Does Finance Make Us Less Social?*

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Abstract

Formal financial contracts and informal risk-sharing agreements within social networks both enable households to manage risk. Using an exogenous reduction in the cost of financial contracting, we find that the increased use of financial contracts to manage household risk is associated with a decline in religious adherence and smaller church congregations. These results indicate that a cost-benefit analysis leads households to replace their participation in social networks with lower-cost financial contracts. Our study contributes toward understanding the implications of emerging technologies known collectively as FinTech that lower the cost of financial contracting.

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I Introduction

Rampini and Viswanathan (2017) conclude that financial contracts offer households incomplete protection against income (wealth) fluctuations due to their high cost.[1] Adverse selection, moral hazard, and limited contract enforcement explain the high cost of using financial contracts to manage household risk. Informal risk-sharing agreements within social networks also offer households incomplete protection against income fluctuations (Ambrus et al. (2014), Fafchamps and Gubert (2007)). As financial contracts and social networks both enable households to manage risk, we examine the interaction between these formal and informal mechanisms for managing risk. Specifically, we examine whether lowering the cost of financial contracting displaces social networks.

Kimball (1988)'s *farmers cooperative* provides a theoretical foundation for risk-sharing agreements within agricultural communities. Intuitively, an informal credit market within the cooperative can delay payments for households experiencing a poor harvest. Although empirical studies of risk-sharing agreements often involve kinship (Townsend (1994), Kinnan and Townsend (2012), Ambrus et al. (2014)), Chen (2010) finds that religiosity alleviates the financial constraints of households and smoothes their consumption. Putnam and Campbell (2010) report that religious adherence increases trust, which is crucial for risk sharing (Karlan et al. (2009)). In contrast to financial contracts, Iannaccone (1994) argues that churches are able to mitigate adverse selection through prohibitions, rituals, and other commitments. As monitoring and information sharing within church congregations are vital to ensure compliance with these commitments, religious adherence is able to mitigate moral hazard and enforce contracts. In particular, access to the risk-sharing agreement can be suspended for members that exert insufficient effort, commit inadequate resources to reducing risk, or fail to reciprocate (Karlan and Zinman (2010)).

With crop insurance and religiosity being proxies for financial contracting and social networks, respectively, we examine household decisions regarding the use of these formal and informal mechanisms for managing agricultural risk. To examine the risk management decisions of households, we focus on field crops (corn, soybeans, wheat, oats, barley, and sorghum) since 97% of the farms

[1] In addition to consumption, Rampini and Viswanathan (2017) study the impact of income fluctuations on durable good purchases and investment in human capital.

that produce field crops are family owned.[2]

Crop insurance compensates agricultural producers whose crop yields are lower than expected. Thus, crop insurance covers idiosyncratic output risk rather than systematic price risk. Our study begins in 1980 when subsidies for the purchase of crop insurance were first introduced by the federal government following decades of weak demand. These subsidies lowered the cost of using financial contracts to manage agricultural risk and were intended to replace disaster assistance. The high cost of providing disaster assistance in response to the Great Flood of 1993 lead the government to further increase subsidies for crop insurance, which doubled the demand for this financial contract (Smith and Glauber (2012)) and reduced income volatility in agricultural counties.

We find greater religiosity in counties that have greater agricultural production and riskier agricultural production due to poor soil. Furthermore, counties where agricultural production is riskier have more religious adherents from "strict" religious denominations capable of mitigating adverse selection (Iannaccone (1994)).[3] These findings indicate that households use religious adherence to manage agricultural risk.[4] More important, following an increase in government subsidies that increased the use of crop insurance, both religious adherence and the average size of church congregations decreased. The displacement of religiosity by financial contracting is larger in counties with higher agricultural risk, which provides further evidence that households use religious adherence to manage agricultural risk. We conclude that a cost-benefit analysis leads households to replace religiosity with financial contracting as a risk management mechanism.

The decrease in religiosity we attribute to less costly financial contracting is not explained by an increase in household income. Besides controlling for income in our empirical specifications, we confirm that the displacement of religiosity by financial contracting occurs in counties for which the average income did not increase following the largest increase in crop insurance subsidies. To clarify, neither religious adherence nor crop insurance are costless. While government subsidies increased the demand for crop insurance, a significant amount of cropland remained uninsured.

[2] Ownership data is from the United States Department of Agriculture's National Agricultural Statistics Service. The preponderance of family ownership is consistent with field crops requiring large amounts of land, which inhibits the delegation of tasks to employees whose effort is difficult to monitor at a distance.

[3] Strict religions include the Church of Jesus Christ of Latter-Day Saints, Evangelicals, and Southern Baptists.

[4] Reverse causality is unlikely since the religious denominations in our study do not encourage agriculture.

Thus, subsidies for crop insurance do not appear to increase household income.[5]

We use crop diversification to measure moral hazard since this determinant of agricultural risk is directly attributable to the actions of agricultural producers (Annan and Schlenker (2015)). Consistent with an increase in moral hazard, the purchase of crop insurance decreases crop diversification. Furthermore, crop yields decline with the use of crop insurance. The decline in crop yields does not result from an expansion into lower productivity land. Instead, consistent with moral hazard, Smith and Goodwin (1996) report that crop yields decline as a result of agricultural producers using less fertilizer after purchasing crop insurance.

The reduction in crop diversification is not explained by crop prices or any systematic change in crop selection. Instead, the reduction in crop diversification is greater in counties experiencing larger declines in religious adherence. This result suggests that the use of financial contracts instead of social networks to manage household risk weakens monitoring.[6] Specifically, with weaker monitoring, agricultural producers with crop insurance can avoid the marginal cost associated with cultivating an additional crop. This marginal cost includes greater effort and greater crop-specific capital investment.

According to Rampini and Viswanathan (2017), households rely on precautionary savings to insure their consumption against income fluctuations (Hubbard et al. (1994)). We find that crop insurance reduces bank deposits. This displacement of precautionary savings confirms the importance of crop insurance to household risk management. Moreover, in contrast to reductions in religiosity, crop insurance leads to larger bank deposit reductions in counties with good soil that have lower agricultural risk. These disparate responses suggest that households with low exposure to agricultural risk relied on precautionary savings before purchasing crop insurance, while households with greater exposure to agricultural risk relied on external risk-sharing agreements through their participation in social networks.

An alternative explanation for the displacement of religiosity by crop insurance is that religious adherence is a response to risk. Intuitively, the psychological comfort associated with religious

[5] Gruber (2005) and Iannaccone (1998) report that religious households are wealthier and better educated, which undermines the assertion that an increase in wealth erodes religiosity.

[6] Martin and Roychowdhury (2015), Chakraborty et al. (2015), Ashcraft and Santos (2009) report weaker monitoring of debt issuers by lenders that use credit default swaps.

"faith" may enable households to better cope with risk. While a decline in religious adherence can be explained by the reduction in agricultural risk from purchasing crop insurance, faith cannot explain the reduction in crop diversification attributable to crop insurance. Faith also cannot explain the disparate implications of crop insurance for religious adherence and precautionary savings that depend on agricultural risk. Instead, these results are consistent with the ability of religious adherence to facilitate risk sharing.

Despite improving our study's identification, government subsidies do not limit its implications. According to Philippon (2017), several technologies known collectively as FinTech are lowering the cost of financial services by enhancing competition, transparency, and efficiency. A burgeoning empirical literature confirms the informational advantages of Fintech relative to traditional credit scores (Berg et al. (2018), Fuster et al. (2018), and Jagtiani and Lemieux (2017)). This use of "soft" information (Liberti and Petersen (2017)) by FinTech poses a challenge to risk-sharing agreements within social networks. Intuitively, as FinTech enables financial contracts to condition on non-traditional sources of information, including social media, FinTech may erode the advantage of using social networks to manage household risk.

A large literature examines the impact of social networks on finance. Social networks have been found to influence CEO compensation (Engelberg et al. (2012)), the performance of venture capitalists (Hochberg et al. (2007)), and portfolio holdings (Hong et al. (2005), Hong et al. (2004)). These implications motivate the emerging literature on social finance (Hirshleifer (2015)). However, instead of studying the financial outcomes of social networks, we contribute to the household finance literature by examining the impact of less costly financial contracting on social networks. By examining the broader implications of finance on society, our study parallels Engelberg and Parsons (2016) who study the implications of finance on investor health.

The literature has found that government assistance to low income households reduces religiosity. For example, Scheve and Stasavage (2006) report higher government welfare expenditures in less religious counties, while Gruber and Hungerman (2007) find that such expenditures crowded out faith-based charities. In contrast to government welfare expenditures, we examine a government intervention that lowered the cost of using financial contracts to manage household risk.

The remainder of the paper is organized as follows. Section II develops the theoretical framework and testable hypotheses underlying our study. Section III provides an overview of crop insurance, while Section IV describes the data used in our empirical tests. Section V reports our main empirical results with Section VI presenting additional robustness tests and extensions. Section VII then concludes.

II Empirical Hypotheses

As households are primarily responsible for the production of field crops, crop insurance provides an ideal laboratory for studying household risk management. To manage agricultural risk, we hypothesize that households use (i) informal risk-sharing agreements within social networks and (ii) formal financial contracts.

A Informal Risk Sharing Agreements within Social Networks

Ambrus et al. (2014), Fafchamps and Gubert (2007), and Ligon et al. (2002) conclude that social networks provide households with informal insurance against income fluctuations. Access to the risk-sharing agreement within a social network acts as collateral since access can be suspended for members that fail to reciprocate (Karlan and Zinman (2010)), exert insufficient effort, or commit inadequate resources to reducing risk. For example, crop diversification reduces agricultural risk but requires greater resources.

Informal risk-sharing agreements in agricultural communities often focus on kinship. Townsend (1994) reports that household consumption in India is insured against income fluctuations by networks based on kinship. Kinnan and Townsend (2012) document the ability of these networks to smooth consumption in Thailand, while Ambrus et al. (2014) find that consumption co-movement is stronger among more socially connected households in Peru. However, risk-sharing agreements are not limited to households in developing countries as Kranton (1996) demonstrates that reciprocity is self-sustaining in a developed economy with cash-based markets.

Proposition 1 in Appendix A formalizes our first hypothesis as the

Social Network Hypothesis: *Households use social networks based on religion to manage their exposure to agricultural risk.*

The above hypothesis is necessary for our second hypothesis that involves financial contracting. The existing literature contains empirical support for the Social Network Hypothesis hypothesis, although not specifically for households exposed to agricultural risk in the United States. Chen (2010) finds that religiosity alleviates household financial constraints and smoothes consumption. Dehejia et al. (2007) report that households are able to insure their consumption against income fluctuations through religious adherence. Putnam (2000) argues that religious adherence enhances reciprocity, which is crucial for risk-sharing agreements, while Berman (2000) concludes that religious adherence facilitates risk-sharing agreements by signaling commitment. Iannaccone (1994) emphasizes that religious adherence has both pecuniary and non-pecuniary costs as well as benefits, with the time allocated to religious activities being a non-pecuniary cost (Azzi and Ehrenberg (1975)).[7]

The implications of our study are not limited to social networks based on religious adherence. However, low-cost social networks (based on recreational clubs for example) are unlikely to be sufficiently stringent to sustain a risk-sharing agreement by mitigating adverse selection and enforcing contracts. Furthermore, although systematic risks arising from natural disasters may affect multiple households within a county, the disparate occupations of religious adherents lowers a congregation's aggregate risk exposure. Specifically, the consumption of agricultural producers experiencing a poor harvest can be financed by other households that are not directly involved in agricultural production.

B Formal Financial Contracts

Crop insurance enables agricultural producers to hedge idiosyncratic output risk.[8] While private insurance companies sell crop insurance, each policy and corresponding premium are subject to approval by the Federal Crop Insurance Corporation (FCIC) before being underwritten by the

[7]The majority of charitable contributions involve religious organizations and religious adherence is the most common motivation for volunteer work (Iannaccone (1998)).

[8]Futures contracts can hedge the risk of price fluctuations for field crops.

United States Department of Agriculture's Risk Management Agency (Glauber (2004)).

Most important, federal subsidies increase the demand for crop insurance. Smith and Glauber (2012) state that *"It is difficult to escape the conclusion that, without large subsidies, agricultural insurance markets are likely to remain small"*. Indeed, until subsidies were introduced in 1980, the demand for crop insurance was negligible.

Proposition 2 in Appendix A formalizes our second hypothesis as the

Substitution Hypothesis: *For households exposed to agricultural risk, the increased use of crop insurance reduces their use of social networks based on religion.*

This hypothesis builds on the previous Social Network Hypothesis since the Substitution Hypothesis assumes that religious adherence provide households with informal insurance against agricultural risk. As subsidies for crop insurance did not affect the cost of religious adherence, reverse causality does not confound the Substitution Hypothesis. Furthermore, access to education and other benefits of religious adherence weaken empirical support for the Substitution Hypothesis.

III Crop Insurance

Crop insurance started in 1938 with the Federal Crop Insurance Act that was enacted in response to the Great Depression and the accompanying Dust Bowl.[9] The Federal Crop Insurance Act of 1980 first introduced subsidies for crop insurance, which lowered the cost of this financial contract. Nevertheless, fewer than 100 million acres were enrolled in the program by the early 1990s. The underwhelming demand for crop insurance is often attributed to the disaster assistance provided by the federal government. For example, after a severe drought in 1988, Congress approved disaster assistance.

Overall, without sufficiently high subsidies, agricultural producers deemed crop insurance to be too costly. The lack of demand for crop insurance is consistent with the expectation that:
i) catastrophic crop failures caused by a natural disaster would result in disaster assistance
ii) informal risk-sharing agreements would be adequate for less catastrophic declines in output

[9] Glauber (2004) and Smith and Glauber (2012) contain extensive descriptions of crop insurance, while Cornaggia (2013) describes the different types of crop insurance policies.

The Great Flood of 1993 was a critically important event for crop insurance. This natural disaster was caused by above-average rainfall in the summer of 1992 that resulted in above-average reservoir levels in the Mississippi and Missouri rivers. As rain persisted into 1993, soils in the region were completely saturated by June and subsequent rain resulted in severe flooding throughout the Midwest. The flooding caused approximately $15 billion in damage after hundreds of levees failed. The consequences of the Great Flood were staggering: over 50 people died, at least 75 towns were covered by flood waters, transportation on the Mississippi and Missouri rivers stopped for two months, and ten commercial airports were completely flooded. At least 15 million acres of agricultural land in the Midwest were inundated, which is equivalent to nearly half of Illinois.

In the aftermath of the Great Flood, Congress passed the Federal Crop Insurance Reform Act (FCIRA) of 1994 to encourage the purchase of crop insurance and thereby reduce the need for disaster assistance. By lowering the cost of crop insurance through subsidies, FCIRA increased the demand for this financial contract as insured acres doubled from about 100 million in 1994 to more than 220 million in 1995.[10] The Agricultural Risk Protection Act of 2000 further increased subsidies for crop insurance.

Figure 1 illustrates the aggregate use of crop insurance over our sample period, and specifically the greater demand for this financial contract following the FCIRA of 1994. However, crop insurance involves moral hazard since agricultural producers are compensated for a lower than expected crop yield regardless of its cause. In contrast, disaster assistance following a natural disaster is less susceptible to moral hazard (provided agricultural producers are not responsible for the amount of damage caused by a natural disaster).

IV Data

The United States Department of Agriculture (USDA) provides data on each county's total acreage and the amount of acreage cultivated with field crops. Annual county-level data on crop insurance

[10] The FCIRA of 1994 also mandated the purchase of crop insurance in order to participate in a myriad of agricultural assistance programs. This mandate was repealed in 1996.

is obtained from the Risk Management Agency at the USDA. To measure agricultural intensity, we compute the annual proportion of each county's total acreage cultivated with field crops (*Agriculture*). To measure financial contracting, we compute the annual proportion of land cultivated with field crops that is covered by crop insurance (*Finance*). Figure 2 illustrates the cross-sectional variation across counties in their use of crop insurance.

We also construct a county-level proxy for agricultural risk using soil conditions. County-level soil data is obtained from the National Cooperative Soil Survey at the USDA's Natural Resources Conservation Service. Soil quality is measured by Available Water Storage (AWS), which refers to the quantity of water that is capable of being stored to a depth of 25 centimeters.[11] Soil that has a higher water retention can withstand greater variation in precipitation, which lowers the risk of agricultural production. Intuitively, good soil with a high AWS is able to self-insure crops against a deficit or surplus of water, while poor soil with a low AWS cannot provide this self-insurance. Figure 3 illustrates the heterogeneity in soil quality across the United States.

Unreported tests verify that crop insurance premiums are lower in counties with good soil. Furthermore, the volatility of crop yields is lower and average crop yields are higher in counties with good soil. Thus, irrigation and other interventions cannot overcome poor soil, which is associated with higher agricultural risk and lower productivity. Furthermore, consistent with adverse selection, subsidies for crop insurance increase the demand for this financial contract more in counties with poor soil than in counties with good soil. However, the demand for crop insurance is less sensitive to temperature and precipitation variability than soil quality. This finding is consistent with agricultural producers being unable to condition on ex-post weather outcomes when deciding to purchase crop insurance. Instead, agricultural producers can condition on their soil characteristics when deciding ex-ante how to manage their exposure to agricultural risk. Moreover, the average soil qualities underlying the six field crops are nearly identical. Thus, crops cannot be matched with a particular soil to mitigate agricultural risk. Overall, our results indicate that soil quality is

[11] The capacity for water storage is measured in centimeters of water per centimeter of soil. This capacity varies depending on soil properties such as organic matter, soil texture, bulk density, and soil structure, with corrections for salinity and rock fragments.

a valid proxy for agricultural risk.[12]

County-level religion and population data are obtained from the United States Religion Census. The number of religious adherents and the number of church congregations for each Christian religion are available every decade for 1980, 1990, 2000, and 2010. The census measures *participation* in a Christian religion and not simply a *belief* in a Christian religion. All adherents of a Christian religion are members of a Christian church congregation. Following Hilary and Hui (2009) and Kumar et al. (2011) who use the same census data, we interpolate these variables for intermediate years. We limit our analysis to Christian religions, although our results are robust to the inclusion of non-Christian religions that have relatively few adherents in agricultural counties.

Our religious adherence rate divides the total number of Christian adherents in a county by the county's total population. An alternative metric for religiosity is the average size of church congregations. This metric accounts for differences across Christian denominations and is robust to migration since an influx of non-adherents does not reduce the number of congregation members. On average, 57% of a county's population are Christian and the average church congregation has 310 members.

Table 1 contains summary statistics aggregated across the counties in our sample. Each county is identified by its five-digit FIPS code. During the 1980 to 2010 sample period, 74,072 county-year observations are available. The summary statistics highlight the significant variation across counties regarding field crop production, the use of crop insurance, agricultural risk, and the proportion of the population that adheres to a Christian religion as well as the average membership of Christian congregations. Appendix B contains a description of each variable.

V Empirical Evidence

This section reports our findings regarding the Social Network Hypothesis and the Substitution Hypothesis. Specifically, we examine whether households use social networks based on religion to manage agricultural risk, and the impact of crop insurance on the use of social networks.

[12]Crop insurance payout rates and premiums are available as alternative risk measures. However, moral hazard causes the payout rates to be endogenous and crop insurance premiums are confounded by the government's provision of subsidies and reinsurance.

To determine whether county-level data on crop insurance has implications for household risk in counties with agricultural production, we examine the time series volatility of annual county-level average income in two subperiods; before 1994 and after 1995. These subperiods are divided by the significant increase in crop insurance attributable to the crop insurance subsidies contained in the FCIRA of 1994. In unreported results, we find a significant income volatility reduction of nearly 50% associated with the increased use of crop insurance. Income volatility reductions in the second subperiod relative to the first subperiod are especially large in counties where agricultural production is risker due to poor soil. Indeed, consistent with adverse selection, counties with poor soil experience larger increases in the demand for crop insurance following the FCIRA of 1994 and larger subsequent income volatility reductions as a consequence.

A Household Risk and Religious Adherence

In the following panel regression involving county-year observations, the rate of religious adherence (*Adherence*) in a county is the dependent variable, and the proportion of land in the county devoted to cultivating field crops (*Agriculture*) is the explanatory variable of primary interest

$$\text{Adherence}_{i,t} \quad = \quad \beta_1 \,\text{Agriculture}_{i,t} + \gamma \,\text{X}_{i,t} + \epsilon_{i,t}\,. \tag{1}$$

County and year fixed effects are included in this specification, with standard errors clustered by county. The county fixed effects absorb fixed variation in the religiosity of individual counties, and the year fixed effects absorb any trend in religiosity across the United States. Therefore, the estimation identifies time series variation in religious adherence within individual counties.

The control variables in X represent the following county characteristics: population and per capita income as well as the percentage of the population that is college educated, foreign born, married, and African American. These control variables may be correlated with religious adherence and agricultural production. For example, religious adherence is higher among households with higher incomes and higher levels of education (Iannaccone (1998) and Gruber (2005)), while population (population density) is lower in counties with higher agricultural production.

The results in Table 2 support the Social Network Hypothesis. In column (1), we present evidence without including any control variables as a starting point. In columns (2) to (7), individual time-varying county characteristics are included. In column (8), all control variables are included.

The evidence indicates an economically sizable and statistically significant positive relation between religious adherence and agricultural risk. In particular, religious adherence is greater in counties with greater agricultural intensity. Several specific findings are worth highlighting. First, the point estimate on the *Agriculture* variable is statistically significant at the 1%-level across all the specifications. The significance level does not attenuate significantly as control variables are added.

Second, the point estimate on the *Agriculture* variable ranges from 0.150 to 0.177 across the specifications. For the most conservative estimate, a one standard deviation increase in agriculture (25%) leads to a 3.8% (= 25% $\times$ 0.150) increase in religious adherence. With the average religious adherence rate being 57% in the United States, this increase in religiosity due to agriculture is economically sizable.

Overall, in support of the Social Network Hypothesis, households exposed to greater agricultural risk are relatively more religious than other households. Figure 4 illustrates the positive county-level relationship between agriculture and religiosity. In an unreported result, compared to counties with good soil, we find that counties where agricultural production is riskier due to poor soil have 60% more religious adherents from "strict" religious denominations that are more effective at mitigating adverse selection (Iannaccone (1994)). This finding examines the composition of religious adherence using a strictness ratio defined as the number of adherents in a strict Christian religion divided by the total number of Christian adherents. Thus, greater exposure to agricultural risk increases religious adherence and the strictness of the social contract within religious adherents. Intuitively, our results indicate that religious adherence facilitates risk sharing among households exposed to agricultural risk.

Due to the inclusion of county fixed effects, the R-squared measures are near one. Therefore, adopting the procedure in Pastor et al. (2018), we also report the time series R-squared. This statistic is obtained by regressing religious adherence on county fixed effects in the first stage, then using the residuals from this regression as dependent variables in the second stage. The R-squared from the second stage represents the time series R-squared.

In principle, two counties with comparable agricultural intensity may have different exposures to agricultural risk if soil conditions are different. The Social Network Hypothesis predicts that religious adherence is greater in counties with higher agricultural risk due to poor soil.

Consistent with this prediction, Table 3 reports that the positive relation between religious adherence and agriculture is stronger in counties with poor soil. In column (1), we include only counties with poor soil (below-median AWS). The point estimate on the *Agriculture* variable is 0.231 and statistically significant at the 1%-level. Thus, the effect is about 54% greater compared to the previously reported effect across all counties. Conversely, in column (2), we only include counties with good soil (above-median AWS). The point estimate is only about 10% of the previously reported effect, and statistically insignificant.

The following panel regressions incorporate soil quality into equation (1)

$$\text{Adherence}_{i,t} = \beta_1 \, \text{Agriculture}_{i,t} + \beta_2 \, \left[\text{Agriculture}_{i,t} \times 1_{\text{Good Soil},i}\right] + \gamma \, \text{X}_{i,t} + \epsilon_{i,t} \qquad (2)$$

$$\text{Adherence}_{i,t} = \beta_1 \, \text{Agriculture}_{i,t} + \beta_2 \, \left[\text{Agriculture}_{i,t} \times \text{Soil Quality}_i\right] + \gamma \, \text{X}_{i,t} + \epsilon_{i,t} \, . \qquad (3)$$

County and year fixed effects remain in both these specifications that add interaction variables involving soil quality. Specifically, we interact *Agriculture* with an *Good Soil* indicator variable that equals one for counties with above-median AWS and zero otherwise.

In column (3) of Table 3, the point estimate for the interaction variable is negative (-0.152) and statistically significant at the 1%-level, indicating lower religious adherence in counties with lower agricultural risk due to good soil. In column (4), we interact *Agriculture* with the continuous *Soil Quality* variable defined as AWS. Recall that agricultural risk declines with larger values of AWS. The negative point estimate (-0.014) in column (4) supports the Social Network Hypothesis since the relationship between religiosity and agricultural intensity is weaker in counties with lower agricultural risk due to good soil.

B Impact of Financial Contracts on Social Networks

Table 4 reports evidence on the Substitution Hypothesis, which posits that lowering the cost of financial contracting displaces social networks based on religion as a mechanism to manage household risk. In the following panel regression, religious adherence is the dependent variable (*Adherence*) and the proportion of cultivated acreage with insurance (*Finance*) is the explanatory variable of primary interest

$$\text{Adherence}_{i,t} \quad = \quad \beta_1 \,\text{Finance}_{i,t} + \beta_2 \,\text{Agriculture}_{i,t} + \gamma \,\text{X}_{i,t} + \epsilon_{i,t} \,. \tag{4}$$

In column (1) of Panel A, we include county fixed effects and year fixed effects. In column (2), we also control for *Agriculture*. In column (3), we add an extensive set of time-varying county characteristics.

In support of the Substitution Hypothesis, the evidence in Table 4 reveals an economically sizable and statistically significant inverse relation between the use of crop insurance and religious adherence. First, the point estimate on the *Finance* variable is statistically significant at the 1%-level across all specifications. The significance level does not attenuate significantly with the addition of control variables. Second, the point estimate on the *Finance* variable is consistently negative, ranging from -0.025 to -0.031 across the different specifications.

To understand the economic impact of financial contracting on religious adherence, the point estimate of -0.025 implies that a 50% increase in the use of crop insurance reduces religious adherence by about 1.25%. The average county-level standard deviation of religious adherence across time is 4.6%, which reflects the stability of religious adherence. Thus, the increased use of financial contracts explains approximately 27% (= 1.25%/4.6%) of the time-series variation in religiosity.

Support for the Substitution Hypothesis highlights the cost-benefit analysis that influences household risk management decisions regarding the use of formal financial contracts versus informal risk-sharing agreements within social networks. In particular, when the cost of using financial contracting to manage risk is reduced, households rely more on formal financial contracts and reduce their demand for the informal mutual insurance provided by religious adherence.

To clarify, the displacement of social networks based on religion does not imply the superiority of financial contracts because subsidies were required to increase the demand for crop insurance. Conversely, the need for subsidies does not necessarily imply that financial contracts are inferior because households received free disaster assistance in the event of a natural disaster. Therefore, our analysis does not enable us to conclude that financial contracts are either superior or inferior to religious adherence at managing risk.

Panel B of Table 4 incorporates soil quality to measure the heterogeneity in agricultural risk. These results indicate that the inverse relation between the use of financial contracts and religious adherence is driven by counties with high agricultural risk. Specifically, for counties with poor soil, the point estimate on the *Finance* variable is -0.032 and statistically significant at the 1%-level. This effect is about 33% greater than the effect for all counties. Conversely, for counties with good soil, the point estimate is virtually zero and statistically insignificant.[13]

Overall, the substitution away from social networks based on religion to financial contracts is concentrated in counties with high agricultural risk.[14] A later analysis of precautionary savings finds evidence of a different substitution in counties with low agricultural risk.

C Robustness Tests

Three robustness tests provide additional support for the Substitution Hypothesis by confirming the inverse relation between crop insurance and religious adherence.

Metropolitan Counties. We estimate equation (4) in metropolitan counties where household exposure to agricultural risk is minimal. Metropolitan counties are defined as those with a population above 200,000.[15] For this subset of counties, Panel A of Table 5 reports no evidence of an inverse relation between the use of financial contracts and religious adherence as the point estimate on the *Finance* variable is 0.013 and statistically insignificant. Therefore, this placebo test finds no

[13] Unreported results confirm that our results are stronger if we analyze counties at the extremes of the soil quality distribution.

[14] The substitution is greater than indicated by the results Table 4 since, consistent with adverse selection, subsidies increase the demand for crop insurance more in counties with poor soil than in counties with good soil.

[15] Similar results are obtained if metropolitan counties are defined as those in the top decile of population density.

substitution effect in counties where no substitution effect is predicted.

Rural counties with a low population density are not examined separately. Recall that *Agriculture* represents the proportion of a county's total acreage under cultivation by field crops. While metropolitan counties have low agricultural intensity, rural counties with poor soil also have low agricultural intensity. Therefore, our empirical specifications condition on *Agriculture* instead of population density.

Counties Unaffected by the Great Flood. Households affected by the Great Flood of 1993 may have became less religious in response to this natural disaster. The FCIRA of 1994 lowered the cost of crop insurance across the United States, including counties unaffected by the Great Flood. Therefore, Panel B of Table 5 reports the results for equation (4) in these unaffected counties. The point estimate on the *Finance* variable within the unaffected counties is -0.031 and statistically significant at the 1%-level. This result indicates that social stress or a loss of faith arising from the Great Flood cannot explain the decline in religiosity we attribute to a lower cost of financial contracting.

Cross-Sectional Analysis. The next cross-sectional analysis avoids using interpolated values for religious adherence. This cross-sectional specification involves county-by-county changes in religious adherence from 1990 to 2000

$$\Delta \text{Adherence}_i \quad = \quad \beta_1 \, \Delta \text{Finance}_i + \beta_2 \, \Delta \text{Agriculture}_i + \gamma \, \Delta \text{X}_i + \epsilon_i \,, \tag{5}$$

since FCIRA was introduced in the middle of this decade.

In equation (5), the change of religious adherence is the dependent variable, and the change in the percentage of insured acres (Δ*Finance*) is the explanatory variable of primary interest. According to Panel C of Table 5, the point estimate on the Δ*Finance* variable in the full specification is -0.043 and statistically significant at the 1%-level. This result confirms that the use of financial contracting during the 1990s to manage household risk lead to a decline in religious adherence.

In unreported robustness tests, we examined religious participation during the 1990s in three Canadian provinces (Manitoba, Saskatchewan, and Alberta) with significant field crop production using Canadian census data. The FCIRA of 1994 did not affect agricultural producers in Canada who have been covered by a comprehensive crop insurance program since 1959. In contrast to counties in the United States, we find a slight increase in religious adherence during the 1990s in these Canadian provinces. Therefore, this placebo test finds no substitution effect in Canada where no substitution effect is predicted.

An additional unreported robustness test examines data from the Panel Study of Income Dynamics (PSID). Although PSID data on religious participation is available more frequently, agricultural counties are under-represented. Nevertheless, annual PSID data reveals a large decline in religious participation from 1994 to 1995 that corresponds to the largest increase in demand for crop insurance.

VI Extensions

This section studies the displacement of religiosity by financial contracting using the average size of church congregations. We also examine the implications of financial contracting for moral hazard and precautionary savings.

A Congregations

Provided religious adherence is a mechanism for households to manage risk, the number of congregation members may proxy for the size of the risk pool providing mutual insurance. In particular, church congregations are predicted to become smaller as risk-sharing agreements within social networks are displaced by financial contracting. This prediction assumes that risk-sharing is conducted within individual congregations where monitoring and contract enforcement may be more stringent.

Panel A of Table 6 reports results with *Congregation Size* as the dependent variable in equation (4). We find that the point estimate on the *Finance* variable is consistently negative in columns (1) through (3) and statistically significant at the 1%-level. This evidence indicates that the use of financial contracts to manage risk reduces the average congregation size, and consequently reduces the average risk pool under risk-sharing agreements within congregations. In addition, consistent with Social Network Hypothesis, the positive point estimate on the *Agriculture* variable indicates that congregations are larger in counties with greater exposure to agricultural risk. Intuitively, congregations are larger in counties where agriculture is riskier, which is consistent with the need for larger risk pools.

We also examine the number of church congregations since a large number of small church congregations can inhibit the effectiveness of risk pooling within a congregation. Panel B of Table 6 reports results with *Number of Congregations* as the dependent variable in equation (4). The point estimate on the *Finance* variable is close to zero in columns (1) through (3) and statistically insignificant. The point estimate on *Agriculture* is also insignificant.

Overall, the results in Table 6 indicate that crop insurance reduces the size of church congregations without affecting the number of congregations. More formally, crop insurance induces change at the intensive margin (congregation size) and not at the extensive margin (number of congregations). This evidence indicates that financial contracting reduces the size of risk pools underling risk-sharing agreements within social networks.

B Crop Diversification

Monitoring by congregation members can limit moral hazard since the provision of informal (non-contractual) mutual insurance by risk-sharing agreements can be rescinded if moral hazard is detected. In contrast, the insurance offered by formal financial contracts is more difficult to rescind.[16] Crop diversification is ideal for measuring moral hazard since the level of diversification can be attributed directly to the actions of agricultural producers and is an important determinant of agricultural risk.

Table 7 reports evidence regarding financial contracting and crop diversification. In the first set of results, the dependent variable in equation (4) is *Crop Herfindahl*. A higher value of this index signifies less crop diversification. We find a positive point estimate on the *Finance* variable of 0.027 across all counties, which is statistically significant at the 1%-level. Therefore, consistent with moral hazard, financial contracting increases agricultural risk. In the second set of results, the dependent variable is *Number of Crops*. We find a negative point estimate of -0.447 on the *Finance* variable across all counties that is statistically significant at the 1%-level. Therefore, both

[16]The incentive to monitor is also limited by reinsurance from the federal government.

results indicate that financial contracting lowers crop diversification.

In addition, the results in Table 7 indicate that the reduction in crop diversification attributable to crop insurance is greater in counties experiencing larger declines in religious adherence. This result suggests that the use of financial contracts to manage household risk weakens monitoring compared to the use of social networks based on religion. Specifically, weaker monitoring may allow agricultural producers with crop insurance to avoid the greater effort and greater crop-specific capital investment required to cultivate additional crops.

Overall, the results in Table 7 are consistent with formal financial contracting being associated with greater moral hazard than informal risk-sharing agreements within social networks. As specialization can justify a reduction in crop diversification due to improved productivity, Table 8 reports results with productivity as the dependent variable in equation (4). In column (1) of Panel A, we examine all six major field crops in our study. The point estimate on the *Finance* variable is -0.021 and statistically significant at the 5%-level. In columns (2) through (7), we analyze these crops individually. All the point estimates except for Soybeans are negative. In contrast to our previous results, the relatively high time series R-squared measures in Table 8 suggest that agricultural productivity varies systematically over time.

The decline in productivity associated with crop insurance is consistent with Roberts et al. (2006) as well as Roberts et al. (2011). Moreover, Smith and Goodwin (1996) find that crop insurance reduces productivity by lowering fertilizer usage. Panel B of Table 8 provides further empirical support for the decline in productivity associated with crop insurance. In particular, the point estimate in column (1) for the *Finance* variable is -0.023 for counties with a large number of religious adherents (above the median). This coefficient is statistically significant at the 5%-level. Therefore, the decline in productivity attributable to crop insurance is driven by relatively religious counties where households are accustomed to monitoring by co-religionists. Furthermore, column (2) reports a point estimate of -0.034 for the *Finance* variable in counties experiencing larger declines in crop diversification (above the median). This coefficient is statistically significant at the 5%-level, and indicates that declines in productivity are associated with moral hazard. Intuitively, the declines in crop diversification and productivity may arise from the weaker monitoring that accompanies the displacement of religious adherence by financial contracting.

Finally, column (3) reports that productivity declines in counties where the amount of cropland under cultivation by field crops is not increasing during the sample period. This result indicates that the decline in productivity in unlikely to be caused by agricultural producers expanding into less productive land.

C Bank Deposits

Besides religious adherence, precautionary savings represents another household risk management mechanism (Hubbard et al. (1994)). According to Rampini and Viswanathan (2017), the high cost of insuring against income shocks leads households to use precautionary savings.

To confirm the importance of crop insurance to household risk management, we examine whether precautionary savings is displaced by financial contracting. In the following panel regression, county-level bank deposits enable us to test whether financial contracting reduces the reliance of households on precautionary savings

$$\log(\text{Bank Deposits})_{i,t} = \beta_1 \, \text{Finance}_{i,t} + \beta_2 \, \text{Agriculture}_{i,t} + \gamma \, \text{X}_{i,t} + \epsilon_{i,t} \, . \tag{6}$$

County and year fixed effects are included in this specification along with county characteristics. Equation (6) is also estimated with the dependent variable replaced by per capita bank deposits.

Panel A of Table 9 reports a negative point estimate on the *Finance* variable, which equals -0.070 and is statistically significant at the 1%-level. Similar results are found after normalizing bank deposits by the county's respective population. The negative point estimate on the *Finance* variable is consistent with our earlier results regarding the displacement of religiosity by finance.

Furthermore, precautionary savings may act as a substitute for religiosity in counties with good soil where agricultural risk is relatively low. Conversely, in counties with poor soil, earlier results have shown that households rely more on religiosity to manage their exposure to agricultural risk. Therefore, Panel B of Table 9 reports on the displacement of precautionary savings by finance in counties with different soil conditions. The greater displacement of bank deposits in counties with good soil is consistent with households relying more on precautionary savings to manage their exposure to agricultural risk.

Unreported results confirm that per capita bank deposits are significantly higher in counties with good soil. A seemingly unrelated estimation procedure examines the difference between the point estimate on the *Finance* variable across counties with different soil conditions. This analysis finds the point estimate on the *Finance* variable for counties with good soil is larger in absolute value than the point estimate for counties with poor soil. This difference is statistically significant, with a p-value of 0.038. Intuitively, as a means to manage exposure to agricultural risk, financial contracting leads to a greater displacement of precautionary savings in low risk counties and religiosity in high risk counties.

VII Conclusion

Using county-level data, we analyze the use of formal financial contracts versus informal risk-sharing agreements within social networks to manage household risk. First, we document that households in counties with greater agricultural risk have higher rates of religious adherence. Thus, social networks based on religion provide informal insurance to manage agricultural risk. Second, we find that lowering the cost of financial contracting through subsidies reduces religious adherence and the average size of church congregations. Intuitively, government subsidies lead households to replace their participation in social networks based on religion with financial contracts.

Moreover, financial contracts is associated with less crop diversification, hence greater risk, without increasing productivity. This evidence indicates that the displacement of social networks by financial contracts as a means to manage risk increases moral hazard. Overall, we find that the use of financial contracting to manage risk displaces social networks based on religion and increases moral hazard. These results have implications for public policy as well as our understanding of household decisions.

Appendix A: Illustrative Model

This appendix presents an illustrative model to formalize religious adherence as a risk management tool following a simplified version of Scheve and Stasavage (2006) and Azzi and Ehrenberg (1975). In the illustrative model, utility $U(c_i, r_i, z_i)$ is a function of three components: consumption, a psychological benefit from religious participation, and leisure. The one-period model examines the religious participation of an individual whose consumption differs across two states; good and bad, These states vary across individuals.

In the good state, which occurs with probability $1-\lambda$, consumption equals $1-p$. This amount normalizes consumption to one unit minus a "premium" p that is paid to insure against the poor state. In the bad state, which occurs with probability λ, consumption is reduced to $m = \frac{p(1-\lambda)}{\lambda}$. This amount equates the expected cost of insurance $(1-\lambda)\,p$ with its expected benefit $\lambda\, m$, assuming consumption would otherwise be zero in the bad state. The state-dependence of consumption is summarized as

State	Probability	Consumption
Bad	λ	m
Good	$1-\lambda$	$1-p$

The amount p represents lost consumption in the good state due to the risk-sharing agreement that transfers this amount of consumption to those experiencing the bad state.

The psychological benefit of religion is a function of religiosity r_i expressed in units of time. This benefit is constant across the two states. For simplicity, the model assumes this benefit equals the amount of time spent participating in religious activities. Thus, the psychological benefit one receives from religion is identical to the fraction of time spent on religious activities. Individuals also derive a benefit from leisure time z_i, with the time spent on religious activities implying less time available for leisure due to the following time constraint that is normalized to 1

$$z_i + r_i \;=\; 1\,. \tag{7}$$

For the utility function $U(c_i, r_i, z_i)$, utility from c_i and r_i is not additively separable. Following Azzi and Ehrenberg (1975), leisure z_i enters the utility function linearly to supplement consumption, while α is an exogenous weight that captures the utility from time spent on (non-religious) leisure activities and is assumed to be identical for all individuals. The resulting log utility equals

$$U(c_i, r_i, z_i) \quad = \quad ln\,(c_i + r_i) + \alpha \times z_i\,. \tag{8}$$

Expected utility equals

$$\begin{aligned} E\left[U(p, r_i)\right] &= (1-\lambda) \times ln\,(1-p+r_i) + \lambda \times ln\,(m+r_i) + \alpha\,(1-r_i) & (9) \\ &= (1-\lambda) \times ln\,(1-p+r_i) + \lambda \times ln\left(\frac{p\ (1-\lambda)}{\lambda} + r_i\right) + \alpha\,(1-r_i) & (10) \end{aligned}$$

Setting the first-order condition for equation (10) with respect to p to 0 results in

$$\frac{\partial E[U]}{\partial p} = 0 \quad \Rightarrow \quad p* = \lambda \tag{11}$$

Thus, the optimal "premium" $p*$ increases with risk, λ.

Proposition 1 *Religious participation increases with risk (Social Contracting Hypothesis).*

Proof: Setting the first-order condition for equation (10) with respect to r_i to 0 results in

$$\frac{\partial E[U]}{\partial r_i} = 0 \quad \Rightarrow \quad r_i* = \frac{1}{\alpha} + \lambda + 1 \tag{12}$$

The first-order condition in equation (12) has the following implications

1. The higher the exposure to risk, λ, the higher is religion participation r_i*.

2. The higher the preference for leisure, α, the lower is religion participation r_i*.

Proposition 2 *The use of financial contracting to manage risk lowers religious participation(Substitution Hypothesis).*

Proof: λ is a function of both risk and financial contracting denoted κ, $\lambda = f(\text{risk}, \kappa)$. With financial contracting lowering risk

$$\frac{\partial \lambda}{\partial \kappa} \quad < \quad 0\,, \tag{13}$$

equation (12) implies that the optimal level of religion participation r_i* declines with financial contracting

$$\frac{\partial r_i*}{\partial \kappa} \quad = \quad \frac{\partial r_i*}{\partial \lambda} \times \frac{\partial \lambda}{\partial \kappa} < 0\,. \tag{14}$$

Appendix B: Variable Description

Total Acres	Number of acres in the county
Agriculture	Number of acres cultivated by field crops divided by total acres
Number of Religious Adherents	Number of religious adherents across all Christian denominations
Religious Adherence	Number of religious adherents divided by population
Soil Quality	Available water storage capacity of the soil
Insured Acres	Number of cultivated acres with crop insurance
Finance	Insured acres divided by acres cultivated by field crops
Congregation Size	Number of religious adherents divided by number of congregations
Number of Crops	Number of different field crops cultivated
Crop Herfindahl	Herfindahl index based on acres cultivated with field crops
Income	Per capita personal income
College Degree	Percentage of population with a college degree
Foreign Born	Percentage of population born in a foreign country
Married	Percentage of adult population that is married
African American	Percentage of the population that is African American

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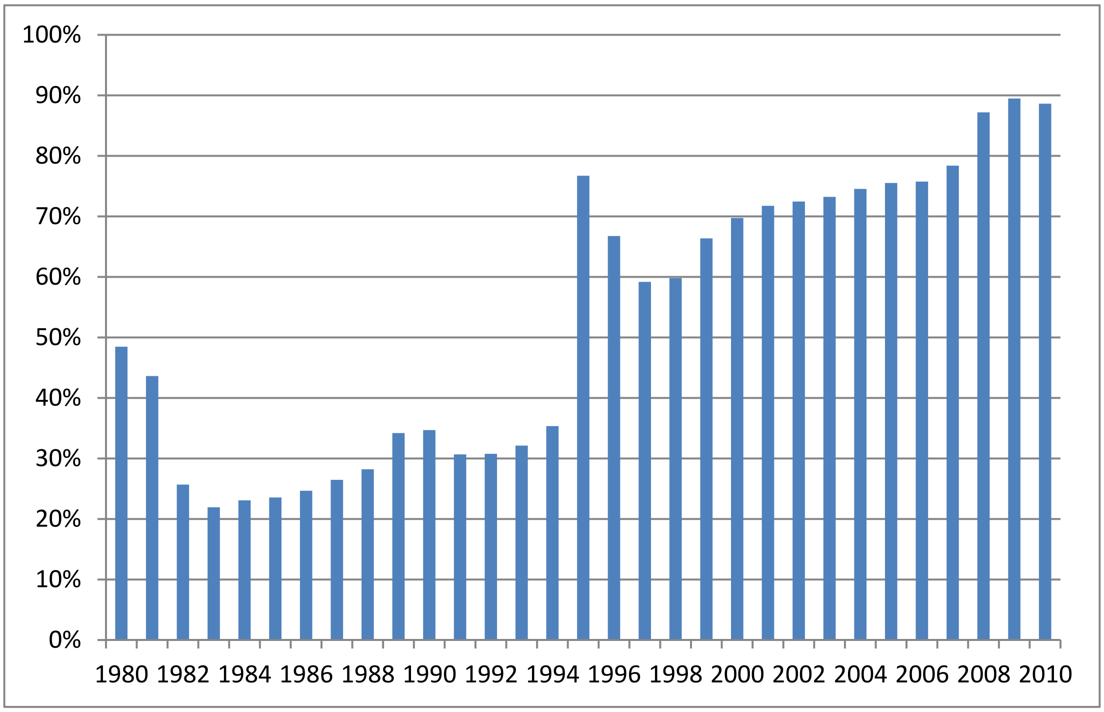
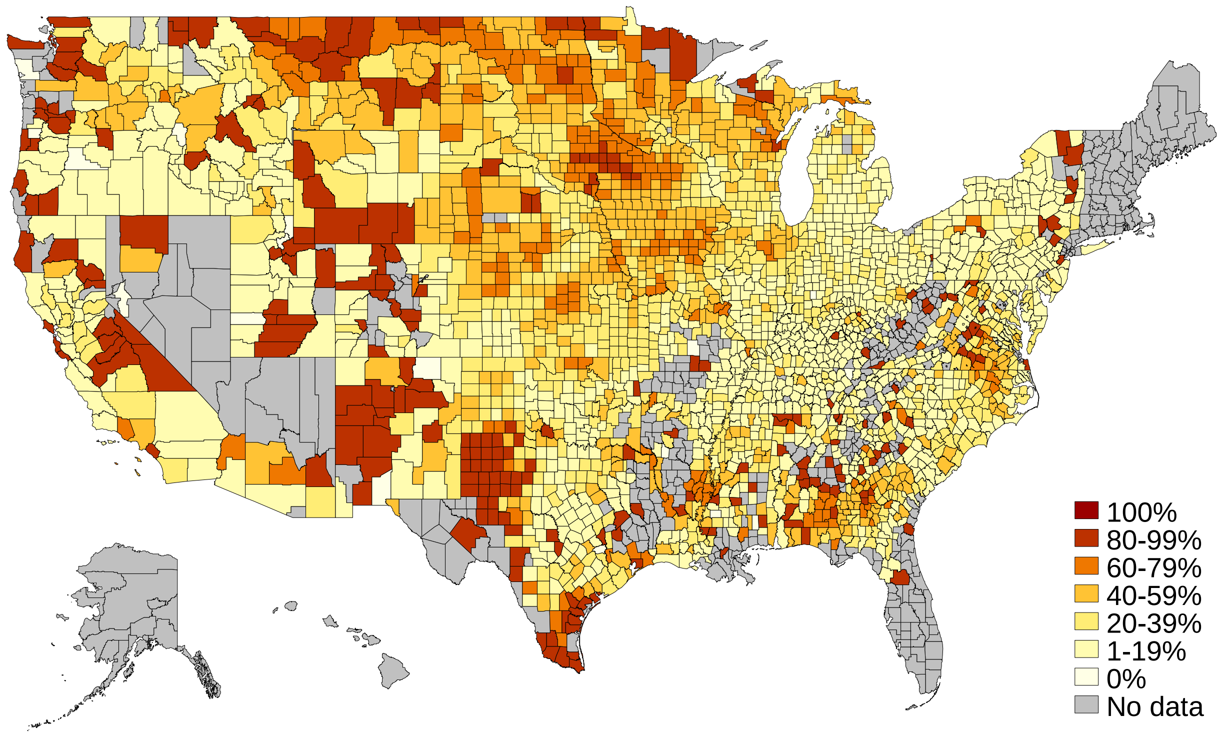
Figure 1: Variation in Percentage of Insured Farm Land Across Years



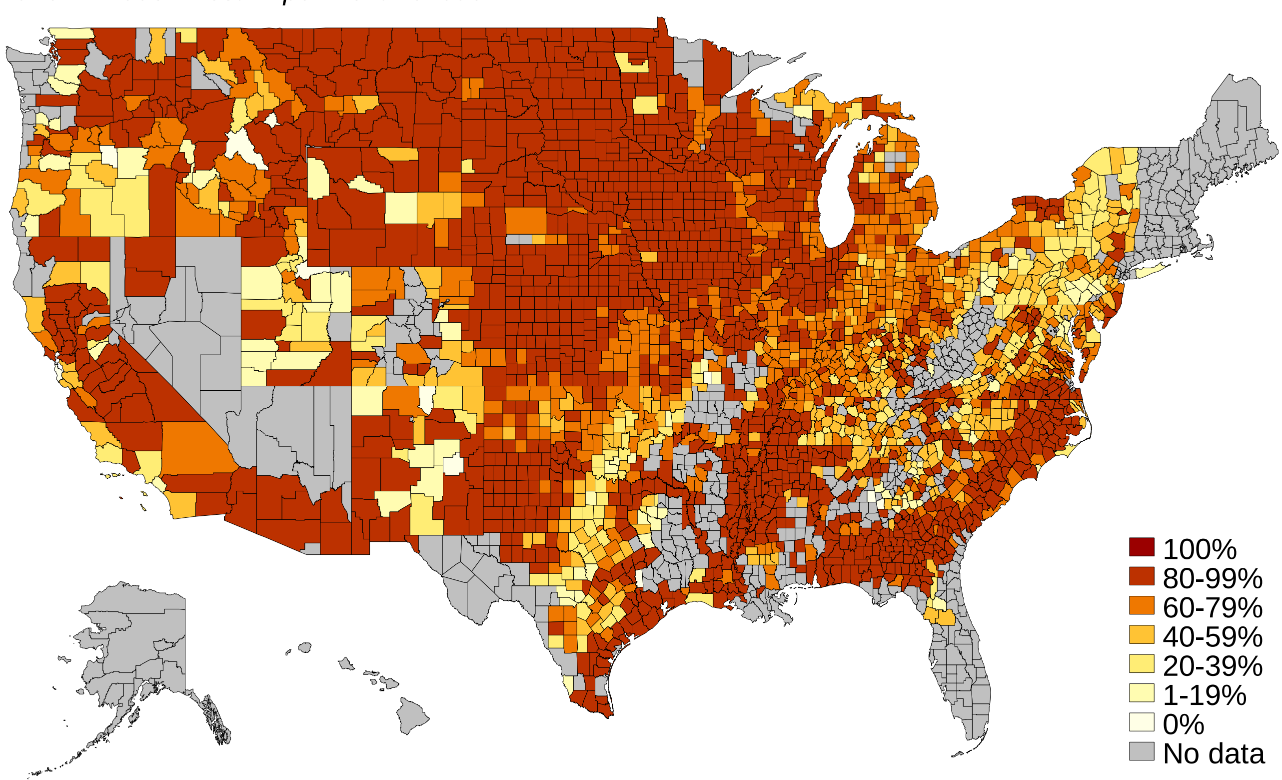
The figure reports the variation in percentage of insured farm land over time from 1980 to 2010. The insurance data are from U.S. Department of Agriculture.

Figure 2: Variation in Percentage of Insured Farm Land Across Counties

Panel A: 1994 - Pre-Experiment Variation

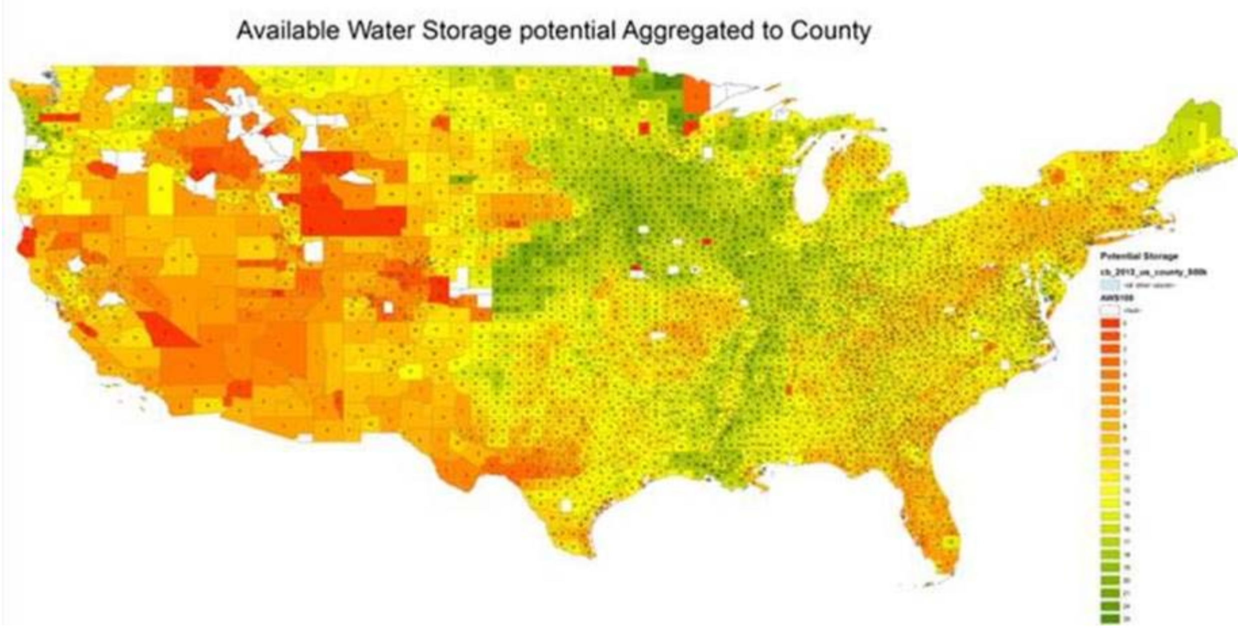


Panel B: 1995 - Post-Experiment Variation



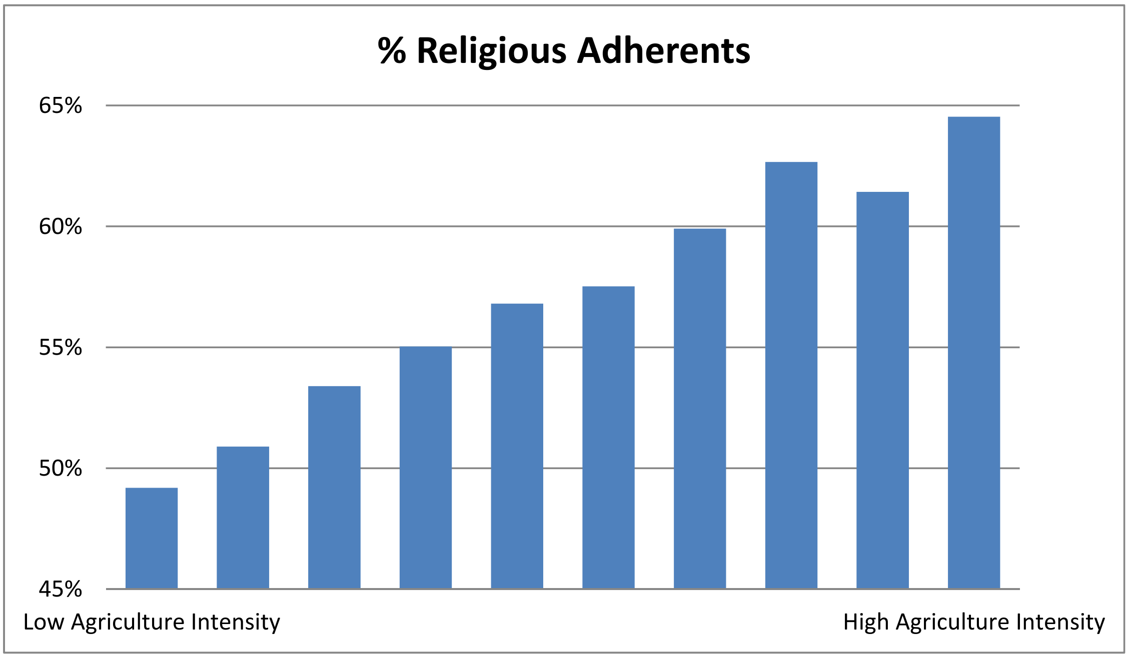
The figure shows the variation in percentage of insured farm land across counties from 1994, before FCIR Act, to 1995, after FCIR Act. The insurance data are from US Department of Agriculture.

Figure 3: Soil Quality Across the U.S.



The figure reports the soil quality across the U.S in 2010. The soil quality is measured by the available water storage capacity (AWS) of the soil to a depth of 25 cm. The data are from US Department of Agriculture.

Figure 4: Agricultural Intensity and Social Contracting



The figure reports the link between agriculture intensity and social contracting. Agroculture intensity is measured by the number of acres that used to grow all the field crops divided by total acres. % Religious Adherents is the number of religious adherents divided by total population. The data are from US Religon Census and US Department of Agriculture. The sample period is from 1980 to 2010.

Table 1: Summary Statistics

The table reports summary statistics for the main variables used in our empirical study. The data underlying these variables are from the United States Census and the United States Department of Agriculture. The sample period is from 1980 to 2010. Appendix B contains the definition of each variable.

Panel A: Agriculture

	Observations	Mean	Std. Dev.	5th percentile	Median	95th percentile
Agriculture	74,072	24%	25%	0%	13%	74%
Soil Quality	72,759	13.15	7.10	3.00	12.00	26.00
Number of Crops	74,072	3.85	1.68	1.00	4.00	7.00
Crop Herfindahl	74,072	0.51	0.20	0.27	0.47	1.00

Panel B: Social Network

	Observations	Mean	Std. Dev.	5th percentile	Median	95th percentile
Number of Religious Adherents	74,072	37,030	128,000	1,980	12,822	135,000
Religious Adherence	74,072	57%	17%	30%	56%	88%
Congregation Size	74,071	310.29	197.95	119.43	255.30	686.43
Number of Congregations	74,072	80.99	126.42	12.00	50.00	232.50

Panel C: Financial Contracting

	Observations	Mean	Std. Dev.	5th percentile	Median	95th percentile
Insured Acres	69,491	61,922	105,000	178	18,949	255,000
Finance	69,491	47%	36%	1%	42%	100%

Panel D: County Characteristics

	Observations	Mean	Std. Dev.	5th percentile	Median	95th percentile
Total Acres	74,072	583,000	701,000	162,000	391,000	1,660,000
Population	74,072	72,194	246,000	3,220	23,038	270,000
Income	74,057	19,019	8,655	8,088	17,432	34,762
College Degree	74,072	9%	4%	4%	8%	17%
Foreign Born	74,072	2%	3%	0%	1%	8%
Married	74,072	46%	5%	38%	47%	53%
African American	74,072	8%	14%	0%	1%	41%

Table 2: Agricultural Production and Religious Adherence

The table reports the effect of agriculture on religious adherence based on the panel regression in equation (1), $\text{Adherence}_{i,t} = \beta_1 \text{ Agriculture}_{i,t} + \gamma \text{ X}_{i,t} + \epsilon_{i,t}$. County and year fixed effects are included in this specification, with standard errors clustered by county. The county characteristics in X include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. The sample period is from 1990 to 2000. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **,* represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture	0.176***	0.159***	0.177***	0.172***	0.175***	0.174***	0.176***	0.150***
	(0.024)	(0.024)	(0.024)	(0.023)	(0.024)	(0.024)	(0.024)	(0.024)
Population		-0.081***						-0.109***
		(0.021)						(0.023)
Income			-0.006					-0.020
			(0.014)					(0.013)
College Degree				1.057***				1.345***
				(0.188)				(0.189)
Foreign Born					-0.088			0.076
					(0.138)			(0.141)
Married						-0.343**		-0.386***
						(0.141)		(0.140)
African American							0.016	0.007
							(0.207)	(0.201)
County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,222	27,222	27,222	27,222	27,222	27,222	27,222	27,222
R-squared	0.959	0.959	0.959	0.960	0.959	0.959	0.959	0.961
Time Series R-squared	0.238	0.244	0.238	0.251	0.238	0.240	0.238	0.266

Table 3: Agricultural Risk and Religious Adherence

The table reports the effect of agriculture on religious adherence for households with different exposures to agricultural risk measured by soil quality. The results are from equation (1) as well as modifications of this equation that include the interaction $\text{Agriculture}_{i,t} \times 1_{\text{Good Soil},i}$ and $\text{Agriculture}_{i,t} \times \text{Soil Quality}_i$ in equation (2) and equation (3), respectively. The sample period is from 1990 to 2000. Good (Poor) Soil refers to counties with above-median (below-median) soil quality measured by available water storage (AWS). County and year fixed effects are included in each specification, with standard errors clustered by county. County Characteristics include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **,* represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Poor Soil	Good Soil	All Counties	All Counties
Agriculture	0.231***	0.023	0.234***	0.360***
	(0.042)	(0.020)	(0.044)	(0.055)
Agriculture × Good Soil Indicator			-0.152***	
			(0.047)	
Agriculture × Soil Quality				-0.014***
				(0.003)
County Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
County Characteristics	Yes	Yes	Yes	Yes
Observations	13,976	13,246	27,222	26,729
R-squared	0.947	0.975	0.961	0.960
Time Series R-squared	0.359	0.168	0.268	0.274

Table 4: Financial Contracting and Religious Adherence

The table reports the effect of financial contracting on religious adherence based on the panel regression in equation (4), $\text{Adherence}_{i,t} = \beta_1 \text{Finance}_{i,t} + \beta_2 \text{Agriculture}_{i,t} + \gamma \text{X}_{i,t} + \epsilon_{i,t}$. The sample period is from 1990 to 2000. Panel A reports the results across all counties. In Panel B, Good Soil (Poor Soil) refers to counties with above-median (below-median) soil quality measured by available water storage (AWS). County and year fixed effects are included in each specification, with standard errors clustered by county. County Characteristics include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **,* represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

Panel A: Effect of Crop Insurance on Religious Adherence

	(1)	(2)	(3)
Finance	-0.031***	-0.027***	-0.025***
	(0.004)	(0.004)	(0.004)
Agriculture		0.152***	0.127***
		(0.024)	(0.024)
County Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
County Characteristics	No	No	Yes
Observations	26,605	26,605	26,605
R-squared	0.959	0.959	0.961
Time Series R-squared	0.248	0.254	0.281

Panel B: Effect Across Household Risk

	Poor Soil	Good Soil
Finance	-0.032***	-0.002
	(0.006)	(0.005)
Agriculture	0.189***	0.035
	(0.044)	(0.022)
County Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
County Characteristics	Yes	Yes
Observations	13,674	13,125
R-squared	0.946	0.974
Time Series R-squared	0.378	0.178

Table 5: Robustness Tests

Panel A and Panel B report the results from the panel regression in equation (4) for metropolitan counties and counties unaffected by the Great Flood of 1993, respectively. County and year fixed effects are included in both specifications, with standard errors clustered by county. County Characteristics include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Panel C reports the results from the cross-sectional regression in equation (5). The dependent variable in this specification involves the change in religious adherence between 1990 and 2000, $\Delta\text{Adherence}_i = \beta_1 \Delta\text{Finance}_i + \beta_2 \Delta\text{Agriculture}_i + \gamma \Delta \text{X}_i + \epsilon_i$. The independent variables are also defined according to their respective change from 1990 to 2000. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **,* represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

Panel A: Metropolitan Counties

Finance	0.013
	(0.008)
Agriculture	-0.045
	(0.062)
County Fixed Effects	Yes
Year Fixed Effects	Yes
County Characteristics	Yes
Observations	2,534
R-squared	0.961
Time Series R-squared	0.227

Panel B: Counties Unaffected by the Great Flood

Finance	-0.031***
	(0.005)
Agriculture	0.160***
	(0.034)
County Fixed Effects	Yes
Year Fixed Effects	Yes
County Characteristics	Yes
Observations	18,220
R-squared	0.950
Time Series R-squared	0.239

Panel C: Cross-Sectional Change in Religious Adherence

	(1)	(2)	(3)
ΔFinance	-0.068***	-0.048***	-0.043***
	(0.010)	(0.010)	(0.010)
ΔAgriculture		0.469***	0.413***
		(0.057)	(0.058)
ΔCounty Characteristics	No	No	Yes
Observations	2,360	2,360	2,360
R-squared	0.022	0.050	0.078

Table 6: Financial Contracting and Church Congregations

The table reports the effect of financial contracting on church congregations. These results are based on equation (4) after replacing the dependent variable with two properties of church congregations. Panel A reports results for the average size of church congregations, which is defined as the number of religious adherents in a county divided by the number of congregations. Panel B reports results for the number of church congregations in a county. County and year fixed effects are included in each specification, with standard errors clustered by county. County Characteristics include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **,* represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

Panel A: Congregation Size

	(1)	(2)	(3)
Finance	-0.070***	-0.066***	-0.069***
	(0.014)	(0.014)	(0.014)
Agriculture		0.105**	0.132***
		(0.045)	(0.043)
County Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
County Characteristics	No	No	Yes
Observations	13,607	13,607	13,607
R-squared	0.986	0.986	0.987
Time Series R-squared	0.109	0.111	0.174

Panel B: Number of Congregations

	(1)	(2)	(3)
Finance	0.009	0.007	-0.005
	(0.007)	(0.007)	(0.007)
Agriculture		-0.036	-0.009
		(0.022)	(0.020)
County Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
County Characteristics	No	No	Yes
Observations	13,607	13,607	13,607
R-squared	0.998	0.998	0.998
Time Series R-squared	0.043	0.044	0.212

Table 7: Financial Contracting and Crop Diversification

The table reports the effect of financial contracting on crop diversification in counties whose agricultural production, defined as the ratio of acres under cultivation by field crops divided by total acres in the county, is above the median. These results are based on equation (4) after replacing the dependent variable with two county-level proxies for crop diversification, a Crop Herfindahl Index and the average Number of Crops grown. County and year fixed effects are included in each specification, with standard errors clustered by county. County Characteristics include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **,* represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

	Crop Herfindahl Index			Number of Crops		
	All	Decline in Religious Adherence		All	Decline in Religious Adherence	
	Counties	High	Low	Counties	High	Low
Finance	0.027***	0.050***	0.007	-0.447***	-0.689***	-0.259**
	(0.007)	(0.010)	(0.010)	(0.084)	(0.126)	(0.107)
Agriculture	-0.045*	-0.115***	-0.003	1.688***	2.901***	0.636**
	(0.025)	(0.037)	(0.034)	(0.213)	(0.284)	(0.278)
County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
County Characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Observations	36,836	36,836	17,075	36,836	19,761	17,075
R-squared	0.804	0.796	0.787	0.796	0.812	0.778
Time Series R-squared	0.168	0.182	0.184	0.449	0.448	0.467

Table 8: Financial Contracting and Productivity

Panel A reports the effect of crop insurance on agricultural productivity measured by per acre crop yields across all counties that produce at least one field crop. The results involve six major field crops based on equation (4) after replacing the dependent variable with the average crop yield in a county. Panel B reports the results for specific counties. The subset entitled "Large Number of Religious Adherents" consists of counties where the number of religious adherents is above the median. The "Large Decline in Crop Diversification" subset consists of counties where the Herfindahl index for field crops had an above-median increase. The "Stable Cropland" subset consists of counties where the amount of land area cultivated with field crops did not increase from 1990 to 2010. The results are for counties whose level of agriculture, defined as the ratio of acres under cultivation by field crops divided by total acres, is above the median. The sample period for all three subsets is from 1980 to 2010. County and year fixed effects are included in each specification, with standard errors clustered by county. County Characteristics include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **,* represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

Panel A: Effect of Crop Insurance on Crop Yields in All Counties

	All Crops	Corn	Soybeans	Wheat	Oats	Sorghum	Barley
Finance	-0.021***	-0.016	0.006	-0.034***	0.045***	-0.045**	-0.103***
	(0.008)	(0.014)	(0.012)	(0.010)	(0.017)	(0.019)	(0.019)
Agriculture	0.034	-0.195***	-0.106***	0.173***	0.290***	-0.044	0.088
	(0.024)	(0.038)	(0.031)	(0.034)	(0.055)	(0.055)	(0.072)
County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Crop Fixed Effects	Yes	No	No	No	No	No	No
Observations	142,867	33,765	31,358	31,117	20,975	15,540	10,112
R-squared	0.790	0.715	0.686	0.681	0.528	0.676	0.621
Time Series R-squared	0.813	0.748	0.779	0.772	0.639	0.778	0.737

Panel B: Effect in County Subsets

	Large Number of Religious Adherents	Large Decline in Crop Diversification	Stable Cropland
Finance	-0.023**	-0.034***	-0.028***
	(0.011)	(0.013)	(0.008)
Agriculture	0.049	0.088*	0.014
	(0.032)	(0.051)	(0.026)
County Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Crop Fixed Effects	Yes	Yes	Yes
Observations	82,747	52,205	122,163
R-squared	0.775	0.752	0.779
Time Series R-squared	0.803	0.776	0.805

Table 9: Financial Contracting and Precautionary Savings

The table reports the effect of financial contracting on precautionary savings. These results are based on equation (4) after replacing the dependent variable with two county-level proxies for precautionary savings, the log of dollar-denominated bank deposits and per capita bank deposits in a county. Bank deposit data is from Federal Deposit Insurance Corporation. Panel A reports the results for all counties, while Panel B reports the results separately for households with different exposures to agricultural risk. Good Soil (Poor Soil) refers to counties with above-median (below-median) soil quality measured by available water storage (AWS). County and year fixed effects are included in each specification, with standard errors clustered by county. County Characteristics include population and per capita income as well as the percentage of the county's population that is college educated, foreign born, married, and African American. Appendix B contains the definition of each variable. To obtain the time series R-squared, we regress religious adherence on county fixed effects in the first stage, then use the residuals from this regression as dependent variables in the second stage and report the corresponding R-squared. Standard errors are reported within parentheses and are White (1980) heteroskedasticity-robust. ***, **, * represents statistical significance (different from zero) at the 1%, 5%, and 10% levels, respectively.

Panel A: Effect of Crop Insurance on Bank Deposits

	Log(Deposits)	Deposits per capita
Finance	-0.070***	-1.510***
	(0.020)	(0.255)
Agriculture	-0.116***	-2.532***
	(0.036)	(0.709)
County Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
County Characteristics	Yes	Yes
Observations	18,428	18,428
R-squared	0.989	0.929
Time Series R-squared	0.606	0.625

Panel B: Effect Across Household Risk

	Good Soil	Poor Soil
Finance	-1.943***	-0.894**
	(0.359)	(0.386)
Agriculture	-2.279***	-2.451*
	(0.821)	(1.427)
County Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
County Characteristics	Yes	Yes
Observations	11,966	6,462
R-squared	0.929	0.917
Time Series R-squared	0.661	0.541