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Religion and Economic Growth: Evidence from U.S. Counties*

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Abstract: This paper examines the impact of religious participation on regional economic growth. Using data on GDP growth for United States counties from the Bureau of Economic Analysis (BEA) Regional Economic Accounts and data on county-level religious participation from the Association of Religion Data Archives (ARDA), this paper estimates the impact of religiosity on growth using two-way fixed-effects Barro regressions for the period 2000 to 2020. In our preferred specification, a ten percentage-point increase in the county religious adherent share reduces the 10-year compound annual growth rate of per-capita GDP by 0.14 percentage points (a 19% reduction relative to the sample mean). A battery of sensitivity checks suggests our results are unlikely to be driven by omitted variable bias: both the Oster (2019) adjustment for selection on unobservables and Kinky Least Squares (KLS) regression estimates indicate that OLS *understates* the negative impact of religion on regional economic growth. We argue that the negative impact of religion on regional economic growth is consistent with previous findings of increased business survival and increased small business activity in a framework where the social capital generated from religious participation results in inefficiently low regional dynamism.

Keywords: economic growth, religion, Barro regression, urban and regional economics, business dynamism, geographic information asymmetries

JEL Codes: Z12, O47, R11

1. INTRODUCTION

For the better part of the twenty-first century, self-reported religiosity has declined in the United States. Figure 1a plots the share of individuals who self-identified as either Catholic or Protestant between 1948 and 2020. Figure 1b plots the share of individuals who report having

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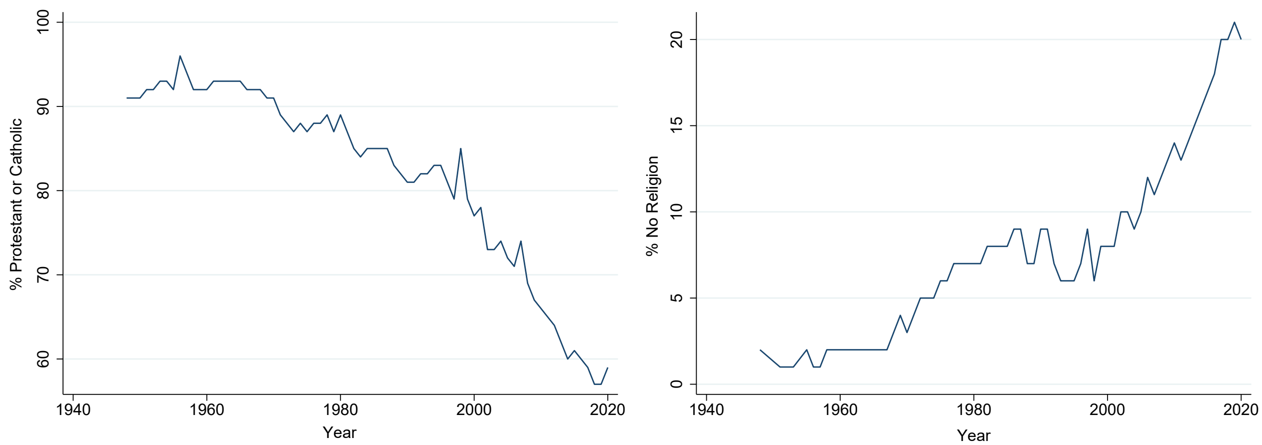
no religion over the same period. From 2000 to 2020, the share of individuals identifying as either Catholic or Protestant declined by nearly 20 percentage points. Over the same period, the share of individuals reporting no religion increased by approximately 15 percentage points.

Figure 1: Religious Affiliation in the United States

(a) % Catholic or Protestant **(b)** % No Religion



Source: Gallup. https://news.gallup.com/poll/1690/religion.aspx.

The long-term decline in religiosity has important implications for the United States' economic growth. As far back as Weber (1905) and Tawney (1926), social scientists have sought to draw a line from religious activity to economic activity. Recent work provides evidence that religious participation is negatively related to long-run growth (Lipford and Tollison, 2003; Barro and McCleary, 2003; Campante and Yanagizawa-Drott, 2015; Herzer and Strulik, 2017), offering cause for optimism regarding the economic impact of the decline in religiosity. However, the negative relationship between religion and economic growth appears to arise primarily in country-level studies that do not address regional heterogeneity in religiosity *within* countries. In the United States, there is significant variation in religiosity and religious participation across regions: 43% of individuals in the Southeastern United States identify as "Very Religious," compared to only 26% of individuals in New England (Norman, 2018). Within countries, religious participation has been positively associated with local business survival (Conroy and Deller, 2020), small business activity (Deller et al., 2018), and local human capital (Becker and Woessmann, 2009; Caicedo, 2019). Thus, whether religiosity negatively impacts *regional* economic growth within countries—and therefore the consequence of the long-term decline in religiosity for regional economic development—remains an open question.

Using new data on county-level Gross Domestic Product (GDP) from the Bureau of Economic Analysis (BEA) and data on county-level religious participation from the Association of Religion Data Archives (ARDA), this paper estimates the impact of local religious participation on economic growth across United States counties between 2000 and 2020. Two-way fixed-effects Barro (1991)-regressions suggest an increase in county-level religious participation—as measured by either religious congregations per 1,000 residents or the share

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of the county population that are religious adherents—reduces the growth rate of per-capita GDP. In our preferred specification, a ten percentage-point increase in the county religious adherent share reduces the 10-year compound annual growth rate of per-capita GDP by 0.14 percentage points (a 19% reduction relative to the sample mean). Although we control for time-invariant county-specific unobserved heterogeneity via the inclusion of county fixed-effects[1], we acknowledge that it is unlikely that this approach can rule out all sources of unobserved regional heterogeneity. Thus, we implement two additional alternative strategies to address the possibility that selection on unobservables might bias our results. First, we implement the Oster (2019) method for bounding coefficient estimates under the assumption of selection on unobservables. Second, we implement the kinky least squares (KLS) approach of Kripfganz and Kiviet (2021). Both approaches suggest our results are unlikely to be driven by omitted variable bias: the Oster (2019) bias-adjustment and KLS estimates indicate that OLS *understates* the negative impact of religion on regional economic growth. Finally, we argue that the negative impact of religion on regional economic growth is consistent with previous findings of increased business survival and increased small business activity in a framework where the social capital generated from religious participation results in inefficiently low regional dynamism (Bunten et al., 2015).

The rest of the paper is organized as follows. Section 2 reviews the existing literature and offers some theoretical considerations. Section 3 discusses the data and estimation strategy. Section 4 presents the results. Section 5 concludes.

2. LITERATURE REVIEW

The findings in this paper relate to the macroeconomic literature on economic growth and religiosity. Barro and McCleary (2003) fill a gap in the literature by investigating the relationship between religious beliefs and economic growth. Using country-level data and an instrumental variables approach, Barro and McCleary (2003) show that increases in church attendance are correlated with a reduction in economic growth. Similarly, Lipford and Tollison (2003) show that religious membership is negatively correlated with per-capita income at the state level in the United States. However, the results in both Barro and McCleary (2003) and Lipford and Tollison (2003) suffer from relatively small sample sizes ($N \approx 150$) and a failure to control for time-invariant geography-specific unobserved heterogeneity. Our paper thus contributes to the macroeconomic literature by extending the growth regression approach to a panel of United States counties. This approach improves on previous studies by (A) allowing for greater regional granularity in the economic impact of religion (e.g., by allowing for differential effects of religion across urban and rural areas), (B) controlling for unobserved time-invariant geography-specific regional heterogeneity via the inclusion of county-fixed effects, and (C) significantly increasing the sample size over previous papers in the macroeconomic literature taking a growth regression approach.

The second contribution of our paper is to the regional economics literature on local entrepreneurship and religious social capital. Malecki (2000) argues that "soft variables"—

[1]Unlike much of the previous literature, which has primarily used a single cross-section of counties, (e.g., see Deller et al., 2018; Conroy and Deller, 2020).

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such as social capital, knowledge, and institutions—may be more important to regional and local economies than other traditional considerations of economic development. With respect to religious activity, Rupasingha and Freshwater (1999) provide evidence that social capital provides a strong motive for religious attendance. Linking religious social capital to entrepreneurship, Deller et al. (2018) examine the impact of religious social capital—the community networks, norms, and trust that open the door for coordination and reciprocity—on the level of local entrepreneurship and small business activity. Deller et al. (2018) demonstrate that local entrepreneurship is positively influenced by a community's religiosity (as measured by the number of congregations per capita). Conroy and Deller (2020) build on the findings of Deller et al. (2018) by investigating the impact of local social capital (inclusive of religious establishments) on the five-year survival rates of new businesses. Conroy and Deller (2020) show that higher rates of social capital are associated with higher rates of business survival. We build on this literature in two ways. First, both Deller et al. (2018) and Conroy and Deller (2020) use only a single cross-section of counties, such that their estimates are potentially biased by unobserved time-invariant county-specific heterogeneity. Intuitively, if both religiosity and growth within a county are correlated with some time-invariant unobserved factor—such as the partisan make-up of local government, the presence (or absence) of natural resources (i.e., oil or natural gas), or the presence (or absence) of institutions of higher education—then failure to control for the unobserved variable will bias the estimated effect of religion on growth[2]. The inclusion of county-fixed effects in our approach alleviates this concern[3]. Second, we argue that the finding of a negative relationship between religiosity and economic growth is consistent with a positive effect of religiosity on business survival in a framework where the social capital generated from religious participation results in inefficiently low regional dynamism. In particular, to the extent that establishment openings and closures have a positive effect on long-run growth via their ability to reduce geographic information asymmetries (Bunten et al., 2015), a reduction in business closures (increased business survival) may reduce economic growth. To the extent that the social capital created by religious participation increases the survival of low-productivity firms, there may be an additional channel through which the positive effect of religion on business survival reduces growth. Thus, our paper contributes to the growing literature emphasizing the dark side of social capital (e.g., see Rodríguez-Pose et al., 2021, who show that increased social capital in areas with declining population is positively associated with support for radical populist politicians).

[2]To offer one concrete example, if proximity to historical portage sites increases both growth (e.g., see Bleakley and Lin, 2012, on portage and path dependence in economic development) and religiosity (via greater exposure to religious proselytization from outside locations as a result of increased trade), then failure to control for the presence of a historical portage site (a time-invariant unobserved variable in the county-level data) will result in a spurious positive relationship between religiosity and growth.

[3]In Section 4 we show that the regression coefficient on religiosity flips from positive to negative when county-fixed effects are included, suggesting that this source of bias may influence previous regional studies using only a single cross-section of counties.

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3. DATA AND ESTIMATION STRATEGY

3.1. Data Description

Data on local religiosity come from the Association of Religion Data Archives' (ARDA) longitudinal series on churches and church membership in the United States (Grammich et al., 2018). The ARDA data contain information on adherence (church membership) and congregation counts for 302 religious groups over the 1980-2010 period. Invitations to participate in the ARDA survey are sent to all Judeo-Christian church bodies listed by the Yearbook of American and Canadian Churches. Denominations that agree to participate in the survey appoint a contact person who—with the help of the denomination office and the yearbook— provides county-level denominational statistics. County-level information is collected in this fashion on a decennial basis. The ARDA data allow us to measure county-level religiosity in two ways: as the share of adherents to any religion in a given county, or as the number of congregations per capita. Although a number of previous studies have used the ARDA data (Lipford and Tollison, 2003; Chetty et al., 2014; Deller et al., 2018), it is not without limitations. First, as Deller et al. (2018) point out, the self-reported nature of the adherence count is subject to measurement error: there may be variation in the definition of adherence and what counts as church membership across denominations. Second, there are instances within the ARDA data where the count of county religious adherents is greater than the county population. These counts result in a county adherence share that is greater than one, which of course, is not possible[4]. Nonetheless, suppressing the counties with adherent shares greater than one (or censoring those observations at one) may exacerbate problems with measurement error to the extent that the *differences* across counties reflect true variation in religiosity, despite seemingly implausible values for the *level* of the adherent share. Thus, noting these limitations, we use both the adherent share and the congregation count as alternative measures of religiosity in what follows. In Section 4, we show that our results are similar across the two alternative measures. Figure 2 maps the adherent share and congregations per 1000 across counties for the year 2010.

To measure economic growth at the local level, we make use of the recently developed series for county-level gross domestic product (GDP) from the Bureau of Economic Analysis (BEA) Regional Economic Accounts. In December 2019, the BEA released the first official series for county gross domestic product, covering the years 2001 to 2018 (Aysheshim et al., 2020). As of 2022, the series has been extended to provide information on county-level GDP up to 2020. The BEA computes county-level GDP as the sum of total compensation of employees, proprietors' income, and other income and costs:

$$\begin{aligned}\text{GDP}_{c,s,t} &= \text{Compensation}_{c,s,t} + \text{Proprietor's Income}_{c,s,t} \\ &\quad + \text{Other Income and Costs}_{s,t} \times \left(\frac{\text{Value Added}_{c,s,t}}{\text{Value Added}_{s,t}}\right), \end{aligned} \tag{1}$$

where state-level other income and costs are apportioned to counties based on the share of county value-added in state value-added[5]. We make use of the BEA estimates of county-

[4]With one exception. In small rural counties where individuals commute to church from other counties, it is theoretically possible for the adherent share to exceed one.

[5]See Aysheshim et al. (2020) for a complete description of the BEA methodology.

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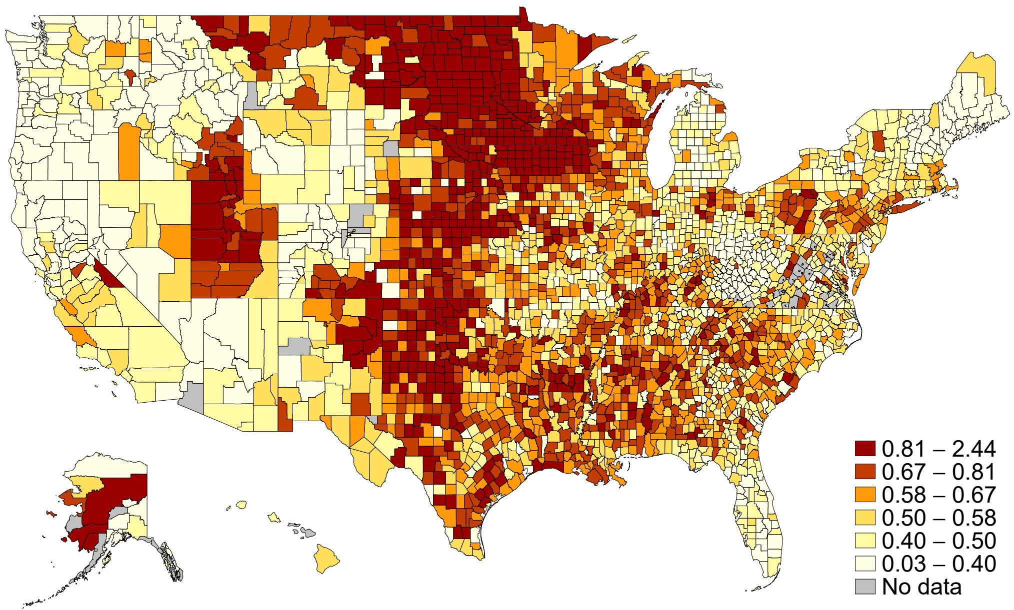
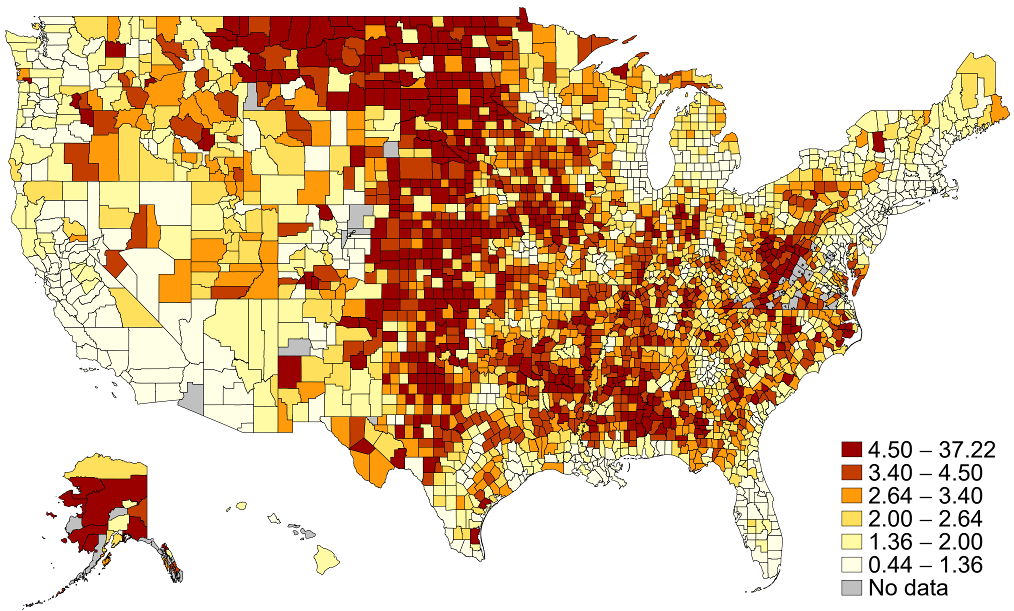
Figure 2: Religiosity Across United States Counties, 2010

(a) Religious Adherent Share



(b) Congregations Per 1,000



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level real GDP per capita (measured in chained 2012 dollars). We use county-level GDP statistics to calculate the compound annual growth rate of real GDP per capita for two decades: 2000-2010 and 2010-2020. We also obtain information on county employment and population from the BEA Regional Economic Accounts.

Data on other county characteristics—including demographic characteristics, education, poverty, and homeownership —are obtained from the Decennial Census and American Community Survey. Data for the year 2000 are obtained from the 2000 Decennial Census (Bureau, 2000). Data for the year 2010 are obtained from the American Community Survey (ACS) five-year estimates (Bureau, 2010). In addition to estimating sample means for the full sample, we also estimate sample means separately by metropolitan status. We classify counties into three separate categories based on the groupings provided by the U.S. Office of Management and Budget (OMB). Counties are included in a metropolitan statistical area (MSA) when they share a high degree of economic and social integration (as measured by commuting ties) within an urbanized area of at least 50,000 population. Counties are classified as micropolitan when they are associated with an urban cluster of at least 10,000 people but less than 50,000 people. Counties are classified as rural if they have a core urban area of less than 10,000 people.

Finally, we obtain information on county-level establishment entry and exit from the Census Business Dynamics Statistics (BDS). BDS provides annual measures of business dynamics (such as job creation and destruction, establishment births and deaths, and firm startups and shutdowns) for the economy overall and aggregated by establishment and firm characteristics. To measure county-level dynamism, we take the ten-year average of county establishment entry and exit rates, where entry and exit rates are, respectively, calculated as the ratio of establishments entering and exiting at time t divided by the average number of establishments in a county in periods t and $t-1$. Our final sample consists of 6,130 county-year observations for 3,065 individual counties spanning the period 2000 to 2020 (with control variables in the years 2000 and 2010, and growth rates for the periods 2000-2010 and 2010-2020). Table 1 presents sample means for the full sample and by metropolitan status.

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Table 1: Sample Means

	(1) Full Sample	(2) Metro	(3) Micro	(4) Rural
% Δ Per-Capita GDP	0.736	0.743	0.555	0.931
	(1.379)	(1.204)	(1.649)	(2.514)
Adherent Share	0.558	0.548	0.590	0.625
	(0.146)	(0.127)	(0.184)	(0.245)
Ln(Congregations per 1,000)	0.0229	-0.149	0.717	1.131
	(0.601)	(0.464)	(0.410)	(0.420)
Ln(Population)	12.79	13.25	10.89	9.851
	(1.625)	(1.327)	(0.589)	(0.687)
Ln(Per-Capita GDP)	16.57	17.10	14.42	13.25
	(1.869)	(1.543)	(0.680)	(0.773)
Homeownership Rate	0.652	0.637	0.711	0.755
	(0.112)	(0.114)	(0.0623)	(0.0519)
Poverty Rate	0.126	0.121	0.143	0.151
	(0.0509)	(0.0483)	(0.0572)	(0.0595)
Non-White Share	0.401	0.439	0.230	0.195
	(0.272)	(0.268)	(0.211)	(0.207)
Dependency Ratio	0.213	0.202	0.254	0.290
	(0.0696)	(0.0623)	(0.0757)	(0.0738)
College Share	0.218	0.234	0.149	0.122
	(0.0866)	(0.0829)	(0.0569)	(0.0482)
Employment-Population Ratio	0.569	0.583	0.516	0.477
	(0.161)	(0.165)	(0.110)	(0.124)
Establishment Entry Rate	10.30	10.63	8.650	8.789
	(2.085)	(1.987)	(1.774)	(1.850)
Establishment Exit Rate	9.784	9.964	8.731	9.135
	(1.450)	(1.389)	(1.313)	(1.538)
N	6,130	2,116	1,360	2,654

Notes: Table presents sample means for the full sample, metropolitan areas, micropolitan areas, and rural areas. Observations are weighted by county population. Standard deviations are reported in parenthesis. Dependency Ratio measures the ratio of persons aged 65+ to those below age 65.

3.2. Estimation Strategy

To estimate the impact of religiosity on long-run growth at the county level, we adopt the following panel fixed-effects Barro (1991) regression framework:

$$\begin{aligned}\%\Delta\text{Per-Capita GDP}_{it} = \beta_0 + \beta_1 \text{Ln(Per-Capita GDP)}_{it} + \beta_2 \text{Religiosity}_{it} \\ + \boldsymbol{X}_{it}^T \boldsymbol{\alpha} + \gamma_i + \delta_t + \epsilon_{it}\end{aligned} \tag{2}$$

where $\%\Delta\text{Per-Capita GDP}_{it}$ is the compound annual growth rate of per-capita GDP in county i between time t and $t+10$, $\text{Ln(Per-Capita GDP)}_{it}$ is the natural log of per-capita

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GDP in county i at time t, Religiosity$_{it}$ is a county-level measure of religiosity—either the county adherent share or the natural log of the number of congregations per 1,000 persons, $\mathbf{X}_{it}$ is a vector of county-level characteristics including population, homeownership, poverty, demographics, education, and employment, γ_i is a county-specific fixed-effect, δ_t is a year-fixed effect, and ϵ_{it} is an idiosyncratic error term.

Although the inclusion of county- and year-fixed effects will absorb significant unobserved heterogeneity, they are unlikely to address all possible sources of omitted variable bias. Thus, in Section 4, we implement several alternative strategies to address endogeneity. First, we augment our estimating equation with the inclusion of state-by-year fixed-effects (thus exploiting identifying variation across counties *within* states). Second, we include population weights to adjust for possible bias arising from "overweighting" rural counties. Third, we implement the Oster (2019) adjustment for selection on unobservables. Fourth, we implement the Kinky Least Squares (KLS) estimator of Kripfganz and Kiviet (2021). A wide array of sensitivity checks suggest our findings are unlikely due to omitted factors: both the Oster (2019) adjustment and KLS approach suggest that our baseline estimates *understate* the magnitude of the negative impact of religion on growth. Finally, in Appendix A we present results from regressions using the growth rate of county per-capita personal income as the dependent variable to alleviate concerns that the results may be driven by measurement error in the BEA county GDP statistics.

4. RESULTS

Table 2 presents results from estimating Equation 2 using the adherent share measure of religiosity. Column (1) presents a simple regression using no controls or fixed effects. Column (2) includes controls (but no fixed-effects). Column (3) adds county-fixed effects (but no controls). Column (4) adds controls and county-fixed effects. Column (5) adds controls, county- and year-fixed effects, Column (6) adds controls, county-, year-, and state-by-year fixed effects, and Column (7) adds all of the above and population weights. The standard errors are clustered at the county level to address the possibility of serial correlation over time within each county, the presence of which would bias the errors downward in the absence of clustering.

The results in Table 2 suggest that county-level religious participation has a statistically significant and economically meaningful negative impact on long-run economic growth. Once county fixed effects are added in Column (3), the positive correlation found in Columns (1) and (2) is eliminated (suggesting that cross-sectional approaches which do not control for unobserved time-invariant county-level heterogeneity are likely to be biased upward). In Columns (4) through (7), the impact of the adherent share is statistically significant and negative. In Columns (5) and (6), the estimated regression coefficient suggests that a ten percentage point increase in the religious adherent share reduces the compound annual growth rate of per-capita GDP by approximately 0.14 percentage points—a 19% reduction relative to the sample mean.

Table 3 presents results from estimating Equation 2 using congregations per 1,000 persons as the measure of religiosity. The results in Table 3 confirm the negative relationship found in Table 2. As before, the naive regression without controls or fixed effects presented in Column

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Table 2: Estimation Results: Adherent Share

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Adherent Share	2.153***	1.428***	0.921	-2.408***	-1.429**	-1.474**	-1.002**
	(0.160)	(0.198)	(0.686)	(0.573)	(0.555)	(0.609)	(0.491)
N	6,130	6,130	6,130	6,130	6,130	6,130	6,130
R^2	0.0418	0.100	0.536	0.702	0.711	0.728	0.761
Controls	N	Y	N	Y	Y	Y	Y
County FE	N	N	Y	Y	Y	Y	Y
Year FE	N	N	N	N	Y	Y	Y
State × Year FE	N	N	N	N	N	Y	Y
Population Weights	N	N	N	N	N	N	Y

Notes: Standard errors are reported in parentheses, clustered at the county level. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively. The dependent variable is the compound annual growth rate of GDP per capita. Control variables include (log) population, (log) per-capita GDP, homeownership, the poverty rate, the share of county residents that are non-white, the dependency ratio (ratio of persons aged 65+ to persons below age 65), the share of the population with at least a bachelor's degree, and the employment-population ratio.

(1) suggests a positive relationship. However, once county-fixed effects are added in Column (3), the effect of religiosity on per-capita GDP growth becomes negative and statistically significant. In Column (6), the estimated regression coefficient suggests that a 10% increase in congregations per-1,000 decreases the compound annual growth rate of per-capita GDP by approximately 0.058 percentage points (a 7.8% reduction relative to the sample mean). Importantly, the similarity in results across Tables 2 and 3 suggest the negative relationship in Table 2 is not primarily driven by measurement error in the adherent share variable.

Table 3: Estimation Results: Congregations per 1,000

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ln(Congregations per 1,000)	0.661***	0.234**	-0.582***	-0.201	-0.480**	-0.583***	-0.541**
	(0.0517)	(0.104)	(0.210)	(0.196)	(0.200)	(0.214)	(0.212)
N	6,130	6,130	6,130	6,130	6,130	6,130	6130
R^2	0.0271	0.0877	0.537	0.699	0.711	0.728	0.762
Controls	N	Y	N	Y	Y	Y	Y
County FE	N	N	Y	Y	Y	Y	Y
Year FE	N	N	N	N	Y	Y	Y
State × Year FE	N	N	N	N	N	Y	Y
Population Weights	N	N	N	N	N	N	Y

Notes: Standard errors are reported in parentheses, clustered at the county level. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively. The dependent variable is the compound annual growth rate of GDP per capita. Control variables include (log) population, (log) per-capita GDP, homeownership, the poverty rate, the share of county residents that are non-white, the dependency ratio (ratio of persons aged 65+ to persons below age 65), the share of the population with at least a bachelor's degree, and the employment-population ratio.

Table 4 expands our results for both the adherent share and congregations per 1,000 mea-

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sures across counties by metropolitan status. Column (1) presents results for metropolitan areas, Column (2) presents results for micropolitan areas, and Column (3) presents results for rural areas. The results presented in Table 4 suggest the negative impact of religion on economic growth is more significant in rural and micropolitan counties. For both the adherent share and congregations per 1,000 measure of religiosity, religion appears to have no statistically significant effect on growth in metropolitan areas. In contrast, the negative effect of the adherent share on growth in rural and metropolitan areas is up to three times are large as the coefficient estimated in the full sample. The increased effect of religiosity on growth in micropolitan and rural counties is consistent with a social capital channel. To the extent that the primary mechanism through which religion impacts growth is via increasing social capital through religious networks, the power of these networks is likely to be larger in areas with fewer people. If religious social capital reduces dynamism by prolonging the survival of low-productivity establishments (thus reducing the establishment exit rate) in micropolitan and rural areas, the negative impact of religion on growth should be larger in these areas. In Section 4.1.3, we provide some direct evidence for this mechanism linking religion to growth.

Table 4: Estimation Results by Metropolitan Status

	(1) Metro	(2) Micro	(3) Rural
Adherent Share	0.336	-3.049**	-1.771**
	(0.677)	(1.503)	(0.853)
N	2,116	1,360	2,654
R^2	0.774	0.707	0.735
Controls	Y	Y	Y
County FE	Y	Y	Y
Year FE	Y	Y	Y
State × Year FE	Y	Y	Y
Ln(Congregations per 1,000)	-0.147	-0.758	-0.646*
	(0.293)	(0.479)	(0.382)
N	2,116	1,360	2,654
R^2	0.774	0.706	0.735
Controls	Y	Y	Y
County FE	Y	Y	Y
Year FE	Y	Y	Y
State × Year FE	Y	Y	Y

Notes: Standard errors are reported in parentheses, clustered at the county level. The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively. The dependent variable is the compound annual growth rate of GDP per capita. Control variables include (log) population, (log) per-capita GDP, homeownership, the poverty rate, the share of county residents that are non-white, the dependency ratio (ratio of persons aged 65+ to persons below age 65), the share of the population with at least a bachelor's degree, and the employment-population ratio.

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4.1. Sensitivity Analysis

4.1.1. Oster(2019) Bias Adjustment

An important robustness check concerns the degree to which selection on unobservables influences our coefficient estimates. Oster (2019) shows that information about the degree of selection on observables can be used to bound regression estimates in the presence of selection on unobservables. Under the assumption of equal selection—that the degree of selection on unobservables equals the degree of selection on observables—the bias-adjusted regression coefficient is given by:

$$\beta_{bias\_adjusted} = \beta_{long} - (\beta_{short} - \beta_{long})\frac{R^2_{max} - R^2_{long}}{R^2_{long} - R^2_{short}} \tag{3}$$

Where β_{long} and R^2_{long} are obtained from the most saturated regression specification using all our control variables, β_{short} and R^2_{short} are obtained from a regression including only the religiosity term as an independent variable, and R^2_{max} is the maximum R^2. Oster (2019) provides $R^2_{max} = 1.3 \times R^2_{long}$ as a conservative candidate for R^2_{max}, in that only 45% of non-randomized results surveyed by Oster (2019) survive this threshold.

Table 5: Oster (2019) Bias Adjusted Coefficients

	Adherent Share (OLS) Tab 2, Col. 6	Congregations (OLS) Tab 3, Col. 6	Adherent Share (Adjusted)	Congregations (Adjusted)
Estimate	-1.002	-0.541	-2.00	-0.92

The results in Table 5 indicate that selection on unobservables is not a primary driver of our results[6]. In fact, the results presented in Table 5 suggest that OLS *understates* the negative impact of religiosity on growth. For both measures of religiosity, the Oster (2019) bias-adjusted coefficients are negative and nearly double in magnitude relative to the OLS estimates.

4.1.2. Kinky Least Squares

As an alternative sensitivity check, we implement the Kinky Least Squares (KLS) estimator developed by Kripfganz and Kiviet (2021). In a setting where the OLS orthogonality assumption ($E[x_1\epsilon] = 0$) is violated for an endogenous regressor x_1, Kripfganz and Kiviet (2021) suggest an alternative instrument-free approach to identification that exploits a non-orthogonality condition: $E[x_1\epsilon] = \rho\sigma_1\sigma_\epsilon$, where ρ is the correlation between the regressor of interest and ϵ (i.e., the degree of endogeneity), σ_1 is the standard deviation of x_1, and σ_ϵ is the standard deviation of ϵ. σ_1 is obtainable directly from the data. Further, defining $\boldsymbol{x_2}$ as a column vector of exogenous regressors[7], Kripfganz and Kiviet (2021) show that σ_ϵ is estimable as the square-root of:

$$\sigma^2_\epsilon(\rho) = \sigma^2_{\epsilon,OLS}(1 - \rho^2\frac{\sigma^2_1}{\sigma^2_1 - \boldsymbol{\sigma}'_{12}\boldsymbol{\Sigma}_{\mathbf{2}}^{\mathbf{-1}}\boldsymbol{\sigma}_{12}}),$$

[6] We here compare the adjusted estimates to our specification without population weights. However, similar results are obtained if we use the estimates from Column 7 from Tables 2 and 3.

[7] Using boldface type to denote vectors.

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where $\sigma^2_{\epsilon,OLS} = N^{-1}\sum_{i=1}^{N} \epsilon^2_{i\,OLS}$ is the variance estimate from the OLS residuals, and $\boldsymbol{\sigma}_{12} = N^{-1}\sum_{i=1}^{N} x_{1i}\boldsymbol{x}_{2i}$ and $\boldsymbol{\Sigma_2} = N^{-1}\sum_{i=1}^{N} \boldsymbol{x}_{2i}\boldsymbol{x}'_{2i}$ are covariance estimates. Given σ_1 and σ_ϵ, and assuming the value of ρ is known, the KLS estimate of β_1 (the regression coefficient on the endogenous regressor x_1) is given by:

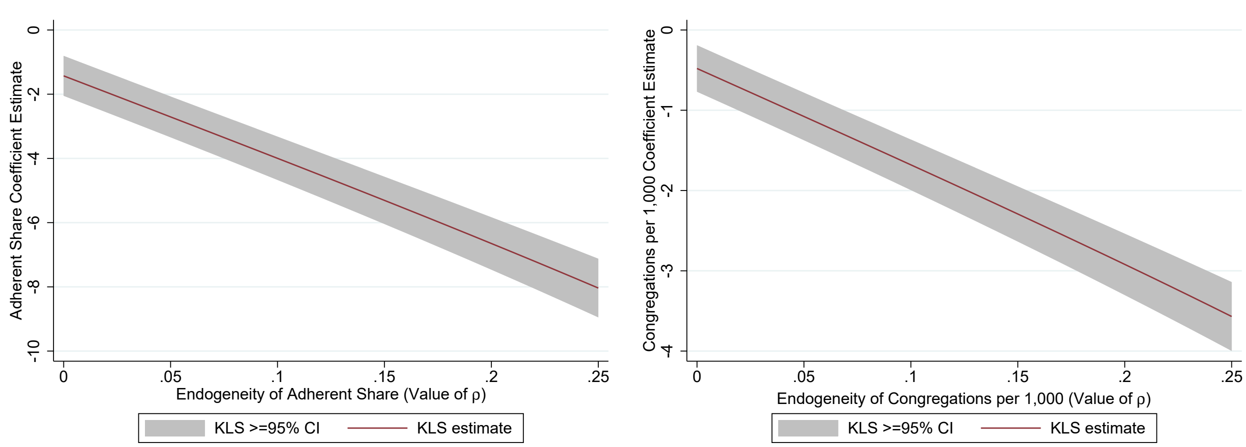
$$\beta_{1,KLS}(\rho) = \beta_{1,OLS} - \frac{\rho\sigma_1\sigma_\epsilon(\rho)}{\sigma_1^2 - \boldsymbol{\sigma}'_{12}\boldsymbol{\Sigma_2^{-1}}\boldsymbol{\sigma}_{12}} \tag{4}$$

However, ρ is, in general, unknown. Thus, Kripfganz and Kiviet (2021) suggest that, rather than tying the KLS estimate to a specific value of $\rho = r$, one might assume that the true value of ρ is constrained by $\rho \in [r_l, r_u]$. In this case, one can bound the KLS regression coefficients $\beta(r)$ within a range for values $r \in [r_l, r_u]$. Importantly, the Oster (2019) test for selection on unobservables gives us information on the possible sign of ρ, in that the results presented in Table 5 suggest that the OLS coefficients are biased upward (in other words, that $\rho > 0$). Thus, we restrict the KLS estimates to those obtained with positive values of ρ. In particular, we assume $\rho \in [0, 0.25]$[8].

Figures 3a and 3b present KLS estimates for the adherent share and congregations per 1,000 for the interval $\rho \in [0, 0.25]$. The displayed confidence intervals are constructed using the KLS variance-covariance estimator provided by Kripfganz and Kiviet (2021). The results in Figures 3a and 3b indicate that—for positive values of ρ—the effect of religion on growth is unambiguously negative for both measures of religiosity. In the case of the adherent share, assuming even a modest correlation between the adherent share and ϵ, $\rho = 0.1$, and adjusting the regression estimate appropriately produces a regression coefficient of approximately -4, which is significantly larger in magnitude than the estimates obtained via OLS. Taken together, both the Oster (2019) bias adjustment and the KLS estimates suggest that the OLS estimates understate rather than overstate the negative effect of religion on growth in U.S. counties.

Figure 3: KLS Estimates of the Effect of Religiosity on Growth

(a) Adherent Share **(b)** Congregations



[8]Larger values of ρ produce increasingly negative coefficient estimates.

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4.1.3. Religion and Business Dynamism

Table 6 presents results from regressions using either county-level establishment entry or exit rates from the Census Business Dynamics Statistics (BDS) as the dependent variable. Columns (1) and (2) use the county religious adherent share as the measure of religiosity. Columns (3) and (4) use the natural log of congregations per 1,000 as the measure of religiosity.

The results in Table 6 suggest that an increase in county-level religiosity reduces local dynamism. In particular, an increase in the county-level religious adherent share is shown to have a statistically significant negative impact on both establishment entry and establishment exit. In contrast, an increase in congregations per capita appears to have no statistically significant impact on either establishment entry or exit (although the sign of the estimated coefficient in the exit rate regression is negative). Taken together, the results in Table 6 suggest that a reduction in regional dynamism may explain at least part of the negative effect of religion on local GDP growth. This proposed mechanism is consistent with prior work establishing a positive effect of social capital (inclusive of religion) on local business survival (Conroy and Deller, 2020)[9]. If religious social networks increase the survival of low-productivity firms, this is likely to reduce local growth through two channels: directly, by lowering the rate of productivity growth, and indirectly, by amplifying geographic information asymmetries that discourage entrepreneurs from making new investments, reducing future employment growth (Bunten et al., 2015). Thus, although the findings in Table 6 do not rule out other possible mechanisms linking religion and local economic growth, they provide suggestive evidence of at least one important channel linking religion, local social capital, business dynamism, and regional growth[10].

[9]To the extent that our results in this section contrast with Deller et al. (2018)—who find a positive effect of religion on local proprietorship—the difference between our findings and theirs are driven by (A) the inclusion of county-fixed effects, and (B) the difference between our measure of business dynamism—a flow measure of activity via establishment entry and exit—and their index of entrepreneurial activity, which primarily uses stock measures of proprietorship. In particular, the two components most correlated with the index constructed by Deller et al. (2018) are proprietorship income per capita and the *share* of wage and salary employment from proprietorships. Neither of these variables needs to be positively related to future growth (or establishment entry). To take one example, a declining rural county may have both a high (relative) proprietorship income per capita and a high share of employment from proprietorships simply in virtue of the fact that there are no outside employers in the county.

[10]We cannot rule out that at least part of the negative impact of religion on economic growth may be explained by a trade-off between religious activity and market activity (e.g., through fewer work hours). A number of papers show that the repeal of so-called "blue laws"—which prohibit retail activity on Sunday—increases market activity, suggesting religious behavior and market behavior may be substituted (Gruber and Hungerman, 2008; Lovenheim and Steefel, 2011). Alternatively, the mechanism observed here may reflect recent changes in the structure of religious institutions in the United States, rather than some inherent feature of religion. Historian Kristin Du Mez argues that American Christianity has increasingly become "a cultural and political movement rather than a community chiefly defined by its theology" (Du Mez, 2020, p.298). Gorski and Perry (2022) present evidence of this effect in their sociological work on the phenomena of Christian Nationalism. Assuming Du Mez (2020) and Gorski and Perry (2022) are correct, the negative effect of religious social capital observed here may be unique to the time period under observation—thus explaining the divergence between our findings and those of Becker and Woessmann (2009) and Caicedo (2019), who find positive effects of historical religious activity (the Reformation and Jesuit Missions in Latin America, respectively) on human capital and economic growth in earlier time

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Table 6: Estimate Results: Dynamism

	(1) Entry Rate	(2) Exit Rate	(3) Entry Rate	(4) Exit Rate
Adherence Share	-0.528**	-0.723***		
	(0.266)	(0.259)		
Ln(Congregations per 1,000)			0.114	-0.0231
			(0.122)	(0.109)
N	6,130	6,130	6,130	6,130
R^2	0.91	0.89	0.91	0.89
Controls	Y	Y	Y	Y
County FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y

Notes: Standard errors are reported in parentheses, clustered at the county level.The 1%, 5%, and 10% levels of significance are given as ***, **, and *, respectively. Dependent variables are county establishment entry and exit rates. Control variables include (log) population, (log) per-capita GDP, homeownership, the poverty rate, the share of county residents that are non-white, the dependency ratio (ratio of persons aged 65+ to persons below age 65), the share of the population with at least a bachelor's degree, and the employment-population ratio.

5. CONCLUSION

Religion matters for local economic growth. In this paper, we use county-level data on GDP from the Bureau of Economic Analysis Regional Economic Accounts and data on county-level religious participation from the Association of Religion Data Archives to investigate the impact of religiosity on local economic growth. Panel fixed-effect Barro regressions suggest an increase in either the share of county religious adherents or the number of congregations per 1,000 residents reduces the rate of local GDP growth. A ten percentage-point increase in the county religious adherent share reduces the ten-year compound annual growth rate of per-capita GDP by 0.14 percentage points (a 19% reduction relative to the sample mean). Alternatively, a 10% increase in congregations per 1,000 residents decreases the compound annual growth rate of per-capita GDP by approximately 0.058 percentage points (a 7.8% reduction, relative to the sample mean). A battery of sensitivity checks suggests our results are unlikely to be driven by omitted variable bias: both the Oster (2019) adjustment for selection on unobservables and Kinky Least Squares (KLS) regression estimates indicate that OLS *understates* the negative impact of religion on regional economic growth. The observed negative effect of religion on local economic growth is consistent with the negative effect of religion on growth previously observed in cross-country macroeconomic studies (Barro and McCleary, 2003).

Our results shed light on the implications of declining religiosity (or "secularization") across regions within the United States. In particular, our findings add to the growing literature emphasizing the dark side of social capital (Villalonga-Olives and Kawachi, 2017; Rodríguez-Pose et al., 2021). Insofar as religious social capital increases the survival of low-

periods.

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productivity firms—reducing productivity growth and amplifying geographic information asymmetries—it is likely to have a negative impact on local growth. To the extent that the secular decline in religiosity displayed in Figure 1a continues, it is thus likely to have positive economic effects in areas with particularly high concentrations of religious social capital, including rural and micropolitan counties where the observed negative effect of religion on growth is greatest.

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APPENDIX

A. ALTERNATIVE MEASURE OF ECONOMIC GROWTH

Table A1 presents results from regressions using the growth rate of county real per-capita personal income as the dependent variable. County personal income statistics are obtained from the Bureau of Economic Analysis (BEA) Regional Economic Accounts. The results in Table A1 support the main findings of the paper. Once controls and fixed effects are included in the regressions, the effect of religion on county-level personal income growth becomes negative (although the effect is statistically insignificant in some specifications).

Table A1: Estimation Results - Real Per-Capita Personal Income Growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Adherent Share	0.494***	0.153*	-1.370***	-0.968***	-0.400	-0.495	-0.208
	(0.0635)	(0.0824)	(0.361)	(0.320)	(0.315)	(0.326)	(0.576)
N	6,130	6,130	6,130	6,130	6,130	6130	6130
R^2	0.0102	0.117	0.325	0.598	0.613	0.673	0.820
Controls	N	Y	N	Y	Y	Y	Y
County FE	N	N	Y	Y	Y	Y	Y
Year FE	N	N	N	N	Y	Y	Y
State × Year FE	N	N	N	N	N	Y	Y
Population Weights	N	N	N	N	N	N	Y
Ln(Congregations per 1,000)	0.340***	-0.0936**	1.217***	-0.0402	-0.196*	-0.303**	0.220
	(0.0209)	(0.0390)	(0.127)	(0.118)	(0.119)	(0.123)	(0.181)
N	6,130	6,130	6,130	6,130	6,130	6,130	6,130
R^2	0.0333	0.117	0.339	0.596	0.613	0.674	0.820
Controls	N	Y	N	Y	Y	Y	Y
County FE	N	N	Y	Y	Y	Y	Y
Year FE	N	N	N	N	Y	Y	Y
State × Year FE	N	N	N	N	N	Y	Y
Population Weights	N	N	N	N	N	N	Y

Notes: Standard errors in parentheses, clustered at the county level. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Dependent variables are the compound annual growth rate of real per-capita personal income. Control variables include (log) population, (log) per-capita GDP, homeownership, the poverty rate, the share of county residents that are non-white, the dependency ratio (ratio of persons aged 65+ to persons below age 65), the share of the population with at least a bachelor's degree, and the employment-population ratio.

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