The Decline of Religiosity in America: Evidence from a Structural Model of Endogenous Church Differentiation

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Abstract

We develop a model of endogenous product differentiation in religious markets to investigate the factors driving religious differentiation and how they interact to explain the recent fall in the demand for religion in the US. Structural estimates reveal that people tend to choose churches that align with their personal values and behaviors and that churches positioning in these dimensions are primarily driven by clergy preferences (supply) rather than societal attitudes (demand). Combining these results, our counterfactuals show that the growing shift towards more liberal values in society is important to explain the increase in the proportion of nones in the US.

Keywords: Endogenous Product Differentiation, Structural Model, Religion.

JEL Codes: C57, L13, Z12.

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1 Introduction

This paper combines insights from empirical works on endogenous product differentiation (Fan, 2013; Gentzkow and Shapiro, 2010; Gentzkow et al., 2014; Crawford et al., 2015) with elements of a theoretical literature on church competition (Barros and Garoupa, 2002; McBride, 2008, 2019) to develop and estimate a structural model of endogenous church differentiation in religious markets. The model allows us to perform a series of counterfactual exercises to study the factors that drive church differentiation in the United States and how they interact to explain the steep rise of the religiously unaffiliated.

In the last decades, the US religion market has experienced a remarkable decline in overall religiosity, with a growing share of Americans reporting as not being members of any church (or "nones") and, to a lesser extent, not attending services nor believing in God (Chaves, 2011). A prevalent thesis put forward by Putnam et al. (2012), among other scholars, attributes this trend to the mismatch between organized religions' traditional doctrines and individuals' evolving values and preferences, the latter becoming increasingly liberal, in contrast to the former, which have been slow to catch up with the new times. As such, understanding how religious institutions characterize themselves in response to shifts in societal values and behaviors and how individuals make decisions about religious affiliations depending on churches' characteristics is essential to comprehend the current state of religiosity in the US.

In line with the spatial models of religious competition – see McBride (2019) for a recent summary of this literature – church differentiation and competition are assumed to occur in a single dimension, commonly labeled as *strictness*, which summarizes the degree to which a church adheres to (and enforces) traditional values. Following the canonical conceptualizations of Kelly (1972) and Iannaccone (1994), on the demand side we construct a measure of individuals' preferences for strictness. We directly incorporate the distance between individual preferences for strictness and churches' strictness levels into a discrete choice demand model (Berry et al., 1995, 2004; Nevo, 2001) for churches. Alternative measures of individual

preferences for strictness are obtained from two different datasets that contain microdata on individuals' religious choices and views on various topics: the General Social Survey (GSS) and the Cooperative Congressional Election Study (CCES), which span from 1972 to 2018 and from 2006 to 2020, respectively. Our measures are based on the first principal component of GSS and CCES variables that capture personal attitudes toward *sex before marriage*, *homosexual relations*, *gay marriage*, *abortion*, and self-reported levels of *political conservatism*.[1]

Under plausible conditions, we show that the structure of the demand model allows us to identify both the strictness of each denomination – which, contrary to individuals' strictness, cannot be computed from GSS and CCES data – and the parameter that gives the effects of the distance between individuals and churches' strictness on the demand for each denomination.

On the supply side, churches are allowed to deviate from profit (membership) maximization: when choosing strictness levels churches' leadership may take into account not only repercussions of this choice on the number of members but also the church's "prophetic orientation".[2] This structure is very close to the one adopted by Gentzkow and Shapiro (2010) and Gentzkow et al. (2014) in their empirical studies of differentiation in the US daily newspaper markets. Our strategy to determine whether churches indeed deviate from profit maximization follows these papers and, more broadly, other empirical papers of markets with differentiated products where players behavior is itself an object of investigation – see, for instance, Nevo (2001) and Miller and Weinberg (2017). In the first stage we estimate the discrete choice demand model; in the second, we numerically solve the supply model for strictness choices that are consistent with a Bertrand-Nash equilibrium where churches strategically choose strictness to maximize profits and compare profit-maximizing strictness

[1]We normalize the resulting principal component measure to range from 0 (which we will qualify as less strict or more liberal) to 1 (equivalently, more strict or more conservative).

[2]This simple formulation is in line with several studies suggesting that the stance of " (...) religious elites blend a concern for rank-and-file opinion with a prophetic orientation" (Wald and Calhoun-Brown, 2014). In a religious context, a "prophetic orientation" usually refers to a belief system or worldview that emphasizes the role of prophetic figures and sacred texts in guiding human behavior.

choices with actual choices.

The estimates of church strictness we obtain from the model shows significant dispersion, with Evangelical churches and Mormons on the more conservative end of the strictness line, Catholics and Mainline/Black Protestant denominations in the middle, and Jews on the more liberal end. This finding is also in line with evidence reported in other surveys; see Hersh and Malina (2017) and Wald and Calhoun-Brown (2014). We validate our church strictness estimates by comparing them to clergy self-reported strictness levels obtained directly from the Cooperative Clergy Study Project (CCSP) – a survey carried out in the US in 2001 (only) with more than 9000 clergies of different denominations. The estimates of church types obtained from our model are highly correlated (coefficient of correlation $\rho = 0.9$) with the CCSP (observed) measure, which suggests that our approach to inferring churches' positions produces meaningful estimates.

This validation exercise also corroborates arguments in favor of the exogeneity of individuals' strictness to churches doctrines, which is a key assumption to the empirical identification of church types and of our counterfactuals. This assumption is essentially the same as that used in Gentzkow and Shapiro (2010), which studies the determinants of media slant: "*(...) Our demand estimates, therefore, rely (...) on the assumption that most variation in* [individuals] *ideology is exogenous with respect to newspaper content.*"[3] Indeed, in the context of this validation exercise, as model-based estimates of church types are sensitive to this assumption – and clergy self-reported views, by construction, are not – the proximity between estimates and data indicates that the exogeneity of individual preferences for strictness is a reasonable premise.[4]

Our main findings reveal that the difference between the strictness of individuals and churches is crucial in explaining the religious choices of the US population, with individuals typically selecting churches that are closely aligned with their own preferences for strictness.

[3]Gentzkow and Shapiro (2010), page 50.

[4]This result is in line with the evidence in Margolis (2018), who argues that personal political views are forged long before religious identities and with various studies showing that Americans overwhelmingly think that religious institutions should stay out of politics (Pew, 2019; Putnam et al., 2012).

Importantly, on the supply side, we find that churches' positions often deviate from profit or membership maximization; in particular, the preferences of clergy members appear to be more influential in explaining religious diversity in the US than societal preferences. These findings hold independent of the dataset, definition of the religious group, variations in the measure of strictness, and different specifications of the model.

In a series of counterfactual analyses we explore these results to explain the massive expansion in the share of the religiously unaffiliated, or religious "nones", in the last decades in the US. First, we show that the secular shift of personal attitudes toward less strict values in recent years accounts for roughly 50% of the increase in the share of nones between 1974 and 2018. Second, we document that the rise of nones would have occurred at a much slower pace if churches' types were only chosen to satisfy the preferences of the demand – and hence maximize membership – irrespective of clergy preferences. All in all, our analysis corroborate theories attributing the recent rise of nones to the growing misalignment between the organized religions' doctrines and individuals' preferences.

We also document that while the growing misalignment between individuals' and churches' positions was a key driver behind the rise of nones, this factor alone is far from enough to explain the continuous fall of Mainline Protestants' share in the US religious market. Instead, the decline of Mainline Protestants seems more related to a decrease in the interest of the US population for that religious family, independently of type differences. Last, our estimates indicate that the utility value of the outside (secular) option has slightly trended upwards over time, consistent with the literature on the importance of secular competition to religious outcomes. However, coupled with the evidence discussed above, this finding suggests that the rise of the nones is mainly driven by changes in preferences for specific religions and less strict values by the US population rather than changes in the secular sector.

Our paper builds on other empirical models of endogenous product differentiation. This literature studies adjustments of product characteristics (Fan, 2013; Crawford et al., 2015; Gentzkow and Shapiro, 2010; Gentzkow et al., 2014) and firms product portfolios (Wollmann,

2018; Draganska et al., 2009) in response to changes in consumers preferences and market structure. Our paper is particularly close to Gentzkow and Shapiro (2010), but instead of examining media ideological biases, we analyze religious strictness in the US religious market. Comparing the results in both markets, we see that a key distinction between the drivers of media slant and the drivers of religions strictness is that the former is explained by demand while the latter by supply.

We add to the literature on the economics of religion by providing the first empirical study of theoretical models widely used by this literature to study religious competition and differentiation. Prior works by Barros and Garoupa (2002), McBride (2008), Montgomery (2003) and Iyer et al. (2014) have laid the foundation for our research. Specifically, our study addresses the criticism that spatial models fail to capture the dynamics that drives strictness of religious groups. To overcome this limitation, we allow religious groups to adjust their types over time in response to both external factors such as competition and demand pressures, as well as internal factors such as churches prophetic orientation. Our findings shed light on the importance of considering both demand and supply-side preferences in explaining religious differentiation.

Finally, our paper also offers new insights to the broad literature on the determinants of religion (see Iyer (2016) for a survey). It informs both the literature on demand-side (Hungerman and Ottoni-Wilhelm, 2021; Auriol et al., 2020; Bentzen, 2019; Ager and Ciccone, 2018; Chen, 2010; McCleary and Barro, 2006; Glaeser and Sacerdote, 2008; Becker and Woessmann, 2013; Buser, 2015; Costa et al., 2019; Hungerman, 2014) and supply-side (Corbi and Komtasu, 2019; McCleary, 2017; Iannaccone et al., 1997; Finke and Iannaccone, 1993; Barro and McCleary, 2005; Olson, 2011) drivers of religiosity. In particular, our estimates unveil the importance of changes in preferences for specific religions and less strict values to explaining major trends in the American religious landscape (Putnam et al., 2012; Chaves, 2011).

This paper is organized as follows. Section 2 describes the data, the measure of strictness

and recent trends in the US religious market. Section 3 presents the theoretical model. Section 4 discusses the estimation of the model and shows its estimates. Section 5 brings the counterfactual results. The last section concludes the paper. The appendix has additional tables and figures and the results of robustness checks of our main findings.

2 Data

This section describes the primary datasets used in this paper and the strictness measure we use throughout our analysis. Next, we present key trends observed in the US religion market during the last 50 years and discuss theories developed to explain these trends. Ultimately, the economic model developed and estimated in the following sections formalizes these theories within a supply and demand framework and evaluates their capacity to explain recent developments in the US religious market.

In order to estimate our model and perform our counterfactual studies, we need our data sources to be (i) large in size, (ii) with detailed information on religious affiliation and individuals opinions on different moral values and sexual norms, (iii) spanning across many years, and (iii) nationally representative. We take advantage of two data-sets that together fulfill these criteria: the Cooperative Congressional Election Study (CCES) and the General Social Survey (GSS).

The General Social Survey (GSS), conducted by the National Opinion Research Center, is one of the most extensively used survey instruments that contain questions concerning respondents' denominational affiliation and religious beliefs and practices, as well as political views and socio-demographic characteristics. It is a long-running (1972 to 2018), roughly biennial nationally representative survey with around 2000 observations per wave.

The Cooperative Congressional Election Study (CCES) is a large-scale internet-based survey comprising national stratified samples ranging from 35,000 to 55,000 respondents per year. Specifically, we use the Cumulative CCES Common Content dataset (Kuriwaki, 2018),

which combines all survey waves between 2006 and 2018 for a sample of more than 450,000 respondents, which is representative even at the US county level. It has been conducted online in November of every year since 2005 and asks a wide range of questions – from political ideology and voting behavior to preferences for redistribution and views on the role of government, to a large number of demographic and socioeconomic questions such as nativity, age, gender, marital status, income, and education – and has been used extensively in the political science, sociology, and political economy literatures. (Ansolabehere and Rivers, 2013; Bazzi et al., 2020; Acharya and Sen, 2016; Giuliano and Tabellini, 2020).

In both datasets, respondents report to which specific religious congregations they belong. It is crucial to our analysis that we recode these disaggregated religious denominations, as initially reported in the surveys, into historically meaningful affiliation categories to avoid conflating religious, economic, social, and political ideas into one monolithic measure. For the GSS, we follow the *reltrad* classificatory system introduced by Steensland et al. (2000), which assigns self-reported Protestants to three distinct groups – namely Mainline, Evangelical, and Black Protestant traditions – and has become the standard way to code GSS and other surveys affiliation data.[5] For the CCES, we take advantage of a larger number of observations and employ a finer classification system by grouping individuals according to both religious family (e.g., Lutheran, Baptist) and tradition (e.g., Evangelical, Mainline) whenever feasible,[6] following the congregation-level classification by Pew (2015). For instance, members of the Southern Baptist Convention are classified as *Evangelical Baptists*, those who belong to the American Baptist Churches USA are assigned to *Mainline Baptists*, and members of the National Baptist Convention are included as *Black Protestants*.

Strictness measure. Economists have traditionally used models of spatial competition to examine the nature of competition for adherents among religious groups. Product differentiation and competition are assumed to occur in a single dimension, commonly labeled as

[5]We also incorporate the corrections suggested by Stetzer and Burge (2016).

[6]In particular, family-tradition groups that have more than 1,000 observations are classified as a separate category, while smaller ones are pooled into broader categories (e.g., Other Evangelical, Other Mainline).

strictness (see McBride (2019) for a critical review of this class of models). In his seminal 1972 book, theologian Dean Kelley argues that traits such as absolutism, conformity, and fanaticism characterize strict churches (Kelly, 1972). Iannaccone (1994) narrows the definition of strictness to a single attribute: the degree to which a group limits, thereby increasing the cost of nongroup activities. But how do we measure strictness?

While we cannot measure all its dimensions, for the purpose of our formal analysis, we measure strictness by combining information from three questions from the GSS. Flynn (2010) explains that members of strict churches might be expected to shun the consumption of alcohol and engage in premarital sex. We capture this dimension by defining *Sex* and *Homosex* as indicators of whether respondents consider "sex before marriage" and "homosexual relations" always wrong. Iannaccone (1994) argues that strict churches encourage living a more moral and restrictive lifestyle, and their members may follow special diets or conservative behavioral codes. We use *Conservatism*, which is a self-reported indicator of the levels of conservatism of each individual, recoded on a scale from 0 (less conservative) to 1 (more conservative). Finally, our measure of strictness is the first principal component extracted from these three variables using polychoric correlations to account for the data discreteness as discussed in Kolenikov et al. (2004) and normalized to the interval $[0, 1]$.[7] When using CCES data, instead of *Sex* and *Homosex* our strictness measure uses *Gay* and *Abortion* which are indicators of whether respondents oppose gay marriage and support abortion, respectively.

Table 1 shows sample means of characteristics of members of the religious groups in each dataset. According to GSS data reported in Panel A, the Jewish are wealthier, older, and more educated than other groups, on average. Among Christians, Mainline Protestants are richer, older, and more educated, followed closely by Catholics, then Evangelicals and Black Protestants. All traditions are overwhelmingly white, except for Black Protestants.

Regarding conservatism, Table 1 shows that Evangelicals are the most conservative, with

[7]We used the standard min-max normalization – i.e. for any $x \in [a, b]$ and $a, b \in \mathbb{R}$ and $b > a$, $\tilde{x} = \frac{x-a}{b-a}$ is the normalized value of x in the $[0, 1]$ interval.

Table 1: Summary Statistics

	Panel A: General Social Survey 1972-2018									
	Income	Education	Age	White	Black	Conservatism	Sex	Homosex	Strictness	Obs
Evangelical	28,305	12.31	47.11	0.89	0.07	0.58	0.46	0.81	0.60	15,790
Mainline	36,032	13.28	50.88	0.95	0.03	0.53	0.23	0.63	0.46	12,503
Black Protestant	19,426	11.61	45.36	0.04	0.96	0.48	0.30	0.79	0.52	5,723
Catholic	34,015	12.78	45.12	0.86	0.04	0.51	0.20	0.58	0.43	15,676
Jewish	52,498	15.03	50.16	0.97	0.02	0.41	0.09	0.26	0.24	1,285
Other faith	32,610	13.71	43.13	0.73	0.11	0.49	0.34	0.57	0.45	3,336
Non-affiliated	33,011	13.64	39.87	0.82	0.11	0.41	0.06	0.29	0.26	7,797
	Panel B: Cooperative Congressional Election Study 2006-2018									
	Income	College	Age	White	Black	Conservatism	Gay	Abortion	Strictness	Obs
Baptist Evangelical	6.32	0.36	52.27	0.759	0.165	3.83	0.70	0.37	0.33	23558
Lutheran Evangelical	7.22	0.45	57.17	0.929	0.018	3.70	0.60	0.46	0.12	5128
Non-deno Evangelical	6.91	0.47	49.91	0.738	0.127	3.79	0.73	0.29	0.43	17614
Other Evangelical	6.67	0.45	52.83	0.765	0.100	3.71	0.66	0.39	0.25	21807
Baptist Mainline	6.06	0.34	49.00	0.617	0.277	3.43	0.49	0.57	-0.18	3690
Episcopalian Mainline	8.19	0.67	58.82	0.878	0.062	2.93	0.26	0.75	-0.71	3910
Lutheran Mainline	7.31	0.49	55.74	0.934	0.016	3.32	0.40	0.62	-0.34	6104
Methodist Mainline	7.28	0.49	57.57	0.906	0.048	3.44	0.47	0.59	-0.20	12893
Other Mainline	7.25	0.50	55.46	0.850	0.063	3.20	0.36	0.66	-0.46	9262
Black Protestant	5.97	0.43	48.37	0.043	0.936	3.13	0.54	0.69	-0.31	8712
Catholic	7.33	0.47	50.96	0.720	0.038	3.37	0.40	0.57	-0.27	62177
Jewish	8.38	0.69	53.81	0.905	0.020	2.75	0.19	0.83	-0.91	7379
Jehovah's Witness	5.36	0.24	45.11	0.423	0.319	4.38	0.80	0.30	0.71	1188
Mormon	6.69	0.53	46.38	0.849	0.033	3.79	0.70	0.31	0.41	4430
Non-western	6.95	0.61	40.23	0.356	0.143	2.81	0.30	0.76	-0.72	5192
Non-affiliated	6.62	0.44	44.42	0.736	0.106	2.92	0.20	0.79	-0.81	90293

Note: In Panel A, *Income* represents family income in constant dollars (base = 1986), *Education* indicates highest year of school completed and *Age* is in years. *Other Faiths* include Buddhism, Hinduism, Other eastern, Muslim/Islam, Native American, Orthodox, inter-nondenominational and Others. *Conservatism* is recoded in a scale from 0 (liberal) to 1 (conservative). *Sex* and *Homosex* are indicators whether respondents consider "sex before marriage" and "homosexual relations" always wrong. In Panel B, *Income* represents average family income bracket ranging from 1 (less than 10k) to 13 (more than 150k), *College* shows share of individuals with a college degree. *Gay* and *Abortion* are indicators whether respondents oppose gay marriage and support abortion, respectively. All other variables are defined as in Panel A. *Stricness* is the first principal component extracted from *Conservatism*, *Sex* (*Gay*) and *Homosex* (*Abortion*) in Panel A (B) using polychoric correlations to account for the data discreteness as discussed in Kolenikov and Angeles (2014).

Catholics and Mainline Protestants reporting more moderate attitudes. Black Protestants and Other Faiths are somewhat more liberal, with Jewish and Non-affiliated positioning themselves most to the left of the spectrum.[8] Attitudes towards sexual norms follow a similar (but not identical) pattern. Evangelicals are again most likely to consider pre-marital sex and homosexual relations as always wrong, with Jewish and Non-affiliated being the least likely. Black Protestants appear with significantly more restrictive attitudes on sex than Catholics and Mainline.

Panel B reports descriptive statistics for the CCES dataset according to our finer classification system. While the CCES dataset spans across shorter time horizon than the GSS

[8]Figure B1 in the appendix shows the distribution of this indicator by religious groups. Despite differences in mean, centrist positions are the most frequent and extreme views are rather rare across all groups.

(12 vs 46 years), its much wider cross-sections allow us gain considerably variation within religious families and traditions. For instance, among Evangelicals, Baptists are more black, younger, and less wealthy and educated than Lutherans. Also, among Lutherans, those who follow the Mainline tradition tend to be wealthier and significantly less conservative according to the self-reported conservatism index and to views on sexuality than their evangelical counterparts.

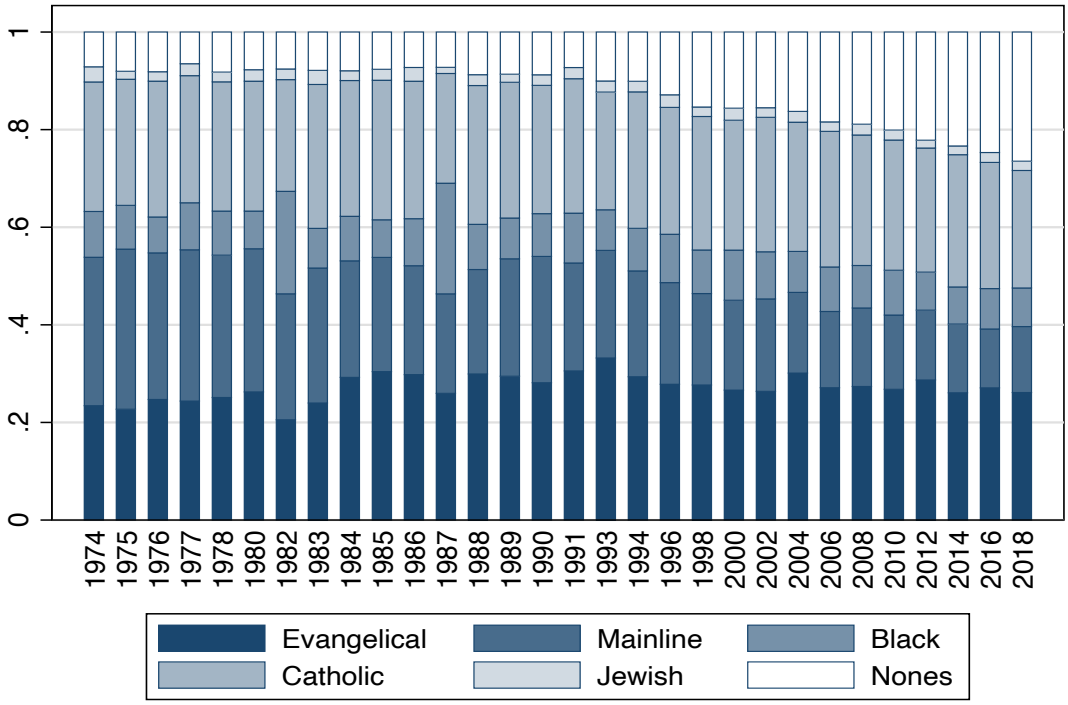
2.1 Trends in Religious Identity: 1974-2018

One of the most notable facts about religion in the US is that Americans are and have been a relatively observant people – be it in terms of church attendance and membership, in private religious beliefs or practices. However, this stability conceals a great deal of change due to increasing religious switching (across traditions or into non-affiliation), lower rates of religious inheritance, and higher rates of religious intermarriage, leading to tremendous religious diversity – including growing ranks of the nonreligious. Against this background of complex forces acting simultaneously over the post-war history of American religion, the direction and pace of change have shifted and accelerated in momentous periods of remaking and even reversal in religious practices and attitudes. The manifestation of these movements in American religion is best measured by looking at the evolution of church affiliation. While it does not necessarily reflect personal beliefs and church attendance, tracking religious identification does provide a window onto relative trends of religious diversity.

Figure 1 shows how membership in different religious traditions has evolved over the last 50 years, according to the GSS. A few patterns stand out. First and foremost, the proportion of Americans who claim no affiliation has increased dramatically. The ratio of "nones" has been steadily rising for a long time – from 3% in 1957, according to a government survey, to 6.8% in 1974, 7.9% in 1990, and 23% in 2018.[9] Second, the proportion of overall Protestants has been declining since 1974, from 64% in 1974 to 46% in 2018. More

[9] As noted by many authors, nones are not necessarily non-believers as some still report to believe in God and attend religious services. These individuals are sometimes described as "spiritual but not religious".

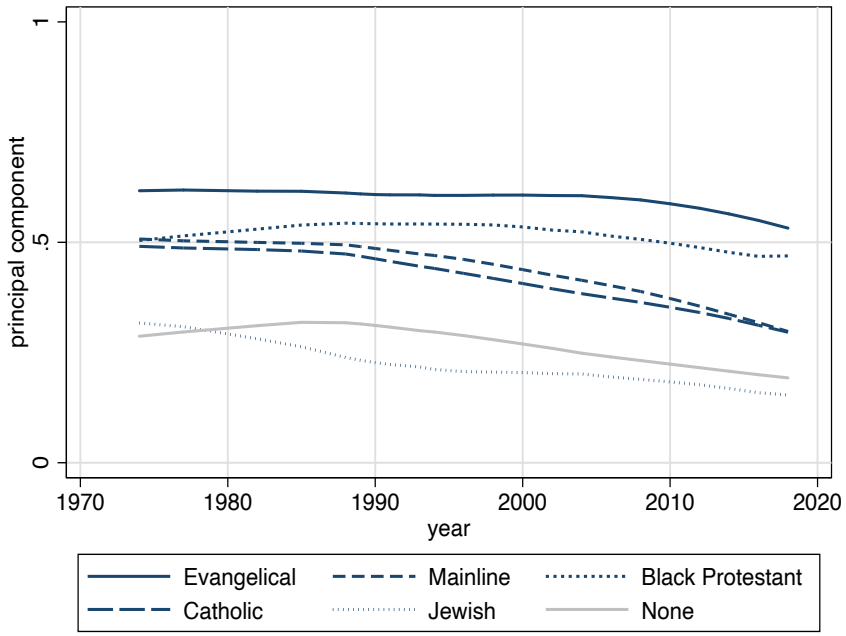
Figure 1: Trends in Church Membership



importantly, the Protestant downfall has been concentrated mainly among the more liberal Mainline Protestant denominations. Catholics, the other relatively sizeable moderate group, did not experience a comparable fall in nominal membership but saw a substantial decline in attendance throughout the same period. The share of Black Protestants has remained remarkably stable across the same years, while Evangelicals initially experienced an increase of moderate magnitude, from 22% in 1974 to 30% in 1990, and then back to 22% in 2018.

What forces can account for these trends? Offering a single causal explanation for these massive movements in American society is a difficult task, as it is likely that many factors are behind them. Yet Putnam et al. (2012) highlight the linkages between personal attitudes – especially toward conservative values and sexual norms – and religious affiliations as a likely vital driving force, deriving from the cultural revolution of the 1960s and its complicated aftermath. In particular, they attribute the rise of the nones to a backlash of an increasingly liberal share of the population against the ascent of the conservative religious

Figure 2: Trends in Strictness Levels



Note: The graph plots the evolution of self-reported strictness by religious groups. Strictness is measured as the first principal component extracted from individual views on sex before marriage, homosexual relations and self-reported conservatism (see Section 2 for more details). All trends are lowess-smoothed.

right.

Figure 2 shows the evolution of our measure of strictness (constructed from GSS data) since the 1970s. Without exception, personal values became less strict across religious groups. Evangelicals start from much higher levels and trend down only slightly, while moderate Catholics, Mainlines, and liberal nones trend down more clearly, especially after 1990.

An important distinction is that *individual* and *church* types – broadly defined to incorporate individuals' and churches' positioning on moral values and sexual norms – are separate concepts. Two key assumptions are implicit in the thesis by Putnam et al. (2012). First, it assumes that individuals' preferences for religious strictness partially drive the demand for religion. Second, on the supply side, church types along the strictness line do not systematically respond to societal changes. Given these premises, the shift of individuals' opinions reported in Figure 2 may have led to a fall in the demand for religion.

A challenge for empirically verifying these conjectures is that church strictness is not

observable across time. In Sections 3 and 4, we develop and estimate a model of demand and supply for religion that explicitly accounts for this distinction and gives us relevant model-based estimates of church types in each period. Then in Section 5, we use the model to formally test and quantify the role of the misalignment between church and individual positions as a driving force behind some of the historical trends in American religiosity.

3 The Model

Following the arguments discussed in the previous section, we develop a simple model of supply and demand for religion that will allow us (i) to test whether differences between individuals' preferences for strictness and the churches' types affect religiosity levels and (ii) to understand how churches' strictness levels are determined, depending on social and clergy preferences, and strategic interactions between churches.

3.1 Demand for Churches

We first consider the demand for churches. Our demand model is close in spirit to the model developed in Gentzkow and Shapiro (2010); see also McBride (2019, 2008), Barro and McCleary (2005) and Barros and Garoupa (2002), among others, for spatial models of church competition. Subsection 3.3 discusses and justifies key assumptions of the model. Variations of this basic framework, including versions where individual preferences for religion vary with individuals characteristics such as education, income and wage, are analyzed in Section 4.4. Estimation of the model including these components has little impact on our main results. Therefore, we describe our ideas based on a more parsimonious version of our demand model.

At each period t, an individual i chooses a church $j \in \{0, 1, 2, ..., J\}$. We assume that the utility individual i at period t derives from choosing church j is given by:

$$u_{ijt} = \gamma \left(\delta_{jt} - \delta_{it}\right)^2 + \xi_{jt} + \zeta_{ijt}. \tag{1}$$

In this equation, δ_{jt} represents church j's strictness level (or type) at period t, δ_{it} represents individual i's preferred strictness; and, ξ_{jt} is a time varying church specific effect that condenses all other churches characteristics affecting individuals choices (e.g. characteristics of temples, number of TV/radio channels owned by the church, characteristics of the clergy, etc.). This term is assumed to be observed by individuals and churches but not by the econometrician. Finally, ζ_{ijt} is an idiosyncratic taste shock observed by individual i but not by the econometrician. We assume that this variable is iid across (i, j, t) with distribution Extreme Value Type I. Heuristically, δ_{it} and δ_{jt} represent individuals' and churches' attitudes about different aspects of society. As in Gentzkow and Shapiro (2010), we note that, all else constant, if $\gamma < 0$ individuals will prefer church j instead of church j' if church j has a level of strictness closer to hers.

The choice $j = 0$ represents the outside option – i.e. if the individual i chooses $j = 0$, she will not be a member of any religion $j \in \{1, 2, ..., J\}$. We assume that the utility of the outside option is given by:

$$u_{i0t} = \xi_{0t} + \zeta_{i0t},$$

where, ξ_{0t} is a time-varying term that captures systematic variations in the utility of the "secular" option and is observed by all agents but the econometrician. All else constant, an increase in this component shifts down the demand for all religious groups at the same time indicating a generalized increase in the opportunity cost of religious participation. The last term ζ_{i0t} is also assumed to be an iid Extreme Value Type I taste shock. Utility maximization implies that individual i chooses church j with probability:

$$S_{ijt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right) = \frac{exp\left(\gamma\left(\delta_{jt} - \delta_{it}\right)^2 + \xi^0_{jt}\right)}{1 + \sum_{r=1}^{J} exp\left(\gamma\left(\delta_{rt} - \delta_{it}\right)^2 + \xi^0_{rt}\right)}, \tag{2}$$

where, $\delta_{-\mathbf{jt}}$ is a vector containing the types of all churches $j' \neq j$ and $\xi^0_{jt} = \xi_{jt} - \xi_{0t}$, that is, the utility of religion j at period t net of the value of the secular option. Finally, the

aggregate demand for denomination j at period t, $S_{jt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right)$, is given by:

$$S_{jt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right) = \frac{\sum_{i=1}^{N_t} S_{ijt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right)}{N_t}, \tag{3}$$

where N_t is the total number of individuals in the market.

3.2 Supply

Churches compete in religious markets for members by choosing a strictness level, δ_{jt}, in each period. As in Gentzkow and Shapiro (2010), we allow churches to deviate from profit or, equivalently, membership maximization. In other words, we assume that when choosing δ_{jt} church j's leaders consider not only the repercussions of this choice on the number of church members but also the "prophetic orientation" of the church. This simple formulation is in line with a number of studies suggesting that the stance of " *(...) religious elites blend a concern for rank-and-file opinion with a prophetic orientation*" (Wald and Calhoun-Brown, 2014). Mathematically, we assume that church j chooses δ_{jt} to maximize the following payoff function:

$$\Pi_{jt} = \theta_j S_{jt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right) N_t - \psi_j \left(\delta_{jt} - \mu_{jt}\right)^2, \tag{4}$$

where, $S_{jt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right)$ is the aggregate market share of church j at period t as specified by equation (3), μ_{jt} represents the "ideal" strictness level of church j at period t – or its prophetical orientation –, θ_j is the marginal benefit of an increase in church j's market share, such that $\theta_j S_{jt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right) N_t$ may be interpreted as church j's pecuniary profits, and ψ_j captures the effects of deviations from churches' ideal type on its payoffs. In the same spirit as in Gentzkow and Shapiro (2010), the last term in equation (4) represents church j's non-pecuniary motivations.

For an interior solution, the first order condition associated to the maximization of church

j's payoffs is given by:

$$2\psi_j\left(\delta_{jt}-\mu_{jt}\right)=\theta_j\frac{\partial S_{jt}\left(\delta_{jt},\delta_{-\mathbf{jt}}\right)}{\partial\delta_{jt}}N_t,$$

where, the left hand side represents the supply of strictness – or, the marginal cost of an increase (decrease) in δ_{jt} relative to μ_{jt} – and the right hand side is the demand for strictness – or, the marginal benefit of an increase (decrease) in δ_{jt}. Rearranging:

$$\delta_{jt}=\frac{\theta_j}{2\psi_j}\frac{\partial S_{jt}\left(\delta_{jt},\delta_{-\mathbf{jt}}\right)}{\partial\delta_{jt}}N_t+\mu_{jt}. \tag{5}$$

This equation holds for all $j\in\{1,2,...,J\}$ at any period of time. It shows that church j's type is a function of society strictness preferences and the types chosen by other churches – captured by $\frac{\partial S_{jt}\left(\delta_{jt},\delta_{-\mathbf{jt}}\right)}{\partial\delta_{jt}}$ – and its ideal strictness level, μ_{jt}. If the ratio $\frac{\theta}{\psi}$ is close to zero, churches are not maximizing profits and their types do not represent society strictness types; conversely, if this ratio is arbitrarily large, churches are maximizing profits and their types are strongly influenced by society preferences. The Bertrand-Nash equilibrium vector of types at any period t, $\delta_t^*=(\delta_{1t}^*,...,\delta_{Jt}^*)$, is obtained from the numerical solution of the system of first order equations for all churches.[10] Next we discuss some limitations of the model.

3.3 Discussion

The model presented in this section is built on a set of restrictive assumptions. In this subsection we anticipate possible consequences of some these assumptions on our estimates and conclusions and raise evidence to justify them.

First, the demand model requires independence between the distribution of the Extreme Value shock, ζ_{ijt}, and the preferred strictness levels of individuals. This assumption could be violated, for example, if δ_{it} is endogenous to religious identity, that is, if religious choices

[10] We do not have a formal proof of existence of the equilibrium in this model. To the best of our knowledge, existence and uniqueness of the Bertrand-Nash equilibrium with logistic demand is still an open question in the literature (Morrow and Skerlos, 2010, 2011). On the other hand, numerical simulations suggest that the equilibrium of this model exists and is unique. We resume this issue in the next section.

influenced how strict individuals like to be. Americans frequently change their religion affiliation by marrying or divorcing, having children, and moving to different geographical areas. They may also do so in response to politics.

In her recent book, Margolis (2018) challenges the notion that religion produced the "God gap" by pointing out that political identities – solidified in adolescence and early adulthood ("impressionable years") – are forged long before religious identities, which are shaped when individuals form families and have children in school. She argues that it is partisanship that pushes people in or out of churches and not the other way around. Another important fact is that while Americans have a broad tendency to see religion as a positive force in society, US adults are resoundingly clear in their belief that religious institutions should stay out of politics. According to a 2019 Pew Research Center survey, close to two-thirds of the public say that organized religion should keep out of political matters, and three-quarters express the view that churches should not come out in favor of one candidate over another during elections (Pew, 2019).[11] Evidence of this type is also present in a much larger sample of countries (Grzymała-Busse, 2015). More formally, in next section we use the data and the model to provide evidence that are in consonance with these arguments.[12]

Second, in the demand model the only term capturing taste heterogeneity at the individual level is the iid Extreme Value shock, ζ_{ijt}. Alternatively, we could have a more flexible utility specification where individuals with different characteristics systematically attribute different utility for different churches. In Section 4 we estimate different specifications augmenting the demand model to incorporate more sophisticated forms of heterogeneity in preferences. Our results indicate that the simpler version of the demand model described by equation (2) performs very well.

[11] Also, the American law forbids religious organizations to endorse or opposing political candidates according to the "Johnson Amendment".

[12] This assumption is essentially the same as that used by Gentzkow and Shapiro (2010), who investigates media ideological biases in the United States: "*(...) we do not have an analogous instrument for the within-market (cross zip code) variation in ideology that identifies our demand model. Our demand estimates therefore rely more heavily than our supply estimates on the assumption that most variation in ideology is exogenous with respect to newspaper content.*" Gentzkow and Shapiro (2010), page 50.

4 Estimation

We now discuss identification and estimation of the model. To estimate supply and demand parameters we first need a measure of types assumed by churches, δ_{jt}. While individuals individual types, δ_{it}, are directly computed from our data, δ_{jt} has to be somehow estimated. Therefore, our first task is to show that δ_{jt} can be recovered from the data. Next we validate our methodology to estimate δ_{jt} using a self-reported measure of clergy attitudes from a large scale survey carried out in the US in 2001. Finally, we show our estimates of δ_{jt} for different religious groups and years and the estimates of our demand and supply model using both the GSS and the CCES datasets. We close this section with a battery of robustness checks of our findings.

4.1 Methodology and Validation

We start our empirical analysis by showing that δ_{jt} can be identified from the data. To see this we open the term in parenthesis in equation (2) and rearrange. The demand model is, therefore, rewritten as:

$$S_{ijt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right) = \frac{exp\left(\widetilde{\xi}_{jt} + \tilde{\delta}_{jt}\delta_{it} + \gamma\delta_{it}^2\right)}{1 + \sum_{r=1}^{J} exp\left(\widetilde{\xi}_{rt} + \tilde{\delta}_{rt}\delta_{it} + \gamma\delta_{it}^2\right)} \tag{6}$$

where, $\widetilde{\xi}_{jt} = \gamma\delta_{jt}^2 + \xi_{jt}^0$ and $\tilde{\delta}_{jt} = -2\gamma\delta_{jt}$. With information on individuals' type, religion and other characteristics we can estimate equation (6) by Maximum Likelihood and obtain $\widetilde{\xi}_{jt}$, $\tilde{\delta}_{jt}$ and γ. With the estimates of γ and $\tilde{\delta}_{jt}$ we recover δ_{jt} using the fact that $\tilde{\delta}_{jt} = -2\gamma\delta_{jt}$.

It is important to notice that δ_{jt} is not identified if γ also varies with consumer characteristics as in many discrete choice models – see, for example, Berry et al. (1995) Berry et al. (2004). To check whether this assumption holds, in Section 4.4 we estimate a version of our model where γ is allowed to vary across individuals. The empirical results support the specification with γ fixed across individuals.

Validation. Next we want to check whether our method produces meaningful estimates of church types. Our strategy is the following: we first compute δ_{jt} using self-reported measures of clergy's attitudes obtained from the Cooperative Clergy Study Project data (CCSP), a detailed survey with approximately 9000 clergy from various denominations carried out in 2001 in the US. The focus of the survey was to understand "*social characteristics, theological beliefs, civic endeavors, and political attitudes and behavior of American clergy*". Then, using equation (6) we estimate δ_{jt} with CCES data and correlate with the estimates obtained from the CCSP.

For this particular validation exercise we will calculate δ_{it} using only the self-reported measure of *conservatism* of each individual as reported in the CCES and not the principal component obtained from this indicator and the other two variables representing individuals' attitudes towards sex as the latter are not asked in the CCSP. We show in Subsection 4.4 that our estimates are qualitatively the same regardless of the indicators used to approximate δ_{it}. Finally, for this exercise we only use data from the CCES as the number of observations for each year is much larger than in the GSS, allowing us to estimate δ_{jt} for nearly all denominations in the CCSP.

Table 2: Estimates of γ (CCES 2008)

	[1]	[2]
γ	-0.594***	-0.651***
	[0.2195]	[0.2288]
Observations	266220	250002
Covariates	No	Yes

Table 2 shows the estimates of γ (standard errors clustered by denomination in brackets) using CCES data for 2008, the first year for which the CCES data is available.[13] The first column shows the estimates from our baseline model, represented by equation (6). In the second column we estimated a more flexible model where we included individuals observed characteristics – income, education and age – interacted with church dummies in

[13]Figure A1 in the appendix suggests that clergy conservatism indicator is pretty stable over time. Given this evidence, the differences between the years in which the CCSP (2001) and CCES (2008) were conducted will not have deep consequences for our validation exercises.

individuals utility function, i.e. allowing individuals utility for each church to vary not only with strictness but also with other individual characteristics.[14]

As expected, γ is negative and significant at 1% in both specifications. The inclusion of covariates seems to have little effect on the point estimates. We also note the estimates of $\tilde{\delta}_{jt}$ are positive and significant at 1% *for all churches* and the inclusion of controls do not cause relevant changes in the results.[15] These findings are important and indicate that correlation of individual strictness with unobserved individual attributes that also affect utility for religion does not seem to cause major concerns.

As discussed above, from the estimates of $\tilde{\delta}_{jt}$ and γ we can compute δ_{jt}. A potential limitation of this approach is that the estimates of δ_{jt} will not necessarily be in the $[0, 1]$ interval – or in the $[1, 5]$ interval with the unnormalized data – and the estimation of a model with hundreds of constraints for all these parameters showed to be unfeasible.[16] So, in practice we are going to estimate the demand model in two stages:

1. **First stage:** estimate equation (6), compute δ_{jt} and normalize these estimates on the $[0, 1]$ interval.[17]

2. **Second stage:** estimate the demand model (2) using the normalized estimates of δ_{jt} obtained in the first stage.

[14] In the other models shown in this section we also included race dummies in the set of covariates. Unfortunately, when these dummies where included in this specification, the estimation algorithm did not converge. Anyway, in the other models, the inclusion of race in the set of covariates did not cause any relevant change to our estimates.

[15] Figure A2 in the appendix shows a scatter plot of the estimates of δ_{jt} for each church from the model with and without covariates. The estimates lie very close to the 45 degrees line.

[16] The number of parameters we are estimating using the full CCES or GSS samples (see next subsection) is around 500 and the CCES (GSS) sample have millions (hundreds of thousands) of observations, which increases a lot the computational burden involved in the estimation of these models.

[17] As we explained before, we used the min-max normalization.

Figure 3: Church Type Correlation: Model (y) and Clergy Study Project Data (x)

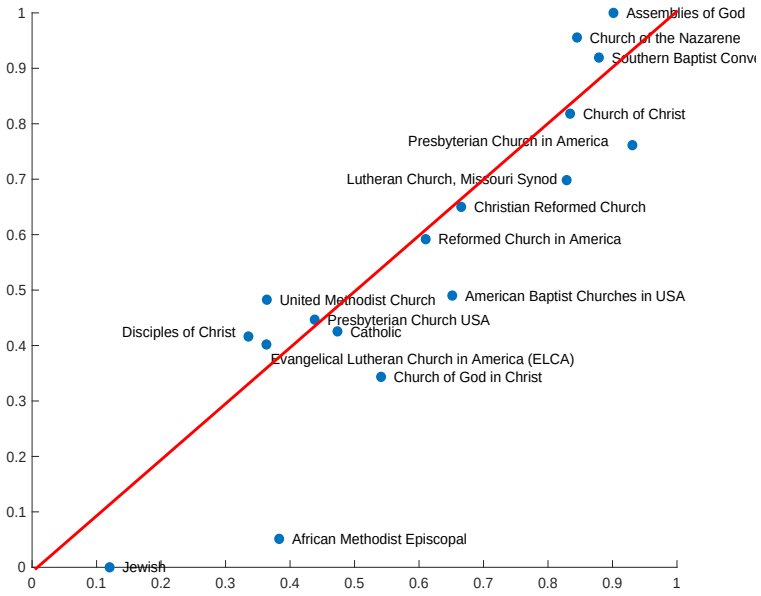


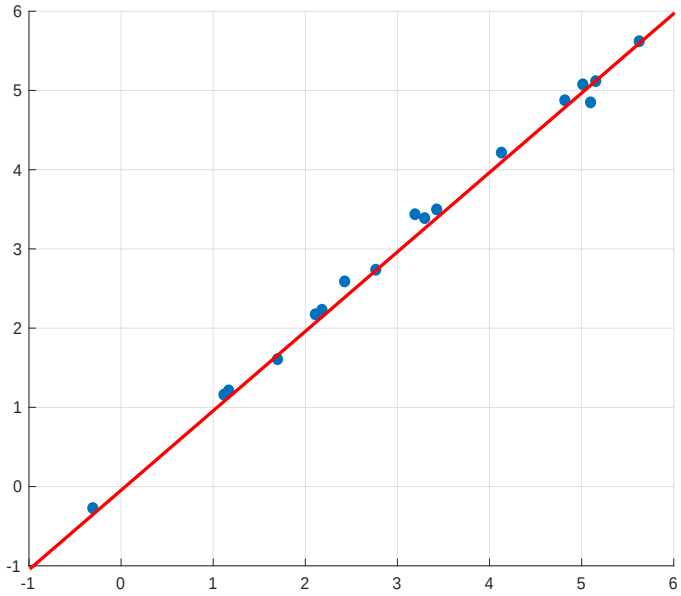
Figure 3 shows a scatter plot of the normalized estimates of δ_{jt} obtained from the model and the estimates of δ_{jt} obtained directly from the CCSP for 17 denominations that were included in both CCSP and CCES data. It seems clear that the model does a good job at estimating δ_{jt}. With very few exceptions, all points are very close to the 45 degrees line. The correlation between observed and estimated δ_{jt} is 0.9. This result is particularly interesting because as the estimates of δ_{jt} obtained from the model depends on the exogeneity of δ_{it} with respect to religious choices, the proximity between these estimates and those obtained directly from the CCSP, which, by construction, do not depend on this assumption, strongly suggests that reverse causation running from religious choice to δ_{it} are not distorting our estimates of δ_{jt}.

Table 3: Estimates of γ Using δ_{jt} Obtained from the CCSP and from the Two-Step Estimation Procedure

	[1]	[2]
γ: CCSP δ_{jt}	-2.5734***	-2.5952***
	[0.1070]	[0.1001]
γ: Two-step procedure	-2.1160***	-2.0190***
	[0.0994]	[0.0873]
Observations	250002	266220
Controls	Yes	No

Lastly, we analyze whether the two step procedure used to estimate our demand model has relevant effects on the demand estimates. We estimate the demand model (2) using δ_{jt} obtained directly from the CCSP data and using the normalized estimates of δ_{jt} shown in Figure 3 – i.e. our second stage estimates. Table 3 shows the estimates of γ for both models and their corresponding standard-errors clustered by denomination. Reassuringly, the estimates produced by the model estimated using church types obtained from the CCSP (rows one and two) and from our two-step procedure (rows three and four) are very close. Independently of the model, the inclusion of covariates has little effect on the demand estimates. Figure 4 shows the estimates of ξ^0_{jt} for the model (without covariates) estimated using δ_{jt} observed in the CCSP data and for the model estimated from our two-step procedure. Again, the estimates produced by both models are almost identical. The coefficient of correlation between the two sets of estimates is equal to 0.998.

Figure 4: Correlations Between ξ^0_{jt} Estimated Using δ_{jt} from the CCSP (y) and from the Two-Step Estimation Procedure (x)



4.2 Church Strictness Level Estimates

We now estimate churches types using data from GSS and the CCES. As mentioned before, the estimation of our model using both datasets may bring complementary findings and reinforce key aspects of the analysis presented in this paper (see Section 2). For the CCES and GSS we estimate δ_{jt} for the religious groups presented in Table 1.

As discussed in Section 2 the measure of strictness from the GSS is the first principal component of three variables: conservatism (same variable used in the previous subsections), a dummy variable that assumes 1 if the individual is against sex before marriage and 0 otherwise, and a dummy variable that assumes 1 if the individual opposes homosexual relations, and 0 otherwise. For the CCES, we compute the first principal component of conservatism, a pro-gay marriage dummy and a dummy that assumes 1 if the individual is against abortion and 0 otherwise.

The estimates of γ from equation (6) – i.e. first stage estimates – for the CCES and

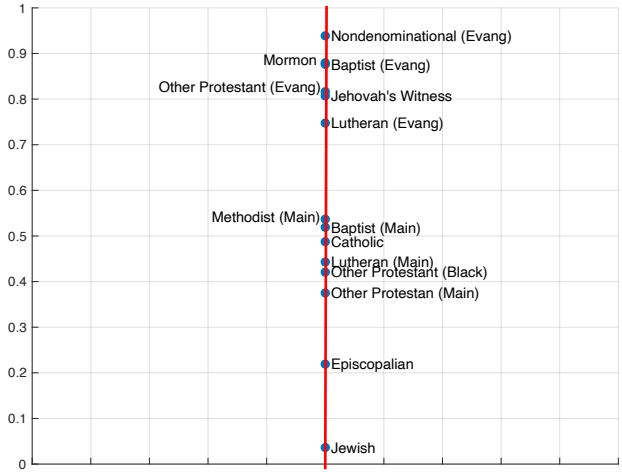
GSS data are in Table B1 in the appendix. For both datasets these estimates are always negative and significant at 1%. The estimates of $\tilde{\delta}_{jt}$ are positive and significant at 1% for all religious groups and years.[18] The inclusion of socio-demographic variables in the estimation has little effect on the estimates of these parameters. Panel 5 shows the average (across years) estimates of (normalized) δ_{jt} for each religious group in the CCES (left hand side) and the GSS (right hand side). Following the procedures described above we estimated δ_{jt} using equation (6) and normalized them to the $[0, 1]$ interval using the min-max formula.

The disposition of churches in the strictness line is consistent with the evidence in the literature – see, for instance, Wald and Calhoun-Brown (2014) and the references therein: in the CCES Jewish are on the left extreme; Mormons and religious groups composed mainly by Evangelical denominations are on the right extreme and Catholics and religious groups that have a majority of Mainline/Black Protestant denominations are located on the center of the line. The figure also indicates that there is significant dispersion in the disposition of churches on the strictness line. In general, the same patterns are observed when we use the GSS data (and, therefore, a more aggregate definition of religious groups) and when we look at self-reported measures of clergy attitudes (horizontal axis in Figure 3).

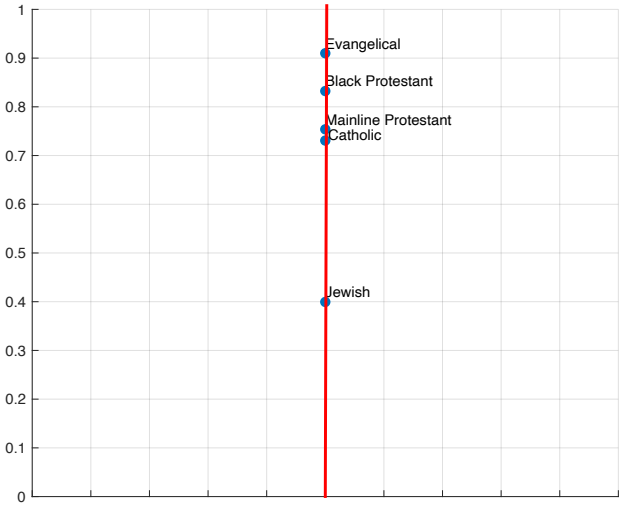
We also note that there is strong positive correlation between δ_{jt} and average δ_{it} of members of each church. The coefficient of correlation is 0.92 in the CCES and 0.88 in the GSS and they are significant at 1% suggesting that there is positive assortative matching between churches and individuals: individuals who prefer higher (lower) levels of strictness prefer more (less) strict churches. Next we investigate further implications of these findings.

[18] Except for Jewish in the GSS, where the estimates of $\tilde{\delta}_{jt}$ are not statistically significant for some years.

Figure 5: Strictness Line – CCES and GSS Datasets



(a) CCES Data



(b) GSS Data

4.3 Demand and Supply Estimates

Now, using the (normalized) estimates of δ_{jt} shown in the previous section, we estimate the demand for churches in equation (4). The estimates of γ for the CCES and for the

GSS are shown in Table 4. As the estimates of δ_{jt} are very similar for the models with and without controls we focus only on the more parsimonious models that do not include controls (in the first and second stages). The results for the CCES (first column) and GSS (second column) models – standard-errors clustered at the denomination level are in brackets – show that γ is negative, significant at 1% and have approximately the same magnitudes independently of the dataset we use to estimate the model. The estimates of γ reported throughout this section, therefore, strongly suggests that alignments between churches' and individuals' strictness levels are relevant to explain religious choices of the US population.

Table 4: Estimates of γ for the CCES and GSS Data

	CCES	GSS
γ	-3.7335***	-4.6625***
	[0.0671]	[0.0766]
Observations	2590890	97950

We now discuss the supply side of our model. More specifically, we are interested in the following question: are churches' types driven by clergy intrinsic preferences (supply) or by society preferences (demand)? Or, in terms of the supply model developed in Section 3.2, are churches choosing their strictness levels to maximize profits or to satisfy the prophetical orientation of their clergy?

Based on the supply model discussed in Section 3.2 there are two ways of answering this question. The first is to directly estimate equation (5) using our estimates of δ_{jt}, of $\frac{\partial S_{jt}\left(\delta_{jt},\delta_{-\mathbf{jt}}\right)}{\partial \delta_{jt}}$ and a proper set of instrumental variables to account for the correlation between $\frac{\partial S_{jt}\left(\delta_{jt},\delta_{-\mathbf{jt}}\right)}{\partial \delta_{jt}}$ and the residual term μ_{jt}. The second is to compute δ_{jt} that would be consistent with profit maximization, i.e. assuming that $\psi_j = 0$ in equation (4), finding the equilibrium vector of δ_{jt}'s from the first order conditions associated to the corresponding maximization problem and comparing this vector to the vector of δ_{jt} estimated directly from the data. As in Gentzkow and Shapiro (2010) we adopted the second approach.[19] Precisely, we do the

[19]The reason is that the sample size that we have to estimate $\frac{\theta}{2\psi}$ for all churches is relatively small and, in particular, in the CCES we do not have sufficient temporal variation in δ_{jt} to precisely identify $\frac{\theta}{2\psi}$ for all churches. Moreover, following the second approach we do not need instrumental variables and the usual IV assumptions to identify the parameters of interest.

following. First, we find the first order conditions of the problem

$$\underset{\delta_{jt}}{max}\ \theta_j S_{jt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right) N_t$$

for each church j and period of time t. The first order condition for any j and t can be trivially written as:

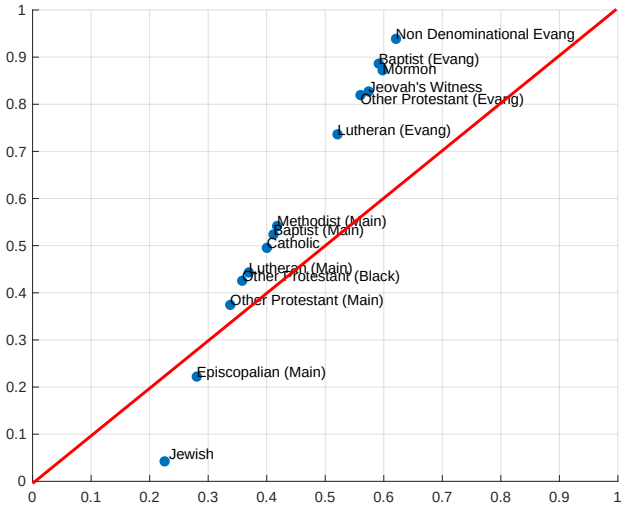
$$\frac{\partial S_{jt}\left(\delta_{jt}, \delta_{-\mathbf{jt}}\right)}{\partial \delta_{jt}} = 0,$$

and the vector of profit-maximizing strictness levels, which we denote by $\delta_t^{pm} = (\delta_{1t}^{pm}, ..., \delta_{Jt}^{pm})$, can be obtained, at each period of time, as the solution to the set of first order conditions for all churches. In light of the discussions in Section 3.3 and the evidence in Section 4.1, we also assume that δ_{it} is exogenous to the model, i.e. it does not depend on δ_{jt}.

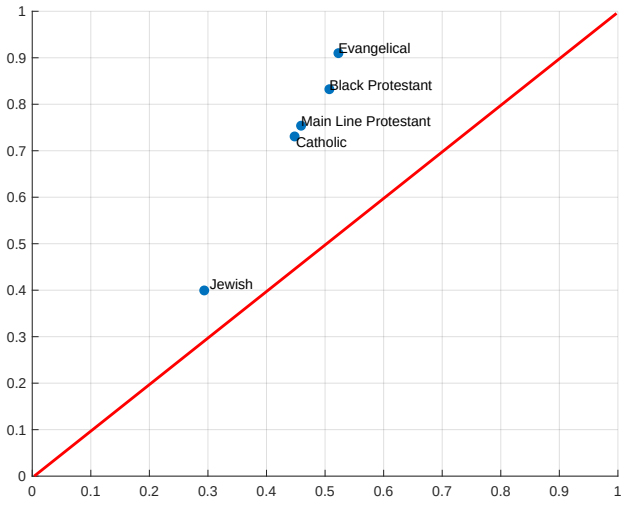
From the demand models in Table 4 we computed δ_t^{pm} and compare δ_{jt}^{pm} with the estimates of δ_{jt} reported in Section 4 – and that were used to estimate the models in Table 4. As briefly mentioned in Section 3, existence and uniqueness of the Bertrand-Nash equilibrium with logistic demand is still an open question in the literature (Morrow and Skerlos, 2010, 2011). To check the existence and stability of the equilibrium of our model we calculate δ_{jt}^{pm} changing the initial guesses several times. The solution algorithm always converged to the same vector, independent of the initial guess.

Figure 6 plots δ_{jt}^{pm} and δ_{jt} averaged across years for all j and both datasets. Evidently, if $\delta_{jt} = \delta_{jt}^{pm}$ for all j then all the dots should be aligned on the diagonal line. Instead, we observe most points below the diagonal and some above the diagonal. A simple linear regression of δ_{jt}^{pm} on δ_{jt} produces a constant of 0.17 and a slope of 0.46 for the GSS and a constant of 0.15 and a slope of 0.41 for the CCES. These coefficients are significant at 1% and the slopes are statistically different from 1 at 1% of significance, which indicates that churches systematically deviate profit maximization when choosing their types.

Figure 6: Profit-Maximizing (x) and Estimated (y) Church Strictness (Principal Component)



(a) CCES Data



(b) GSS Data

4.4 Robustness analysis

Together, the findings presented throughout this section indicate that (i) individuals seem to prefer churches that adopt types that are closer to their own preferred strictness levels and

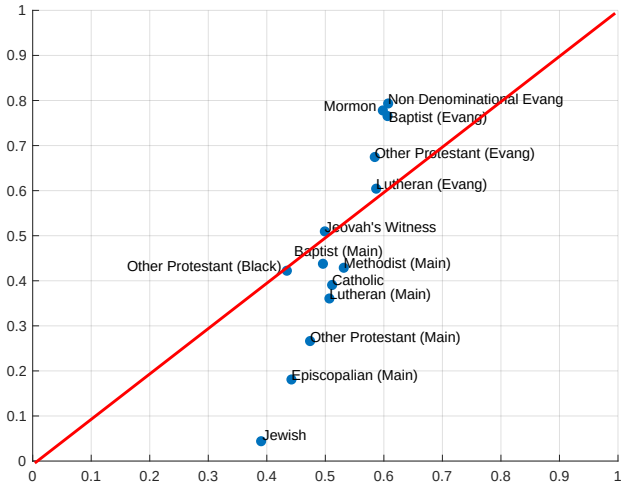
that (ii) church types – especially those with more strict stances – are strongly driven by clergy preferences (supply side) and not by society preferences (demand side). This section discusses robustness analyses of these conclusions.

We first examine whether our results are robust to the choice of variables we use to measure individual strictness. To do that, we reestimate the supply and demand models using only the self-reported measure of conservatism – ranging from 0 (liberal) to 1 (extremely conservative) – to represent δ_{it}. This variable has been used in many studies as a measure of individuals conservatism (Gentzkow, 2016; Putnam et al., 2012; Hout and Fischer, 2014). Tables B2 and B3 in the appendix show, respectively, the first and second stage estimates of γ for the CCES and GSS for models with and without controls. Results are quite close to the ones reported in the previous subsections. Figure B2 in the appendix plots the strictness line for the CCES and GSS.[20] Figure 6 plots δ_{jt}^{pm} and δ_{jt} averaged across years for all j and both datasets. Again, the results shown in both figures are close to those shown in figures 5 and 6, which were built based on precisely the same procedures except for the variable we use to denote strictness. This battery of exercises shows that our results are also robust to changes in the variables we use to represent individual preferences for strictness.

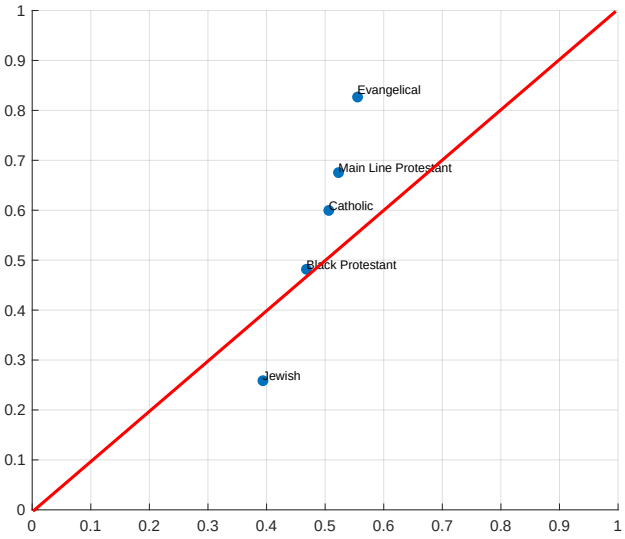
Second, the different versions of the demand model estimated in this section consider that γ is fixed across individuals – and without this assumption δ_{jt} cannot be identified from the data. To test whether this assumption is reasonable we match the CCSP data with the CCES data for 2008 and using self-reported clergy attitudes from the CCSP we estimate a demand model similar to the model used to estimate the coefficient γ in the first row of Table 3 but allowing γ to vary across individuals and churches. Precisely, the model is the same as the model in the first column/first row of Table 3 but now we assume $\gamma_{ijt} = \gamma_0 + \Theta_{\mathbf{j}}\mathbf{X_{it}}$, where $\mathbf{X_{it}}$ is a vector containing i's income, education and age, γ_0 is a constant and $\Theta_{\mathbf{j}}$ is a vector of parameters multiplying $\mathbf{X_{it}}$. Results of the interactions between individuals covariates, church dummies and $(\delta_{jt} - \delta_{it})^2$ and of γ_0 are in Table B4 in the Appendix – the model also

[20] Again, as the estimates of the model with and without covariates are very close, we focus on the model estimates without covariates.

Figure 7: Profit Maximizing (x) and Estimated (y) Church Strictness (Alternative Measure)



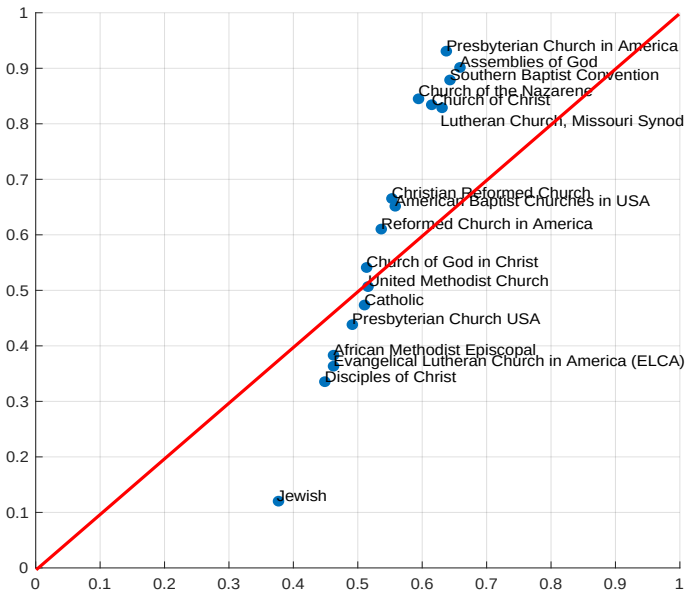
(a) CCES Data



(b) GSS Data

includes interactions between each covariate and church dummies (not shown). The results are pretty clear: γ_0 is quite close to the coefficients in Table 3 and almost all interactions of individual characteristics and distance are not significant. These results suggest that the model with fixed γ appear to be a very good approximation to describe the demand for

Figure 8: Profit Maximizing (x) and Observed (y) Church Strictness (CCSP data)



religion in the US.

Finally, we close this section showing that our second conclusion – i.e. that church type is driven by clergy preferences – also holds independently of how δ_{jt} is obtained. To do this we compute profit maximizing church strictness using the CCSP demand model (without covariates) and compare it with self-reported clergy attitudes we observe in the CCSP.[21] Figure 8 plots observed and profit maximizing strictness levels using the CCSP data. The patterns shown by this graph are strikingly close to the patterns shown in figures 7 and 6. Notably, observed church strictness is much more extreme than profit maximizing levels. Next section uses the model and findings reported in this section for a series of counterfactual exercises.

[21] In this exercise, we measure strictness using only our conservatism index as variables that capture attitudes toward sex are not available from CCSP.

5 Strictness and Religious Trends

We now explore the analytical possibilities of our demand and supply model to test the thesis put forth by Putnam et al. (2012) that highlights the role of shifting societal views toward less strict values in explaining major trends in the American religious landscape in the last 50 years – see discussions in Section 2.1. We proceed in three steps. First, we quantify the importance of shifting values of the US population to explain these trends. Second, we investigate how strictness levels chosen by churches – inconsistent with profit maximization as revealed by our model estimates in Section 4 – have affected church membership in the US. Third, we evaluate how changes in preferences for religion (net of differences between churches' and individuals' strictness) affect the evolution of the US religion market.

5.1 Model Fitting and the Importance of Strictness

We start by showing the fitting of our models to the data and quantifying the effects of the misalignment between church and individual stances about strictness on religious choices. First, we examine the fitting of our models to the data by comparing the average market share of each denomination observed in the data with market shares predicted by the demand models. Next, we evaluate the importance of alignments of church and individual strictness. To do this we first use the model to predict the average share of each denomination and the average share of the outside option using both datasets, the CCES and the GSS. Then we recompute these same shares assuming $\gamma = 0$ or, in other words, assuming that differences between church and individual types do not affect the demand for churches. The exercises shown in this (and the next) subsection are based on our main measure of strictness – namely the principal component extracted from variables that capture self-reported conservatism and attitudes toward sex. The appendix shows the results for the models where δ_{it} is approximated by conservatism only.

Table 5: Data, Model and Counterfactual $\gamma = 0$ Market Shares for the CCES and GSS (Principal Component Models)

Denomination	(a) Data	(b) Model	(c) $\gamma = 0$	(c)-(b)
		CCES		
Baptist (Evang)	8.71%	8.77%	14.02%	5.25%
Baptist (Main)	1.32%	1.32%	1.21%	-0.11%
Catholic	23.23%	22.80%	20.61%	-2.19%
Episcopalian (Main)	1.53%	1.48%	1.25%	-0.23%
Jehovah's Witness	0.28%	0.30%	0.42%	0.12%
Jewish	2.77%	2.79%	2.78%	-0.01%
Lutheran (Evang)	2.01%	1.97%	2.37%	0.40%
Lutheran (Main)	2.36%	2.36%	2.04%	-0.32%
Methodist (Main)	5.03%	4.99%	4.66%	-0.33%
Mormon	1.66%	1.65%	2.48%	0.83%
Nondenominational Evang	6.51%	6.45%	11.62%	5.17%
Other Protestant (Black)	3.32%	3.26%	2.83%	-0.43%
Other Protestant (Evang)	8.19%	8.24%	11.42%	3.18%
Other Protestant (Main)	3.51%	3.49%	2.93%	-0.56%
Nones	**29.57%**	**30.14%**	**19.37%**	**-10.77%**
		GSS		
Evangelical	25.10%	26.52%	41.21%	14.69%
Mainline	19.70%	18.84%	18.05%	-0.79%
Black Protestant	8.90%	8.87%	10.81%	1.94%
Catholic	23.90%	25.18%	22.64%	-2.54%
Jewish	1.77%	1.95%	1.08%	-0.87%
None	**16.70%**	**18.64%**	**6.20%**	**-12.44%**

Table 5 shows the results. Column (a) has the market share of each religious group averaged across years as observed in the data; column (b) has the same numbers as predicted by the model; column (c) has the market shares under the counterfactual scenario where $\gamma = 0$ and column (d) has the difference between columns (c) and (b). The comparison between columns (a) and (b) reveals that the models fit remarkably well to the data, independently of the dataset we use. The comparison between columns (b) and (c) suggests that differences between societal and church preferences for strictness explain roughly 1/3 (2/3) of the share of individuals that choose not to be affiliated with any religious group in the CCES (GSS). When we eliminate strictness preferences from individuals utility function, the share of the outside option (rows labeled as "Nones" in the table) falls from 30.14% to 19.37% (from 18.64% to 6.2%) in the CCES (in the GSS). Interestingly, the denominations occupying the right and the left extremes of the strictness line would gain market share, and the ones in

the center of the strictness line would lose. Table B5 in the Appendix shows the results of the same exercises for the models where δ_{it} is approximated by self-reported conservatism. Our conclusions are qualitatively the same.

5.2 Changes in Strictness and Religious Membership

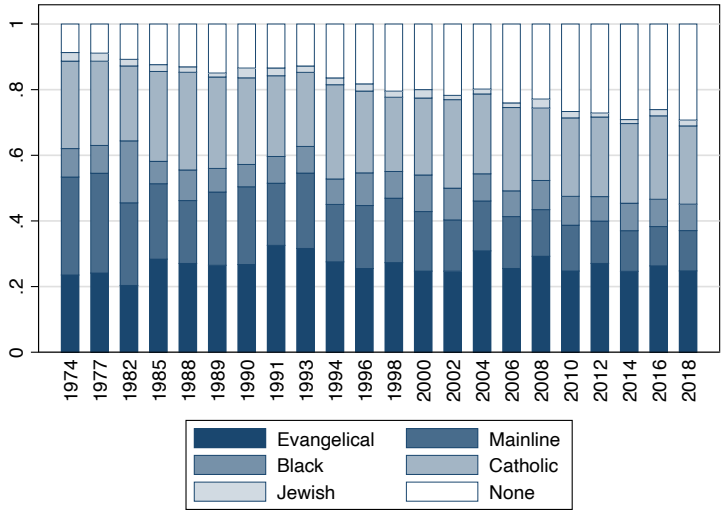
As discussed above, the results in Table 5 (and Table B5 in the appendix) suggest that differences between individual and church types, summarized by the component $\gamma\left(\delta_{jt}-\delta_{it}\right)^2$ in our demand model, are relevant to explain the demand for religion. This subsection aims to quantify its importance in explaining changes observed in the US religion market during the last decades. As our interest here lies in studying long-run trends, we focus our analysis on the estimates based on data from the GSS. Next, we compute the distribution of δ_{it} in 1974 and recompute the market shares of each religious group from 1974 until 2018, drawing δ_{it} for each year from the 1974 distribution. This experiment allows us to understand how changes in values of the US population affected religiosity in the US.

Figure 9 illustrates our results. Panel (a) shows the shares of each religious group as predicted by our baseline model; Panel (b) shows the shares of the same groups holding the distribution of δ_{it} fixed at 1974 levels. The comparison between panels shows that if the distribution of δ_{it} were fixed at the 1974 levels the fraction of nones in 2018 would have been approximately 10 percentage points lower than that predicted by the model. This suggests that changes in δ_{it} represent more than 50% of the increase in the level of nones in the 1974-2018 period. In sum, changes in personal attitudes toward less strict values had non-negligible effects on the evolution of the share of nones.

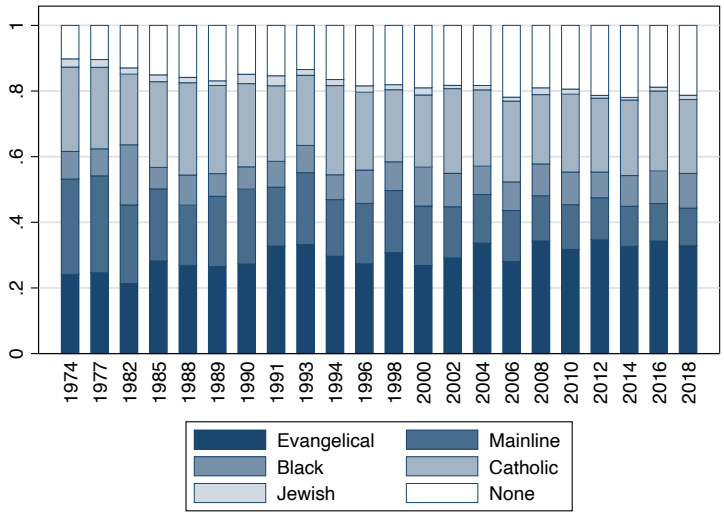
We now look at the supply side of our model. What would happen to the trends observed during the last decades if churches had updated their strictness types to accommodate changes in the distribution of δ_{it}? To answer this question, we recompute the demand for churches using δ_{jt}^{pm} instead of the observed values of this variable. As defined in Section 4, δ_{jt}^{pm} represents church types consistent with profit maximization. Figure 10 shows the re-

sults. In a nutshell, levels of religiosity would be much greater at any point in time under this alternative scenario. The effects of shifts in δ_{it} on the growth of nones would be inexpressive compared to the evidence present in the data.

Figure 9: Changes in Strictness and their Effects on the Demand for Religion

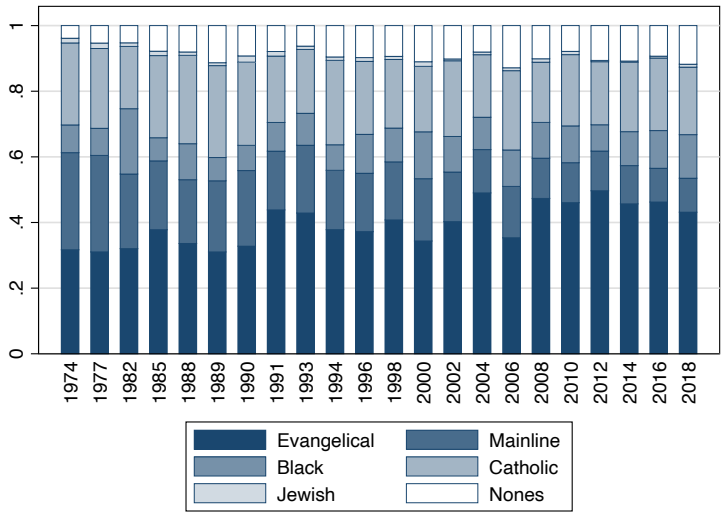


(a) Market Shares as Predicted by the Model



(b) Market Shares with δ_{it} 1974

Figure 10: Demand for Religion of Profit Maximizing Churches



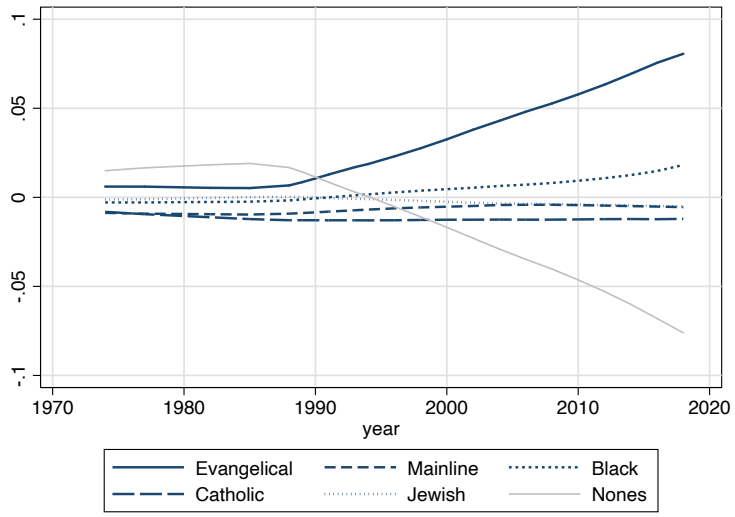
The evidence presented in figures 9 and 10 shows that changes in strictness had important consequences for religiosity in the US. In particular, our analysis indicates that these developments resulted from both supply and demand forces. On the one hand, as the distribution of δ_{it} shifted to the left of the strictness spectrum, it moved demand away from major religious groups and towards the secular option. On the other hand, this movement had more profound repercussions on the religious market as a whole – and in the levels of nones in particular – as churches did not optimize their types in response to shifting societal views. Had this happened, we would still have observed increases in the share of nones, but at a much slower pace.

5.3 Preferences Changes and Religion in the US

Having established the importance of changes in δ_{it} and its implications for religious choices, we now look at the role of other factors influencing religious preferences, summarized in our model by the demand shifter ξ^0_{jt}. This exercise is particularly relevant because changes in the distribution of δ_{it} cannot explain the dramatic fall of participation of Mainline Protestant denominations in the US religious scene (see Figure 1) as we show below. Figure 11 plots

the lowess-smoothed difference between the graphs in panels (a) and (b) of Figure 9. The fall of Mainline Protestants' market share has little to do with changes in δ_{it}. On the other hand, it shows that shifting views have affected mainly Evangelicals and the nones. They would have, respectively, gained and lost significant space in the US religious life if the δ_{it} distribution had remained constant at the 1974 levels.

Figure 11: Difference in Shares with δ_{it} 1974 and Baseline Model Prediction

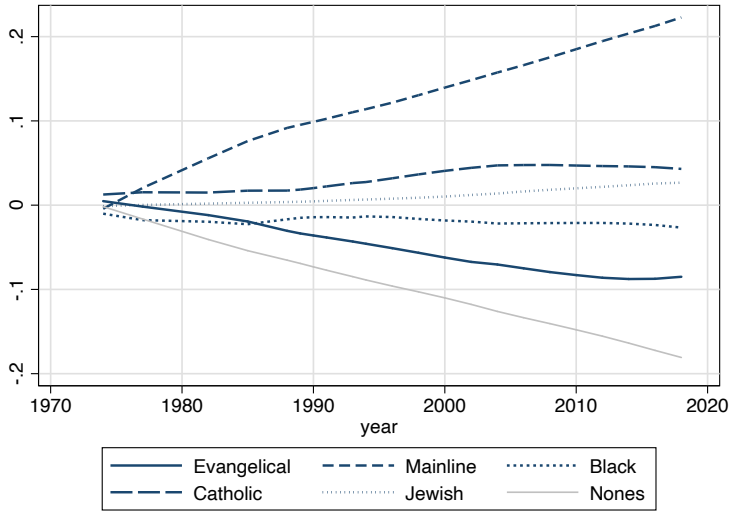


To investigate the role of changes in preferences on the demand for religion, we recompute the numbers in Figure 11 keeping constant the term ξ^0_{jt} in the demand model – i.e. the time-varying demand shifter for each church – at the 1974 levels, instead of the distribution of δ_{it}. The results are in Figure 12. We see here three important findings. First, the graph suggests that the fall in the share of Mainline Protestants is explained by the fall in the interest of the US population for that religious group. For reasons that may be beyond the scope of this paper, being affiliated to Mainline Protestant denominations has become less attractive to the typical US citizen, independently of her views toward strict values.[22] Second, if changes in attitudes negatively affected the growth of Evangelical denominations,

[22]One can speculate that secular forces have been better substitutes for traditional Mainline churches, while creative Evangelical leaders were able to keep their congregations more interesting to their members. See more about the utility of the secular option below.

preferences for churches worked in the opposite direction. In other words, the relatively stable share of Evangelicals during the last 40-50 years was the result of two countervailing forces: the shift in societal views toward less strict values had negative impacts on the demand of Evangelical denominations, and changes in preferences for the religion led to an increase in the demand for Evangelical denominations. Third, the increase in the share of nones is explained by changes in the distribution of strictness and changes in preferences for religion.

Figure 12: Differences of Religion Shares with and without Changes in Preferences

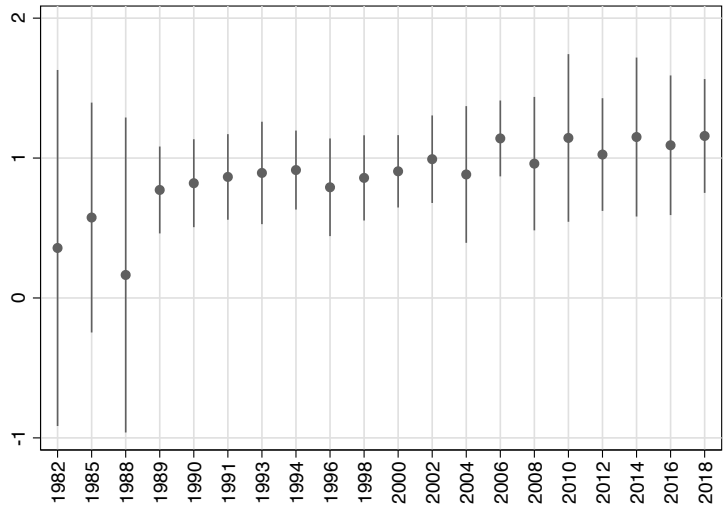


Finally we examine the factors behind changes in preferences for religion. Recall that the term ξ_{jt}^0 is a function of two model primitives, ξ_{jt}, i.e. a "bundle" of characteristics of religious group j, $j \neq 0$, at period t, and ξ_{0t}, i.e. the utility of the secular option (net of the idiosyncratic taste shock ζ_{i0t}). Having estimated ξ_{jt}^0 for all religious groups j we can decompose this term into its two components by regressing it on year dummies. The (negative of the) estimate of the coefficient attached to each year dummy is our estimate of ξ_{0t}; the residuals of the regression are the estimates of ξ_{jt}.

Figure 13 shows the estimates of ξ_{0t} and corresponding 95% confidence intervals. We find

a positive but gentle trend in the utility of the secular option.[23] Coupled with the evidence in figures 11 and 12, this finding suggests that the rise of the nones cannot be quantitatively explained only by secularization of the US society (Putnam et al., 2012; Chaves, 2011; Hout and Fischer, 2014). Changes in preferences of the US population for specific religions and for strictness are more salient to explain the demand for religion in the US than changes in the utility of the secular option.

Figure 13: Estimates of the Utility for the Secular Option, ξ_{0t}



6 Summary and Conclusions

In this paper, we develop and estimate a model of religious competition that allows us to test whether differences between societal attitudes toward strict values and the strictness levels assumed by churches affect the demand for religion. In particular, we study how societal and clergy preferences and strategic interactions between churches determine churches' positions along the strictness continuum.

Our model estimates show that church differentiation across the strictness dimension is

[23]There is an important literature on the importance of secular competition to religious outcomes which considers how congregations interact with the shopping mall, the government, the schools and other institutions (Hungerman, 2010; Gruber and Hungerman, 2008) as well as the growing options of leisure associated with the computer and the internet age.

relevant to explain religious identity. On the supply side, we report a significant dispersion in the disposition of churches on the strictness line. Importantly, we show that churches' strictness levels are driven, at least partially, by the clergy's intrinsic preferences or prophetic orientations (supply) and not by society's preferences (demand). Our counterfactual scenarios indicate that society's shifting views toward less strict values, especially regarding attitudes towards sexual norms, can explain a sizable fraction of key trends in American church membership levels observed in the last decades.

Taken together, our findings show that the rise of the nones is a consequence of the growing misalignment between the increasingly less strict views of the general public and the more strict and static positioning of organized religion. However, a note of caution is warranted as we close this narrative. As Putnam et al. (2012) put it, *history never ends*. Religious entrepreneurs have the incentive to attend to this growing underserved niche in a dynamic religious market with free entry. Thus considering the fall in affiliation rates as a symptom of secularization forces might prove misleading.

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Appendix

This appendix is divided in two parts. Appendix A contains information on the Cooperative Clergy Study Project that was used to validate the estimates of our model. Appendix B brings additional tables and figures, mostly related to robustness checks of our main results.

Appendix A: The Cooperative Clergy Study Project

Table A1: CCSP Clergy Conservatism Indicator

Denomination	δ_{jt}	Observations
African Methodist Episcopal	0.383	83
American Baptist Churches in USA	0.652	530
Assemblies of God	0.901	336
Catholic	0.474	429
Christian Reformed Church	0.665	397
Church of God in Christ	0.541	83
Church of Christ	0.834	358
Disciples of Christ	0.335	557
Evangelical Free (*)	0.899	261
Evangelical Lutheran Church in America (ELCA)	0.363	681
Jewish	0.120	377
Lutheran Church, Missouri Synod	0.829	652
Mennonite (*)	0.531	377
Church of the Nazarene	0.845	605
Presbyterian Church USA	0.438	473
Presbyterian Church in America	0.931	464
Reformed Church in America	0.610	372
Southern Baptist Convention	0.879	455
Unitarian-Universalists (*)	0.062	488
United Methodist Church	0.507	453
United Methodist Women	0.364	199
Willow Creek Association (*)	0.783	303
Total	0.589	8933

This table shows the denominations in the CCSP data that was used in the estimations in Section 4. Denominations market with (*) are present in the CCSP data but not in the CCES data and, therefore, were dropped from our empirical exercises.

Figure A1: CCSP Clergy Conservatism Index for 2001 and 2009

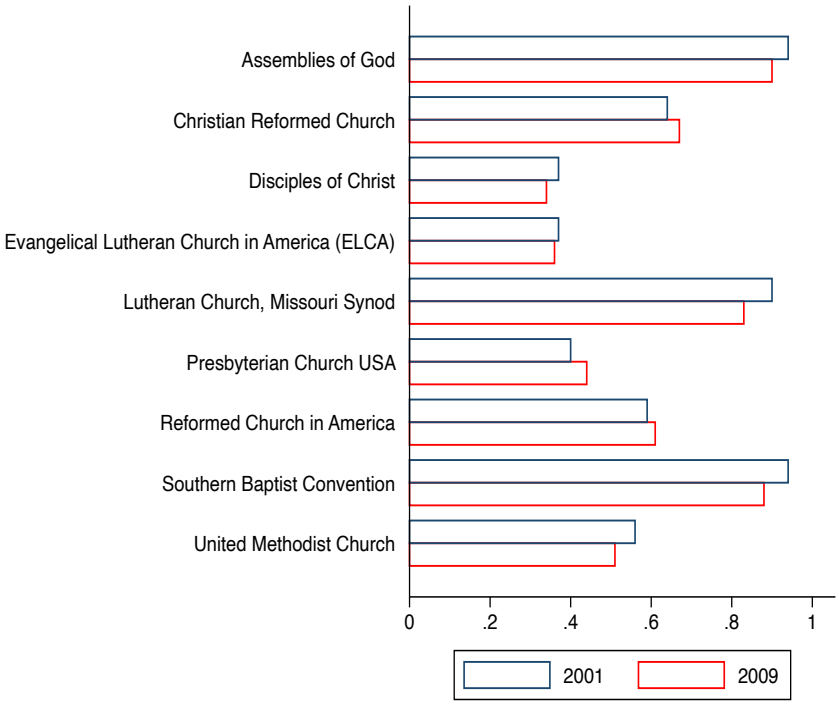
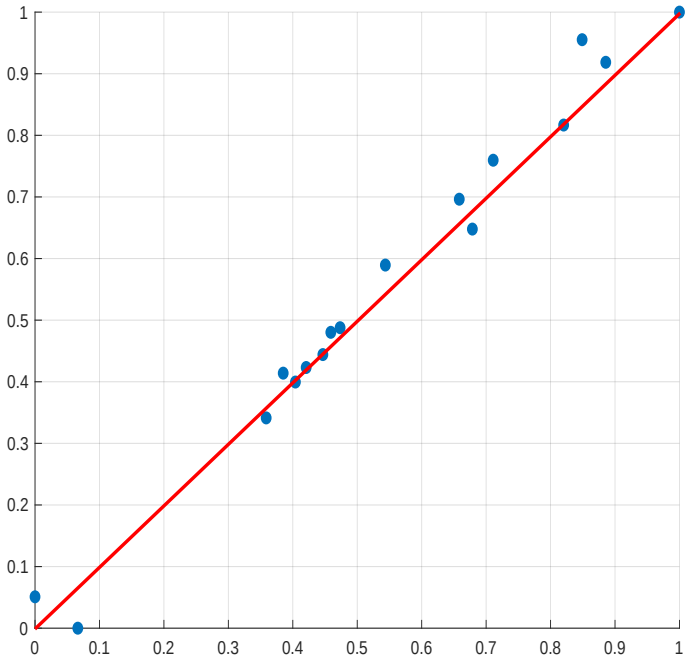


Figure A2: Correlations Between δ_{jt} from the Model with (y axis) and without (x axis) Covariates – CCSP Dataset



Appendix B: Auxiliary Tables and Figures

Figure B1: Individuals Political Views Distribution by Religious Group

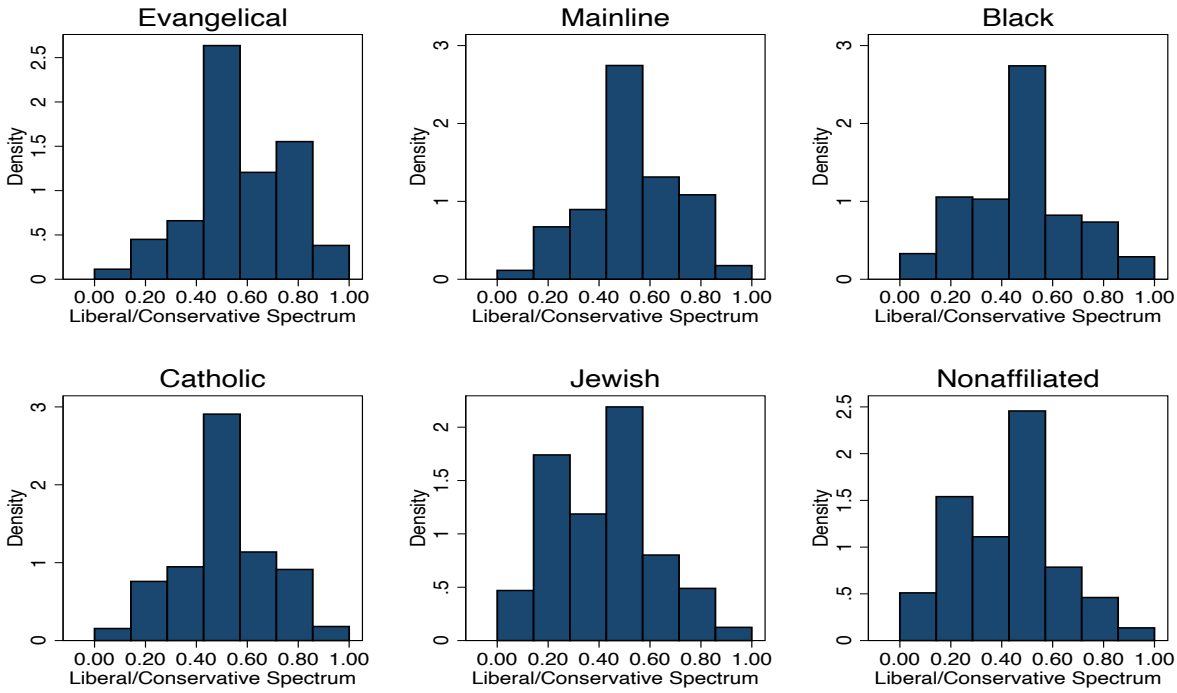


Table B1: Estimates of γ for the CCES and GSS Data – First Stage Models

	[1]	[2]
γ CCES	-1.5151***	-1.5854***
	[0.1478]	[0.0810]
Observations	2590890	5,313,285
γ GSS	-4.2400***	-4.7534***
	[0.4259]	[0.4359]
Observations	97950	88980
Controls	No	Yes

Table B2: Estimates of γ for the CCES and GSS Data with Alternative Measure of Strictness – First Stage Models

	[1]	[2]
γ CCES	-0.2155**	-0.2771***
	[0.0995]	[0.0840]
Observations	4754265	5313285
γ GSS	-1.4234***	-0.9833***
	[0.3310]	[0.3027]
Observations	271308	301536
Controls	Yes	No

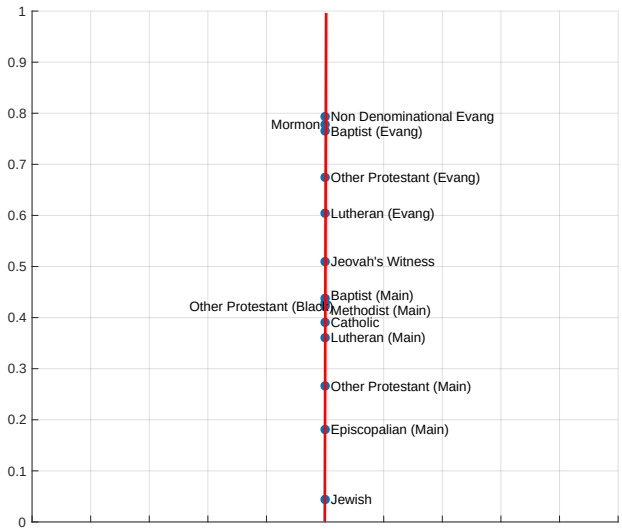
Table B3: Estimates of γ for the CCES and GSS Data with Alternative Measure of Strictness – Second Stage Models

	[1]	[2]
γ CCES	-2.1742***	-2.1727***
	[0.0741]	[0.0810]
Observations	4754265	5313285
γ GSS	-3.6509***	-3.4693***
	[0.0371]	[0.0282]
Observations	271308	301536
Controls	Yes	No

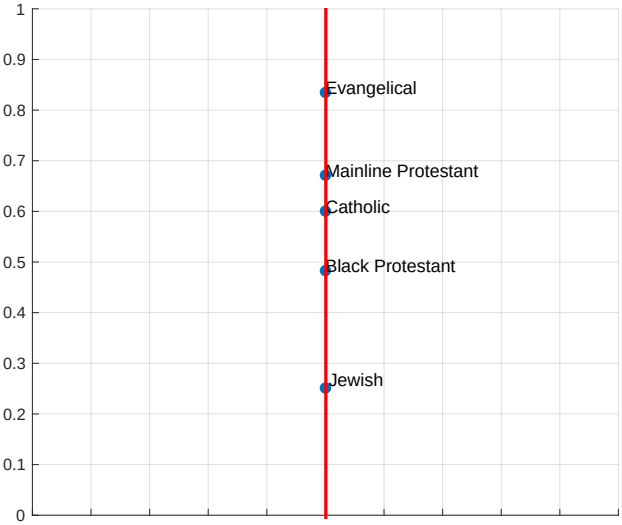
Table B4: Demand Model Estimated with CCSP Strictness and γ_{ij}

Denomination	γ_0	Distance×Education	Distance×Income	Distance×Age
	-2.2556***			
	[0.5057]			
African Methodist Episcopal		-4.7951	-0.2211	0.0928
		[4.0315]	[1.4615]	[0.1468]
American Baptist Churches in USA		-0.8249	-0.1856	0.0670*
		[0.6426]	[0.3378]	[0.0345]
Assemblies of God		-1.1900**	0.1603	-0.0284
		[0.5711]	[0.2500]	[0.0338]
Catholic		-0.1813	0.1341**	0.0168
		[0.1342]	[0.0659]	[0.0103]
Christian Reformed Church		0.9370	-0.3775	-0.0335
		[1.0333]	[0.5994]	[0.0948]
Church of God in Christ		-0.4048	-0.2183	-0.0012
		[0.6167]	[0.3145]	[0.0415]
Church of Christ		-0.5505	-0.1857	0.0510
		[2.1657]	[1.0521]	[0.1623]
Disciples of Christ		-6.1003**	1.0204	0.0124
		[2.7218]	[0.7713]	[0.1189]
Evangelical Lutheran Church in America (ELCA)		-1.2230*	0.6656**	0.0060
		[0.7078]	[0.3281]	[0.0423]
Jewish		-0.0766	0.1845	0.0175
		[0.2615]	[0.1292]	[0.0175]
Lutheran Church, Missouri Synod		0.0644	0.0804	-0.0100
		[0.1752]	[0.0869]	[0.0134]
Church of the Nazarene		-0.4163	0.0117	0.0145
		[0.3095]	[0.1521]	[0.0201]
Presbyterian Church USA		-0.4480	0.3738**	0.0122
		[0.3335]	[0.1664]	[0.0231]
Presbyterian Church in America		-0.7154*	0.1509	0.0197
		[0.3929]	[0.1823]	[0.0247]
Reformed Church in America		-3.2115	0.0959	0.0682
		[2.3886]	[0.9558]	[0.1201]
Southern Baptist Convention		-0.3720*	-0.3397***	0.0108
		[0.2076]	[0.1078]	[0.0141]
United Methodist Church		-0.0194	0.0824	-0.0018
		[0.2361]	[0.1196]	[0.0161]
Observations		250,002		

Figure B2: Strictness Line – CCES and GSS Datasets



(a) CCES Data



(b) GSS Data

Table B5: Data, Model and Counterfactual $\gamma = 0$ Market Shares for the CCES and GSS (Models Estimated from the Alternative Measure of Strictness)

Denomination	(a) Data	(b) Model	(c) $\gamma = 0$	(c)-(b)
		CCES		
Baptist (Evang)	8.84%	8.82%	9.60%	0.78%
Baptist (Main)	1.30%	1.27%	1.30%	0.03%
Catholic	23.03%	23.04%	23.44%	0.40%
Episcopalian (Main)	1.68%	1.68%	1.96%	0.28%
Jehovah's Witness	0.26%	0.25%	0.26%	0.01%
Jewish	2.65%	2.79%	4.01%	1.22%
Lutheran (Evang)	1.97%	1.95%	2.01%	0.06%
Lutheran (Main)	2.37%	2.37%	2.41%	0.04%
Methodist (Main)	5.06%	5.08%	5.07%	-0.01%
Mormon	1.76%	1.76%	1.91%	0.15%
Nondenominational Evang	6.71%	6.71%	7.38%	0.67%
Other Protestant (Black)	3.09%	2.94%	3.68%	0.74%
Other Protestant (Evang)	8.39%	8.46%	8.74%	0.28%
Other Protestant (Main)	3.62%	3.65%	3.91%	0.26%
Nones	**29.27%**	**29.24%**	**24.31%**	**-4.93%**
		GSS		
Evangelical	26.17%	26.9%	33.21%	6.27%
Mainline	20.43%	22.3%	22.44%	0.15%
Black Protestant	8.82%	9.3%	8.34%	-0.95%
Catholic	25.36%	26.8%	24.93%	-1.91%
Jewish	1.91%	2.2%	2.18%	0.02%
None	**13.09%**	**12.5%**	**8.90%**	**-3.58%**