burial, mothers after childbirth, assistance for the elderly, and interest-free loans from hundreds to thousands of dollars. Social insurance, however, is not limited to those who participate ex ante. Personal interviews conducted in Indonesia suggest that religious organizations help individuals after they experience negative income shocks. One Islamic school reported increasing attendance during the crisis by offering scholarships to students who could no longer afford their public school fees. One Pengajian group

facilitated ex post insurance by rapidly increasing membership and matching individuals seeking employment and employers seeking workers through public announcements.

I illustrate in a simple model how religion can provide ex-post social insurance. I model group identity in the form of religious intensity as representing the degree of social insurance in which people participate. Recent experimental evidence documents that induced group identity increases the the degree of altruism towards ingroup members (Chen and Li 2008). But what sustains groups that immediately help those who join after receiving a negative shock? I posit that religion is able to provide ex-post insurance (insurance after some but not all information is revealed) because social sanctions overcome the individual rationality constraints that would otherwise prevent ex-post insurance groups from forming. Economists have noted social pressure and individual guilt can work as enforcement mechanism for social insurance (Fafchamps 2004). Guilt is nurtured through religious and family education, but more formal enforcement mechanisms are implemented by organized groups that fund social insurance programs (Ellsworth 1989).

2.2.1 Models of Religion and Models of Insurance

The model builds on the work of Iannaccone (1992), Berman (2000), Richardson (2005), and McBride (2007) who theorize that religion provides local public goods such as mutual insurance and screen out potential free-riders from benefiting from these local public goods. They formalize the important insight that religion requires outward displays of religious intensity and sacrifice as a tax on non-religious activities. The tax on alternative activities induces members to contribute more to the provision of local public goods. Displays of religious intensity and sacrifice screen out potential free-riders of the local public goods, which have positive externalities for other group members. Participation and local public goods provision are complements, not substitutes.

The formulation below provides microfoundations for the provision of mutual insurance and highlights what makes ex-post social insurance self-sustaining. In addition to Iannaccone (1992) and Berman (2000), it also follows the theoretical work of Coate and Ravallion (1993), Kocherlakota (1996), Alvarez and Jermann (2000), Krueger and Perri (2002), and Genicot and Ray (2003): religion as a risk-sharing mechanism helps complete a missing market for credit. In these models, risk-sharing mechanisms are self-sustaining because agents are punished with permanent autarky (participate or not) if they choose to defect. In my model, agents can change their degree of participation in mutual insurance at any time by increasing or decreasing their religious intensity. I isolate and focus on the ex-post aspect of mutual insurance because this aspect departs from the previous literature, although in reality religion provides both ex-ante and ex-post insurance.

2.2.2 Tithing and Redistribution

Dahl and Ransom (1999) find in their study of tithing that individuals who attend regularly, who serve in volunteer positions, and who have previously served as missionaries think much more comprehensively about what items should be tithed, whereas individuals who avoid seeking advice from religious leaders hold a narrower definition of the tithable income base and individuals who have

religious doubts are less generous in their tithing donations. In my model, more religious individuals contribute a greater share of their income. Agents receive a high or low shock (independently and identically distributed). After the shock is realized, agents choose religious intensity to smooth consumption. Agents choose a fraction of money to put in Pengajian and the rest to keep for themselves. The fraction put in Pengajian denotes an agent's religious intensity.

Since funds from donations are used for any purpose–construction of buildings, general upkeep, salaries for religious leaders, risk-sharing mechanisms–those who participate more get more benefit from these local public goods. For tractability, agents in my model redistribute the resource pool according to each agent's relative religious intensity. For example, if someone contributes 5% of his income to the pool and another person contributes 10% of his income to the pool, the second person will receive twice the share of the pool as the first person (even if the second person is poorer) because the second person is twice as religious as the first. I conjecture the results of the model still follow as long as the benefit from local public goods is weakly monotonically increasing in religious intensity.

Because religious intensity can be chosen after agents realize their income shock, religious intensity functions as ex-post insurance. Most financial institutions only provide ex-ante insurance because there is no way to compel agents to donate after a positive shock. Hence, for ex-post insurance to be possible (break even) there must be something that deters agents from not participating, which in turn encourages agents who receive negative shocks to participate more because they can appropriate more of the positive shocks. A strong form of social sanction towards those who are of other religious organizations or less religiously intense, provided in the doctrine of many religions, including those in Indonesia (Muhaimin 2006), facilitates religion's function as ex-post insurance by encouraging people who receive positive shocks to participate. Mutual insurance groups without such strong social sanctions such as rotating savings groups will be less stable.

2.3 Set Up

Agents receive a shock ($L < H$):

$$x = \begin{cases} H & \text{with probability } \frac{1}{2} \\ L & \text{with probability } \frac{1}{2} \end{cases}$$

There is a continuum of agents of unit measure. Utility $u(.)$ is a standard increasing concave function of income. Agents have only one decision to make: the level of religious intensity $Q_x \in [0, 1]$ after the shock x is realized. The payoff to an agent who realizes x is:

$$U_x = u[(1 - Q_x)x + \frac{Q_x}{\overline{Q}}(\overline{\mu})] - V(\frac{\overline{Q}}{Q_x}) - C(Q_x) \tag{1}$$

Religious intensity $Q_x$represents the fraction of income agents put in Pengajian, $1 - Q_x$ represents the fraction agents keep separate from the risk-sharing pool. Average religious intensity is $\overline{Q} = \frac{1}{2}(Q_H + Q_L)$ and the budget of the religious group is $\overline{\mu} = \frac{1}{2}(HQ_H + LQ_L)$. For shorthand, I will

use H to label an agent who receives a high shock and use L to label an agent who receives a low shock. Agents divide the Pengajian budget in a manner proportionate to their relative religious intensity, which is $Q_x/\overline{Q}$. Note that agents do not receive the same amount they put in: agents who receive negative shocks will get money from agents who receive positive shocks even if their religious intensities are the same. This is true under a weaker assumption that the benefit received from Pengajian is merely weakly increasing in religious intensity. In the extreme case, as religious intensity goes to 1, positive and negative shocks are completely smoothed.

Since agents who receive positive shocks would otherwise not participate, social sanction $V(.)$ ensures the stability of ex-post insurance. Social sanctions are greater for those who participate less and are captured by $V(\frac{\overline{Q}}{Q_x})$, if $Q_x < \overline{Q}$, and $V(.) = 0$, if $Q_x \geq \overline{Q}$ (the religiously intense do not sanction themselves). Since displaying religious intensity involves attendance, I model the cost of displaying religious intensity with $C(Q_x)$, which is convex. The cost function prevents a corner solution where those who receive L choose maximum intensity. I assume $V(.)$ and $C(.)$ are smooth functions and such that optimal Q_x is never 1 or 0. If optimal Q_x can be 0 or 1, all the propositions would still hold with weak inequality instead of strong inequality.

In equilibrium, agents take into account how the decision of others affects the Pengajian budget $\overline{\mu}$ and optimize their religious intensity by equating marginal benefits to marginal costs in equation 1. It can be immediately observed that agent L chooses a higher level of religious intensity than agent H, $Q_L^* > Q_H^*$. The intuition is simply that the higher is Q_H the less agent H gets, whereas for agent L, the higher is Q_L the more he gets.

It is important to see that H's religious intensity is, in a sense, complementary for L's religious intensity: those who are more religiously intense prefer others to be religiously intense as well in order to appropriate their high income draw. This captures the local public goods aspect of club goods theory (Buchanan 1965). This is also consistent with the devout giving alms in hopes for future gain (Brenner 1998). Therefore, for L, there are positive externalities from others' participation. However, those who are less religiously intense prefer others to be less religiously intense to prevent appropriation of their high income draw. So for H, there are negative externalities from others' participation.

2.4 Crisis

I now consider what happens during a crisis. Those who realize a high income shock relative to others will decrease their religious intensity while those who realize a low income shock relative to others will increase their religious intensity. Social sanctions facilitate the stability of ex-post insurance by deterring those who receive positive shocks from not participating, which in turn encourages those who receive negative shocks to participate because they can appropriate more of the positive shocks.

Proposition 1 *: Suppose income, H or L, drops by a large number M. Then the dispersion of religious intensity increases. $\frac{\partial}{\partial M}(\frac{Q_L^*}{Q_H^*}) > 0$. Social sanction $V(.)$ facilitates the stability of ex-post insurance. During crisis, groups without strong punishment will decline in participation.*

The intuition behind this result is as income falls, the marginal utility increases, which tends to increase L's desire for consumption smoothing but tends to increase H's desire to keep money for himself.

This result does not depend on H and L falling by the same amount M. The result holds if the crisis weakly increases the spread between positive and negative shocks. In fact, the sample mean of village standard deviation of consumption shocks is much higher during the crisis than during a non-crisis period. A weakly increasing spread, $(H - L)$, reinforces L's desire for consumption smoothing and H's desire to keep money for himself.

Mutual insurance groups may vary in degree of social sanctions against reducing participation or against non-group members. For instance, religious doctrine is missing in groups such as rotating savings clubs. Without sanctions for relative lack of intensity, H will decline in religious intensity. If H declines in intensity, then L will decline in intensity as well because the less H participates, the smaller is the Pengajian budget. Since both Q_H^* and Q_L^* tend to fall, this means insurance schemes without a strong form of social sanction, such as rotating savings groups, may tend to fail during crisis. Moreover, there should be little relative change in participation intensity in these groups for those who realize a low income shock vs. those who realize a high income shock.

If mutual insurance is less efficient, less is gained from decreasing intensity by H and less is gained from increasing intensity by L. Economic distress should be less stimulating of other social activities that provide less mutual insurance.

Proofs are in the mathematical appendix.

2.5 Credit Availability

I now consider what happens when credit is available. Credit institutions allow households to smooth across time, making religious intensity less necessary since it serves to smooth across space (i.e. people).

For simplicity, I assume an infinite-horizon model. The infinite-horizon model without credit gives the same comparative statics (Proposition 1) as the one-period setup since agents solve the identical maximization problem in each period. To more starkly illustrate the intuition, I also assume credit is costless, although the discussion below will make clear it is only necessary that credit availability induces a discrete reduction in the marginal cost of credit.

Proposition 2 *: If alternative credit is available, religious intensity does not need to increase. Credit availability reduces Q_L^* more than it reduces Q_H^* so that $\frac{\partial}{\partial M}(\frac{Q_L^*}{Q_H^*})|_{Credit} < \frac{\partial}{\partial M}(\frac{Q_L^*}{Q_H^*})|_{NoCredit}$.*

The intuition is that credit availability allows agents to smooth intertemporally by themselves and achieve their Pareto frontier. Smoothing via religious intensity, on the other hand, is constrained according to how much others contribute to $\overline{\mu}$ and entails cost $C(.)$. Since $u(.)$ is concave, L's marginal utility is high so credit matters more for L than for H, which is why Q_L^* falls further than Q_H^* when credit is available. Convex costs, $C(.)$, reinforces L's desire to decrease religious intensity Q_L^* more than H decreases Q_H^* when credit is available.

In reality, the marginal cost of credit may vary and be greater than the marginal cost of Pengajian, in which case credit availability may not affect religious intensity. The appropriate interpretation of credit availability then is a discrete reduction in the marginal cost of credit (or interest rate), which, all else equal, tends to decrease Q_L^* (and would never increase Q_L^*). As long as the marginal cost of credit is increasing, Q_L^* and Q_H^* will not go to zero. For example, if agents cannot borrow the large amount necessary in one period for whatever reason, then Pengajian picks up the slack.

I have assumed the mosque does not provide intertemporal smoothing; I only model interspatial smoothing among agents. Religious groups may also have foreign resources (or from organizations like Jemaah Islamiah) that they transfer to individuals with greater religious intensity. I also do not consider agents smoothing from a buffer-stock of wealth. Even if buffer-stock methods of intertemporal smoothing are available, they should not affect the comparative statics on credit availability, which should then be interpreted as a discrete reduction in the interest rate. The other comparative statics should also be unaffected. The model predicts religious intensity of those who receive negative shocks to increase and religious intensity of those who receive positive shocks to decrease whether or not interspatial motivations (such as these non-standard peer effects) are strong relative to intertemporal motivations.

2.6 Consumption Smoothing

I derive from the model a test of consumption smoothing among villagers. The model suggests that if religious institutions provide social insurance, villagers will smooth more of their consumption shocks with each other. Since religious institutions are measured before the crisis, a test of consumption smoothing among villagers would examine whether the crisis had a smaller impact on the spread of consumption changes in places where there are more religious institutions.

In the model, the crisis causes both H and L to fall to $\widetilde{H}$ and $\widetilde{L}$. To be consistent with the notation in Proposition 1, let the decline for H be $M_H = H - \widetilde{H}$ and the decline for L be $M_L = L - \widetilde{L}$. The variance of consumption shock is $Stdev^2 = \frac{\frac{1}{2}(H-\mu)^2+\frac{1}{2}(L-\mu)^2}{1}$, where $\mu = \frac{H+L}{2}$. This simplifies to $(\frac{H-L}{2})^2$. So, the standard deviation $Stdev = \frac{H-L}{2}$. Hence, the impact of the crisis on the standard deviation of consumption shocks within a village can be written as, $Crisis\_Stdev(\Delta E_{ij})_j - NonCrisis\_Stdev(\Delta E_{ij})_j = \frac{\widetilde{H}-\widetilde{L}}{2} - \frac{H-L}{2} = \frac{1}{2}[M_L - M_H]$. The LHS variable is therefore the fall for L minus the fall for H due to the crisis. Since the the sample mean of village standard deviation of consumption shocks is much higher during the crisis than during a non-crisis period, the crisis weakly increases the spread between positive and negative shocks, i.e. the fall for L is weakly greater than the fall for H. So, $\frac{1}{2}[M_L - M_H] = Crisis\_Stdev(\Delta E_{ij})_j - NonCrisis\_Stdev(\Delta E_{ij})_j \equiv Y > 0$.

Consider what happens when religious institutions, measured by worship buildings, are available. The fall for L is mitigated while the fall for H is exacerbated: H must share some of their money with L. Thus M_L falls while M_H rises so Y decreases, so religious institutions should be expected to reduce the standard deviation of consumption shock that is due to the financial crisis.

Note that this departs from standard tests of insurance in the literature (Townsend 1994 and Dehejia, DeLeire, and Luttmer 2005). A straightforward extension, however, includes the standard test and predicts that religious institutions mitigate the effect of income shocks on consumption shocks at the household level.

2.7 Opportunity Cost of Time

The existing literature often models religious intensity as a function of the opportunity cost of time (Azzi and Ehrenberg 1975, Gruber 2004, Gruber and Hungerman 2008). Suppose $C(Q)$ in equation 1 is the opportunity cost of time. Then as wages fall, religious intensity increases but so do other social activities and labor supply may decrease. To see this, observe that the larger is Q, the more forgone earnings, i.e. $C'(Q) = f(w)$ where $f'(.) > 0$. As wages w fall, the opportunity cost falls, hence $\frac{\partial}{\partial M}(\frac{Q_L^*}{Q_H^*}) > 0$ even if religious intensity provides no social insurance. Economic distress should stimulate other social activities at least as much as religious intensity if the marginal cost to participation is the same. On the other hand, the discussion of Proposition 1 suggests economic distress should be less stimulating of other social activities that provide less mutual insurance.

Suppose further that the opportunity cost of time, $C(Q) = Qf(w) = (1 - L)f(w)$, where L is labor supply. Then $\frac{\partial}{\partial M}(\frac{L_L^*}{L_H^*}) < 0$, where L_x is labor supply for agent x. Economic distress should decrease labor supply if religious intensity responds only to opportunity cost of time instead of also social insurance concerns.

2.8 Qualitative Evidence

The role of charity and insurance in Islam in Indonesia has been noted in a survey of the religious studies literature (Marty and Appleby 1992). Religious leaders organize charities, administer mosque funds, seed Koran study groups, and run Islamic boarding schools (Hadiwinata 2003). Religious leaders also frequently act as patrons for villagers seeking employment or credit, accentuating their role as social insurance providers (Schiller 1996). Over 2600 Islamic boarding schools on Java have both economic and social programs aiding community development (Moran 1996), however, more recently Islamic charities have been tied to terrorist groups, such as al-Qaeda (Burr and Collins 2006).

Pengajian, while not the sole forum through which social insurance occurs in Indonesian villages, appears to act as the nexus for the religious provision of social insurance. Donations to the mosque typically occur during Pengajian (even though Pengajians can be held away from the mosque, in any public or private space). Donations can be used to build new mosques, upkeep current mosques, pay salaries, or help people in need. The role of monetary contributions have been noted by ethnographers (Kipp 1993), the World Bank, and surveys. The World Bank describes Pengajian as: "Activities include reading and discussions from religious texts and communal prayers, together with savings and credit activities and sharing of concerns. Those who happen to have met with misfortunes can share their problems at the Pengajian and hope to find caring listeners and may even receive small amounts of material assistance" (Narayan and Petesch 2001). In a survey on how

households cope with poverty, Pengajian is the only community institution that received a high rating by all groups, rural/urban/men/women. It was ranked higher in importance and effectiveness than arisan/savings and loan cooperation (Mukherjee 1999).

Pengajian donations accumulate to a sizeable amount, a large fraction of which is devoted to charity. A recent ethnography estimates half a million Rupiah was collected between 1987 and 1988 (Kim 2006). In my own field work, I collected balance sheet data showing donations, attendance, and social welfare spending by one religious group in Banjarnegara, one of the villages in the Hundred Villages Survey. Charitable expenditures amount to 35% of total donations. For comparison, in the US, up to 20-25% of church expenditures are for charitable purposes, exceeding $24 billion in philanthropic services annually (Bittle 1992, Gruber and Hungerman 2005).

The social insurance function of Pengajian is more than what can be captured by donation amounts alone. One interviewee indicated that a Pengajian member gave her a new bed when hers was destroyed in a fire. As noted previously, Pengajian groups can publicly announce individuals seeking employment and employers seeking workers and Islamic schools can offer scholarships to students who cannot afford public school fees. One Islamic school interviewed indicated that nominal minimal fees are set yet families can contribute any amount beyond the minimum.

3 Design of Study

3.1 Data

The empirical analysis draws from The Hundred Villages Survey, collected by the Indonesian Central Statistics Office. The panel dataset follows 8,140 households from May 1997 to August 1999, beginning before the crisis and continuing in four waves after the crisis (Figure 1). Pengajian is measured using the response to "In the past 3 months, has your household increased, decreased, stayed the same, or not participated in the study of Koran (Pengajian)?" This question is asked right after the peak of the crisis in August 1998 and is coded as +1/0/-1. Non-participation is coded along with staying the same as 0. The main results do not change when non-participation is coded as -0.5 or when they are excluded. In some specifications I also code separately increase vs. stay the same or decrease and decrease vs. stay the same or increase. All households are able to increase participation since mosques have multiple Pengajians, villages have multiple mosques, Pengajians can meet multiple times per week, and individuals can attend local as well as regional Pengajians.

The measure of economic distress I focus on is change in monthly per-capita nonfood consumption expenditures. Change in total (nonfood and food) per-capita consumption expenditures is a poorer measure of distress because landowners able to grow their own food do not need to pay market prices on food and may substitute towards consuming privately-grown agricultural products. The data does not distinguish consumption expenditures for home-grown food, it only provides a category for food expenditures more generally. Wetland hectares (and dryland hectares) are in fact correlated, conditionally and unconditionally, with larger than average decreases in per-capita food

expenditures (excluding consumption on home-grown food presumably) even though it is correlated, conditionally and unconditionally, with smaller than average decreases in per-capita nonfood expenditures. Government workers have larger decreases in per-capita nonfood expenditures as well as per-capita food expenditures. The results are qualitatively the same using the US/Rupiah exchange rate to normalize to dollars or with using a CPI index. The dataset and remaining variable construction are described in greater detail in the data appendix.

Since consumption is the only available economic variable (income is not available for all households in the dataset), I use consumption as a proxy for economic welfare. I instrument for consumption using a measure of income shock, the amount of wetland holding (or government occupation). Note that for households who participate in Pengajian before the crisis, the actual drop in consumption may actually be greater, since their consumption is protected. Unfortunately, Pengajian participation is only recorded after the crisis. I can however examine whether other religious institutions measured before the crisis mitigate the effect of income shocks on consumption shocks as a Townsend insurance test (1994).

The measure for change in religious intensity comes from May 1998 to August 1998 since the Pengajian question refers to the past 3 months, whereas the measure for income shock comes from differencing expenditures in May 1997 and August 1998 (See Figure 1). However, as the time-series in Figure 1 suggests, half of the sharp increase in Rp/USD occurs in the 3 months before August 1998. The CPI index for foodstuff also sharply increases relative to the general CPI index during this time period. Therefore, the manner in which wetland owners and government workers are disproportionately affected by the relative price shocks should still apply for the 3 months before August 1998. If preferred, with additional linearity assumptions, the coefficients could be scaled up by a factor of two.

3.2 Identification Strategy and Specifications

The correlation between economic variables and religious intensity is generally difficult to interpret since the causality may run in both directions and the relationship may reflect omitted variables. For example, the religiously fervent may eschew adopting advantageous technologies because of fatalistic beliefs such as, "why vaccinate the cow, the cow's life is in God's hands." I therefore use the financial crisis to identify a discontinuous change in economic conditions.

Consider the following linear specification for latent religiosity:

$$Q^*_{ijt} = \beta E_{ijt} + \alpha_{0t} + \alpha'_{1t}\mathbf{X}_{ij} + \delta_{jt} + u_i + \varepsilon_{ijt}, \text{ for } t = 1, 2, \ i = 1..N, \text{ and } j = 1..J \tag{2}$$

where Q^*_{ijt} represents religious intensity for individual i in village j at time t, E_{ijt} represents monthly per-capita non-food expenditures, $\mathbf{X}_{ij}$ represents a set of pre-crisis control variables (household head characteristics: age, education, gender, ever-married, literate, follows media (TV or radio) and household characteristics: size, modernity (index of owning a stove, radio, TV, refrigerator, satellite dish, motorbike, and car), farming dummy, service dummy, hectares of dryland owned, and

pre-crisis monthly per-capita non-food expenditures)[1], δ_{jt} represents village time fixed effects, and u_i represents household fixed effects. The subscript t on α_{1t} allows the effect of pre-crisis control variables $\mathbf{X}_{ij}$ to vary over time.

Taking first differences (implicit individual fixed effects) results in:

$$\Delta Q^*_{ij} = \beta \Delta E_{ij} + (\alpha_{02} - \alpha_{01}) + (\alpha_{12} - \alpha_{11})' \mathbf{X}_{ij} + \gamma_j + \omega_{ij}, \text{ for } i = 1..N \text{ and } j = 1..J$$

where ΔQ^*_{ij} represents changes in religious intensity for individual i in village j, ΔE_{ij} represents changes in monthly per-capita non-food expenditures, $\gamma_j = \delta_{j2} - \delta_{j1}$ represents village fixed effects, and $\omega_{ij} = \varepsilon_{ij2} - \varepsilon_{ij1}$.

In practice, ΔQ^*_{ij} is unobserved. Instead, I observe ΔQ_{ij}, which denotes increase, decrease, or no change in Koran study. In particular, I first estimate the linear probability specification:

$$\Delta Q_{ij} = \beta \Delta E_{ij} + c + \alpha' \mathbf{X}_{ij} + \gamma_j + \varepsilon_{ij} \tag{3}$$

where ΔQ_{ij} represents changes in Koran study for individual i in village j, γ_j represent village fixed effects, and c is a constant. Because ΔQ_{ij} has the following ordered structure:

$$\Delta Q_{ij} = \begin{cases} -1 & if \quad \Delta Q^*_{ij} \leq \mu_1 \\ 0 & if \quad \mu_1 \leq \Delta Q^*_{ij} \leq \mu_2 \\ 1 & if \quad \Delta Q^*_{ij} \geq \mu_2 \end{cases}$$

I will also estimate the following ordered probit specification to test whether economic distress stimulates religious intensity:

$$\begin{aligned}
\Pr(\Delta Q_{ij} &= -1|\mathbf{I}_{ij}) = F_{\omega_{ij}}(\mu_1 - \beta \Delta E_{ij} - (\alpha_{02} - \alpha_{01}) - (\alpha_{12} - \alpha_{11})' \mathbf{X}_{ij} - \gamma_j | \mathbf{I}_{ij}) \\
\Pr(\Delta Q_{ij} &= 0|\mathbf{I}_{ij}) = F_{\omega_{ij}}(\mu_2 - \beta \Delta E_{ij} - (\alpha_{02} - \alpha_{01}) - (\alpha_{12} - \alpha_{11})' \mathbf{X}_{ij} - \gamma_j | \mathbf{I}_{ij}) - \\
&\quad F_{\omega_{ij}}(\mu_1 - \beta \Delta E_{ij} - (\alpha_{02} - \alpha_{01}) - (\alpha_{12} - \alpha_{11})' \mathbf{X}_{ij} - \gamma_j | \mathbf{I}_{ij}) \\
\Pr(\Delta Q_{ij} &= 1|\mathbf{I}_{ij}) = 1 - F_{\omega_{ij}}(\mu_2 - \beta \Delta E_{ij} - (\alpha_{02} - \alpha_{01}) - (\alpha_{12} - \alpha_{11})' \mathbf{X}_{ij} - \gamma_j | \mathbf{I}_{ij})
\end{aligned}$$

where $\mathbf{I}_{ij} = (1, \mathbf{X}_{ij}, \gamma_j)$ and $F_{\omega_{ij}}(.|\mathbf{I}_{ijt})$ is normal. Equation 3 is the linear approximation of the ordered probit specification. I will estimate linear probability, ordered probit, and probit specifications (when comparing only increase vs. stay the same or decrease and decrease vs. stay the same or increase). The incidental parameters problem is mitigated because I have 100 villages and 8140 households, roughly an 80:1 ratio.

Even with individual fixed effects, a difference-in-differences framework correlating economic distress and changes in religious intensity may still lead to biased estimates because increases in religious intensity, will in turn, mute the economic distress that stimulated it. Moverover, omitted variables such as a propensity for taking fewer precautions may be correlated with suffering greater

[1]Construction of these variables is described in the data appendix.

economic distress and lack of changes in religious intensity.

To identify the causal impact of economic distress, I exploit the fact that during a period of rapid inflation, demand for non-staples tends to fall more than demand for staples, so relative prices favor staple growers. The price of rice increased by up to 280% while in comparison, prices of non-staples increased by less or even depreciated during the crisis (Levinsohn et al. 2003). The more rice a household grows, the more cushioned it would be from the crisis. Therefore, the amount of wetland a household owns before the crisis should be expected to cushion it from economic distress during the crisis.

In addition, rapid inflation tends to disproportionately affect workers with sticky wages. In particular, government workers, whose wages are set by federal law, are likely to suffer greater economic distress. Most government workers in rural areas work in education or health and their basic salary is fixed by national law based on their rank and experience. Note that government workers also own land: the average government household owns 0.56 hectares of dryland and 0.15 hectares of wetland while the average non-government household owns 0.73 hectares of dryland and 0.17 hectares of wetland. The differential impaact of the financial crisis based on government occupation and wetland ownership has been already documented by earlier studies of the Indonesian financial crisis (e.g., Knowles et al. 1999, Frankenberg et al. 1999, and Levinsohn et al. 2003).

The first stage regression is:

$$\Delta E_{ij} = \pi_0 + \pi_1' \mathbf{Z}_{ij} + \pi_2' \mathbf{X}_{ij} + p_j + \eta_{ij} \tag{4}$$

where $\mathbf{Z}_{ij}$ represents the instruments, pre-crisis hectares of wetland owned and pre-crisis government occupation dummy for individual i in village j. The corresponding reduced form regression is:

$$\Delta Q_{ij} = \beta' \mathbf{Z}_{ij} + c + \alpha' \mathbf{X}_{ij} + \gamma_j + \varepsilon_{ij} \tag{5}$$

The identification assumption is $E(\varepsilon_{ij} \mathbf{Z}_{ij}) = 0$. Robustness checks of the identification assumption are provided in Sections 4.2 and 4.3.

The basic idea behind the identification strategy can be illustrated in a differences-in-differences framework. In Table 1, I present summary statistics by group that outline the identification strategy. The results are imprecise, due to the fact that only a small part of the available information is used. Columns 1 and 2 show the mean monthly per-capita non-food expenditure before and after the crisis for different categories of wetland hectares (greater than or less than 0.3 hectares) and whether or not the household head works in government. These estimates are unconditional correlations and do not control for possible differentiating characteristics of household heads who work in government or of households that own more wetland. For controls, please see the specification in Section 3.2 and the estimates in the subsequent sections. Columns 3-5 show for each category of wetland and government occupation the means of changes in monthly per-capita non-food expenditure, Pengajian participation, and non-religious social activities participation. Two important features of the data can be observed. First, households owning more wetland–which, on average, suffered

less economic distress–tend to decrease Pengajian relative to other households. Second, households in government occupation–which, on average, suffered greater economic distress–tend to increase Pengajian relative to other households. Column 5 shows the same pattern is not true for non-religious social activities. The Wald estimate (an imprecise instrumental variables estimator) of the impact of economic distress on religious intensity is the ratio of Pengajian change and economic distress and can be obtained by dividing -0.022 by 1.4 (-0.016) or 0.068 by -4.8 (-0.014).

3.3 First Stage: Relative Price Shocks and Differential Impact of Financial Crisis

Table 2 documents the relationship between wetland hectares and per-capita nonfood expenditure changes during the crisis using the specification in equation 4. On average, an additional hectare of wetland corresponds to a $1.13 smaller decrease in per-capita nonfood expenditures relative to other households (Column 5). Being in government corresponds to roughly $2.04 larger decrease in per-capita nonfood expenditures relative to other households (Column 5). The relationship holds with and without controlling for household characteristics and village fixed effects (Columns 1-4). The F-statistic of joint significance of wetland hectares and government occupation is 7.16 in Column 5. These results corroborate earlier findings by Frankenberg et al. (1999) and Levinsohn et al. (2003) who find that those who were able to grow rice were less affected by the crisis as rice prices and spending on rice dramatically increased. The results also corroborate findings by Knowles et al. (1999) that indicate government workers were more affected by the crisis as their salaries tend to be inflexible in the short run.

Column 6 displays similar results when examining percentage changes in per-capita nonfood expenditures. For example, dividing the government expenditure change, $2.04, by the baseline, $12.9 (indicated in Column 1 of Table 1) gives roughly a 15% decline, the same percentage decline indicated in Column 6 in Table 2. Changes in log expenditures however, do not give a statistically significant first stage for wetland. Frankenberg et al. examine changes in log expenditures using the Indonesian Family Life Survey (IFLS2+) and find those whose main activity is agriculture were relatively better off. It is possible that the poor, who often do not collect wages in developing countries, report more poorly measured and noisy expenditure numbers. This non-classical measurement error may bias estimates using logs, which emphasize the poorer part of the distribution more. Consumption data at the bottom of the income distribution tends to be of lower quality (Meyer and Sullivan 2007). One must remain agnostic about exactly which form of economic distress stimulates religious intensity. Without additional instruments for each channel of causality, it is not possible to isolate the potentially different effects of actual changes (sticker shock) vs. percentage changes (relative changes) or per-capita changes vs. overall changes, etc.

4 Estimating the Impact of Economic Distress on Religious Intensity

4.1 Reduced Form Evidence

Do people who experience larger negative shocks relative to others increase their religious intensity? To examine whether wetland owners are less likely to increase religious intensity and whether government workers are more likely to increase religious intensity, I estimate equation 5. Panel A in Table 3 shows the main experiment. On average, a hectare of wetland is associated with 2% greater likelihood of decreasing Pengajian whereas government occupation is associated with 6% greater likelihood of increasing Pengajian (Columns 1 and 3), suggesting that economic distress stimulates religious intensity. This relationship holds controlling for household characteristics and village fixed effects (Columns 2 and 4).

Column 5 displays the joint estimation and Column 6 displays the overall ordered probit marginal effect.[2] The estimates of marginal effects in Column 6 are very similar to the OLS estimates in Column 5. I then compute the probit marginal effect for increasing (+1 vs. 0/-1) in Column 7 and the probit marginal effect for decreasing (-1 vs. 0/+1) in Column 8. The difference between the marginal effects in Column 7 and the marginal effects in Column 8 are very similar to the OLS estimates in Column 5. Moreover, Columns 7 and 8 reveal that those who realize a high income shock relative to others decrease their religious intensity during crisis while those who realize a low income shock relative to others increase their religious intensity during crisis, as Proposition 1 suggests. This result is sharpest for those who receive a high income shock. This is consistent with findings by Abramitzky (2008) on Israeli kibbutzim, where the most productive individuals are the most likely to exit during a financial crisis.

It is not clear whether Pengajian increases reflect changes on the intensive or extensive margin since pre-crisis Pengajian information is unavailable. Under the rough assumption that pre-crisis households participate in Pengajian if any adult or child attend Islamic school, government workers appear to have joined Pengajian studies while wetland owners decreased pre-existing Pengajian studies.

4.2 Placebo Experiment

In examining the causal impact of economics on religion, one identifying assumption is that religious organizations do not manipulate economic conditions for their advantage. Here, it is reasonable to think that imams do not dictate economic policy nor was the financial crisis an anticipation or consequence of religious fervor. However, several possibilities still threaten the identification assumption. The most important potential problem is that the instruments, wetland hectares and government occupation, may be correlated with omitted factors that drive changes in religious intensity. To test

[2]The overall marginal effect is calculated from: $\frac{\delta}{\delta x}E(y|x) = \frac{\delta}{\delta x}P(y=1|x) - \frac{\delta}{\delta x}P(y=-1|x)$ since $E(y|x) = E(y=1)P(y=1|x) + E(y=0)P(y=0|x) + E(y=-1)P(y=-1|x) = P(y=1|x) - P(y=-1|x)$.

this possibility, I use dryland hectares and service occupation as "placebo instruments" for wetland hectares and government occupation.

Besides rice, the other crops grown in Indonesia include corn, cassava, sweet potatoes, peanuts, and soybeans. 66% of households in the sample own dryland and 31% of households in the sample own wetland; 25% own both wetland and dryland. Wetland often refers to any land growing rice so households who grow more than just rice would report owning both types of land. The growing season differs somewhat for wetland and dryland crops. The wet season is from November to March, so field preparation and planting, which are by far the most labor-intensive activities, occur outside of the 3-month window before the first post-crisis wave in August 1998. This mitigates the concern that wetland owners were too busy to increase Pengajian. Dryland crops have much longer growing seasons. This would tend to increase the likelihood that dryland owners decrease Pengajian because they are too busy, but as we shall see, wetland holders display decreases in Pengajian whereas dryland holders do not.

To the extent dryland owners share unobservable characteristics with wetland owners, and service workers share unobservable characteristics with government workers, these serve as a check of the identification assumption. Wetland and dryland hectare ownership are both strongly associated with larger family sizes and with having fewer modern amenities. Government and service workers are significantly more likely to have graduated with 8 or more years of education, to be able to read and write, and to follow radio or newspapers. There is no consistent pattern on whether the differences between government workers are non-government workers are more extreme than the differences between service workers and non-service workers along observed household head and household characteristics. The same is true for amount of wetland and dryland owned. The relative price of rice increased much more than relative prices of other food items (Levinsohn et al. 2003) and service workers have more flexible wages than government workers, so these placebo groups should be less affected by economic distress relative to other households.

The pattern of economic distress is in fact much less pronounced for dryland hectares and service occupation. I estimate equation 4 for the "placebo instruments." An additional hectare of dryland mitigates the decrease in per-capita nonfood expenditures by \$0.39 (Column 7 of Table 2), about a third of the effect (\$1.13) of an additional hectare of wetland owned (Column 5). Working in the service sector is associated with much smaller and statistically insignificant \$0.19 smaller declines in per-capita nonfood expenditures, while working in government is associated with a \$2.04 larger decline (Columns 7 and 5).

Panel B of Table 3 displays the reduced form relationship, specified in equation 5, between the "placebo instruments" and Pengajian change during the crisis. The relationship between religious intensity changes and the "placebos" is almost nil in all specifications. A striking contrast can be seen when comparing the coefficients in Column 5 for the true instruments vs. the "placebo instruments" in Panels A and B and this contrast exists both with and without controls (Columns 1 and 3).

I also check whether the treatment and control groups differ in religious intensity prior to the cri-

sis by examining whether pre-crisis religious intensity is conditionally orthogonal to the instruments. Appendix Table B displays the results for conditional orthogonality between pre-crisis religious intensity and the instruments. Each cell represents a separate OLS regression of the corresponding measure of religious intensity (described in the data appendix) on each instrument, hectares of wetland owned, hectares of dryland owned, government occupation dummy, and service occupation dummy. All regressions are run at the individual level. Village religious intensity regressions control for clustering at the village level. The estimates suggest land ownership is slightly positively correlated with pre-treatment household religious intensity and government and service occupations are slightly negatively correlated with pre-treatment household religious intensity. There does not appear to be a consistent pattern between the instruments and village religious intensity. To the extent pre-crisis religiosity may drive changes in religious intensity during the crisis, that the "placebo instruments", dryland hectares and service occupation, are much more correlated with pre-treatment household religious intensity than are the true instruments, suggest these "placebos" are a good choice.

4.3 Post Experiment

Wetland hectares and government occupation may also be associated with differential trends in religious intensity and economic change that coincide with the financial crisis. To explore whether the differential changes in religious intensity reflect differential trends, I examine whether one year after the crisis, between two periods without a crisis, the instruments are associated with either economic distress or changes in religious intensity. I use the change in Pengajian recorded in May 1999 and the difference between expenditures in May 1999 and December 1998 (I am unable to use the panel wave that immediately follows the crisis wave because Pengajian is not recorded in December 1998). As can be seen in Figure 1, this period forms a natural control experiment since the Rp/USD exchange rate moved little.

If the crisis was indeed responsible for the differential performance of government workers and wetland owners, one should not expect the same pattern of economic distress a year after the crisis. I estimate equation 4 for this period after the crisis using the same pre-crisis controls. Wetland hectares are associated with a statistically insignificant \$0.32 relative decline (Column 8 of Table 2) compared to \$1.13 relative improvement during the crisis (Column 5). Government workers actually display a reverse pattern of distress as households recover from the financial crisis relative to others. They are associated with a \$3.38 relative improvement compared to other households (Columns 8 and 5). This does not necessarily imply government workers are recovering to pre-crisis levels. Their average monthly per-capita non-food expenditure in May 1999 is \$8.3 compared to \$12.9 in May 1997. Nor are households as a whole recovering completely from the crisis. The crisis summary statistics at the bottom of Appendix Table A indicate only partial recovery on average.

Since government workers display a strong improvement relative to others, we should expect a relative decrease in Pengajian during this period. I estimate equation 5 for wetland hectares and government occupation a year after the crisis. Panel C of Table 3 indicates that after the

crisis, neither the amount of wetland owned nor government occupation is strongly correlated with Pengajian change. Government workers display a negative coefficient for Pengajian (Column 5). Dryland hectares and service workers are not correlated with expenditure changes or Pengajian changes during this period.

4.4 2SLS Estimates

In what follows, I use the exhibited pattern of distress to calculate the impact of a dollar of per-capita nonfood expenditure change on changes in religious intensity. Table 4 estimates equation 3 for Pengajian in linear, ordered probit, and probit specifications.[3]Columns 7 suggest that a $1 decline in per-capita nonfood expenditure stimulates a 2% increase in the likelihood to increase Pengajian. Since the average household suffered a $4.70 decline in per-capita nonfood expenditure out of a pre-crisis average of $7.33, as noted in Appendix Table A crisis summary statistics (the median household suffered a $2.94 shock out of a pre-crisis median of $4.75 monthly non-food per-capita expenditures), this suggests the average household became 9% more likely to increase Pengajian due to economic distress. The consistency across controls suggests remaining omitted variables bias may be small (compare Columns 3 and 4 and Columns 5 and 6). The estimates of the linear probability model displayed in the first row are very similar to the overall ordered probit marginal effects displayed in the second row.

Importantly, the estimates using wetland hectares and government occupation as separate instruments are very similar, which acts as an overidentification test (compare Columns 3-4 with Columns 5-6). The Sargan overidentification statistic is 0.299 and the p-value is 0.585. This indicates that the null hypothesis that both instruments are exogenous (or more precisely, given the exogeneity of one instrument, the other is also exogenous) to changes in Pengajian cannot be rejected at the 10% level. Since instrumental variables estimates represent only the change in behavior for those most affected by the instrument, a priori, one could imagine that an estimate based on government workers might represent only a small fraction of the population and thus be difficult to generalize. However, a marginal unit of wetland should benefit any household. Since the treatment effects for two very different populations are so similar, it suggests the estimated elasticity may be interpreted as one that represents the entire population.

Probit marginal effects for increasing (+1 vs. 0/-1) and decreasing (-1 vs. 0/+1) religious intensity are displayed in the third row. As the model suggested, when the source of variation is from hectares of wetland, doing better off causes a decrease in Pengajian, as indicated by Columns 3 and 4. When the source of variation is from government workers, larger economic distress causes an increase in Pengajian, as indicated by Columns 5 and 6. The difference between the marginal effects for increasing and the marginal effects for decreasing are also similar to the estimates from the linear model in row 1.

[3]I used Stata programs implementing Amemiya Generalized Least Squares (AGLS) estimators for probit with endogenous regressors. Newey (1987) provides the formulas used. I modified these Stata programs to run ordered probit as well.

Columns 1-2 presents OLS estimates of equation 3. These estimates of the correlation between economic distress and changes in religious intensity are close to 0. The sign flips from Column 1 to 2 as controls are added; this suggests omitted variables may play an important role. Measurement error in expenditures, which may be exacerbated in differences, also biases OLS estimates towards 0.

4.5 Islamic Schools

Having established that economic distress stimulates Pengajian, I now turn to the other measure of religious intensity that is measured in changes, the sending of one's children to Islamic school, a measure that may even have intergenerational ramifications. Returns to schooling at Islamic schools (pesantren or madrasah) are lower than at non-Islamic schools (Berman and Stepanyan 2003) and, in the Hundred Villages Survey, parents report paying substantially larger fees at Islamic schools than at non-Islamic schools, so an increase in Islamic school attendance would be remarkable.

I find that households suffering greater economic distress increase the number of children sent to Islamic schools and decrease the number of children sent to secular schools. Only households who send children to school before the crisis are included in the sample, which reduces the sample size to 4,255 households. Estimates suggest households who experience a $1 decline in per-capita nonfood expenditures are roughly 1% more likely to switch a child to Islamic school (Columns 3 and 4 of Table 5 Panel A) and roughly 1% more likely to switch a child from secular schools (Columns 3 and 4 of Table 5 Panel B). The estimates are not symmetric since households may also take children into and out of school. Islamic school attendance increases are statistically significant at the 10% level. The Sargan overidentification statistic is 0.279 and the p-value is 0.597, meaning that the null hypothesis that both instruments are exogenous to changes in Islamic school attendance cannot be rejected at the 10% level. The consistency across controls suggests remaining omitted variables bias may be small (compare Columns 3 and 4). Replicating the placebo and post experiments for Islamic schools as in Table 3 indicate the point estimates are a small fraction of the point estimates for the main experiment. The results are qualitatively similar using percentage of children attending Islamic school.[4]

The average household suffered a $4.70 decline so the average household was roughly 5% more likely to switch a child to Islamic school, out of a baseline of 0.15 number of children attending Islamic school in May 1997, a sizeable fraction. Islamic schools also become relatively more expensive over the survey time frame: parents pay a relatively constant 45 cents per month or 2% of total expenditures (monthly per-capita expenditures in May 1997 was $20.9) at non-Islamic schools while the fee of Islamic schools increased from being 35% higher in December 1998 to 80% higher than

[4]Identical results are obtained if I run the standard specification, analogous to equation 2:

$$M_{ijt} = \beta E_{ijt} + \alpha_{0t} + \alpha_{1t}' \mathbf{X}_{ij} + \delta_{jt} + u_i + \varepsilon_{ijt}$$

for $t = 1, 2$, $i = 1..N$, and $j = 1..J$ where M_{ijt} represents the number of children sent to Islamic school (Madrasah) by household i in village j in time t and per-capita non-food expenditures E_{ijt} are instrumented by $\mathbf{Z}_{ij} Post_t$. $Post_t$ is a dummy variable indicating whether the time period is after the crisis. Household fixed effects are represented by u_i.

the fee for non-Islamic schools in August 1999. This increase in Islamic school fees may reflect an increasing demand for Islamic schools. It may also reflect increases in voluntary payments to Islamic schools. In one religious school in a village in the survey, nominal minimal fees are set yet families can contribute any amount beyond the minimum. Moreover, children who cannot afford school fees may be provided scholarships, suggesting another form of consumption smoothing provided by religious schools.

Consistent with an increasing demand, according to a 1992 Library of Congress report (LOC), an upper bound of 17% of the Muslim school-age population attended Islamic schools in 1992.[5] According to IFLS2 conducted in 1997, 18% of Muslim households with children attending school have sent children to an Islamic school. But according to a nation-wide poll conducted in 1999, 30% of Muslim households with school-aged children sent their children to an Islamic school (Wagner 1999). These snapshots of time suggest the financial crisis coincided with a sharp increase in Islamic school attendance (consistent with Hartono and Ehrmann (2001)), which seems remarkable because of potential long-term effects on children's beliefs.

4.6 Other Social Activities

A question that naturally arises is whether Pengajian captures religious intensity or is just another social activity. In Table 6, I compare Pengajian with all the other social activities that are surveyed. Column 1 displays the earlier result (from Column 7 Table 4) that economic distress stimulates Pengajian. Columns 2 through 6 indicate that economic distress stimulates less participation in every other surveyed social activity: sports (Olahraga), burial society (Kematian), club for obtaining skills (Karang Taruna), family welfare movement (PKK and "occasional training for women"), and "10 helps for housing" (Dasawisma). The information at the bottom of Table 6 indicates three of the activities are also free, suggesting their smaller increase is not because of activity fees. Moreover, sports, club for learning skills, and PKK are also available in 83%-96% of villages. In contrast, only 71% of villages have Islamic chapels and 82% have mosques (83% have Islamic chapels or mosques), so the small or no increase in other activities is not due to the lack of available facilities.

This evidence suggests that opportunity cost of time alone cannot explain the increase in religious intensity, since economic distress should also stimulate other social activities. On the other hand, the discussion of Proposition 1 suggests economic distress should be less stimulating of other social activities that provide less mutual insurance. Significantly, Column 7 of Table 6 indicates that economic distress does not stimulate participation in another mutual insurance group, rotating savings clubs (Arisan). This result is consistent with the model's predictions since rotating savings clubs have much weaker social sanctions than religious groups. Mean changes are indicated in the third row of Table 6. More people overall reported decreasing rotating savings club participation (Column 7) than reported increasing it, suggesting mutual insurance groups without strong social sanctions are in fact declining relative to Pengajian.

[5] 17% results from dividing 15%, the overall percentage of school-age population attending Islamic school in the Library of Congress report, by 87%, the proportion of the population that is Muslim.

4.7 Labor Supply

Next, to investigate whether Pengajian increases just because people have more leisure, I examine whether wetland owners supply more labor and government workers supply less labor than others during the crisis. Table 7 estimates the reduced form analog of equation 5. Instead of regressing

$$\Delta L_{ij} = \beta' \mathbf{Z}_{ij} + c + \alpha' \mathbf{X}_{ij} + \gamma_j + \varepsilon_{ij}$$

where ΔL_{ij} indicates labor supply change for household i in village j, I estimate the equivalent specification:

$$L_{ijt} = \beta' \mathbf{Z}_{ij} Post_t + \alpha_{0t} + \alpha'_{1t} \mathbf{X}_{ij} + \delta_{jt} + u_i + \varepsilon_{ijt}, \text{ for } t = 1, 2, i = 1..N, \text{and } j = 1..J$$

where $Post_t$ is a dummy variable indicating whether the time period is after the crisis, L_{ijt} indicates labor supply for household i in village j in time t, and u_i represents household fixed effects (the notation is like that of equation 2). This specification highlights the overall labor supply change for the entire population, captured in α_0. Previous regressions are not run this way because Pengajian data is only available in changes.

The coefficient on $Post_t$ in Table 7 indicates all households increased labor supply, as measured by average household hours worked per week. The magnitudes suggest people switching from home production to market production. This is consistent with Frankenberg et al.'s (1999) finding that female employment increased during the crisis and that a large number of women joined the informal workforce or family businesses (including working on the family farm). In fact, dividing 21 (coefficient on $Post_t$ in Column 1) by 7 days/week and multiplying by the average number of working age household members (4.16 average household size - 1.79 average number of children in school = 2.37) gives just over 7 hours/day increase in labor supply, equivalent to perhaps one woman per household leaving home production and entering the workforce. Columns 1 and 3 indicate those who were hit harder by economic distress increased their labor supply relative to others (suggesting a backwards bending labor supply), inconsistent with the notion that Pengajian increases because people have more leisure. With controls, the coefficient for wetland remains significant but not for government workers.[6]

5 Does Religious Intensity Function as Ex-Post Social Insurance?

Sections 3 and 4 establish that economic distress stimulates religious intensity. But neither a decrease in opportunity cost of time nor extra leisure time appear to explain increase in religious intensity: there is minimal corresponding increase in any other social activity and labor supply does not decrease for households more affected by the crisis. In fact, it is not that people on the margin

[6]Controlling for ownership of modern amenities and service occupation particularly affects the coefficient on government workers.

reduce labor and increase religious intensity but that they increase labor and within non-labor allocation, they substitute towards religion. While the survey does not allow finding out precisely what non-labor activity decreased, economic distress did reduce television ownership. It is possible that households sold their televisions to make ends meet and that this freed up time for labor and Pengajian.

In this section, I now turn to the evidence that religious intensity provides ex-post insurance, consistent with the model presented in Section 2. Without data on transfers between households, I am unable to show definitive proof that individuals receive aid from religious groups immediately after increasing their religious intensity. I am, however, able to show that an increase in religious intensity, within three months, alleviates household need for credit. I also show that households with alternative forms of credit available do not increase their religious intensity in response to economic distress. I then show that households with additional religious institutions available had smaller variance in their consumption shocks due to the crisis. Finally, I show that religious institutions mitigate the effect of the instruments for economic distress (income shock) on economic distress itself (consumption shock).

5.1 Do Religious Institutions Provide Aid Ex Post?

I have noted anecdotal evidence from personal interviews of religious groups providing aid after negative shocks are revealed. Pengajian groups simultaneously increase attendance and provide public announcements to aid those seeking jobs or workers. Islamic schools induce higher attendance with scholarships for families who can no longer afford public school fees. I find in the Hundred Villages Survey, within three months, increasing religious intensity results in subsequent alleviation of the need for alms or credit in order to meet basic daily needs. Households that increase participation in Koran study during the crisis (during the three months previous August 1998) see a 50% reduction in the likelihood to need alms or credit three months later (in December 1998) whereas households that report constant Koran study are 24% less likely to need alms or credit three months later and households that decrease participation see a 20% reduction in the likelihood to need alms or credit three months later. Households that did not participate in Pengajian are only 5% less likely to need alms or credit three months later. Results for Islamic school attendance are analogous. Households that increase Islamic school attendance also report greater reductions in likelihood to need alms or credit than households with constant or decreasing Islamic school attendance. Similar results are found using non-food expenditures as outcome variable instead of alleviating credit constraints.

Mean reversion is unlikely to explain the differential reduction in needing alms or credit to meet basic daily needs because non-participating households are 5% less likely to need alms or credit three months later. Under mean reversion, non-participating households should have had a decrease in credit constraints in-between those of households that increased Pengajian and households that decreased Pengajian. Moreover, rates of credit constraints among households are diverging after the crisis.

Without data on who is the employer, I am unable to show definitive proof of Pengajian providing

employment networks ex post. I do find however that households hit harder by the crisis yet also increasing in Pengajian report larger increases in labor supply than those hit harder but did not increase Pengajian.

5.2 Does Religious Intensity Increase For Lack of Credit?

The model suggests religious intensity does not respond to economic distress if alternative forms of consumption smoothing are available. To investigate this hypothesis, I estimate

$$\Delta Q_{ij} = \beta_0 \Delta E_{ij} + \beta_1 (\Delta E_{ij} C_j) + \alpha_0 C_j + \alpha_1' \mathbf{X}_{ij} + \gamma_j + \varepsilon_{ij}$$

where C_j represents credit availability in village j and credit availability, according to residents of Indonesia, is defined as having banks, microfinance institutions, or BRI loan products. The BRI bank system is the backbone of the rural financial system in Indonesia (Holloh 2001) and BRI loan products are a special form of credit with low collateral requirements. In one village in the survey, BRI loan products were especially available during the crisis for government workers because they were considered to have "fixed" jobs. A feature of the BRI loan product that helps loan collection is the reduction of interest for timely repayments (Holloh 2001). Microfinance programs were also helpful for laid-off workers to start small businesses of their own (Akatiga 1999).

The coefficient of the interaction $\Delta E_{ij} C_j$ indicates whether the effect of economic distress on religious intensity decreases with the availability of credit. The coefficient is negative and significant, confirming Proposition 2. The estimate is robust to specifications with and without controls, displayed in Columns 1 and 2 of Table 8. Dividing 0.30 by 0.37 in Column 2 or 0.32 by 0.35 in Column 3 suggests credit availability reduces the effect of economic distress on religious intensity by roughly 80%. Credit availability also reduces the effect of economic distress on switching children from secular to Islamic schools (not displayed).

To address the possibility credit availability proxies for general economic development, I include the interaction of economic distress with number of shops and the interaction of economic distress with an urban dummy. The standard errors of the coefficients of interest, β_0 and β_1, increase (in Column 3) while the magnitudes remain unchanged. This suggests there is something particular about credit availability, not economic development, that influences how economic distress stimulates religious intensity. The Sargan overidentification statistic is 3.610 and the p-value is 0.461. This indicates that the null hypothesis that the instruments interacted with credit availability and other measures of economic development are exogenous to changes in Pengajian cannot be rejected at the 10% level. If economic distress is interacted with pre-crisis poverty levels, measured by own poverty or fraction of poor in the village, estimates suggest that all groups, not just the poor or those in less developed areas, increase religious intensity with economic distress (not displayed).

Religious intensity may have increased most where insurance is lacking. Remarkably, the proportion of households participating in Pengajian increased from 47% to 73% from August 1998 to August 1999 where there were no Islamic chapels or mosques. Elsewhere, the proportion of

households participating in Pengajian only increased from 64% to 71%.

5.3 Do Religious Institutions Smooth Consumption Shocks?

The model suggests that if religious institutions provide social insurance, villagers will smooth more of their consumption shocks with each other. Since religious institutions are measured before the crisis, a test of consumption smoothing among villagers would examine whether the crisis had a smaller impact on the spread of consumption changes in places where there are more religious institutions. To do this, I identify an exogenous component of the financial crisis based on the village-level version of the instrument, the Gini coefficient of wetland hectares. Since wetland hectares cushion household economic distress, the Gini coefficient of wetland ownership within a village identifies the inequality of economic cushioning during the crisis. In this sub-section, I show that this exogenous crisis component (Gini coefficient of wetland) interacted with pre-crisis number of worship buildings is negatively associated with the impact of the crisis on standard deviation of consumption shocks.

The theory suggests the following reduced form specification:

$$Crisis\_Stdev(\Delta E_{ij})_j - NonCrisis\_Stdev(\Delta E_{ij})_j = \beta_0 I_j + \beta_1' I_j \mathbf{S}_j + \alpha_0' \mathbf{S}_j + \alpha_1' \mathbf{X}_j + \kappa_p + \eta_{jp}$$

where $Stdev(\Delta E_{ij})_j$ is constructed by calculating each household's change in monthly per-capita nonfood consumption expenditures and then computing the village-level standard deviation of these consumption shocks. $Crisis\_Stdev(\Delta E_{ij})_j$ is computed using the consumption shocks during the financial crisis. $NonCrisis\_Stdev(\Delta E_{ij})_j$ is computed using consumption shocks during the post experiment described earlier. The standard deviation captures consumption smoothing among villagers. Differencing addresses potential fixed omitted variables associated with village consumption smoothing. I_j represents the village-level instrument, Gini coefficient of wetland hectares, $\mathbf{S}_j$ represents potential social insurance institutions, total worship buildings per 1000 population, 1996-97 INPRES (Presidentially Instructed Program for Village Assistance) funds per 1000 population, and credit availability, $\mathbf{X}_j$ represents village and geographic controls (urban dummy, population, area, number of shops per 1000 population, mean pre-crisis monthly per-capita non-food expenditures, and dummies for geographic characteristics flat, steep, beach, forest, valley, and river) and κ_p represents province fixed effects.

In the previous sub-section, I showed that credit availability lowered the effect of economic distress on religious intensity. Here, using an analogous specification, I ask, do worship buildings lower the effect of wetland Gini coefficient on the standard deviation of consumption shocks? As preliminary step, I first show that there is a strong reduced form relationship between wetland Gini coefficient and the standard deviation of consumption shock due to the financial crisis (Columns 1 and 3 of Appendix Table C).

The coefficients of interest, β_0 and β_1, are displayed in Columns 2 and 4. The negative sign on

the interaction of the wetland Gini coefficient and worship buildings suggest religious institutions facilitates consumption smoothing among villagers. The average religious worship buildings per 1000 population is 3.83 (Appendix Table A village summary statistics). Multiplying 3.83 by the coefficient 7.47 and dividing by 40.58 (Column 2) suggests the average number of religious worship buildings reduced the effect of the financial crisis on standard deviation of consumption shock by 70%. Comparing Columns 2 and 4 suggests the relationship is robust to adding village and geographic controls and province fixed effects. The relationship is not robust however to using the coefficient of variation or interquartile range of village consumption changes. This may be because the mean of consumption shocks during the non-crisis period is very small, and dividing by them makes the non-crisis numbers extremely large.

The large positive coefficient on credit availability in Column 4 suggests credit availability widens the spread of consumption shocks during the financial crisis. The intuition for this result is that those who lose little, lose even less when credit is available. But those who lose little, lose instead more when their relative gain is transferred to those who lose more in religiously intense places. To illustrate this in the model, consider what happens when credit is available. The fall for L is still mitigated. But the fall for H may be mitigated too. That is, M_L falls and M_H falls, so credit availability should be expected to not reduce as much as religious institutions do, the standard deviation of consumption shock that is due to the financial crisis. If M_H falls *more* than M_L falls when credit is available, then credit availability may widen the standard deviation of consumption shock that is due to the financial crisis. This would be the case if H smooths more of their crisis-shock M_H than L smooths of their crisis-shock M_L. Therefore, whether credit availability reduces or widens standard deviation during the crisis is a priori ambiguous. Note that the incentives of L and $H$are not in opposition with credit availability, unlike the situation with religious groups.

5.4 Do Religious Institutions Smooth Individual Consumption Shocks?

The methodology developed in the previous sub-section provides evidence of spatial insurance that departs from the usual income-consumption-translation tests of insurance (Townsend 1994, Dehejia, DeLeire, and Luttmer 2007). A straightforward extension of the model predicts that religious institutions mitigate the effect of income shocks on consumption shocks at the household level. Income data is not available for all the households and Pengajian is not recorded before the crisis, so I use wetland hectares and government occupation as proxies for income shocks and interact them with pre-crisis religious institutions. I find that religious institutions mitigate the effect of income shocks on economic distress. Each hectare of wetland results in \$3.42 cushion but the average number of worship buildings per 1000 population reduces this cushion by \$2.17; the point estimates are statistically significant at the 1% level. Government occupation results in \$2.13 exacerbation from the crisis and the average number of worship buildings per 1000 population mitigates this shock by \$0.81; these point estimates are not statistically significant. I report conditional correlations, but unconditional correlations give similar results. I also find that religious institutions mitigate the effect of income shocks on the household's standard deviation of consumption shocks.

Another test of consumption smoothing is whether economic distress stimulates religious intensity more when the dispersion of shocks increases. There is some evidence that economic distress stimulates more Koran study and Islamic school attendance in areas with high Gini coefficient of wetland than with low Gini coefficient of wetland but the point estimates are not statistically significantly different.

5.5 Alternative Theories

In this section, I consider several alternative theories to explain the findings in this paper. I ask each of the following questions in turn: Does economic distress stimulate religious intensity or distress stimulate religious intensity? Do religious groups provide ex-post insurance or redistributive altruism? Does economic distress stimulate religious intensity because poverty is linked to religious intensity? Does economic distress stimulate religious intensity because religious organizations bond labor? Does economic distress not stimulate other social activities because they are luxury goods? And, does religious intensity provide ex-post insurance or merely increase contentment?

5.5.1 Distress

Variation in other kinds of distresses such as family deaths (infants) do not increase Pengajian. This suggests economic distress, not just any distress, is responsible for Pengajian increases. It also makes it less likely that religious intensity merely provides solace or moral, emotional, or psychological support. This may seem counter-intuitive to the common notion that bad times stimulate religious feeling. However, casual observation suffers from a self-selection problem in reports: the econometrician does not observe all people who suffer distress even if the religiously intense claim distress stimulates religiosity. A priori, deaths of family members may be equally likely to cause someone to turn away from God.

5.5.2 Altruism

Religious institutions are not associated with lower inequality of consumption levels, which begs the question why religious institutions would altruistically smooth temporary shocks but not permanent inequality. A model of social insurance, however, allows the smoothing of temporary and not permanent shocks. Altruism also fails to explain why only those who participate in Pengajian experience alleviation of credit constraints during the crisis.

5.5.3 Poverty

Religious intensity does not decrease as economic conditions improve after the crisis. Rather, Pengajian participation rates continue to increase from 61% in August 1998 to 71% in August 1999 (Appendix Table A crisis summary statistics). This casts doubt on religious intensity being strictly pegged to income. If there are adjustment costs to choosing religious intensity, then arbitrarily small shocks would not affect religious intensity and religious intensity would not necessarily correspond

to income levels. In fact, dryland hectares, an instrument for a small shock, is not correlated with changes in religious intensity (however, using dryland hectares as an instrument to detect nonlinear, quadratic effects does not result in statistically significant findings). Moreover, there is no relation between Pengajian and monthly per-capita nonfood expenditures in the cross-section. Outside Indonesia, Krueger and Maleckova (2003) do not find that poverty causes terrorism and DiPasquale and Glaeser (1997) do not find that poverty matters for race riots. A model of social insurance, however, is consistent with an increase in religious intensity even after economic conditions improve. A large shock increases agents' posterior likelihood of volatile income distributions and increase expected volatility. Anecdotally, the separation between mosque and state appears to be decreasing: Indonesia elected a Muslim cleric as president in October 1999 and new federal laws mandate all schools to provide Islamic prayer rooms and all children must be taught in their respective religion.

5.5.4 Luxury Goods

If social activities are luxury goods and income effects outweigh substitution effects, then Koran study is an inferior good and Islamic schools a Giffen good (the relative price of Islamic schools increased). Religious intensity being an inferior good is inconsistent with the lack of correlation between income and religious intensity (Iannacone 1998).

5.5.5 Labor Bonding

If religious organizations bond labor (give money because they can prevent individuals from leaving in a future period), then labor supply will be less backwards-bending where there are more religious institutions. Those in distress should be better able to sell future labor to religious organizations and so do not need to work as hard in the present period. However, the opposite is true: labor supply is more backwards-bending where there are more religious institutions (labor is more than twice as backwards-bending in places with per-capita number of worship buildings above the median than below the median, although the difference is not statistically significant). Moreover, if religious organizations bond labor, landless households with few child labor opportunities should be particularly inclined to send their children to (boarding) Islamic schools. However, land ownership is associated with decreases in household size.

5.5.6 Contentment

Increased contentment fails to explain why religious institutions reduce the standard deviation of consumption shocks within a village by 70%.

6 Conclusion

In this paper, I present a model of religious intensity functioning as ex-post social insurance. I model religion as a risk-sharing mechanism where people pool their resources and redistribute the

pool according to their relative religious intensities. Agents choose a proportion of income to put in Pengajian. This proportion represents their religious intensity. The pool is divided according to how much agents contribute as a fraction of their income. The model has the empirical implications that those who are hit harder by economic distress will increase their religious intensity and those who are hit less hard will decrease their religious intensity. The effect should be mitigated when other forms of credit are available. Religious institutions facilitate consumption smoothing. Agents receive ex-post insurance. Strong social sanctions against relative lack of intensity facilitate the stability of ex-post insurance (sharing occurs after information is revealed) by deterring agents who receive positive shocks from participating less. This in turn encourages agents who receive negative shocks to participate more because they can appropriate more of the positive shocks. Alternative social insurance mechanisms respond more weakly to economic distress.

Empirically, I demonstrate economic distress stimulates religious intensity by exploiting the fact that rapid inflation cause relative prices to favor growers of staples, namely rice, and hurt sticky wage-earners, particularly government employees, whose salaries are set by federal law. I find that households experiencing a $1 decline in monthly per-capita nonfood expenditures are 2% more likely to increase Koran study and 1% more likely to switch a child to Islamic school. These results do not obtain for "placebo instruments," dryland hectares and service occupation. Any counter-explanation for rice-growers and government employees displaying changes in religious intensity must address why the same changes are not seen for growers of dryland crops and workers in service occupations.

Participation in other social activities (including arisan) do not increase while labor supply increases with economic distress. These findings are inconsistent with an opportunity cost view of religious intensity that does not account for social insurance. Instead, using a difference-in-differences strategy, I show that households that increase Pengajian during the crisis have less unmet demand for alms and credit for meeting basic daily needs within three months. The effect of economic distress on religious intensity essentially disappears in places where credit is available. Religious institutions reduce the spread of consumption shocks during the the crisis. Religious institutions also mitigate the effect of income shocks on consumption shocks. These results are consistent with predictions derived from the model of religious intensity functioning as ex-post social insurance.

Direct evidence on social sanctions is beyond the scope of this paper. In other work, however, I find that religious intensity is linked more strongly to social violence in regions that are more economically distressed and, importantly, alternative social insurance mitigates this effect (Chen 2007). To the extent governments, international organizations, and NGOs are concerned about ideological extremism, in particular because it may lead to religious conflict and violence, these results suggest that increasing their role in social insurance may mitigate fundamentalist tendencies. Indeed, there is evidence that religious intensity is lower in places where there is greater public funding, particularly funding that provides social insurance (Hungerman 2004, Gruber and Hungerman 2005). Countries inordinately dependant on natural resources may be subject to greater fluctuations and may find reducing fundamentalist tendencies to be yet another reason to diversify. Economic shocks

have been found to increase conflicts (Miguel 2005 and Miguel, Satyanath, and Sergenti 2004), so if globalization increases the risk individuals face, providing insurance against that risk may be important in preventing ethnic-religious conflicts.

Social scientists increasingly view group identities like ethnicity as social constructs potentially affected by an individual's environment and economic conditions. Religious intensity provides a particularly apt context to study group identity as it is arguably more of a choice than ethnicity. I have shown that social insurance with punishment is particularly successful in an uncertain environment. This may help explain why some religions and group identities replace others over time. If one models group identities as a form of social insurance (Chen and Li 2008, Fryer 2003), then in the long-run competition between social insurance groups, with volatility, religions with harsher punishment are more stable and successful. As volatility declines, groups or religions with reduced punishment or violence become relatively successful. Violence should be interpreted broadly, as it need not be physical. The mere exclusion of nongroup members, much less the concept of hell common in many religions, substitutes for violence that keeps ex-post insurance self-sustaining. Given the variation in doctrine, the content of beliefs and interpretation of religious texts may in fact be subject to economic forces, but this is for future research.

7 Mathematical Appendix

Proof of Proposition 1 The structure of this proof is mainly an argument by continuity. Suppose $f(x_0)$ is the incentive to change x_0. Consider a change in the environment to $\widetilde{f}$ such that $\widetilde{f}(x_0) > 0$. Then there exists a δ such that it is still the case $\widetilde{f}(x_0 + \delta) > 0$. Therefore, the optimum in the new environment must be at least $+\delta$ different than the optimum x_0 in the old environment (if not, we have proof by contradiction).

It can be immediately observed that agent L chooses a higher level of religious intensity than agent H, $Q_L^* > Q_H^*$. It is sufficient to show that $\frac{\partial}{\partial Q_H} U_H|_{Q_H=Q_L} < \frac{\partial}{\partial Q_L} U_L|_{Q_H=Q_L}$, which follows immediately from examining the derivative of the first term in equation 1. Since $H > \frac{\overline{\mu}_1}{Q} > L$, $u'[(1-Q_H)H + \frac{Q_H}{Q}(\overline{\mu}_1)]\{-H + \frac{\overline{\mu}_1}{Q}\} < u'[(1-Q_L)L + \frac{Q_L}{Q}(\overline{\mu}_1)]\{-L + \frac{\overline{\mu}_1}{Q}\}$. The first term is negative while the second term is positive.

Let $\Delta \equiv \frac{\partial}{\partial Q_L} U_L|_{Q_H=Q_L} - \frac{\partial}{\partial Q_H} U_H|_{Q_H=Q_L}$. Let $E(.) \equiv u'[(1-Q_L)L + \frac{Q_L}{Q}(\overline{\mu}_1)]\{-L + \frac{\overline{\mu}_1}{Q}\} - u'[(1-Q_H)H + \frac{Q_H}{Q}(\overline{\mu}_1)]\{-H + \frac{\overline{\mu}_1}{Q}\}$. By continuity, there exist δ_1, δ_2, and δ_3 such that $E(.)|_{Q_L=Q_H} - E(.)|_{Q_L=Q_H+\delta_1} < \frac{\Delta}{3}$, $-\frac{\partial}{\partial Q_H} V(Q_H|Q_L)|_{Q_L=Q_H+\delta_2} < \frac{\Delta}{3}$, and $[\frac{\partial}{\partial Q_L} C(Q_L) - \frac{\partial}{\partial Q_H} C(Q_H)]|_{Q_L=Q_H+\delta_3} < \frac{\Delta}{3}$. Let $\delta = \min(\delta_1, \delta_2, \delta_3)$. Then, $\frac{\partial}{\partial Q_H} U_H|_{Q_H} < \frac{\partial}{\partial Q_L} U_L|_{Q_L=Q_H+\delta}$. Thus, $Q_L^* > Q_H^*$.

To show that crisis increases the dispersion of religious intensity, i.e. $\frac{\partial}{\partial M}(\frac{Q_L^*}{Q_H^*}) > 0$, it is sufficient to show that $\frac{\partial}{\partial M}[\frac{\partial}{\partial Q_L} U_L|_{Q_L=Q_L^{*,M=0}} - \frac{\partial}{\partial Q_H} U_H|_{Q_H=Q_H^{*,M=0}}] > 0$, where $Q_{x_1}^{*,M=0}$ denotes the equilibrium solution when $M = 0$. Again, the result follows from examining the derivative of the first term in equation 1. Let $F(.) \equiv \frac{\partial}{\partial Q_L} U_L|_{Q_L=Q_L^{*,M=0}} - \frac{\partial}{\partial Q_H} U_H|_{Q_H=Q_H^{*,M=0}}$. Since no other term besides the first in equation 1 contains M, $\frac{\partial}{\partial M} F(.) = \frac{\partial}{\partial M} E(.)|_{Q_L=Q_L^{*,M=0}, Q_H=Q_H^{*,M=0}}$, which in turn

equals $\{-L+\frac{\overline{\mu}_1}{\overline{Q}}\}\frac{\partial}{\partial M}u'[(1-Q_L^{*,M=0})L+\frac{Q_L^{*,M=0}}{\overline{Q}}(\overline{\mu}_1)]-\{-H+\frac{\overline{\mu}_1}{\overline{Q}}\}\frac{\partial}{\partial M}u'[(1-Q_H^{*,M=0})H+\frac{Q_H^{*,M=0}}{\overline{Q}}(\overline{\mu}_1)]$. Concave utility implies $\frac{\partial}{\partial M}E(.)|_{Q_L=Q_L^{*,M=0},Q_H=Q_H^{*,M=0}}>0$. This result holds relative to any reference point $M=M_1$, not just $M=0$. Intuitively, $F(.)$ represents the tendency for dispersion of religious intensity to increase. If $F(.)>0$, then there is room either for Q_L to increase or Q_H to decrease. This is formally shown in the following.

Let $\Delta \equiv F(.)|_{M=M_2}-F(.)|_{M=M_1}$ where $M_2>M_1$ and the reference point for $F(.)$ is $M=M_1$: that is, consider the equilibrium solution $Q_{x_1}^{*,M=M_1}$ when $M=M_1$. $\frac{\partial}{\partial M}F(.)>0$ implies $\Delta>0$ as well. It will be convenient to denote equation 1 as $U_x=T_{x,1}(.)+T_{x,2}(.)+T_{x,3}(.)$. By continuity, there exist δ_{1L}, δ_{1H}, δ_{2L}, δ_{2H}, δ_{3L}, and δ_{3H} such that $-\frac{\partial}{\partial Q_L}T_{L,p}(.)|_{Q_L=Q_L^{*,M=M_1},M=M_1}+\frac{\partial}{\partial Q_L}T_{L,p}(.)|_{Q_L=Q_L^{*,M=M_1}+\delta_{pL},M=M_2}<\frac{\Delta}{6}$, where $p=1...3$, and $\frac{\partial}{\partial Q_H}T_{H,p}(.)|_{Q_H=Q_H^{*,M=M_1},M=M_1}-\frac{\partial}{\partial Q_H}T_{H,p}(.)|_{Q_H=Q_H^{*,M=M_1}-\delta_{pH},M=M_2}<\frac{\Delta}{6}$, where $p=1...3$. Let $\delta=\min(\delta_{1L},\delta_{1H},\delta_{2L},\delta_{2H},\delta_{3L},\delta_{3H})$. Then $[\frac{\partial}{\partial Q_L}U_L|_{Q_L=Q_L^{*,M=M_1}+\delta,M=M_2}-\frac{\partial}{\partial Q_H}U_H|_{Q_H=Q_H^{*,M=M_1}-\delta,M=M_2}]-[\frac{\partial}{\partial Q_L}U_L|_{Q_L=Q_L^{*,M=M_1},M=M_1}-\frac{\partial}{\partial Q_H}U_H|_{Q_H=Q_H^{*,M=M_1},M=M_1}]>0$. Thus $\frac{Q_L^*}{Q_H^*}|_{M=M_2}>\frac{Q_L^*}{Q_H^*}|_{M=M_1}$.

To show social sanctions facilitate the functioning of ex-post insurance, consider the extreme case when $V(.)=0$. It is easy to see the equilibrium Q_H^* drops, $Q_H^*|_{V\neq 0}>Q_H^*|_{V=0}$. If $U_H|_{V\neq 0}$ is maximized at $Q_H^*|_{V\neq 0}$, then $\frac{\partial}{\partial Q_H}U_H|_{V=0}(Q_H^*|_{V\neq 0})<0$. Thus there exists a δ such that $\frac{\partial}{\partial Q_H}U_H|_{V=0}(Q_H=Q_H^*|_{V\neq 0}-\delta)<0$. Therefore $Q_H^*|_{V\neq 0}>Q_H^*|_{V=0}$.

But equilibrium Q_L^* drops as well: $Q_L^*|_{V\neq 0}>Q_L^*|_{V=0}$. If $U_L|_{V\neq 0}$ is maximized at $Q_L^*|_{V\neq 0}$ and $Q_H^*|_{V\neq 0}$, then $\frac{\partial}{\partial Q_L}U_L|_{V=0}(Q_L^*|_{V\neq 0},Q_H^*|_{V=0})<0$. The only consideration for agent L when Q_H^* drops is how it affects income, $(1-Q_L)L+\frac{Q_L}{\overline{Q}}(\overline{\mu}_1)=L+\frac{(Q_HQ_L)(H-L)}{(Q_H+Q_L)}$. It is clear that for L, the more H participates, the larger is the Pengajian budget and the more L gains from participating. Formally, $\frac{\partial}{\partial Q_H}\frac{\partial}{\partial Q_L}\{L+\frac{(Q_HQ_L)(H-L)}{(Q_H+Q_L)}\}=\frac{2(Q_HQ_L)(H-L)}{(Q_H+Q_L)^3}>0$. Thus there exists a δ such that $\frac{\partial}{\partial Q_L}U_L|_{V=0}(Q_L^*=Q_L^*|_{V\neq 0}-\delta,Q_H^*|_{V=0})<0$. Therefore $Q_L^*|_{V\neq 0}>Q_L^*|_{V=0}$.

By continuity, the lower is $\frac{\partial}{\partial Q_H}V(.)$, then the more Q_H^* and Q_L^* fall.

Note it cannot be the case Q_H^* increases taking into account the decline in Q_L^*. If Q_H^* increases then so will Q_L^* because H's religious intensity is, in a sense, complementary for L's religious intensity. Q.E.D.

Proof of Proposition 2 Consider first the choice of Q_L^*. If L can smooth intertemporally by himself, he can achieve his Pareto frontier without having to pay the Pengajian cost $C(Q_L^*)$. The proof follows because both the choice set of L increases and, from inspecting equation 1, we know L was previously at a constrained optimum–L would increase religious intensity Q_L more if it weren't for cost $C(.)$. Observe that with credit, L can obtain $\frac{L+H}{2}$ in every time period if he chooses. However the amount agent L receives from Pengajian is $L+\frac{(Q_HQ_L)(H-L)}{(Q_H+Q_L)}$. L receives the payoff $\frac{L+H}{2}$ when $\frac{Q_HQ_L}{Q_H+Q_L}=\frac{1}{2}$. Examining $Q_H=\frac{Q_L}{2Q_L-1}$ reveals that this can never be the case since $Q_L,Q_H\in(0,1)$. Thus, with costless credit, one obtains a discrete fall in Q_L^* when credit is available relative to when credit is not available.

Credit availability affects Q_H^* in a similar fashion: If H can smooth intertemporally by himself,

he can achieve his Pareto frontier without having to pay either the Pengajian cost $C(Q_H^*)$ or the $T_{H,1}$ cost of providing ex-post insurance for L agents. Moreover, with a discrete fall in Q_L^*, social sanction $V(\frac{\overline{Q}}{Q_{x_1}})$ declines as well, meaning H no longer needs to keep Q_H^* as high to forestall social sanctions. Both forces tend to decrease Q_H^*. Taking into account the decline in Q_L^* on $T_{H,1}$ is a force that tends to increase Q_H^*.

Q_L^* falls further than Q_H^*, because $u(.)$ is concave and $C(.)$ is convex. Consider first only $C(.)$ relative to $u(.)$ in equation 1 when credit becomes available. $C(.)$ is convex so $C'(Q_L^*) > C'(Q_H^*)$. Since $u(.)$ is concave, then $u'(.)|_{Q_L^*,NoCredit} > u'(.)|_{Q_H^*,NoCredit}$. $C'(Q_L^*)$ and $u'(.)|_{Q_L^*,NoCredit}$ both measure L's tendency to reduce Q_L^* when credit becomes available. $C'(Q_H^*)$ and $u'(.)|_{Q_H^*,NoCredit}$ measure H's tendency to reduce Q_H^* when credit becomes available. So clearly Q_L^* will fall further than Q_H^* considering only $C(.)$ and $u(.)$. Considering the first term in equation 1, the decline in Q_L puts upward pressure on Q_H while the decline in Q_H puts downward pressure on Q_L, which reinforces credit availability reducing Q_L^* more than it reduces Q_H^*. (Considering the social sanction term in equation 1, a sufficient additional condition is that $C'(Q_L^*) + u'(.)|_{Q_L^*,NoCredit} > C'(Q_H^*) + u'(.)|_{Q_H^*,NoCredit} + V'(Q_H^*)$.) Then $\frac{\partial}{\partial M}(\frac{Q_L^*}{Q_H^*})|_{Credit} < \frac{\partial}{\partial M}(\frac{Q_L^*}{Q_H^*})|_{NoCredit}$. Q.E.D.

8 Data Appendix

The empirical analysis draws from The Hundred Villages Survey, collected by the Indonesian Central Statistics Office. The panel dataset follows 8,140 households from May 1997 to August 1999, beginning before the crisis and continuing in four waves after the crisis (Figure 1). In the pre-crisis period, the survey observes 120 randomly selected households in each of 100 communities. There is a codebook in Bahasa that discusses sampling. What it says is that they initially sampled 2 enumeration areas per village in 1997, with 60 households per enumeration area. In 1998, they wanted to represent more of the village, so in the villages where there were more than 2 enumeration areas (i.e. areas that they had not yet sampled), they randomly sampled a third enumeration area, randomly dropped 20 households from each of the previous 2 enumeration areas, and then added a new enumeration area with 40 households. The partial replacement of pre-crisis households is why the panel contains 8,140 instead of 12,000 households.

Roughly one-third of the treatment groups attrite during resampling, and the attrition rates are similar across treatment and placebo groups. 28% of those owning wetland and 28% of those owning dryland leave the sample. 34% of those not owning any wetland and 39% of those not owning any dryland leave the sample. 31% of government workers, 37% of service workers, 32% of non-government workers, and 32% of non-service workers leave the sample.

The survey also collects village-level information in the first wave of 1997 and 1998. A more detailed description of the survey questions and variable construction used in the tables is provided below. The survey is in Indonesian and was translated with the help of two translators.

Wetland and dryland hectares information is taken from the question that asks for total area that is owned of each of wetland and dryland. Government occupation is taken from the question "Status

of main job last week" where the choices are: work by ourselves without other's help, working with other's help from temporary worker, working with permanent worker, government staff, public staff, private worker, and family worker. Government and public staff were coded as government worker. In Indonesian, the answer choices for government worker are "Buruh/karyawan pemerintah" and "Buruh/karyawan BUMN/BUMD". Service occupation is taken from the question, "Main job during last week," where the choices are agriculture, mining, industry, electricity, construction, business, transportation, finance, service, and other.

I focus on two outcome measures for ΔP_{ij}. One is the response to "In the past 3 months, has your household increased, decreased, stayed the same, or not participated in the study the Koran (Pengajian)?" More precisely, the phrase is "Pengajian/kegiatan agarma lainnya," which translates to religious activity, however translators say the question would be interpreted by native Indonesians as specifically referring to Koran study; non-Muslims may interpret the question as referring to the equivalent in their respective religion. This question is asked after the crisis and is coded as -1/0/+1. The other is the number of children in the household attending Islamic school. Islamic school attendance is coded from the following. Individuals older than 5 are asked the question "level of highest education that have ever had", which includes the responses, elementary, Ibtidaiyah (Islamic), secondary school, Tsanawiyah (Islamic), junior high/vocational, high school, aliyah (Islamic), diploma I/II, diploma III/Bachelor, and diploma IV/graduate.

The endogenous regressor, ΔE_{ij}, is measured using per-capita monthly nonfood consumption expenditure change from May 1997 to August 1998. Monthly nonfood expenditures are obtained from the question "Total non-food expense last month". Dividing this number by household size gives the per-capita information. Expenditures are normalized to US$ to ease interpretation. Exchange rate data obtained from www.oanda.com. The results are qualitatively the same using a CPI index, which is obtained from www.bi.go.id/bank_indonesia_english/main/statistics.

The controls, $\mathbf{X}_{ij}$, include pre-crisis May 1997 values of: household head characteristics–age, years of education (1-8 where 8=graduated), gender (1=male, 0=female), ever-married (1=married, divorced, or widowed, 0=not married yet), literate (able to read and write), and follows media (listened to radio or read newspaper last week); household characteristics–household size, modernity (Sum of dummy indicators for ownership of stove, radio, television, refrigerator, satellite dish, motorbike, and car), dryland hectares, farming dummy, service worker dummy, last month's per-capita non-food expenditures; village characteristics–urban dummy, population, area, number of shops per 1000 population; geographic characteristics–dummies for flat, steep (the excluded topography dummy is slight angle), beach, forest, valley, river terrain (the excluded geography dummy is other); and fiscal characteristics–INPRES (Presidentially Instructed Program for Village Assistance, implemented during 1996-1997) funding received normalized to $ per 1000 population, which divides into funds used for productive economic effort, for buildings and facilities, for offices and institutions, and for human resources, and total IDT (another village assistance program) funds received by the household between 1994-1996.

Participation in other social activities is asked alongside the question on Koran study. Each

question follows the same format: "In the past 3 months, has your household increased, decreased, stayed the same, or not participated in __?" is coded as -1/0/+1. Same and not participated are coded as 0. The questions are asked in the following order: Family Welfare Movement (occasional training for women), a program called 10 helps for housing (a form of rotating savings group of 10 households in the same neighborhood whose function is primarily social), a national club designed for common people with the purpose to obtain useful abilities (like a practical non-formal school for adults), burial society, sport, Koran study, and savings club (whose meetings are tea parties). Participation in Koran study, savings club, 10 helps for housing, Family Welfare Movement is free. Participation in sport, burial society, and club to obtain skills require fees. According to the village-level survey, 92% of villages have sport clubs, 83% have club for obtaining skills, 96% have Family Welfare Movement organizations, 71% have Islamic chapels, and 82% have mosques. Labor supply information is obtained by taking the mean of each household member's "total hours of any work during last week" and computing the change of this mean between pre- and post-crisis periods.

Credit availability is defined as having a bank, microfinance institution (response to question on lembaga keu), or BRI loan product (response to question on kupedes) available in village. Standard deviation of village shock refers to the standard deviation of individual changes in non-food expenditures over the crisis. A household is considered as needing alms or credit to meet basic daily needs if they respond they do not have basic supplies (of "9 basic need") for next week nor a supply of money, and so in order to get food, they are waiting for package, (trying to) borrow from someone else, or waiting for someone to give. This information is only asked after the crisis.

Village-level religiosity measures of per capita number of mosques, Islamic chapels, churches, Hindu temples, and Buddhist temples are taken from the 1997 PODES data (Potensial Desa/Village Potential Statistics), which asks for 1996 information. The religiosity measures of per capita number of Islamic boarding schools, religious schools, and seminaries are taken from 1998 PODES. New religious schools and seminaries are unlikely to be built during the crisis, so I interpret both pieces of data as pre-crisis numbers and divide by the 1997 PODES population accordingly (1998 PODES population numbers would be affected by crisis-induced migration).

I use the entire sample of 8,140 households. Appendix Table A presents some descriptive statistics.

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Figure 1: Timing of 100 Villages and PODES Survey Waves and the Rp/USD Exchange Rate

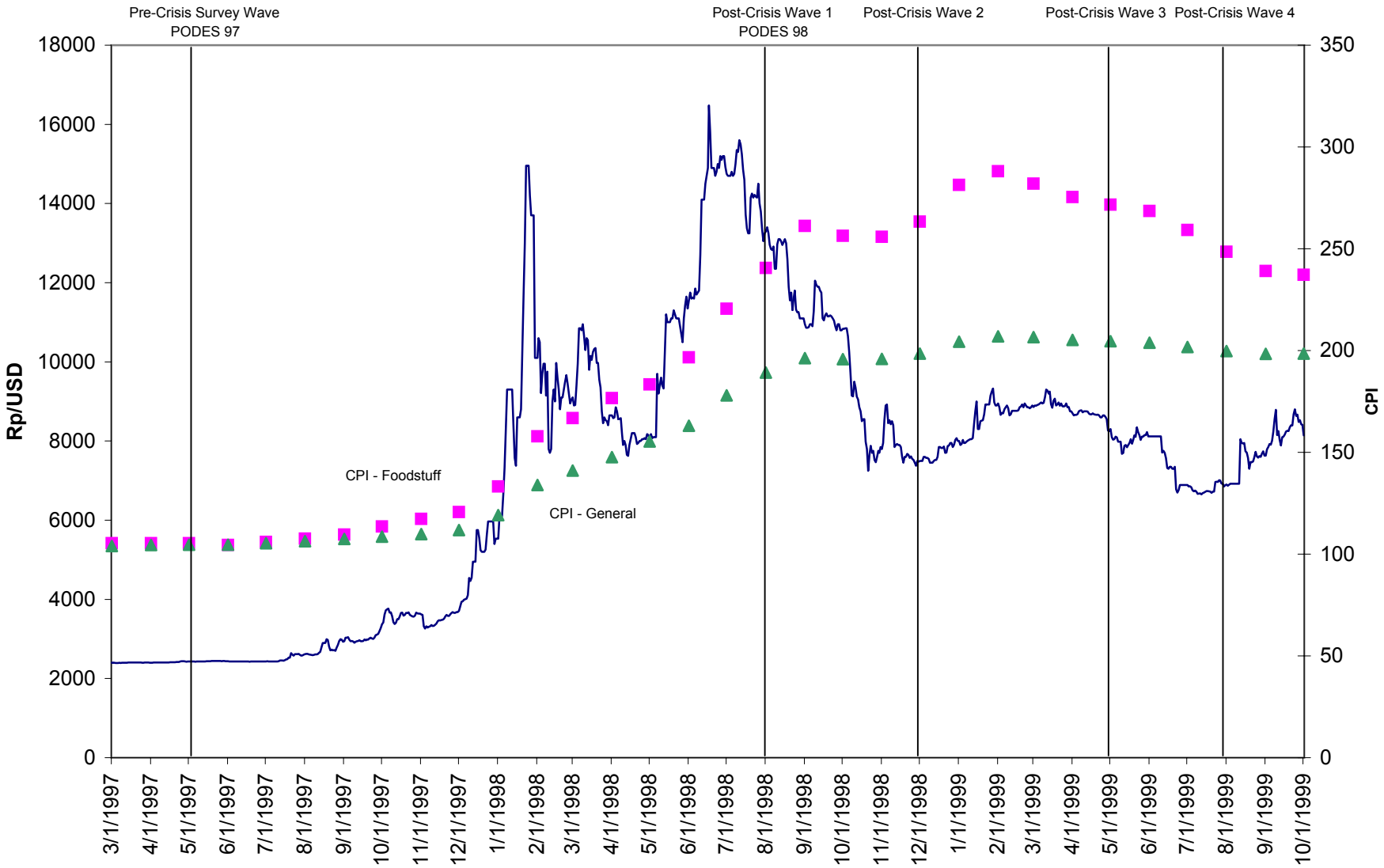

Table 1--Summary Statistics by Group

	Per-Capita Non-Food Expenditure $/mo		Per-Capita Non-Food	Penganjian	Average Non-Rel	
	1997 May	1998 August	Expenditure Change	Change	Social Change	N
	(1)	(2)	(3)	(4)	(5)	
<= 0.3 Hectares Wetland	7.5	2.6	-4.9	0.007	-0.035	6742
	(0.2)	(0.1)	(0.2)	(0.005)	(0.002)	
> 0.3 Hectares Wetland	6.6	3.0	-3.5	-0.015	-0.037	1398
	(0.2)	(0.6)	(0.6)	(0.013)	(0.005)	
Difference	-0.9	0.5	1.4	-0.022	-0.002	
	(0.4)	(0.4)	(0.6)	(0.013)	(0.005)	

	Per-Capita Non-Food Expenditure $/mo		Per-Capita Non-Food	Penganjian	Average Non-Rel	
	1997 May	1998 August	Expenditure Change	Change	Social Change	N
Not Government	7.0	2.6	-4.4	-0.001	-0.037	7633
	(0.2)	(0.2)	(0.2)	(0.005)	(0.002)	
Government	12.9	3.8	-9.1	0.067	-0.009	507
	(0.6)	(0.2)	(0.6)	(0.020)	(0.011)	
Difference	5.9	1.2	-4.8	0.068	0.029	
	(0.6)	(0.7)	(0.9)	(0.020)	(0.008)	

Standard errors in parentheses. Coefficients display group means.

Table 2--First Stage: Correlation of Instruments with Impact of Financial Crisis

	Change in Per-Capita Non-Food Expenditure $/mo (1998 August - 1997 May)					Percent Change	Placebo	Post
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Wetland Hectares	1.24***	1.12***			1.13***	0.036*		-0.32
	(0.42)	(0.36)			(0.36)	(0.022)		(0.46)
Government			-4.76***	-2.00**	-2.04**	-0.154***		3.38***
			(0.86)	(0.97)	(0.97)	(0.060)		(1.25)
Dryland Hectares							0.39***	
							(0.15)	
Service							0.19	
							(0.58)	
Controls	N	Y	N	Y	Y	Y	Y	Y
Fixed Effects	N	Village	N	Village	Village	Village	Village	Village

Standard errors are in parantheses. Coefficients represent OLS regressions.
Control variables are Household Head and Household Characteristics listed below.
Household Head Characteristics -- Age, Years of Education (8 = graduated), Gender, Ever-Married, Literate, Follows Media (tv or radio)
Household Characteristics -- Household Size, Modernity (Index of Stove, Radio, TV, Fridge, Satellite Dish, Motorbike, Car),
Farming Dummy, Service Dummy, Dryland Ownership (ha), Pre-Crisis Per-Capita Non-Food Expenditure
Percent Change refers to Per-Capita Non-Food Expenditure Percentage Change (1998 August - 1997 May)
Placebo refers to Correlation of "Placebo" Instruments with Per-Capita Non-Food Expenditure Change (1998 August - 1997 May), Wetland replaces Dryland as Control
Post refers to Correlation of Instruments with Per-Capita Non-Food Expenditure Change (1999 May - 1998 December)

Table 3--Reduced Form Relationship between Instruments and Pengajian Change

	Pengajian Change in Past 3 Months (Increase +1/Same 0/Decrease -1)						Increase vs 0/-1	Decrease vs +1/0
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A -- Main Experiment: 1998 August								
Wetland Hectares	-0.019**	-0.019**			-0.020**	-0.017**	-0.003	0.017***
	(0.009)	(0.010)			(0.010)	(0.008)	(0.008)	(0.006)
Government			0.068***	0.057**	0.057**	0.048**	0.037	-0.024
			(0.020)	(0.027)	(0.027)	(0.024)	(0.026)	(0.016)
Panel B -- Placebo Experiment: 1998 August								
Dryland Hectares	-0.001	0.000			0.000	-0.003	-0.006	-0.005
	(0.004)	(0.004)			(0.004)	(0.008)	(0.004)	(0.004)
Service			0.023	0.006	0.006	-0.008	-0.001	-0.011
			(0.016)	(0.016)	(0.016)	(0.022)	(0.012)	(0.011)
Panel C -- Post Experiment: 1999 May								
Wetland Hectares	-0.000	-0.003			-0.003	0.000	0.000	0.005
	(0.009)	(0.009)			(0.009)	(0.004)	(0.008)	(0.008)
Government			-0.029	-0.013	-0.013	0.006	-0.004	0.009
			(0.019)	(0.026)	(0.026)	(0.014)	(0.018)	(0.022)
Controls	N	Y	N	Y	Y	Y	Y	Y
Fixed Effects	N	Village	N	Village	Village	Village	Village	Village

Control variables are Household Head and Household Characteristics listed in Table 2. In Placebo Experiment, dryland control is replaced by wetland control.
Standard errors are in parantheses. Columns 1-5 display OLS estimates. Column 6 displays overall ordered probit marginal effects. Columns 7 and 8 display marginal effects for increasing and decreasing Pengajian which are computed from probits comparing increasing vs. same/decrease and probits comparing decreasing vs. same/increase.

Table 4--Impact of Economic Distress on Pengajian (2SLS)

	Pengajian Change in Past 3 Months (Increase +1/Same 0/Decrease -1)						
	OLS	OLS	IV	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Per-Capita Non-Food	0.0001	-0.0003	-0.016*	-0.017*	-0.014***	-0.028	-0.021**
Expenditure Change	(0.0003)	(0.0003)	(0.009)	(0.010)	(0.005)	(0.019)	(0.009)
	OProbit	OProbit	OProbit-IV	OProbit-IV	OProbit-IV	OProbit-IV	OProbit-IV
Per-Capita Non-Food	0.0001	-0.0001	-0.015*	-0.015*	-0.014***	-0.024	-0.018**
Expenditure Change	(0.0003)	(0.0001)	(0.009)	(0.009)	(0.005)	(0.016)	(0.008)
Marginal Effect for +1 vs 0/-1:	-0.0002	0.0000	0.004	-0.003	-0.009***	-0.016	-0.008
	(0.0002)	(0.0002)	(0.005)	(0.009)	(0.003)	(0.016)	(0.008)
Marginal Effect for -1 vs 0/+1:	-0.0002	0.0003	0.015**	0.015**	0.005	0.014	0.014***
	(0.0002)	(0.0002)	(0.007)	(0.006)	(0.003)	(0.015)	(0.005)
IV	N	N	Wet	Wet	Govt	Govt	Both
Controls	N	Y	N	Y	N	Y	Y
Fixed Effects	N	Village	N	Village	N	Village	Village

Standard errors are in parantheses. Control variables are Household Head and Household Characteristics listed in Table 2.
Overall ordered probit marginal effects are displayed. Marginal effects for increasing and decreasing Pengajian are computed from probits comparing increasing vs. same/decrease and probits comparing decreasing vs. same/increase.

Table 5--Impact of Economic Distress on Islamic School Attendance (2SLS)

	OLS (1)	OLS (2)	IV (3)	IV (4)
Panel A -- Islamic School Attendance Change				
Per-Capita Non-Food	0.000	-0.000	-0.008*	-0.010*
Expenditure Change	(0.000)	(0.000)	(0.004)	(0.006)
Panel B -- Secular School Attendance Change				
Per-Capita Non-Food	0.000	-0.000	-0.005	0.007
Expenditure Change	(0.001)	(0.001)	(0.008)	(0.012)
IV	N	N	Both	Both
Controls	N	Y	N	Y
Fixed Effects	N	Village	N	Village

Standard errors are in parantheses. Control variables are Household Head and Household Characteristics listed in Table 2. Islamic school attendance is defined as the number of children households send to Islamic schools. Only households with children attending school before the crisis are included in the sample. Secular school attendance is defined similarly.

Table 6--Impact of Economic Distress on Other Activities (2SLS)

Social Activities Participation Change in Past 3 Months (Increase +1/Same 0/Decrease -1)

1998 August	Koran study Pengajian	Sports	Burial Society	Club for Learning Skills	Training for Women	10 Helps for Housing	Savings Club Tea Parties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Per-Capita Non-Food	-0.0003	-0.0001	-0.0000	0.0001	0.0001	0.0001	0.0004*
Expenditure Change	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
	IV	IV	IV	IV	IV	IV	IV
Per-Capita Non-Food	-0.0207**	-0.0064	-0.0060	-0.0001	-0.0009	-0.0012	-0.0043
Expenditure Change	(0.0091)	(0.0048)	(0.0055)	(0.0039)	(0.0051)	(0.0046)	(0.0052)
Mean Change	0.003	-0.043	-0.021	-0.032	-0.052	-0.037	-0.028
Controls	Y	Y	Y	Y	Y	Y	Y
Fixed Effects	Village	Village	Village	Village	Village	Village	Village
Cost	free/donation	fee	fee	small fee	usually free	free	free
% Available	no information	92%	no information	83%	96%	no information	no information
Islamic Chapels % Available	71%						
Mosques % Available	82%						

OLS and IV specifications include all controls and village fixed effects. Instruments are wetland ownership and government occupation.
Control variables are Household Head and Household Characteristics listed in Table 2.

Table 7--Reduced Form Relationship between Instruments and Labor Supply Change

	Average Household Hours Worked/Week				
1997 May, 1998 August	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)
Wetland * Post	-0.95**	-0.93**			-0.92**
	(0.39)	(0.39)			(0.39)
Government * Post			3.19***	-1.13	-1.09
			(0.81)	(1.06)	(1.06)
Post	21.21***	14.99***	20.83***	15.40***	15.00***
	(0.21)	(2.22)	(0.21)	(2.22)	(2.22)
Controls	N	Y	N	Y	Y
Fixed Effects	Household	Household	Household	Household	Household

Control variables are interactions of a dummy for post-crisis with the previous controls, Household Head and Household Characteristics and Village Fixed Effects, listed in Table 2. Standard errors are in parantheses.

Table 8--Evidence Suggesting Religious Intensity Functions as Social Insurance: Credit

	Pengajian Change in Past 3 Months (Aug 1998)		
	IV	IV	IV
	(1)	(2)	(3)
Per-Capita Non-Food Expenditure Change	-0.018***	-0.037***	-0.035*
	(0.007)	(0.014)	(0.020)
Per-Capita Non-Food Expenditure Change	0.021***	0.030**	0.032*
* Credit Availability	(0.008)	(0.013)	(0.019)
Per-Capita Non-Food Expenditure Change			0.037
* Number Shops Per 1000 Pop			(0.066)
Per-Capita Non-Food Expenditure Change			-0.013
* Urban			(0.025)
Controls	N	Y	Y
Fixed Effects	N	Village	Village

Standard errors are in parentheses.
Instruments are wetland ownership, government, and their interaction with credit availability.
Credit Availability is defined as having a Bank, Microfinance, or BRI Loan Product available in Village.
Control variables are Household Head and Household Characteristics listed in Table 2.

Appendix Table A--Descriptive Statistics

Household Summary Statistics		Village Summary Statistics	
Percentage Own Wetland	31%	Standard Deviation of Village Consumption Shock	11.42
Percentage Own Dryland	66%	during Crisis (Aug 1998 - May 1997)	(1.56)
Percentage in Farming	66%	Standard Deviation of Village Consumption Shock	9.22
Wetland Ownership (Hectares)	0.17	Non-Crisis (May 1999 - Dec 1998)	(2.16)
	(0.01)	Total Worship Buildings Per 1000 Pop	3.83
Dryland Ownership (Hectares)	0.72		(0.28)
	(0.01)	Religious Schools per 1000 Pop	0.12
Surname Indicates Haj Pilgrimage	1.0%		(0.04)
Number of Children attending Islamic School	0.15	Seminaries per 1000 Pop	0.01
	(0.01)		(0.01)
Monthly Per-Capita Food Expenditure, May 1997	14.6	% Pengajian Participation in Village, August 1998	0.61
	(0.1)		(0.03)
Monthly Per-Capita Non-Food Expenditure, May 1997	7.3	Credit Available	0.34
	(0.2)		(0.05)
Household Size	4.16	Number Shops Per 1000 Pop	0.07
	(0.02)		(0.03)
Government worker	6%	Urban	0.20
Service Worker	10%		(0.04)
N	8140	1996-1997 INPRES Funds in $/1000 Pop	0.91
			(0.09)
		N	99

Crisis Summary Statistics

	1998 Aug	1998 Dec	1999 May	1999 Aug
Monthly Per-Capita Non-Food Expenditure, Change	-4.7	1.1	-0.1	0.2
	(0.2)	(0.2)	(0.2)	(0.2)
Pengajian Participation Rate	61%	unavail.	67%	71%
Pengajian Increase in Last 3 Months	9%	unavail.	7%	7%
Pengajian Decrease in Last 3 Months	9%	unavail.	10%	11%

Appendix Table B--Correlation of Instruments and Pre-Crisis Religious Intensity

	Wetland (ha)	Dryland (ha)	Government	Service
	(1)	(2)	(3)	(4)
Panel A: Household Religious Intensity				
Surname Indicates Haj Pilgrimage	0.001	0.006***	-0.003	-0.011***
	(0.002)	(0.001)	(0.007)	(0.004)
Number of Children Attending Islamic School	0.013	0.007	-0.007	-0.021
	(0.016)	(0.005)	(0.036)	(0.021)
Number of Adults who Attended Islamic School	0.021**	0.010***	-0.039	-0.009
	(0.010)	(0.004)	(0.025)	(0.015)
Controls	Y	Y	Y	Y
Fixed Effects	Village	Village	Village	Village
Panel B: Village Religious Intensity				
Mosques in Village Per 1000 Pop	0.036	0.039*	0.172*	0.028
	(0.050)	(0.020)	(0.095)	(0.059)
Islamic Chapels Per 1000 Pop	-0.079	0.033	-0.136	0.112
	(0.145)	(0.065)	(0.278)	(0.172)
Churches Per 1000 Pop	0.156	-0.009	-0.109	-0.032
	(0.110)	(0.013)	(0.067)	(0.037)
Hindu Temples Per 1000 Pop	0.012*	0.001	-0.004	-0.007
	(0.007)	(0.002)	(0.018)	(0.006)
Buddhist Temples Per 1000 Pop	-0.002	0.001	-0.004	-0.004
	(0.001)	(0.001)	(0.006)	(0.004)
Islamic Boarding Schools Per 1000 Pop	0.002	0.006	0.018	0.004
	(0.009)	(0.004)	(0.020)	(0.012)
Religious Schools Per 1000 Pop	0.019	0.002	-0.021	0.034**
	(0.024)	(0.008)	(0.031)	(0.016)
Seminaries Per 1000 Pop	-0.002	0.002	0.004	0.006
	(0.002)	(0.002)	(0.005)	(0.005)
Controls	Y	Y	Y	Y
Fixed Effects	Province	Province	Province	Province

Each coefficient represents separate OLS regressions on instrument, conditional on controls and fixed effects.
Standard errors in parentheses. All controls are pre-crisis May 1997 values.
Controls in Panel A are Household Head and Household Characteristics listed below.
Controls in Panel B are Household Head, Household, Village, Geography, and Fiscal Characteristics listed below. Measures in Panel B are collected at the village level so the corresponding regressions control for village-level clustering and have province fixed effects.
Household Head Characteristics -- Age, Years of Education (8 = graduated), Gender, Ever-Married, Literate, Follows Media (tv or radio)
Household Characteristics -- Household Size, Modernity (Index of Stove, Radio, TV, Fridge, Satellite Dish, Motorbike, Car), Farming Dummy, Service Dummy, Dryland Ownership (ha), Pre-Crisis Per-Capita Non-Food Expenditure
Column 2 controls for Wetland Ownership (ha) instead of Dryland Ownership (ha). Ha: hectares
Village Characteristics -- Urban, Population, Size, Number of Shops, Mean Pre-Crisis Per-Capita Non-Food Expenditures
Geography Characteristics -- Flat, Steep, Beach, Forest, Valley, River
Fiscal Characteristics -- 1996-1997 INPRES Funds Per 1000 Pop for Economic Activity, Building and Facilities, Offices and Institutions, Human Resources, and IDT funds

Appendix Table C--Evidence Suggesting Religious Intensity Functions as Social Insurance: Consumption Smoothing Among Villagers

	Change in Standard Deviation of Consumption Shock			
	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)
Wetland Gini	18.08**	40.58***	24.35***	13.59
	(7.97)	(12.85)	(8.43)	(18.18)
Wetland Gini * Worship Buildings per 1000 pop		-7.47**		-7.53*
		(3.75)		(3.81)
Wetland Gini * 1996-97 INPRES Funds $/1000 pop				7.25
				(12.35)
Wetland Gini * Credit Availability				66.45***
				(18.70)
Village, Geographic Controls	N	N	Y	Y
Fixed Effects	N	N	Province	Province

Village-level regressions. Controls are Village and Geographic characteristics listed below.
Wetland Gini refers to Gini Coefficient of Wetland Ownership.
Change in Standard Deviation of Consumption Shock is computed by considering the per-capita nonfood consumption expenditure shock households received between two periods over the crisis, and taking the standard deviation of those household shocks for each village. Then the same standard deviation of consumption shocks is computed for two periods without an intervening crisis, the periods used for the Post Experiment earlier in the paper. The difference between the Crisis standard deviation and the non-Crisis standard deviation is the variable of interest. Standard deviation captures consumption smoothing in a village. Differencing addresses potential fixed omitted variables associated with consumption smoothing. Columns 1 and 3 show that Wetland Gini is strongly associated with a larger standard deviation of consumption shocks during the crisis. Columns 2 and 4 display the coefficients of interest.
Village Characteristics -- Urban, Population, Size, Number of Shops Per 1000 Pop, Mean Pre-Crisis Per-Capita Non-Food Expenditures
Geography Characteristics -- Flat, Steep, Beach, Forest, Valley, River