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# Does local religiosity affect organizational risk-taking? Evidence from the hedge fund industry☆

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ABSTRACT

We examine the impact of local religious beliefs on organizational risk-taking behaviors using hedge funds as a new and unique setting. We find robust evidence that local religiosity is significantly negatively related to both total and idiosyncratic volatilities of hedge funds during 1996–2013. This relation is primarily driven by semi-directional funds, reversed for directional funds, and nonexistent for non-directional funds. Consistent with the local preference channel, the impact of local religiosity on risk-taking is only pronounced among funds for which local managers and investors are economically more important, namely young and small funds. Further, hedge funds located in more religious counties tend to hold less risky stocks and diversify their stock portfolios across industries, thus contributing to lower hedge fund risk-taking. Overall, our evidence suggests that local culture, in particular religiosity, may motivate hedge fund managers to reduce risk.



## 1. Introduction

There has been a growing literature on the impact of local culture, particularly local religious beliefs, on organizational risk-taking behaviors. In general, theoretical studies predict a negative effect of local religiosity on organizational risk-taking based on two premises. First, sociologists and psychologists have long recognized that individuals are likely influenced by local culture and beliefs through social interactions, which in turn reinforce individual preferences such that they share the same identity with each other (Tajfel, 1978; Hogg and Abrams, 1988). Second, prior research (e.g., Osoba, 2003; Hilary and Hui, 2009) has established a robust association between religious beliefs and individuals' risk aversion, likely due to the fact that most religions teach their

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followers to prioritize spiritual endeavors over monetary gain which typically requires taking financial risks. To the extent that local religiosity induced risk aversion affects an organization's key stakeholders, local religiosity can exert a negative impact on organizational risk-taking behaviors.

Consistent with the theoretical prediction, empirical evidence suggests that local religiosity negatively affects risk-taking by non-financial firms (Hilary and Hui, 2009) and banks (Adhikari and Agrawal, 2016b). However, Shu et al. (2012) show that for a sample of growth and aggressive growth mutual funds, Catholic belief encourages more risk-taking while Protestant belief is associated with less risk-taking.[1] Interestingly, Shu et al. (2012) also document a positive relation between total religiosity and mutual fund risk-taking as an extension of their main results, because these funds tend to locate in more Catholic areas.

Given mixed empirical evidence, this paper aims to shed light on the effect of local religiosity on organizational risk-taking using hedge funds as a new and unique setting. Specifically, we examine whether and how local religious beliefs affect hedge fund managers' risk-taking behaviors.

We focus on hedge funds for several reasons. First, hedge funds have many unique features which may mitigate the potential effect of local religiosity on their risk-taking, thus offering an ideal setting for our purpose. For instance, compared to mutual funds, hedge fund managers have stronger financial incentives to make profits as they are typically paid a significant portion of excess returns as performance fees (e.g., 20%) in addition to fixed management fees. They also invest a considerable amount of personal wealth into their own funds. And they face extraordinary competition from their peers and are under constant pressure to deliver superior performance. All these features may motivate hedge fund managers to focus on performance-maximizing investment strategies, which are culturally invariant. In addition, compared to mutual funds, hedge funds have more flexibility and less constraints in risk-taking so that the impact of local culture on hedge fund investment decisions is likely to be minimal. In particular, hedge funds are lightly regulated and not required to hold diversified portfolios so they can take large and concentrated stakes in individual firms more easily; they also face fewer conflicts of interests than mutual funds who may have other business relations with the invested companies; and they have lock-up provisions that restrict the investors from withdrawing their principal over certain lock-up periods. Overall, these unique features make hedge funds least likely to be affected by local religiosity, if any. Therefore, if we document significant evidence in the hedge fund industry, it will provide strong support for the impact of local religious beliefs on organizational risk-taking.

Second, despite the tremendous growth of the hedge fund industry over the past two decades[2] and a growing literature on hedge funds, the effect of local religious beliefs, an important aspect of local culture, on hedge fund risk-taking behaviors has never been explored. Notably, while existing literature has focused on fund-, strategy-, and market-specific determinants of hedge fund risk-taking (e.g., Fung and Hsieh, 1997; Brown et al., 2001; Chen, 2011; Aragon and Nanda, 2012; Smith et al., 2016), human behavior is still a missing piece. This is particularly surprising given the importance of understanding the risk-taking incentives of hedge funds, which are frequently blamed for causing systemic risk during financial crises such as the 1998 Long Term Capital Management debacle and 2007–2009 financial crisis. Indeed, anecdotal evidence suggests that human behavior plays an important role during financial crises.[3] Our paper fills the gap in the literature by investigating the role of one specific aspect of human behavior, namely local religiosity induced risk aversion, in explaining hedge fund risk-taking.[4]

Finally, unlike mutual funds, hedge funds have various investment strategies, such as directional, semi-directional, and non-directional strategies. While directional funds (such as macro) take direct market exposure and risk, semi-directional funds (such as equity hedge and event-driven) tend to diversify market risk by taking both long and short, diversified positions, and non-directional funds (such as equity market neutral) aim to minimize market risk altogether. Therefore, it would be interesting to see whether local religiosity has different effects on the risk-taking behaviors of various hedge fund strategies, especially given that Shu et al. (2012) only focus on a sample of growth and aggressive growth mutual funds.

To the extent that local religiosity may affect the risk preferences of hedge fund managers and investors, we hypothesize that hedge funds located in more religious areas are less likely to take risk. For instance, hedge fund managers are often local or conform to local cultural and religious forms. Moreover, the literature on local bias suggests that hedge funds tend to hold more local stocks in their portfolios (Teo, 2009), and hedge fund investors (e.g., funds of funds) have a preference for local hedge funds (Sialm et al., 2014). As a result, higher local religiosity may induce higher risk aversion of hedge funds' managers and investors, thus resulting in lower risk-taking. The alternative hypothesis is that local religiosity has no effect on the risk-taking behaviors of hedge funds due to their unique features as discussed earlier.

Using a sample of 7173 hedge funds from the HFR database and county-level religiosity data during 1996–2013, we find that local religiosity is significantly negatively related to hedge funds' total and idiosyncratic return volatilities. This result appears to be primarily driven by the semi-directional strategies such as equity hedge and event-driven, which diversify market risk by taking both long and short, diversified positions. In contrast, religiosity has a significant positive effect on hedge fund risk-taking for the most aggressive directional strategies such as macro, and an insignificant effect for the least aggressive non-directional

[1] As in Shu et al. (2012), several studies also focus on the different effects of Catholic and Protestant beliefs on risk-taking, including Stulz and Williamson (2003), Kumar (2009), Kumar et al. (2011), Baxamusa and Jalal (2015), Adhikari and Agrawal (2016a), and Schneider and Spalt (2017). While we focus on the *level* of local religiosity (i.e., total religiosity) in this paper, we also study different religious groups and discuss in more details the relevant literature in Section 3.7 for completeness.

[2] According to Hedge Fund Research (HFR), the total assets under management (AUMs) by global hedge funds have increased dramatically from $50 billion in 1990 to $3 trillion in 2015.

[3] For instance, in a testimony to the U.S. House of Representatives Committee on hearing on hedge funds, Lo (2008) attributes financial crises to be "a consequence of the interactions between hardwired *human behavior* and the unfettered ability to innovate, compete, and evolve."

[4] One caveat is that religiosity might have implications other than risk aversion, thus resulting in a measurement error. However, as argued in Adhikari and Agrawal (2016b), any resulting attenuation bias should only bias us against finding significant results.

strategies such as relative value. These findings highlight the importance of considering the heterogeneity of fund strategies when examining the effects of religiosity on hedge fund risk-taking behaviors.

While our results suggest a negative effect of local religiosity on hedge fund risk-taking, they may also be driven by endogeneity due to reverse causality in the sense that more risk-averse managers tend to choose funds located in areas with more religious populations, or due to omitted variables that are correlated with both local religiosity and hedge fund risk-taking. We use a variety of control variables in our regressions and include (strategy × year) fixed effects to control for unobservable, omitted variables that are specific to each strategy and year. To further establish causality, we employ several additional tests. First, we construct two instrumental variables following prior literature, i.e., the three-year lagged local religiosity and three-year lagged local education level, and undertake an instrumental variables (IV) regression analysis. Second, we follow Wintoki et al. (2012) and perform the dynamic panel generalized method of moments (GMM) estimation. Finally, following Shu et al. (2012), we use local religiosity of hedge fund managers' undergraduate college locations, which is presumably uncorrelated with unobservable, uncontrolled characteristics of fund locations, to further address potential omitted variables bias. Our results remain robust after controlling for endogeneity.

Further, we find that the risk mitigating effect of local religiosity exists for both financial crisis and non-crisis periods but appears to be stronger during crisis periods (especially for idiosyncratic risk), when it is most important and needed, i.e., during time periods with excessive risk-taking and uncertainty. The results are also robust to excluding hedge funds located in New York (the top one state of hedge fund concentration, which constitutes 38% of our sample funds), suggesting that our findings are not driven by the state with the greatest hedge fund concentration. However, we do not find that local religiosity affects hedge fund performance as proxied by the Nine-Factor (a combination of Carhart (1997) four factors and Fung and Hsieh (2004) seven factors) Alpha.

We next explore the local preference channel through which local religiosity may affect hedge fund risk-taking. The evidence suggests that the effect of local religiosity on the risk preferences of local managers and investors may, at least partially, help explain our findings. Specifically, we find that the negative relation between local religiosity and risk-taking is only pronounced among funds for which local managers and clients are economically more important, i.e., young rather than old, and small rather than large funds.

Finally, analyses of hedge fund holdings show that funds located in counties with higher religiosity ratios tend to hold less risky stocks and diversify their stock portfolios across industries, thus contributing to lower hedge fund return volatilities.

We make several important contributions to the literature. First, our paper is part of a growing literature on the effects of local religiosity on organizational risk-taking (e.g., Kumar et al., 2011; Shu et al., 2012; Adhikari and Agrawal, 2016b). More broadly, our findings contribute to a nascent literature on the impacts of local culture, including local religiosity, on managerial incentives and corporate decision-making (e.g., Grinblatt and Keloharju, 2001; Hilary and Hui, 2009; Giannetti and Yafeh, 2012; Li et al., 2013; Ahern et al., 2015; Jiang et al., 2015; Adhikari and Agrawal, 2016a; Boubakri and Saffar, 2016; Karolyi, 2016; Elnahas et al., 2017; Schneider and Spalt, 2017; Shen and Jun, 2017) as well as firms' involvement in questionable activities (e.g., Grullon et al., 2009; Dyreng et al., 2012; McGuire et al., 2012; Boone et al., 2013; Callen and Fang, 2015).[5]

Moreover, to the best of our knowledge, our study is the first to examine the effect of local culture, particularly local religious beliefs, which is largely a missing aspect in the hedge fund literature, on hedge fund risk-taking behaviors. Finally, we contribute to the literature on portfolio location and home bias. While prior studies examine the potential advantages (e.g., lower monitoring and information acquisition costs) of a fund due to the geographical proximity to the stocks in its portfolio (Coval and Moskowitz, 1999; Coval and Moskowitz, 2001), we document that location may also affect hedge fund behaviors through local culture.

It is worth noting that our paper differs from, as well as complements, Shu et al. (2012) in several aspects. First and foremost, unlike Shu et al. (2012) who focus on different religious groups and document a positive (negative) relation between Catholic (Protestant) beliefs and mutual fund risk-taking, we document that *overall* local religiosity mitigates hedge fund risk-taking, and this negative relation is primarily driven by semi-directional strategies. We also show that the difference could be attributed to fund styles. Specifically, we find that local religiosity is significantly positively related to risk-taking for the most aggressive directional strategies which take direct market exposure and risk (such as macro), similar to the sample of growth and aggressive growth mutual funds used in Shu et al. (2012). Second, we establish causality by performing instrumental variable regressions and dynamic panel GMM estimation. Finally, while Shu et al. (2012)'s results cannot be attributed to local bias, it is possible that our results are driven by hedge fund managers' local preferences (Teo, 2009).

The rest of the paper proceeds as follows. Section 2 describes the data and provides summary statistics. Section 3 presents our main findings regarding the effect of local religiosity on hedge fund risk-taking. Section 4 explores the local preference channel through which local religiosity may impact hedge fund risk-taking. Section 5 examines how local religiosity affects hedge fund stock holdings and portfolio diversification. Section 6 concludes.

## 2. Data and measures

In this section, we first discuss our hedge fund sample and then present county-level religiosity and demographic data. In particular, we describe data sources, sample selection, and variable construction, and provide summary statistics for the key variables used in our analyses.

[5] Economists and sociologists have long documented significant effects of religious beliefs on various social behaviors: marriage (Lehrer and Chiswick, 1993), divorce (Heaton and Pratt, 1990), crime (Evans et al., 1995), suicide (Bainbridge, 1989), and drug and alcohol consumption (Cochran and Akers, 1989). Until more recently, financial researchers have examined the effects of religion primarily at the macro level, such as on government quality (Porta et al., 1999), creditor protection (Stulz and Williamson, 2003), and economic growth (Guiso et al., 2003).

### 2.1. Hedge fund sample

Our hedge fund data come from the HFR database, which reports fund characteristics and operational data (including business address), along with monthly returns and AUMs. To mitigate survivorship bias, we include both live and graveyard funds located in the US from January 1994 when HFR started to track graveyard funds through December 2013. To ensure that the same fund does not appear multiple times in the database, we only keep funds with net monthly returns denominated in the US dollar. If a hedge fund has both off- and on-shore funds, we keep the fund with the longest return history or the largest asset size. Further, to alleviate backfill and incubation biases, we delete return observations of a fund prior to the date it was added to the database (Aggarwal and Jorion, 2010).[6] As a result, our sample period is effectively from 1996 to 2013. We also require a fund to have at least 12 monthly returns during the sample period. Finally, we keep funds with the following primary investment strategies: Equity Hedge, Event-Driven, Fund of Funds, Macro, and Relative Value. Our final sample contains 7173 hedge funds, of which 2194 are live and 4979 are graveyard funds.

As our focus is on the hedge fund risk-taking behaviors, we estimate two risk measures in year $y$ for individual funds using a 12-month rolling window[7]: (1) *Total Risk*, defined as the standard deviation of 12 monthly hedge fund returns in year $y$; and (2) *Idiosyncratic Risk*, calculated as the standard deviation of the residuals from the following nine-factor model, in which we combine the Carhart (1997) four factors and Fung and Hsieh (2004) seven factors, using 12 months of data in year $y$:

$$\begin{aligned} r_{i,t} = {} & \alpha_i + \beta_{i,MKT} MKT_t + \beta_{i,SMB} SMB_t + \beta_{i,HML} HML_t + \beta_{i,UMD} UMD_t \\ & + \beta_{i,TERM} TERM_t + \beta_{i,CREDIT} CREDIT_t + \beta_{i,PTFSBD} PTFSBD_t \\ & + \beta_{i,PTFSFX} PTFSFX_t + \beta_{i,PTFSCOM} PTFSCOM_t + \varepsilon_t \end{aligned} \tag{1}$$

where $r_{i,t}$ is the month-$t$ return on fund $i$ in excess of the one-month T-bill rate; *MKT* is the market return in excess of the one-month T-bill rate; *SMB* is the small-minus-big size factor, *HML* is the high-minus-low book-to-market factor; *UMD* is the momentum factor; *TERM* is a bond market factor defined as the return spread of the Barclays Capital 7–10 year Treasury index and the one-month T-bill rate; *CREDIT* is a credit spread factor defined as the return spread of the Barclays Capital Corporate Bond Baa Index and the 7–10 year Treasury index; and *PTFSBD*, *PTFSFX*, and *PTFSCOM* are the trend-following factors of Fung and Hsieh (2001) for bonds, currencies, and commodities, respectively.[8]

Table 1 provides summary statistics of key variables for our full sample during 1996–2013, which contains 26,287 hedge fund-year observations after requiring non-missing values on all key variables. Note that all variables are winsorized at the upper and lower 1% levels to ensure our results are not driven by extreme values. Panel A of Table 1 shows that an average hedge fund in our sample has monthly total risk of 3% and idiosyncratic risk of 1%. This indicates that a large proportion (33.3%) of total hedge fund risk is due to idiosyncratic risk. We also observe substantial variations of both risk measures in the full sample. For instance, the 75th percentile is 0.04 (0.01) for total (idiosyncratic) risk, which is considerably larger than the 25th percentile of 0.01 (0.00).

In our analyses, we control for various hedge fund characteristics that are shown in prior literature (e.g., Chen, 2011; Smith et al., 2016) to affect hedge fund risk-taking. Panel B of Table 1 reports summary statistics of these fund characteristics (see Appendix A for variable definitions). Approximately 58% of all hedge funds in our sample use leverage (*leverage*), and 89% have a management fee structure that includes a high watermark provision (*high_watermark*). On average, the AUMs of a hedge fund (*fund_assets*) are $160 million; the AUMs of a hedge fund firm (*firm_assets*) are $9 billion; the lockup period (*lockup*) is 4.7 months; the advance notice period required for asset redemptions from a fund (*advance_notice*) is 43 days; annual management fee (*management_fee*) is 1.42%; annual incentive fee (*incentive_fee*) is 16.95%; and the minimum investment required for a fund (*minimum_investment*) is $1.22 million. Further, only 13% of our sample funds specify a hurdle rate (*hurdle_rate*), but almost all (93%) of the funds perform an annual audit (*audit*).

### 2.2. Religiosity and demographic data

We collect religiosity data from the Association of Religion Data Archive (ARDA). The data set, initially constructed by the Glenmary Research Center and the Association of Statisticians of American Religious Bodies and distributed by the ARDA website, contains county-level religion statistics for 133 Judeo-Christian church bodies every 10 years. Our main variable of interest is the county-level religiosity ratio (*REL*), calculated as the total number of adherents of all congregations to the total population in the county as reported by the U.S. Census Bureau. Following prior studies (e.g., Alesina and La Ferrara, 2000; Hilary and Hui, 2009; Shu et al., 2012), for our sample period of 1996–2013, we linearly interpolate religiosity ratios between the survey years of 1990, 2000, and 2010 and use the data in 2010 to set the values for the 2011–2013 period.[9]

Panel C of Table 1 indicates that an average hedge fund is located in a county with 50% religious population, which is similar to the U.S. average (55.64%). There also exists wide variation in religiosity ratios in our sample. For instance, the 75th percentile of religiosity ratio is 0.59, while the 25th percentile is 0.42.

[6] Alternatively, we follow Fung and Hsieh (2000), Teo (2011), and Bali et al. (2011) and delete the first 18 months of returns of all individual hedge funds in our sample, and our results remain robust.

[7] Our results are robust if we use an 18, 24, 36, or 60-month rolling window in constructing hedge fund risk measures.

[8] We thank Ken French and David Hsieh for providing their risk factors on their respective websites: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html and http://faculty.fuqua.duke.edu/~dah7/Datalibrary/TF-FAC.xls.

[9] As a robustness check, we do not linearly interpolate religiosity data and find similar results.

**Table 1**
Summary statistics.
This table provides summary statistics of key variables for our full sample during 1996–2013. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels.

| Variable | N | Mean | Std. Dev. | P25 | Median | P75 | Min | Max |
|---|---|---|---|---|---|---|---|---|
| Panel A. Hedge fund risk measures | | | | | | | | |
| Total risk | 26,287 | 0.03 | 0.03 | 0.01 | 0.02 | 0.04 | 0.00 | 0.16 |
| Idiosyncratic risk | 26,287 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.05 |
| Panel B. Hedge fund characteristics | | | | | | | | |
| Leverage | 26,287 | 0.58 | 0.49 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| High_watermark | 26,287 | 0.89 | 0.31 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Fund_assets ($mn) | 26,287 | 160.47 | 367.24 | 11.34 | 39.34 | 125.00 | 0.29 | 2500.00 |
| Firm_assets ($mn) | 26,287 | 8950 | 33,900 | 71 | 365 | 2200 | 0.50 | 326,000 |
| Lockup | 26,287 | 4.70 | 6.78 | 0.00 | 0.00 | 12.00 | 0.00 | 60.00 |
| Advance_notice | 26,287 | 43.20 | 28.26 | 30.00 | 30.00 | 60.00 | 0.00 | 365.00 |
| Management_fee | 26,287 | 1.42 | 0.54 | 1.00 | 1.50 | 2.00 | 0.00 | 6.00 |
| Minimum_investment ($mn) | 26,287 | 1.22 | 3.14 | 0.25 | 1.00 | 1.00 | 0.00 | 100.00 |
| Incentive_fee | 26,287 | 16.95 | 6.75 | 15.00 | 20.00 | 20.00 | 0.00 | 65.00 |
| Hurdle_rate | 26,287 | 0.13 | 0.34 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Audit | 26,287 | 0.93 | 0.25 | 1.00 | 1.00 | 1.00 | 0.00 | 1.00 |
| Panel C. Local religiosity | | | | | | | | |
| REL | 26,287 | 0.50 | 0.11 | 0.42 | 0.44 | 0.59 | 0.30 | 0.73 |
| Panel D. Demographic characteristics | | | | | | | | |
| Age | 26,287 | 35.55 | 2.70 | 34.13 | 35.72 | 36.40 | 29.38 | 44.50 |
| Edu | 26,287 | 39.55 | 11.44 | 29.50 | 39.22 | 48.14 | 17.60 | 58.10 |
| Income | 26,287 | 45,883.21 | 18,566.29 | 32,319.00 | 46,980.80 | 62,300.00 | 5394.00 | 83,829.00 |
| ttlpop (000) | 26,287 | 1860.00 | 1940.00 | 805.00 | 1530.00 | 1590.00 | 50.08 | 9820.00 |
| mf | 26,287 | 0.92 | 0.04 | 0.87 | 0.91 | 0.94 | 0.86 | 1.03 |
| Minority | 26,287 | 0.33 | 0.12 | 0.25 | 0.36 | 0.43 | 0.05 | 0.59 |
| Married | 26,287 | 0.16 | 0.04 | 0.12 | 0.15 | 0.19 | 0.11 | 0.29 |

We also control for a broad set of demographic variables in our analyses as in previous literature (e.g., Iannaccone, 1998; Hilary and Hui, 2009, and Shu et al. (2012)). Specifically, we obtain the county-level demographic data from the U.S. Census Bureau for the three years 1990, 2000, and 2010. Appendix A also provides definitions of these demographic variables.

Panel D of Table 1 provides descriptive statistics of county-level demographic variables. For the county where a typical hedge fund is located, the median age of the population (*age*) is 35.55 years, the fraction of population who are 25 years or older with a Bachelor's, postgraduate, or professional degree (*edu*) is 39.55%, the mean per capita personal income (*income*) is $45,883, the total county population (*ttlpop*) is 1.86 million, the ratio of male to female population (*mf*) is 0.92, the proportion of minorities in the total county population (*minority*) is 33%, and the fraction of married to total households (*married*) is 16%.

Table 2 presents the correlation coefficients among all of the key variables. Specifically, we find that local religiosity (*REL*) is significantly negatively correlated with idiosyncratic risk.[10] The correlation coefficients provide preliminary evidence that hedge funds located in more religious counties are more likely to undertake lower risk, in particular, lower idiosyncratic risk.

## 3. Empirical analysis: Local religiosity and hedge fund risk-taking

This section presents our main findings regarding the impact of local religious beliefs on hedge fund managers' risk-taking behaviors. We start with a portfolio analysis of excess fund risk measures sorted by local religiosity in Section 3.1, and then perform panel and Fama-MacBeth regressions in Section 3.2. Section 3.3 examines the relation between local religiosity and hedge fund risk-taking across various fund investment strategies. In Section 3.4, we attempt to address potential endogeneity concerns using instrumental variables (IV) regressions and dynamic panel generalized method of moments (GMM) estimation. We also conduct regression analysis using fund managers' college-location religiosity to further address the potential omitted variable problem associated with fund locations. Section 3.5 performs additional robustness tests including financial crisis analysis and subsample analysis excluding funds in New York. Section 3.6 examines whether local religiosity affects hedge fund performance. Finally, we discuss the results across different religious groups in Section 3.7.

[10] While total and idiosyncratic risk have among the lowest correlations with religiosity ratio (0.00 and −0.04), the correlation coefficients are comparable to those of other demographic variables, e.g., −0.03 and 0.00 for age, −0.03 and 0.01 for education, −0.02 and 0.01 for income, −0.04 and −0.01 for minority ratio, and 0.04 and 0.01 for marriage ratio. Indeed, it appears that most of the correlation coefficients are statistically significant, which we believe are likely due to the large sample size (26,287 observations).

**Table 2**
Correlation coefficients.
This table reports the correlation coefficients among the key variables for our full sample during 1996–2013. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) | (20) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1). Total risk | 1.00 | | | | | | | | | | | | | | | | | | | |
| (2). Idio. risk | 0.61* | 1.00 | | | | | | | | | | | | | | | | | | |
| (3). REL | 0.00 | −0.04* | 1.00 | | | | | | | | | | | | | | | | | |
| (4). Log_fund_at | −0.21* | −0.12* | −0.02* | 1.00 | | | | | | | | | | | | | | | | |
| (5). Log_firm_at | −0.19* | −0.13* | 0.04* | 0.50* | 1.00 | | | | | | | | | | | | | | | |
| (6). Adv_notice | −0.13* | −0.06* | −0.01* | 0.19* | 0.06* | 1.00 | | | | | | | | | | | | | | |
| (7). Log min inv | −0.12* | −0.07* | −0.00 | 0.29* | 0.20* | 0.15* | 1.00 | | | | | | | | | | | | | |
| (8). mgmt fee | 0.05* | 0.06* | 0.01 | −0.00 | −0.02* | −0.05* | 0.00 | 1.00 | | | | | | | | | | | | |
| (9). Incentive fee | 0.19* | 0.16* | −0.04* | −0.13* | −0.17* | −0.22* | 0.09* | 0.19* | 1.00 | | | | | | | | | | | |
| (10). High water | 0.05* | 0.07* | −0.07* | −0.02* | −0.09* | −0.05* | 0.07* | 0.06* | 0.50* | 1.00 | | | | | | | | | | |
| (11). Lockup | 0.08* | 0.06* | −0.08* | −0.02* | −0.11* | 0.26* | 0.11* | −0.04* | 0.09* | 0.10* | 1.00 | | | | | | | | | |
| (12). Hurdle_rate | −0.06* | −0.04* | 0.02* | 0.02* | 0.08* | 0.09* | 0.04* | −0.20* | −0.06* | 0.00 | 0.00 | 1.00 | | | | | | | | |
| (13). Leverage | 0.14* | 0.11* | −0.01 | −0.07* | −0.05* | −0.13* | −0.01* | 0.08* | 0.27* | 0.13* | 0.01 | −0.10* | 1.00 | | | | | | | |
| (14). Audit | −0.03* | 0.01 | −0.03* | 0.07* | 0.04* | 0.05* | 0.00 | 0.05* | 0.02* | 0.08* | 0.05* | −0.00 | 0.03* | 1.00 | | | | | | |
| (15). Age | −0.03* | 0.00 | −0.01 | 0.05* | −0.04* | 0.09* | 0.00 | 0.09* | −0.05* | −0.02* | 0.01 | −0.08* | −0.02* | −0.01 | 1.00 | | | | | |
| (16). Edu | −0.03* | 0.01 | −0.15* | 0.19* | 0.15* | 0.09* | 0.09* | 0.12* | 0.02* | 0.04* | 0.04* | −0.06* | 0.06* | 0.00 | 0.41* | 1.00 | | | | |
| (17). Income | −0.02* | 0.01 | 0.28* | 0.10* | 0.06* | 0.10* | 0.05* | 0.11* | −0.04* | −0.01 | 0.00 | −0.06* | −0.00 | −0.04* | 0.59* | 0.66* | 1.00 | | | |
| (18). Log_totlpop | −0.06* | −0.03* | 0.05* | 0.08* | 0.10* | −0.00 | 0.08* | 0.12* | 0.01 | 0.04* | −0.07 | 0.01 | −0.06* | 0.05* | −0.18* | −0.03* | −0.03* | 1.00 | | |
| (19). mf | 0.10* | 0.05* | −0.08* | −0.19* | −0.22* | −0.04* | −0.09* | −0.10* | 0.03* | −0.01* | 0.06* | −0.02* | −0.01* | −0.02* | −0.16* | −0.42* | −0.07* | −0.23* | 1.00 | |
| (20). Minor | −0.04* | −0.01* | −0.04* | 0.13* | 0.19* | 0.02* | 0.07* | 0.10* | 0.00 | 0.01 | −0.01 | −0.01* | −0.05* | 0.00 | −0.04* | 0.39* | 0.33* | 0.37* | −0.27* | 1.00 |
| (21). marr | 0.04* | 0.01 | 0.15* | −0.18* | −0.27* | −0.01 | −0.09* | −0.09* | −0.02* | −0.03* | 0.01 | 0.01* | −0.02* | −0.01 | 0.07* | −0.52* | −0.15* | −0.32* | 0.55* | −0.76* |

* Indicates significance levels at 5% or better.

**Table 3**
Excess hedge fund risk-taking sorted by local religiosity.
This table reports average excess fund total and idiosyncratic risk sorted by local religiosity. Each year during 1996–2013, we sort hedge funds into quintiles based on local religiosity. We then calculate the means of excess fund total and idiosyncratic risk for each quintile, and report the time-series means of both excess risk measures. We also report the differences between the top and bottom religiosity quintiles and the associated t-statistics. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. We obtain excess risk measures of a fund by subtracting the annual median values within the fund's investment strategy.

| | Low | 2 | 3 | 4 | High | High-low | *t*-Stat |
|---|---|---|---|---|---|---|---|
| Mean Excess Total Risk | 0.0094 | 0.0055 | 0.0069 | 0.0061 | 0.0069 | −0.0025*** | −4.6574 |
| Mean Excess Idiosyncratic Risk | 0.0105 | 0.0087 | 0.0090 | 0.0088 | 0.0093 | −0.0012*** | −3.8926 |

*** Denotes significance at 1% level in a two-tailed test.

### 3.1. Portfolio analysis: Hedge fund risk-taking sorted by local religiosity

To investigate the relation between local religiosity and hedge fund risk-taking, we first conduct a portfolio analysis. Each year we sort hedge funds into quintiles based on their local religiosity ratios. To control for investment strategy, we adjust both risk measures of a fund by subtracting the annual median values within the fund's investment strategy to obtain *excess* total and idiosyncratic risk measures. We then calculate the annual means of these measures for each quintile, and report the time-series averages. We also report the differences between the top and bottom religiosity quintiles and the associated *t*-statistics.

The results in Table 3 suggest a negative relation between hedge fund risk-taking and local religiosity. For instance, the difference in the mean excess *Total Risk* between the highest and lowest religiosity quintiles is −0.25%, which is statistically and economically significant. We observe a similar pattern for the mean excess *Idiosyncratic Risk*, although the magnitude is smaller. Taken together, our portfolio analysis suggests that indeed, hedge funds located in an area with more religious populations are associated with lower total and idiosyncratic risk-taking. As these fund managers typically hold an under-diversified wealth portfolio with a disproportionately greater weight invested in the fund they work for (e.g., through human capital or monetary investment), total and idiosyncratic risk-taking can have substantial impacts on their wealth and utility.

We note that the relations between religiosity and risk-taking measures are not monotonic. This is however consistent with Shu et al. (2012), who find that while the relations between Protestant ratio and excess risk measures, in particular idiosyncratic risk, are negative, the relations between Catholic ratio and risk measures are positive. Given the opposite relations the two components of total religiosity ratio and risk measures, it is not surprising that they also find a weak non-monotonic relation between risk measures and total religiosity ratio (see Table 2 Panel A of Shu et al., 2012). These findings emphasize the importance of understanding the heterogeneity in religious beliefs in studying the effect of religion on risk-taking (i.e., the opposite effect of Protestant versus Catholic ratio on risk-taking). Our results confirm their findings in the hedge fund data, although the spread between the high and low quintiles of total religiosity ratio is negative and significant, again highlighting the importance of considering religion heterogeneity.[11] Further, we do not control for other risk determinants in the portfolio sorting analysis, which might contribute to the non-monotonicity in portfolio risk.

### 3.2. Regression analysis of hedge fund risk-taking on local religiosity

To control for a variety of fund characteristics and county-level demographic variables that may affect fund risk-taking, we perform multivariate regressions of hedge fund risk measures on local religiosity as follows:

$$HFRisk_{i,t+1} = \alpha + \beta REL_{i,t} + \gamma Fund_{i,t+1} + \delta Demo_{i,t} + \varepsilon_{i,t+1}, \quad (2)$$

where $HFRisk_{i,t+1}$ is the risk-taking measure (total or idiosyncratic risk) of hedge fund $i$ in year $t + 1$, $REL_{i,t}$ is the county-level local religiosity ratio of fund $i$ in year $t$, $Fund_{i,t+1}$ contains control variables pertaining to fund characteristics in year $t + 1$, and $Demo_{i,t}$ contains control variables pertaining to local demographic factors in year $t$.[12] We also control for various fixed effects. If local religiosity induced risk aversion leads to lower risk-taking of hedge funds, a negative coefficient ($\beta$) is expected; otherwise an insignificant $\beta$ is anticipated, suggesting that local religion has no effect on hedge fund risk-taking behaviors.

In Panel A of Table 4, we follow Shu et al. (2012) and run panel regressions including (strategy × year) fixed effects to control for any unobservable, omitted variables that are specific to each strategy and year.[13] We find a significant negative coefficient on *REL* for total risk. Economically speaking, a one standard deviation increase in *REL* (0.11) leads to a reduction of 0.08% in total risk, which represents 2.6% of the standard deviation in total risk (model (3)). For idiosyncratic risk, a one-standard-deviation increase in *REL* translates into a decrease of approximately 0.02% in idiosyncratic risk, representing 2.2% of the standard deviation in idiosyncratic risk (model (4)).

[11] In Section 3.7, motivated by Shu et al. (2012) and other previous studies, we also consider the effect of Protestant vs. Catholic on risk-taking for completeness and find mixed results. This is not surprising given that the literature is inconclusive regarding the differences across the religious groups in their effects on risk-taking. Therefore our study focuses on the *level* of local religiosity.

[12] Results are robust to using control variables in year $t$ or $t + 1$.

[13] As a robustness check, we include both strategy and year fixed effects to control for any unobservable, omitted, investment strategy-specific factors and variations due to time, and find similar results. We also find robust results using Newey–West robust standard errors to control for time-series autocorrelations of fund volatilities.

**Table 4**
Regression analyses of hedge fund risk-taking on local religiosity.
This table presents regression analyses of hedge fund risk-taking on local religiosity during 1996–2013. Panel A provides fixed-effects panel regression results using strategy × year fixed effects. Panel B provides Fama-MacBeth regression results, where each year we run cross-sectional regressions of hedge fund risk measures on local religiosity using strategy fixed effects, and then calculate the time-series averages of regression coefficients. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. *P*-values are shown in parentheses.

Panel A. Fixed effects panel regressions

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Total risk | Idiosyncratic risk | Total risk | Idiosyncratic risk |
| REL | −0.011*** | −0.002*** | −0.007*** | −0.002** |
| | (0.000) | (0.002) | (0.001) | (0.025) |
| Log_fund_assets | | | −0.164*** | −0.014*** |
| | | | (0.000) | (0.004) |
| Log_firm_assets | | | −0.058*** | −0.018*** |
| | | | (0.000) | (0.000) |
| Log_advance_notice | | | −0.000 | −0.000 |
| | | | (0.169) | (0.484) |
| Log_minimum_investment | | | −0.001*** | −0.000*** |
| | | | (0.000) | (0.000) |
| Management_fee | | | 0.003*** | 0.001*** |
| | | | (0.000) | (0.000) |
| Incentive_fee | | | −0.000 | 0.000*** |
| | | | (0.703) | (0.009) |
| High_watermark | | | 0.002*** | 0.001** |
| | | | (0.002) | (0.024) |
| Log_lockup | | | 0.001*** | 0.000*** |
| | | | (0.000) | (0.000) |
| Hurdle_rate | | | 0.000 | 0.000 |
| | | | (0.984) | (0.580) |
| Leverage | | | 0.004*** | 0.001*** |
| | | | (0.000) | (0.001) |
| Audit | | | 0.001 | 0.001*** |
| | | | (0.291) | (0.004) |
| Age | −0.000 | 0.000 | 0.000 | 0.000 |
| | (0.962) | (0.550) | (0.861) | (0.615) |
| Edu | −0.000 | 0.000 | 0.000 | 0.000 |
| | (0.210) | (0.431) | (0.978) | (0.467) |
| Log_income | 0.000 | −0.000 | −0.000 | −0.000 |
| | (0.878) | (0.931) | (0.848) | (0.873) |
| Log_ttlpop | −0.001*** | −0.000 | −0.001*** | −0.000 |
| | (0.000) | (0.155) | (0.003) | (0.302) |
| mf | −0.009* | 0.001 | −0.013*** | 0.000 |
| | (0.075) | (0.813) | (0.010) | (0.998) |
| Minor | 0.002 | −0.000 | 0.002 | −0.001 |
| | (0.450) | (0.727) | (0.550) | (0.487) |
| marr | 0.043*** | 0.009*** | 0.028*** | 0.005 |
| | (0.000) | (0.006) | (0.002) | (0.100) |
| Constant | 0.061*** | 0.000 | 0.090*** | 0.005 |
| | (0.001) | (0.992) | (0.000) | (0.388) |
| (Strategy × year) fixed effects | Yes | Yes | Yes | Yes |
| Observations | 26,259 | 26,259 | 26,259 | 26,259 |
| R-squared | 0.237 | 0.138 | 0.273 | 0.156 |

Panel B. Fama-MacBeth regressions

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Total risk | Idiosyncratic risk | Total risk | Idiosyncratic risk |
| REL | −0.017*** | −0.005*** | −0.016*** | −0.004** |
| | (0.000) | (0.009) | (0.001) | (0.020) |
| Log_fund_assets | | | −0.194*** | −0.017*** |
| | | | (0.000) | (0.003) |
| Log_firm_assets | | | −0.055*** | −0.014*** |
| | | | (0.000) | (0.003) |
| Log_advance_notice | | | −0.000 | −0.000 |
| | | | (0.313) | (0.984) |
| Log_minimum_investment | | | −0.002*** | −0.000*** |
| | | | (0.000) | (0.000) |
| Management_fee | | | 0.003*** | 0.001*** |
| | | | (0.000) | (0.000) |
| Incentive_fee | | | −0.000 | 0.000** |
| | | | (0.384) | (0.034) |

**Table 4** *(continued)*

| Panel B. Fama-MacBeth regressions | | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Total risk | Idiosyncratic risk | Total risk | Idiosyncratic risk |
| High_watermark | | | 0.003*** | 0.001** |
| | | | (0.000) | (0.025) |
| Log_lockup | | | 0.002*** | 0.000*** |
| | | | (0.000) | (0.004) |
| Hurdle_rate | | | −0.001 | −0.000 |
| | | | (0.287) | (1.000) |
| Leverage | | | 0.005*** | 0.001*** |
| | | | (0.000) | (0.000) |
| Audit | | | 0.002 | 0.001** |
| | | | (0.236) | (0.017) |
| Age | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.874) | (0.388) | (0.539) | (0.224) |
| Edu | 0.000*** | 0.000** | 0.000*** | 0.000** |
| | (0.002) | (0.010) | (0.002) | (0.041) |
| Log_income | −0.010*** | −0.002*** | −0.008*** | −0.002** |
| | (0.000) | (0.009) | (0.004) | (0.023) |
| Log_ttlpop | −0.001*** | −0.000 | −0.001** | 0.000 |
| | (0.002) | (0.973) | (0.026) | (0.470) |
| mf | −0.014 | −0.000 | −0.017** | −0.000 |
| | (0.109) | (0.943) | (0.046) | (0.965) |
| Minor | 0.001 | −0.002 | 0.001 | −0.003 |
| | (0.797) | (0.159) | (0.798) | (0.102) |
| marr | 0.053*** | 0.006 | 0.035** | −0.000 |
| | (0.004) | (0.424) | (0.012) | (0.962) |
| Constant | 0.147*** | 0.030*** | 0.147*** | 0.030*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Strategy fixed effects | Yes | Yes | Yes | Yes |
| Observations | 26,259 | 26,259 | 26,259 | 26,259 |
| R-squared | 0.177 | 0.095 | 0.230 | 0.128 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

Panel B of Table 4 presents Fama-MacBeth (Fama and MacBeth, 1973) regression results. Specifically, we run cross-sectional regressions of hedge fund risk measures on local religiosity each year controlling for strategy fixed effects, and then calculate the time-series averages of regression coefficients. The table shows that local religiosity is significantly negatively related to both total and idiosyncratic volatilities. Indeed, both the statistical significance and economic magnitude of the coefficients on *REL* are substantially improved relative to those panel regression results. More specifically, a one-standard-deviation increase in *REL* (0.11) leads to a reduction of 0.18% and 0.04% in total and idiosyncratic risk, respectively, which are equivalent to 5.9% and 4.4% of the standard deviation in total and idiosyncratic risk (models (3) and (4)). The coefficient estimates on control variables are consistent with prior literature (e.g., Chen, 2011).

Overall, the regression results show that hedge funds located in counties with higher religiosity ratios are more likely to undertake lower total and idiosyncratic risk, indicating that risk aversion induced by local religiosity may lead to lower risk-taking even in the highly competitive hedge fund industry.

### *3.3. The relation between local religiosity and hedge fund risk-taking by investment strategy*

In this section we investigate whether our main findings change across various hedge fund investment strategies. Some funds are willing to take direct market exposure and risk (directional strategies), such as managed futures, global macro, and emerging market funds. Some diversify market risk by taking both long and short, diversified positions (semi-directional strategies), such as fund-of-funds, equity hedge, event-driven, and multi-strategy funds. Others aim to minimize market risk altogether (non-directional strategies), such as equity market neutral, fixed income arbitrage, and convertible arbitrage funds.

We divide our full sample into five subsamples based on the investment strategies provided by the HFR database: (1) equity hedge, (2) event-driven, (3) fund of funds, (4) macro, and (5) relative value, and perform subsample analysis. The equity hedge, event-driven, and fund of funds (strategies (1) through (3)) are semi-directional strategies that rank in the middle regarding risk level; macro (strategy (4)) is the directional strategy that involves the greatest risk; and relative value (strategy (5)) is the non-directional strategy that is the least aggressive.

In untabulated tests, we conduct portfolio analysis and examine the average excess risk measures across quintiles of religiosity ratio for different investment strategies. We find that after excluding the most and least aggressive strategies (i.e., excluding

**Table 5**
Regression analyses of local religiosity and hedge fund risk-taking by fund strategy.
This table reports fixed-effects panel regressions and Fama-MacBeth regression results of hedge fund risk-taking on local religiosity during 1996–2013 by fund strategy. Strategy (1) is Equity Hedge, Strategy (2) is Event-Driven, Strategy (3) is Fund of Funds, Strategy (4) is Macro, and Strategy (5) is Relative Value. Strategies (1) through (3) are semi-directional, (4) is directional, and (5) is non-directional investment strategies. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. *P*-values are shown in parentheses. All control variables are included in regressions; for brevity, only the coefficients on *REL* are presented.

| | | Fixed effects | | Fama-MacBeth | |
|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) |
| | | Total risk | Idiosyncratic risk | Total risk | Idiosyncratic risk |
| Strategy (1): Equity hedge | REL | −0.025*** | −0.006*** | −0.041*** | −0.010*** |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| | Year fixed effects | Yes | Yes | No | No |
| | Observations | 10,339 | 10,339 | 10,339 | 10,339 |
| | R-squared | 0.226 | 0.122 | 0.130 | 0.087 |
| Strategy (2): Event-driven | REL | −0.019* | −0.001 | −0.052*** | −0.010* |
| | | (0.093) | (0.609) | (0.004) | (0.052) |
| | Year fixed effects | Yes | Yes | No | No |
| | Observations | 2974 | 2974 | 2974 | 2974 |
| | R-squared | 0.159 | 0.089 | 0.249 | 0.202 |
| Strategy (3): Fund of funds | REL | 0.008*** | −0.000 | 0.013* | 0.002 |
| | | (0.004) | (0.880) | (0.063) | (0.420) |
| | Year fixed effects | Yes | Yes | No | No |
| | Observations | 4776 | 4776 | 4776 | 4776 |
| | R-squared | 0.311 | 0.214 | 0.211 | 0.217 |
| Strategy (4): Macro | REL | 0.024*** | 0.008** | 0.020 | 0.002 |
| | | (0.000) | (0.017) | (0.148) | (0.743) |
| | Year fixed effects | Yes | Yes | No | No |
| | Observations | 4046 | 4046 | 4046 | 4046 |
| | R-squared | 0.131 | 0.102 | 0.225 | 0.192 |
| Strategy (5): Relative value | REL | 0.008 | 0.001 | 0.026** | 0.002 |
| | | (0.121) | (0.568) | (0.023) | (0.385) |
| | Year fixed effects | Yes | Yes | No | No |
| | Observations | 4124 | 4124 | 4124 | 4124 |
| | R-squared | 0.248 | 0.151 | 0.202 | 0.183 |
| Strategies (1), (2), & (3) | REL | −0.017*** | −0.004*** | −0.032*** | −0.007*** |
| | | (0.000) | (0.000) | (0.000) | (0.000) |
| | (Strategy × year) FE | Yes | Yes | No | No |
| | Strategy FE | No | No | Yes | Yes |
| | Observations | 18,089 | 18,089 | 18,089 | 18,089 |
| | R-squared | 0.294 | 0.158 | 0.154 | 0.095 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

strategies (4) and (5)), the mean values of both fund excess *Total Risk* and *Idiosyncratic Risk* decrease with religiosity, and the result is stronger compared to the full sample result in Table 3. For instance, the difference between the highest and lowest religiosity quintiles is −0.83% ($t = -8.66$) and −0.29% ($t = -9.10$) for mean excess *Total Risk* and *Idiosyncratic Risk*, respectively. Overall, the portfolio result suggests that the negative relation between religiosity and hedge fund risk taking appears to be driven by the semi-directional strategies.

To ensure the robustness of the results, we also estimate fixed effects panel and Fama-MacBeth regressions of hedge fund risk-taking on local religiosity (*REL*) by strategy. We include all control variables, but only report the coefficients on *REL* for brevity. For panel regressions, we include year fixed effects for each of the five strategies, and (strategy × year) fixed effects for semi-directional strategies (1), (2), and (3) altogether.

Consistent with the portfolio analysis, the regression results in Table 5 show that indeed the negative relation between local religiosity and hedge fund risk-taking is primarily driven by semi-directional strategies (which account for 69% of our sample), in particular equity hedge and event-driven funds (which account for 51% of our sample). Notably the magnitude of negative coefficients on *REL* is substantially improved for semi-directional strategies compared to full sample regressions in Table 4.

The panel regression results in Table 5 also show that in contrast to semi-directional strategies, the least aggressive non-directional strategy such as relative value exhibits no significant relation between local religiosity and risk-taking. For the most aggressive directional strategy, macro, however, local religiosity is significantly positively related to fund risk-taking. This positive relation is consistent with Shu et al. (2012)'s finding that the more risky growth and aggressive growth equity mutual funds located in more religious counties tend to take more risk. Overall the evidence suggests that the difference between the results of our paper and Shu et al. (2012) could be attributed to fund styles.

To summarize, Table 5 shows that the effects of local religiosity on hedge fund risk-taking may vary across different fund strategies, and the negative relation between religiosity and risk-taking holds only for semi-directional funds. Our findings highlight the importance of considering the heterogeneity of fund strategies when studying the effects of religiosity on hedge fund risk-taking behaviors.

### 3.4. Endogeneity

Thus far, we have documented a significant negative relation between local religious beliefs and hedge fund risk-taking, particularly total and idiosyncratic return volatilities. While our results suggest a negative effect of local religiosity on hedge fund risk-taking, they are also consistent with two alternative explanations. First, this negative association may be due to reverse causality in the sense that more risk-averse managers tend to choose funds located in areas with more religious populations. In particular, local culture and religious beliefs may attract fund managers and employees who share the same cultural background, as individuals prefer to work and reside in areas having local culture and beliefs with which they feel comfortable (Schneider, 1987). For example, Hilary and Hui (2009) show that CEOs consistently choose to work for employers with the same local culture. Second, the negative association may be driven by other unobservable omitted factors correlated with both local religiosity and hedge fund risk-taking.

To distinguish between these alternative explanations and establish causality, we have conducted various tests to control for potential endogeneity. For example, we use a variety of control variables in our regressions and include (strategy × year) fixed effects to control for unobservable, omitted variables that are specific to each strategy and year. We now perform additional tests to further control for potential endogeneity including IV regressions and dynamic panel GMM estimation. We also use managers' college-location religiosity to further address the potential omitted variables bias associated with fund locations.

#### 3.4.1. IV regressions

Following prior literature, we identify two instrumental variables for our endogenous variable (*REL*).[14] Following Hilary and Hui (2009), we use the 3-year lagged religiosity (*REL_lag3*) as the first instrument. To the extent that local religiosity remains stable over time, historical religiosity is expected to be positively related to current religiosity (the relevance criterion). However, there is no obvious reason as to why local religiosity three years ago would impact current risk-taking by hedge funds, other than through the effects of current religiosity (the exclusion criterion). The second instrument used is the fraction of advanced education attained in a hedge fund's local county lagged by three years, *edu_lag3*. Specifically, education attainment is defined as the percentage of people 25 years and above who have a Bachelor's, postgraduate, or professional degree. Prior literature suggests a negative relation between education level and religious beliefs because secular education emphasizes secular beliefs (i.e., scientific and rational thoughts) that may disagree with many traditional religious beliefs (e.g., Albrecht and Heaton, 1984; Glaeser and Sacerdote, 2008). While county education level tends to be negatively related to local religiosity ratio (the relevance criterion), it should not have any direct impact on hedge fund risk-taking behaviors, other than through religiosity (the exclusion criterion). Since we use two instruments for one endogenous variable, we are able to estimate an over-identified system and conduct various statistical tests for instrument validity.

In the first stage of IV regressions, we regress *REL* on the two instruments, along with various hedge fund characteristics and county-level demographic variables. In the second stage, we regress various risk-taking measures on the fitted value of *REL* from the first stage estimation and all controls. We include (strategy × year) fixed effects in all of our regressions for both stages.[15]

Table 6 presents the IV regression results. The endogeneity test *p*-value suggests that lagged religiosity ratios are not subject to endogeneity concerns. Thus we should exercise caution when interpreting IV regression results and rely more on the baseline panel regressions.[16] Nevertheless, we still report the test statistics. The first stage evidence shows that both instruments are significantly related to current *REL* as predicted, satisfying the relevance criterion. The first stage F-test also indicates that the weak instrument problem is unlikely ($p$-value < 0.0000). The second stage *p*-value for Hansen J-statistic equals 0.2279 for total risk and 0.7720 for idiosyncratic risk. Therefore, our two instruments are jointly exogenous and valid.

More importantly, the second stage regression results show that *REL* is still significantly negatively related to total and idiosyncratic risk. Both the statistical significance and economic magnitude of the coefficient estimates on *REL* are similar to the baseline panel regressions. Overall the evidence suggests that local religiosity has a negative effect on hedge fund risk-taking behaviors, and endogeneity is not of primary concerns for our analyses.

#### 3.4.2. Dynamic panel GMM estimations

To further address the potential endogeneity problem, we follow Wintoki et al. (2012) and apply a dynamic panel GMM estimator in this section. Specifically, we estimate the following dynamic GMM model of Blundell and Bond (1998) using lagged risk measures as our instruments.[17]

$$HFRisk_{i,t+1} = \alpha + \theta HFRisk_{i,t} + \beta REL_{i,t} + \gamma Fund_{i,t+1} + \delta Demo_{i,t} + \varepsilon_{i,t+1}, \quad (3)$$

[14] As a robustness check, we use an alternative instrumental variable, i.e., the median age of the county population lagged by three years, in the IV regressions; the results are qualitatively similar. Specifically, consistent with prior literature (e.g., Argue et al., 1999), we find a significant positive relation between age and religiosity in the first stage regression and robust results in the second stage regressions.

[15] As robustness checks, we use a variety of alternative model specifications and fixed effects and our results remain unchanged.

[16] Since we use lagged *REL* (rather than concurrent *REL*) as our variable of interest, endogeneity is less of a concern, which is confirmed by the endogeneity test *p*-values (0.8998 and 0.3664 for total and idiosyncratic risk, respectively). We thank the referee for suggesting the use of lagged *REL* in regression analyses. In untabulated tests, we also use concurrent *REL* in our regressions and find robust evidence, except that the endogeneity test *p*-values are <0.0000 suggesting concurrent *REL* is endogenous.

[17] Results are similar when we use dependent variables lagged by multiple years as our instruments. For details on the dynamic panel GMM estimation and the Stata program used, see the Appendix of Wintoki et al. (2012). For studies using dynamic panel GMM estimation, see also Roodman (2009), Warr et al. (2012), and Flannery and Hankins (2013), among others.

**Table 6**
Instrumental variables (IV) regressions of hedge fund risk-taking on local religiosity.
This table shows instrumental variable (IV) regression results of hedge fund risk-taking on local religiosity during 1996–2013. The first stage regresses local religiosity (REL) on the two instrumental variables, lagged 3-year religiosity (REL_lag3) and lagged 3-year fraction of advanced education attained by population aged 25 or above of the county (edu_lag3). The second stage regresses hedge fund risk-taking on the fitted value of REL from the first stage. The two stages are jointly estimated. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. *P*-values are shown in parentheses. Constants are omitted.

| | First stage | Second stage | |
|---|---|---|---|
| | | (1) | (2) |
| | REL | Total risk | Idiosyncratic risk |
| REL | | −0.007*** | −0.002*** |
| | | (0.008) | (0.007) |
| REL_lag3 | 0.4216*** | | |
| | (0.0000) | | |
| Edu_lag3 | −0.0670*** | | |
| | (0.0000) | | |
| Log_fund_assets | −0.0403*** | −0.165*** | −0.014*** |
| | (0.0040) | (0.000) | (0.000) |
| Log_firm_assets | 0.0424*** | −0.057*** | −0.017*** |
| | (0.0000) | (0.000) | (0.000) |
| Log_advance_notice | 0.0008*** | −0.000 | −0.000 |
| | (0.0040) | (0.211) | (0.275) |
| Log_minimum_investment | 0.0004*** | −0.001*** | −0.000*** |
| | (0.0030) | (0.000) | (0.000) |
| Management_fee | −0.0005 | 0.003*** | 0.001*** |
| | (0.1850) | (0.000) | (0.000) |
| Incentive_fee | 0.0000 | −0.000 | 0.000*** |
| | (0.5600) | (0.664) | (0.000) |
| High_watermark | 0.0010 | 0.002*** | 0.001*** |
| | (0.1700) | (0.000) | (0.001) |
| Log_lockup | 0.0003* | 0.001*** | 0.000*** |
| | (0.0720) | (0.000) | (0.000) |
| Hurdle_rate | −0.0012* | 0.000 | 0.000 |
| | (0.0750) | (0.997) | (0.583) |
| Leverage | −0.0022*** | 0.004*** | 0.001*** |
| | (0.0000) | (0.000) | (0.000) |
| Audit | 0.0002 | 0.001 | 0.001*** |
| | (0.8280) | (0.243) | (0.000) |
| Age | −0.0047*** | 0.000 | 0.000 |
| | (0.0000) | (0.933) | (0.880) |
| Edu | 0.0008*** | −0.000 | 0.000 |
| | (0.0000) | (0.916) | (0.593) |
| Log_income | 0.0543*** | 0.000 | 0.000 |
| | (0.0000) | (0.962) | (0.722) |
| Log_ttlpop | −0.0015*** | −0.001*** | −0.000 |
| | (0.0000) | (0.001) | (0.595) |
| mf | −0.1152*** | −0.013** | −0.001 |
| | (0.0000) | (0.040) | (0.771) |
| Minor | −0.0148*** | 0.002 | −0.001 |
| | (0.0010) | (0.405) | (0.488) |
| marr | 0.2416*** | 0.030*** | 0.006** |
| | (0.0000) | (0.000) | (0.027) |
| (Strategy × year) fixed effects | Yes | Yes | Yes |
| Observations | 26,190 | 26,190 | 26,190 |
| R-squared | 0.9146 | 0.188 | 0.107 |
| Endogeneity test *p*-value | | 0.8998 | 0.3664 |
| First stage *p*-value for F-statistic | 0.0000 | | |
| Second stage *p*-value for Hansen J-statistic | | 0.2279 | 0.7720 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

where $HFRisk_{i,t+1}$ is the total or idiosyncratic risk of hedge fund $i$ in year $t + 1$, $REL_{i,t}$ is the local religiosity ratio of fund $i$ in year $t$, $Fund_{i,t+1}$ contains fund characteristics in year $t + 1$, and $Demo_{i,t}$ contains demographic factors in year $t$. We also control for various fixed effects. The untabulated results show that the coefficients on *REL* are significantly negative for both total and idiosyncratic volatilities, and the economic magnitudes are indeed substantially enhanced relative to the other previously used methodologies. In sum, we document qualitatively similar results after controlling for endogeneity using dynamic panel GMM estimators.

*3.4.3. Hedge fund managers' college-location religiosity*

To further address the potential omitted variables bias arising from the unobservable omitted characteristics of fund locations, we explore the effects of fund managers' college-location religiosity on their risk-taking behaviors. College-location religiosity may capture fund managers' religious beliefs for at least two reasons (Shu et al., 2012). First, it is likely that people with certain religious beliefs are drawn to a college which has a similar local culture and religion. Second, local religiosity at the college location may help nurture a person's religious beliefs during the college years. Using managers' college-location religiosity may address the omitted variable issue as college-location religiosity may not be associated with fund-location characteristics. In particular, it is unlikely that the religiosity ratios of college locations far enough from hedge fund locations, i.e., in different U.S. Census Bureau regions, are significantly correlated with the characteristics associated with fund locations (Shu et al. (2012)).[18]

To proceed with our tests, we first conduct an extensive internet search for the biographies of hedge fund managers and hand collect the names of the undergraduate universities attended by fund managers for each of our sample hedge funds.[19] We then use the county-level religiosity ratios of managers' college locations (*College REL*) to replace local religiosity in our main regressions. We also conduct tests on a subsample of fund managers whose undergraduate universities are located in different U.S. Census Bureau regions.

Table 7 reports multivariate regression results of total and idiosyncratic risk on managers' college-location religiosity ratios. Panel A uses the full sample where we can manually identify fund managers' undergraduate colleges in the U.S., and Panel B uses the subsample where managers' colleges are located in different U.S. Census Bureau regions than fund locations. Note that, for both the full- and sub-sample tests, we exclude the most risky, directional strategy (Macro) and the least aggressive, non-directional strategy (Relative Value) to avoid the confounding effects from these two strategies as shown in Section 3.3. Namely, we only focus on hedge funds whose investment strategies belong to the semi-directional category: (1) Equity Hedge, (2) Event-Driven, and (3) Fund of Funds. In addition, we control for the demographic characteristics associated with both college and fund locations in all tests.

Panel A of Table 7 shows that the coefficients on *College REL* are significantly negative, suggesting that indeed religious beliefs affect the level of hedge fund risk-taking. Panel B of Table 7 shows that once we consider the subsample where the college location is in a different U.S. Census Bureau region than the fund's location, the coefficient estimates on *College REL* remain significant and negative for total risk but insignificant for idiosyncratic risk, suggesting that while the omitted variable problem may exist, our results are not simply driven by this issue.

*3.5. Additional robustness tests*

In this section, we perform several additional robustness tests. First, we examine the effect of financial crises on our main findings. We also investigate whether our results are robust to the exclusion of hedge funds located in New York, which has the highest fund concentration.

*3.5.1. The effect of financial crises*

In this section, we examine the effect of local religiosity on hedge fund risk-taking during financial crisis versus non-crisis periods. Specifically, we refer to the years of 1998 (Asian financial crisis and LTCM), 2007, and 2008 (the most recent subprime mortgage crisis) as crisis period, and non-crisis period otherwise. Table 8 shows that while the coefficients on *REL* are significantly negative across both crisis and non-crisis periods, the effect appears to be larger for the crisis period, in particular for idiosyncratic risk.[20] Overall the evidence suggests that the risk-reduction effect of *REL* is especially stronger and more valuable during crisis years, which are characterized by excessive risk-taking and uncertainty.

*3.5.2. Excluding hedge funds located in New York*

We now examine whether our findings are robust to the exclusion of states that have the highest hedge fund concentrations. While the locations of our sample hedge funds distribute across 46 states in the U.S., the top three states of hedge fund concentration are New York (38%), California (12.6%), and Illinois (9.5%). Altogether, these states constitute approximately 60% of the full sample. In light of the dominance of New York in hedge fund locations, we conduct robustness tests by excluding funds located in New York.

The regression results in Table 9 reports a robust negative relation between local religiosity and hedge fund total and idiosyncratic volatilities when hedge funds located in New York are excluded from the sample. To further ensure the robustness of our findings, we also exclude hedge funds located in the top two states and the top three states and find similar results. This evidence suggests that the negative relation between local religiosity and hedge fund risk-taking is not driven by states that have the highest hedge fund concentrations.

[18] The U.S. Census Bureau classifies the U.S. territory into four regions: Northeast, Midwest, South, and West. See detailed classifications at http://www2.census.gov/geo/docs/maps-data/maps/reg_div.txt.

[19] Similar to Shu et al. (2012), analyses of college location religiosity significantly reduce our sample size due to (1) missing information on undergraduate colleges attended by fund managers from internet search; and (2) fund managers attending non-U.S. undergraduate universities.

[20] Again, we only focus on semi-directional strategies in the regressions to mitigate potential confounding effects.

**Table 7**
Regression analyses of hedge fund risk-taking on managers' college-location religiosity?
This table reports fixed effects panel regression results of hedge fund risk-taking on local religiosity (REL) versus fund managers' undergraduate college location religiosity (College REL) during 1996–2013. Panel A uses the full sample (including strategies 1 (Equity Hedge), 2 (Event-Driven), and 3 (Fund of Funds)) where we can manually identify fund managers' undergraduate colleges in the U.S., while Panel B uses the subsample where the undergraduate colleges attended by fund managers are in different U.S. Census Bureau regions than fund locations. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. Demographic variables associated with fund managers' college locations are also controlled in all tests. *P*-values are shown in parentheses. Constants are omitted.

| | Panel A. Full sample | | Panel B. Subsample of different regions | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Total risk | Idiosyncratic risk | Total risk | Idiosyncratic risk |
| College REL | −0.010*** | −0.003*** | −0.006** | −0.001 |
| | (0.000) | (0.008) | (0.019) | (0.180) |
| Log_fund_assets | −0.064 | −0.007 | −0.084** | −0.006 |
| | (0.145) | (0.588) | (0.030) | (0.661) |
| Log_firm_assets | −0.061** | −0.017** | −0.034 | −0.014* |
| | (0.029) | (0.023) | (0.296) | (0.099) |
| Log_advance_notice | −0.000 | 0.000* | −0.003*** | −0.000 |
| | (0.890) | (0.065) | (0.009) | (0.470) |
| Log_minimum_investment | −0.003*** | −0.001*** | −0.003*** | −0.001*** |
| | (0.000) | (0.001) | (0.000) | (0.002) |
| Management_fee | 0.003** | 0.001*** | 0.003** | 0.002*** |
| | (0.026) | (0.000) | (0.027) | (0.001) |
| Incentive_fee | −0.000 | 0.000* | −0.000 | 0.000** |
| | (0.737) | (0.092) | (0.103) | (0.018) |
| High_watermark | 0.001 | −0.000 | −0.001 | −0.000 |
| | (0.494) | (0.757) | (0.641) | (0.354) |
| Log_lockup | 0.002*** | 0.000** | 0.001*** | 0.000 |
| | (0.000) | (0.012) | (0.003) | (0.510) |
| Hurdle_rate | 0.002 | 0.001** | 0.002 | 0.001** |
| | (0.197) | (0.012) | (0.161) | (0.021) |
| Leverage | 0.003*** | 0.001** | 0.004*** | 0.001** |
| | (0.000) | (0.012) | (0.000) | (0.033) |
| Audit | 0.004* | 0.002** | 0.007*** | 0.003*** |
| | (0.053) | (0.024) | (0.001) | (0.002) |
| College age | 0.000*** | 0.000** | 0.001*** | 0.000** |
| | (0.009) | (0.016) | (0.002) | (0.032) |
| College edu | −0.000*** | −0.000* | −0.000** | −0.000 |
| | (0.002) | (0.088) | (0.027) | (0.679) |
| College log_income | −0.000 | 0.000 | −0.001 | −0.000 |
| | (0.606) | (0.549) | (0.185) | (0.558) |
| College log_ttlpop | 0.001** | 0.000 | −0.001** | −0.000*** |
| | (0.017) | (0.131) | (0.011) | (0.005) |
| College mf | 0.012* | 0.003 | −0.009 | −0.007** |
| | (0.052) | (0.174) | (0.201) | (0.025) |
| College minor | −0.007*** | −0.002** | −0.003 | 0.000 |
| | (0.006) | (0.013) | (0.328) | (0.860) |
| College marr | −0.009 | −0.001 | −0.007 | 0.007 |
| | (0.350) | (0.903) | (0.723) | (0.285) |
| Age | −0.000 | 0.000 | 0.000 | 0.000 |
| | (0.367) | (0.733) | (0.803) | (0.371) |
| Edu | 0.000*** | 0.000*** | 0.000** | 0.000*** |
| | (0.009) | (0.001) | (0.012) | (0.001) |
| Log_income | −0.005** | −0.002** | −0.007*** | −0.003*** |
| | (0.034) | (0.015) | (0.004) | (0.001) |
| Log_ttlpop | 0.001 | 0.000 | 0.002** | 0.000 |
| | (0.143) | (0.459) | (0.028) | (0.213) |
| mf | 0.021* | 0.009** | 0.064*** | 0.020*** |
| | (0.070) | (0.034) | (0.000) | (0.002) |
| Minor | 0.002 | −0.001 | 0.009 | 0.001 |
| | (0.775) | (0.547) | (0.207) | (0.799) |
| marr | −0.016 | −0.005 | −0.017 | −0.008 |
| | (0.352) | (0.473) | (0.314) | (0.334) |
| (Strategy × year) fixed effects | Yes | Yes | Yes | Yes |
| Observations | 6282 | 6282 | 4059 | 4059 |
| R-squared | 0.300 | 0.178 | 0.307 | 0.195 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

**Table 8**
Analysis of financial crises.
This table reports fixed effects panel regressions of hedge fund risk-taking on local religiosity (REL), on subsamples partitioned on financial crisis period. Crisis refers to years of 1998, 2007, and 2008; and Non-Crisis otherwise. The sample includes strategies 1 (Equity Hedge), 2 (Event-Driven), and 3 (Fund of Funds). All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. *P*-values are shown in parentheses. Constants are omitted.

| | Crisis | | Non-crisis | |
|---|---|---|---|---|
| | Total risk | Idiosyncratic risk | Total risk | Idiosyncratic risk |
| REL | −0.017** | −0.009*** | −0.017*** | −0.003*** |
| | (0.035) | (0.000) | (0.000) | (0.000) |
| Log_fund_assets | −0.120*** | −0.003 | −0.149*** | −0.020*** |
| | (0.000) | (0.778) | (0.000) | (0.000) |
| Log_firm_assets | −0.061*** | −0.022*** | −0.071*** | −0.018*** |
| | (0.002) | (0.000) | (0.000) | (0.000) |
| Log_advance_notice | 0.001 | 0.001*** | 0.001*** | 0.001*** |
| | (0.254) | (0.002) | (0.004) | (0.000) |
| Log_minimum_investment | −0.001*** | −0.000* | −0.001*** | −0.000*** |
| | (0.001) | (0.063) | (0.000) | (0.000) |
| Management_fee | 0.005*** | 0.001*** | 0.002*** | 0.001*** |
| | (0.000) | (0.006) | (0.001) | (0.004) |
| Incentive_fee | −0.000* | 0.000 | −0.000** | 0.000* |
| | (0.079) | (0.130) | (0.013) | (0.055) |
| High_watermark | 0.004*** | 0.000 | 0.002*** | 0.001*** |
| | (0.003) | (0.657) | (0.002) | (0.005) |
| Log_lockup | 0.001*** | 0.000* | 0.001*** | 0.000*** |
| | (0.000) | (0.094) | (0.000) | (0.001) |
| Hurdle_rate | 0.001 | 0.000 | 0.000 | 0.000 |
| | (0.314) | (0.743) | (0.893) | (0.379) |
| Leverage | 0.004*** | 0.001** | 0.003*** | 0.001*** |
| | (0.000) | (0.013) | (0.000) | (0.000) |
| Audit | −0.003 | 0.001 | 0.000 | 0.000 |
| | (0.191) | (0.294) | (0.857) | (0.154) |
| Age | −0.000 | −0.000* | −0.000*** | −0.000 |
| | (0.561) | (0.087) | (0.003) | (0.111) |
| Edu | −0.000 | −0.000 | −0.000** | 0.000 |
| | (0.252) | (0.124) | (0.042) | (0.653) |
| Log_income | 0.004 | 0.003* | 0.003* | 0.000 |
| | (0.413) | (0.085) | (0.078) | (0.546) |
| Log_ttlpop | −0.001* | −0.000 | −0.001*** | −0.000 |
| | (0.060) | (0.227) | (0.000) | (0.538) |
| mf | −0.038* | −0.004 | −0.023*** | −0.002 |
| | (0.051) | (0.471) | (0.003) | (0.431) |
| Minor | 0.008 | −0.004 | −0.003 | −0.000 |
| | (0.365) | (0.193) | (0.330) | (0.752) |
| marr | 0.034 | −0.006 | 0.006 | 0.002 |
| | (0.208) | (0.456) | (0.596) | (0.487) |
| (Strategy × year) FE | Yes | Yes | Yes | Yes |
| Observations | 3639 | 3639 | 14,450 | 14,450 |
| R-squared | 0.272 | 0.138 | 0.287 | 0.158 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

### *3.6. Local religious beliefs and hedge fund performance*

Thus far, we have shown that risk aversion induced by local religiosity leads to lower hedge fund risk-taking. The natural question therefore arises as to whether local religious beliefs subsequently affect hedge fund performance. To address this question, we use the Nine-Factor Alpha estimated from annual regressions of monthly fund returns on the Carhart (1997) and Fung and Hsieh (2004) combined nine factors as shown in Eq. (1).

In untabulated tests, we estimate panel and Fama-MacBeth regressions of hedge fund performance as proxied by Nine-Factor Alphas on local religiosity. To control for potential endogeneity, we also run IV regressions and dynamic panel GMM estimation. Across all models, *REL* is insignificantly related to Alpha, suggesting that local religiosity does not affect hedge fund performance.

The overall evidence indicates that while local religiosity reduces hedge fund risk-taking, it does not (negatively) impact fund performance. Therefore, the higher return volatilities of hedge funds located in counties with lower religiosity ratios are not rewarded by higher returns. This finding has important implications for investors, fund managers, and policy makers alike.

**Table 9**
Excluding hedge funds located in New York.
This table reports fixed effects panel and Fama-MacBeth regression results of hedge fund risk-taking on local religiosity during 1996–2013, excluding funds located in New York. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. *P*-values are shown in parentheses. Constants are omitted.

| | Fixed effects | | Fama-MacBeth | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | Total risk | Idiosyncratic risk | Total risk | Idiosyncratic risk |
| REL | −0.012*** | −0.003** | −0.020*** | −0.004** |
| | (0.000) | (0.029) | (0.000) | (0.026) |
| Log_fund_assets | −0.198*** | −0.020*** | −0.242*** | −0.025*** |
| | (0.000) | (0.000) | (0.000) | (0.002) |
| Log_firm_assets | −0.045*** | −0.014** | −0.038** | −0.008 |
| | (0.002) | (0.020) | (0.018) | (0.168) |
| Log_advance_notice | −0.001*** | −0.000 | −0.001*** | −0.000* |
| | (0.002) | (0.168) | (0.002) | (0.081) |
| Log_minimum_investment | −0.001*** | −0.000*** | −0.002*** | −0.000*** |
| | (0.000) | (0.001) | (0.000) | (0.000) |
| Management_fee | 0.003*** | 0.001*** | 0.002*** | 0.001** |
| | (0.000) | (0.001) | (0.002) | (0.029) |
| Incentive_fee | 0.000 | 0.000** | 0.000 | 0.000** |
| | (0.114) | (0.021) | (0.209) | (0.038) |
| High_watermark | 0.002** | 0.001** | 0.002** | 0.001** |
| | (0.035) | (0.016) | (0.027) | (0.010) |
| Log_lockup | 0.002*** | 0.000*** | 0.002*** | 0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Hurdle_rate | 0.001 | 0.000 | 0.001 | 0.000 |
| | (0.173) | (0.486) | (0.294) | (0.643) |
| Leverage | 0.004*** | 0.001*** | 0.006*** | 0.001*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Audit | 0.000 | 0.001** | 0.000 | 0.001 |
| | (0.976) | (0.041) | (0.883) | (0.113) |
| Age | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.608) | (0.317) | (0.991) | (0.342) |
| Edu | 0.000*** | 0.000** | 0.000*** | 0.000 |
| | (0.010) | (0.036) | (0.008) | (0.180) |
| Log_income | −0.005* | −0.002* | −0.003 | −0.001 |
| | (0.061) | (0.068) | (0.359) | (0.492) |
| Log_ttlpop | −0.000* | 0.000 | −0.001* | 0.000 |
| | (0.062) | (0.948) | (0.058) | (0.381) |
| mf | −0.031*** | −0.002 | −0.035*** | −0.002 |
| | (0.001) | (0.483) | (0.008) | (0.445) |
| Minor | 0.001 | −0.001 | 0.002 | −0.003* |
| | (0.775) | (0.226) | (0.683) | (0.063) |
| marr | 0.037*** | 0.007** | 0.032** | −0.004 |
| | (0.000) | (0.025) | (0.047) | (0.610) |
| (Strategy × year) fixed effects | Yes | Yes | No | No |
| Strategy fixed effects | No | No | Yes | Yes |
| Observations | 16,149 | 16,149 | 16,149 | 16,149 |
| R-squared | 0.271 | 0.160 | 0.243 | 0.138 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

### *3.7. Across religious groups: Catholic vs. Protestant*

It is worth noting that Shu et al. (2012) focus on the effects of different religious beliefs, i.e., Catholicism vs. Protestantism, on mutual fund risk-taking. In this paper, we instead focus on the effect of the *level* of local religiosity on hedge fund risk-taking because prior literature has established a robust association between religious beliefs and individuals' risk aversion. However, the literature is inconclusive regarding the differences across religious groups.

On the one hand, several studies suggest that Catholics may exhibit less aversion to speculative risk than average population, whereas Protestants exhibit more aversion to speculative risk (Halek and Eisenhauer, 2001). This distinction may reflect differences in religious teachings regarding gambling in general: while Protestant philosophy strongly condemns any kind of gambling activity and considers it sinful, Catholic philosophy is somewhat tolerant of gambling and Catholic churches even use bingo and lottery for their own fundraising (Halek and Eisenhauer (2001) and Adhikari and Agrawal (2016a)). Indeed, Kumar (2009) and Kumar et al. (2011) show that both individual and institutional investors in predominantly Catholic (Protestant) locations invest more (less) in lottery-type stocks. Shu et al. (2012) show that mutual finds located in counties with high Catholics to Protestants ratio (CP-Ratio) tend to undertake higher risk. Adhikari and Agrawal (2016a) show that firms headquartered in counties with higher CP-Ratio tend to be more innovative.

On the other hand, Stulz and Williamson (2003) suggest that Protestants tend to be more risk-tolerant than Catholics. Similarly, Baxamusa and Jalal (2015) find that CEOs who self-identify as Catholics are inclined to undertake less risk.

In contrast to both of the above views, Hilary and Hui (2009) show that non-financial firms headquartered in counties with high Catholic or Protestant ratios take less risk. Likewise, Adhikari and Agrawal (2016b) document that a large Catholic or Protestant population in an area negatively predicts bank risk-taking, although the latter result is weaker.

Given this ambiguity in literature, we focus on the *level* of local religiosity in this paper. Nevertheless, for completeness we also consider the CP-Ratio as well as the separate Catholic and Protestant ratios as measures of local religious beliefs, and find mixed results. Specifically, both the CP-Ratio and Catholic ratio are negatively related to hedge fund risk, while the Protestant ratio is either positively or insignificantly related to fund risk. Further, the results are primarily driven by semi-directional strategies.

## 4. Local preference channel: risk preferences of local managers and investors

So far we have documented that hedge funds located in more religious counties tend to take less risk. In this section, we investigate the underlying channel through which local religiosity could negatively affect hedge fund risk-taking behaviors, namely, the effect of local religiosity on the risk aversion of local hedge fund managers and investors.

Arguably, the risk preferences of local managers and investors could play an important role in determining the impact of local religiosity on hedge fund risk-taking. For instance, hedge fund managers are often local or conform to local cultural and religious forms, and they care greatly about hedge fund idiosyncratic risk because they are often under-diversified and their human capital, compensation, and total wealth are disproportionately tied to the fund that they manage. In addition, the literature on local bias suggests that hedge funds tend to hold more local stocks in their portfolios (Teo, 2009), which makes fund idiosyncratic risk important for them. Moreover, hedge fund managers are hired to act in the best interest of their investors and can benefit from catering to local investors' risk preferences. In sum, higher local religiosity could induce higher risk aversion of local managers and investors, thus leading to lower hedge fund risk-taking. This argument implies that if the risk preferences of local managers and investors present one mechanism by which local religiosity affects hedge fund risk-taking, we expect to find a more pronounced effect of local religiosity on risk-taking in subsamples of hedge funds for which local managers and investors are economically more important.

To test the local preference channel, we consider two indicators of the importance of local managers and investors: hedge fund age and size. Younger and smaller funds are more dependent upon and thus affected by local managers and investors compared to older and larger funds. For instance, local investors' preferences are perhaps less important to old and large hedge funds, which are more established, highly visible, and have large and disperse investor bases. Moreover, as Yonker (2016) implies, small hedge funds are more likely to have local residents in the top management team. Therefore, we expect to see stronger effects of local religiosity on risk-taking in young rather than old, and small rather than large funds.

Panel A of Table 10 compares young versus old hedge funds, where young funds are defined as those aged below the sample median (i.e., 5 years for our sample) and old funds those above. We show that the negative relation between local religiosity and hedge fund risk-taking is only significant for young funds but nonexistent for old funds. This result is consistent with local preference hypothesis, to the extent that young and new funds rather than old and established ones depend more on local managers and investors and in turn are more affected by local residents' risk preferences.

Panel B of Table 10 compares small and large funds, where small ones are those with AUMs below the sample median and large ones otherwise. Again, consistent with the local preference channel, we find that the negative effect of local religiosity on hedge fund risk-taking is only significant for small funds but insignificant for large funds.

Overall, the subsample regression results show that the inverse relation between local religiosity and hedge fund risk-taking is primarily driven by funds more likely to cater to local risk preferences, namely young and small funds. These analyses suggest that risk preferences of local managers and investors may constitute one channel through which local religiosity mitigates hedge fund risk-taking.

## 5. Local religiosity and hedge fund holdings

In this section we examine hedge fund stock holdings to investigate whether hedge funds located in more religious counties tend to take lower risk by investing in less risky stocks and diversifying risk at the portfolio level.

We obtain holdings from Thomson Reuters CDA/Spectrum institutional holdings (13F) database, which reports quarterly U.S. equity positions of all institutions (including hedge fund firms) with more than $100 million of AUMs. Since hedge fund firms are not identified in 13F, we follow Brunnermeier and Nagel (2004) and Griffin and Xu (2009) and match hedge funds in our main sample with the 13F database by their holding firm names. Note that the 13F fillings of matched firms might include the positions of their mutual fund business, because 13F data is reported at the holding firm level instead of the fund level. To classify a matched firm as a hedge fund firm, we use the following criteria to ensure that its main line of business is in hedge funds, but not in mutual funds. First, we include a matched firm in our sample if it is not registered with SEC, as registration is a prerequisite to advise mutual funds. Second, if a matched firm does not have the same name as the holding company of a mutual fund in the CDA/Spectrum database, we also include it in our sample. Third, we manually check the SEC ADV forms to ensure a company included in our sample to charge performance-based fees and have over 50% of its investment listed as “other pooled investment vehicles” or over 50% of its clients as “high net worth individuals.” Finally, for matched firms that still cannot be identified, we check their websites to see if their primary business is in hedge funds. Our final matched sample includes 724 hedge fund

**Table 10**
Tests of local preference channel: subsample analyses.
This table presents tests of local preference channel by estimating regressions of hedge fund risk-taking on local religiosity (REL), on subsamples partitioned on fund age (Young vs. Old) and fund size (Small vs. Large). All control variables are included in the regressions but not reported for brevity. Subsample Young (Old) contains hedge funds with an age smaller than (greater than or equal to) the sample median for each year. Subsample Small (Large) contains hedge funds with fund assets smaller than (greater than or equal to) the sample median for each year. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. *P*-values are shown in parentheses. Controls are omitted.

| | | Total risk | | Idiosyncratic risk | |
|---|---|---|---|---|---|
| | | Fixed effects | Fama-MacBeth | Fixed effects | Fama-MacBeth |
| Panel A. Young vs. old funds | | | | | |
| Young | REL | −0.013*** | −0.029*** | −0.001 | −0.003 |
| | | (0.002) | (0.001) | (0.110) | (0.105) |
| | All controls | Yes | Yes | Yes | Yes |
| | (Strategy × year) FE | Yes | No | Yes | No |
| | Strategy FE | No | Yes | No | Yes |
| | Observations | 12,004 | 12,004 | 12,004 | 12,004 |
| | R-squared | 0.250 | 0.228 | 0.114 | 0.115 |
| Old | REL | 0.001 | 0.000 | −0.001 | −0.003* |
| | | (0.878) | (0.977) | (0.168) | (0.094) |
| | All controls | Yes | Yes | Yes | Yes |
| | (Strategy × year) FE | Yes | No | Yes | No |
| | Strategy FE | No | Yes | No | Yes |
| | Observations | 14,255 | 14,255 | 14,255 | 14,255 |
| | R-squared | 0.313 | 0.284 | 0.231 | 0.206 |
| Panel B. Small vs. large funds | | | | | |
| Small | REL | −0.012*** | −0.022*** | −0.003** | −0.005** |
| | | (0.001) | (0.001) | (0.042) | (0.018) |
| | All controls | Yes | Yes | Yes | Yes |
| | (Strategy × year) FE | Yes | No | Yes | No |
| | Strategy FE | No | Yes | No | Yes |
| | Observations | 13,131 | 13,131 | 13,131 | 13,131 |
| | R-squared | 0.243 | 0.209 | 0.135 | 0.123 |
| Large | REL | 0.002 | −0.004 | −0.001 | −0.002 |
| | | (0.295) | (0.279) | (0.400) | (0.210) |
| | All controls | Yes | Yes | Yes | Yes |
| | (Strategy × year) FE | Yes | No | Yes | No |
| | Strategy FE | No | Yes | No | Yes |
| | Observations | 13,128 | 13,128 | 13,128 | 13,128 |
| | R-squared | 0.306 | 0.264 | 0.192 | 0.168 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

firms, corresponding to 1405 hedge funds. Since 13F dataset does not cover the short positions or derivatives, we only focus on the long equity positions of hedge fund firms. We then estimate various holdings-based risk measures for each hedge fund firm following Shu et al. (2012) and run panel regressions (similar to Eq. (2)) of these measures on lagged local religiosity, controlling for fund characteristics and demographic variables as well as (Strategy × Year) fixed effects.

First, we investigate whether hedge funds located in counties with higher religiosity ratios tend to reduce risk-taking by holding individual stocks with lower return volatilities. To answer this question, we need to estimate *Average Total Risk and Average Idiosyncratic Risk*. Specifically, for year-*y* measures, we first estimate total and idiosyncratic risk of individual stocks with at least 12 months of return observations on a 12-month rolling window basis as the standard deviation of monthly returns and the residuals from the Carhart (1997) four-factor model, respectively, using data during year *y*.[21] We then calculate value-weighted averages of total and idiosyncratic risk of individual stocks held by each hedge fund firm based on the reported portfolio holdings at the end of year $y - 1$.

Table 11 reports multivariate regression results of holdings-based risk measures on local religiosity. Panel A of Table 11 shows that local religiosity is negatively related to the average total return volatility of stocks held by hedge funds with a marginal significance level (*p*-value = 0.099), but insignificantly related to the average idiosyncratic return volatility. Our results provide some weak evidence that higher local religiosity ratios reduce hedge fund managers' risk-taking at the individual stock level, i.e., through holding less risky stocks.

We next examine whether the differences in hedge fund risk-taking behaviors across counties with varying local religiosity ratios are also attributed to portfolio diversification. To explore this channel, we examine total and idiosyncratic return volatilities of hypothetical holdings-based hedge fund portfolios. Specifically, for year-*y* measures, we first calculate monthly buy-and-hold

[21] Results using other windows such as 24 months are similar.

**Table 11**
Local religiosity and hedge fund holdings.
This table reports fixed effects panel regression results of average total and idiosyncratic risks of stocks held by hedge funds, holdings-based portfolio total and idiosyncratic risks, and the industry concentration of hedge fund portfolios on local religiosity in Panels A, B, and C, respectively. All of the variables are defined in Appendix A and winsorized at the upper and lower 1% levels. *P*-values are shown in parentheses. Constants are omitted.

| | Panel A. Average risk of stocks held | | Panel B. Holdings-based portfolio risk | | Panel C. Industry concentration of portfolio | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Average total risk | Average idiosyncratic risk | Holdings-based portfolio total risk | Holdings-based portfolio idiosyncratic risk | Industry Herfindahl Index | KSZ Index |
| REL | −0.010* | −0.005 | −0.026*** | −0.025*** | −0.176*** | −0.170*** |
| | (0.099) | (0.267) | (0.000) | (0.000) | (0.000) | (0.000) |
| Log_fund_assets | 0.105*** | 0.046** | 0.091*** | 0.069*** | 0.051 | 0.252* |
| | (0.000) | (0.015) | (0.000) | (0.000) | (0.774) | (0.066) |
| Log_firm_assets | −0.242*** | −0.176*** | −0.110*** | −0.114*** | −1.533*** | −1.155*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Log_advance_notice | 0.006*** | 0.005*** | 0.004*** | 0.003*** | 0.012*** | 0.009*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.002) | (0.002) |
| Log_minimum_investment | 0.000 | 0.000 | −0.000* | −0.000*** | −0.010*** | −0.005*** |
| | (0.773) | (0.253) | (0.069) | (0.009) | (0.000) | (0.005) |
| Management_fee | 0.003*** | 0.001** | 0.003*** | 0.002*** | 0.022*** | 0.019*** |
| | (0.006) | (0.032) | (0.000) | (0.000) | (0.000) | (0.000) |
| Incentive_fee | −0.000 | −0.000 | −0.000** | −0.000** | −0.000 | 0.000 |
| | (0.536) | (0.859) | (0.014) | (0.027) | (0.836) | (0.990) |
| High_watermark | 0.002 | 0.002 | 0.007*** | 0.005*** | 0.055*** | 0.043*** |
| | (0.279) | (0.196) | (0.000) | (0.000) | (0.000) | (0.000) |
| Log_lockup | 0.001*** | 0.001*** | 0.000 | −0.000 | −0.005** | −0.001 |
| | (0.002) | (0.001) | (0.402) | (0.507) | (0.025) | (0.696) |
| Hurdle_rate | −0.002 | −0.001 | 0.001 | 0.001 | 0.029*** | 0.021*** |
| | (0.148) | (0.239) | (0.467) | (0.173) | (0.002) | (0.002) |
| Leverage | −0.005*** | −0.004*** | −0.004*** | −0.002*** | 0.027*** | 0.015*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Audit | 0.005*** | 0.003*** | 0.004*** | 0.002** | 0.032*** | 0.032*** |
| | (0.006) | (0.009) | (0.006) | (0.031) | (0.001) | (0.000) |
| Age | 0.001*** | 0.000*** | 0.000 | −0.000 | 0.004** | 0.002 |
| | (0.000) | (0.005) | (0.148) | (0.290) | (0.012) | (0.107) |
| Edu | 0.001*** | 0.001*** | 0.000 | −0.000** | −0.002*** | −0.002*** |
| | (0.000) | (0.000) | (0.869) | (0.015) | (0.004) | (0.000) |
| Log_income | −0.028*** | −0.022*** | −0.001 | 0.007*** | 0.123*** | 0.119*** |
| | (0.000) | (0.000) | (0.641) | (0.000) | (0.000) | (0.000) |
| Log_ttlpop | −0.001 | −0.001* | −0.001*** | −0.001*** | 0.004 | 0.004 |
| | (0.167) | (0.083) | (0.000) | (0.009) | (0.202) | (0.153) |
| mf | 0.086*** | 0.067*** | 0.024** | −0.006 | 0.265*** | 0.142* |
| | (0.000) | (0.000) | (0.034) | (0.448) | (0.005) | (0.051) |
| Minor | 0.002 | 0.003 | −0.008 | −0.007* | −0.317*** | −0.197*** |
| | (0.757) | (0.546) | (0.106) | (0.070) | (0.000) | (0.000) |
| marr | 0.052*** | 0.048*** | 0.059*** | 0.048*** | −0.429*** | −0.212** |
| | (0.010) | (0.001) | (0.000) | (0.000) | (0.000) | (0.024) |
| (Strategy × year) FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 5932 | 5932 | 6286 | 6286 | 6363 | 6363 |
| R-squared | 0.533 | 0.477 | 0.493 | 0.283 | 0.175 | 0.161 |

* Denotes significance at 10% level in a two-tailed test.
** Denotes significance at 5% level in a two-tailed test.
*** Denotes significance at 1% level in a two-tailed test.

returns of these portfolios based on their reported quarterly equity holdings on a value-weighted basis. We then estimate holdings-based portfolio total and idiosyncratic risk on a 12-month rolling window basis, respectively, as the standard deviation of hypothetical fund portfolio monthly returns and the residuals from the Carhart (1997) four-factor model, using data during year *y*. Panel B of Table 11 shows that local religiosity is significantly negatively related to holdings-based portfolio total and idiosyncratic risk, suggesting that the risk-reduction effects associated with local religiosity manifest in fund portfolio diversification.

Finally, to shed further light on portfolio diversification, we directly investigate two metrics of industry concentration of hedge fund portfolios: (1) *Industry Herfindahl Index*, defined as the sum of squared industry weights of a hedge fund firm portfolio; and (2) *KSZ Index*, i.e., Kacperczyk et al. (2005) industry concentration index, defined as the sum of squared differences between a fund portfolio's industry weights and the corresponding market's industry weights. Note that to calculate year-*y* measures, we use the reported holdings of hedge fund firms at the end of year *y*. Panel C of Table 11 documents that local religiosity is significantly negatively related to both concentration measures, suggesting that hedge funds located in lower religiosity ratio areas tend to deviate from well-diversified portfolios and concentrate in fewer industries.

Overall, the results suggest that hedge funds located in counties with higher religiosity ratios not only tend to hold individual stocks with lower return volatilities, but also diversify their portfolios across industries, thus contributing to lower hedge fund risk-taking.

Shu et al. (2012) document that local religiosity only appears to affect mutual fund risk-taking at the portfolio level, but not at the individual stock level. We find weak evidence that religiosity may reduce risk by encouraging holdings of less risky individual stocks. One potential explanation for this slight difference is that whereas mutual funds experience closer scrutiny and thus are less willing to take risk on individual stocks that may be observable to competitors and clients, hedge funds are lightly regulated and subject to less scrutiny, and hence tend to undertake risk at the individual stock level as well as the portfolio level. Further, while Shu et al. (2012) suggest that their results cannot be attributed to mutual fund managers' local stock preference, it is possible that our results are driven by hedge fund managers located in more religious counties investing disproportionally in less risky local stocks (Teo, 2009).

## 6. Conclusions

In this paper, we examine the effect of local religious beliefs on organizational risk-taking using hedge funds as a new and unique setting. While prior literature suggests that local religiosity induced risk aversion may mitigate hedge fund risk-taking, the unique features of hedge funds (e.g., stiff competition and heightened financial incentives) may make it least likely for religion to affect hedge fund risk-taking behaviors. Thus, if we document significant evidence in the hedge fund industry, it would provide strong support for the impact of local religiosity on organizational risk-taking.

Using a sample of 7173 hedge funds from the HFR database and county-level religiosity data during 1996–2013, we document robust evidence that local religiosity is significantly negatively related to total and idiosyncratic risk of hedge funds. This relation still holds even after controlling for endogeneity using IV regressions and dynamic panel GMM estimations, and after addressing omitted variables issue using managers' college-location religiosity. The overall evidence indicates that indeed local religious beliefs instill a risk-aversion culture to the hedge fund industry. Further investigation reveals substantial variation in the effects of religiosity on hedge fund risk-taking across investment strategies. Specifically, the risk-reducing effect appears to be primarily driven by the semi-directional strategies such as equity hedge and event-driven, reversed for the most aggressive directional strategies such as macro, and insignificant for the least aggressive non-direction strategies such as relative value. These findings highlight the importance of considering the heterogeneity of fund strategies when examining the effects of religiosity on hedge fund risk-taking behaviors.

Moreover, we find that the risk mitigating effect of local religiosity exists for both crisis and non-crisis periods but appears to be stronger during crisis period (especially for idiosyncratic risk), when it is most important and needed, i.e., during time periods with excessive risk-taking and uncertainty. The result is also robust to excluding hedge funds in the state with the highest hedge fund concentration. However, we do not find local religiosity affects hedge fund performance.

We next investigate the underlying channel through which local religiosity mitigates hedge fund risk-taking. The evidence shows that the effect of local religiosity on the risk preferences of local managers and investors may, at least partially, help explain our findings. Specifically, we find that the negative relation between local religiosity and hedge fund risk-taking is only pronounced among funds for which local managers and investors are economically more important, i.e., young rather than old, and small rather than large funds.

Finally, analyses of hedge fund equity holdings show that funds located in counties with higher religiosity ratios tend to hold less risky stocks and diversify their stock portfolios across industries, thus contributing to lower hedge fund return volatilities.

Taken together, our evidence shows that local religious beliefs, an important component of local culture, may motivate hedge fund managers to reduce risk-taking. These findings could further our understanding of the effect of local religiosity on organizational risk-taking behaviors in the financial industry in general and the hedge fund sector in particular, as well as on corporate decision-making. Our study also provides important insights into hedge fund managers' risk-taking incentives. Further, our results have important implications for investors and policymakers alike, especially those who are concerned about the risk-taking behaviors of hedge funds and their impact on the whole economy. In particular, a potential policy implication is that any regulatory tools aimed at preventing hedge funds from taking excessive risks should also take into account differences inherent in culture-driven risk-taking preferences of hedge funds' key stakeholders.

## Appendix A. Variable definitions

| Variables | Definitions |
|---|---|
| Hedge fund risk-taking measures: | |
| Total risk | Standard deviation of monthly returns of each hedge fund on a 12-month rolling window. |
| Idiosyncratic risk | Standard deviation of the residuals from the nine-factor model, in which we combine the Carhart (1997) four factors and Fung and Hsieh (2004) seven factors. |
| Average total risk | Value-weighted average total risk of stocks held by each hedge fund. Each year, we estimate total risk as the standard deviation of monthly returns on a 12-month rolling window basis for each stock with at least 12 months of return observations. |

**Appendix A** (*continued*)

| Variables | Definitions |
|---|---|
| Average idiosyncratic risk | Value-weighted average idiosyncratic risk of stocks held by each hedge fund. Each year, we estimate idiosyncratic risk as the standard deviation of the residuals from the Carhart (1997) four-factor model on a 12-month rolling window basis for each stock with at least 12 months of return observations. |
| Nine-factor alpha | The intercept from the annual regressions of monthly hedge fund returns on the combined Carhart (1997) and Fung and Hsieh (2004) nine factors. |
| Holdings-based portfolio total risk | We first calculate holdings-based portfolio returns as the monthly buy-and-hold returns of hedge funds' reported equity holdings, and then estimate total risk as the standard deviation of holdings-based returns of a hedge fund firm on a 12-month rolling window basis. |
| Holdings-based portfolio idiosyncratic risk | We first calculate holdings-based portfolio returns as the monthly buy-and-hold returns of hedge funds' reported equity holdings, and then estimate idiosyncratic risk as the standard deviation of the residuals of holdings-based returns of a hedge fund firm from the Carhart (1997) four-factor model on a 12-month rolling window basis. |
| Industry Herfindahl Index | The sum of squared industry (four-digit SIC code) weights of a hedge fund firm. |
| KSZ Index | Kacperczyk et al. (2005) industry concentration index, defined as the sum of squared differences between a hedge fund firm's industry (four-digit SIC code) weights and the corresponding market's industry weights. |
| Local religiosity measures: | |
| REL | The religiosity ratio of the county where a fund is located, calculated as the total number of adherents of all congregations divided by the total population in the county. |
| College REL | The religiosity ratio of the county where a fund manager's undergraduate college is located, defined as the total number of adherents of all congregations divided by total population in the county. |
| Hedge fund characteristics: | |
| Leverage | Specifies whether a hedge fund intends to use leverage. |
| High_watermark | Specifies whether fees are taken only after a high watermark. |
| Fund_assets | Total assets under management by the hedge fund. We take the natural logarithm in regressions (log_fund_assets). |
| Firm_assets | Total assets under management by the hedge fund firm. We take the natural logarithm in regressions (log_firm_assets). |
| Lockup | Lockup interval (the number of months that new investor cannot redeem assets). |
| Advance_notice | Indicates advance notice (in days) required for redemptions. |
| Management_fee | Annual management fee (in percentage). |
| Minimum_Investment | Minimum investment for the hedge fund. We take the natural logarithm in regressions (log_minimum_investment). |
| Incentive_fee | Annual incentive fee (in percentage). |
| Hurdle_rate | Specifies whether a hurdle rate exists. |
| audit | Indicates whether an annual audit is performed. |
| Local demographic characteristics: | |
| Age | The median age of the county population. |
| Edu | The fraction of advanced education attained. Educational attainment is defined by the percentage of people 25 years and above who have a Bachelor's, postgraduate, or professional degree. |
| Income | The mean per capita personal income of a county. |
| ttlpop | Total county population. We take the natural logarithm in regressions (log_ttlpop). |
| mf | The ratio of male to female population in the county. |
| Minority | The fraction of the minority population in the total county population. |
| Married | The fraction of married households in the total number of households. |

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