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ABSTRACT

We examine the decentralization of liquor policies in Texas during the Post-Prohibition era using newly collected historical legislative roll call data. By combining these data with local referendum vote shares, we analyze both legislators' and constituents' preferences on liquor policy. We develop a probabilistic voting model incorporating spillovers and peer effects. Results reveal substantial heterogeneity in preferences among voters, reflecting differing attitudes toward alcohol regulation. Spillover effects are significant, yet the model predicts notable gains from decentralization. Finally, we link legislators' policy preferences to alcohol consumption data and compare model-based welfare estimates with traditional consumption-based measures.

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1. Introduction

The temperance movement in the U.S. was dedicated to promoting moderation and, more often, complete abstinence from intoxicating liquor. The organized efforts supporting this movement involved religious coalitions that linked alcohol to virtually all of society's ills, including immorality, criminality, and lack of patriotism. The crowning achievement of the temperance movement was the passage of the 18th Amendment to the United States Constitution in 1917.[2] This amendment prohibited the production, sale, and transport of intoxicating liquors, but it did not provide an enforcement strategy. The National Prohibition Act, known informally as the Volstead Act, was enacted by the United States Congress in 1919 to establish and enforce a uniform liquor control policy throughout the U.S.

Neither the Volstead Act nor the 18th Amendment were enforced with great success. Rather, entire illegal economies such as bootlegging, speakeasies, and distilling operations flourished. The public appetite for alcohol remained strong, and, despite initial success in suppressing alcohol consumption in the early 1920s, alcohol consumption rebounded to approximately two-thirds of the Pre-Prohibition level by the end of the 1920s (Warburton, 1932). Widespread public disobedience, political corruption, and bribery undermined enforcement. Courts became overwhelmed with Prohibition-related cases, and juries were reluctant to convict minor offenders. Organized crime took over the production and distribution of liquor, leading to sharp increases in violent crime. Law enforcement efforts were soon recognized as insufficient to deal with organized crime cartels, changing beliefs about enforcement costs and attitudes toward liquor control policies (Garcia-Jimeno, 2016).

Responding to widespread disenchantment with Prohibition Era policies, the United

[2] The 18th Amendment was ratified and became effective in 1919.

States Congress passed the 21st Amendment in 1933, voiding the Volstead Act. The political compromise that ended the Prohibition Era specified that liquor policies were no longer decided at the federal level. Instead, each state could determine its policy. This compromise resulted in widespread policy decentralization in the U.S. Roughly half of the states further delegated the decision-making power to county governments or local municipalities. States with more heterogeneous preferences and strong voting minorities were more likely to decentralize liquor policies after the end of the Prohibition Era (Strumpf and Oberholzer-Gee, 2002).

The purpose of this paper is to study state and local liquor policies in Texas, which was the largest state in the Union that decided to decentralize liquor policies. We have systematically collected new roll call voting data on the Texas state legislature for this historical period. Almost all relevant liquor policy votes in the Texas legislature were taken between 1931 and 1937. To conduct our analysis, we extensively searched the Texas legislative archives and hand-collected new data from several rarely used historical sources. We exploited the journals' classifications of bills by policy issue to identify all bills related to liquor policy. We then manually searched through thousands of roll call votes in the journals and recorded every substantive vote on a liquor policy bill. We included all votes in an attempt to pass the bill, as well as votes to amend the bill when the amendment would have changed the policy content of the bill. We identified 102 roll calls on bills and amendments that dealt with alcohol and liquor policies. To the best of our knowledge, no previous study has systematically collected and analyzed roll call voting data for this fascinating historical period.

Using standard scaling techniques, we estimate the legislators' bliss points based on their observed roll call votes.[3] We treat liquor policy as a "pliable issue" on which legislators were

[3]See, for example, Poole and Rosenthal (1985, 1991), Heckman and Snyder (1997), or Clinton, Jackman, and Rivers (2004). We discuss these techniques in detail below.

free to take any position they wanted to appeal to their constituents. Our estimates suggest that there was little party discipline within the Texas Democratic Party, which dominated state politics during the period we study. Instead, in both the Texas House of Representatives and Senate, there was much heterogeneity in the bliss points of legislators and preferences over liquor policy.

Next, we link legislators' bliss points to voters' preferences using a probabilistic voting model.[4] The historical context discussed in detail below supports the adoption of a probabilistic voting model for the period, premised on weak parties and office-motivated politicians.[5] A multi-dimensional voting model is particularly appealing, as liquor policy was neither the sole nor necessarily the most salient dimension shaping political behavior in Texas during the 1930s and 1940s. Several discrete voter types capture the heterogeneity in voter preferences within each district. We show how to estimate the parameters of a probabilistic voting model with a multi-dimensional policy space using a flexible GMM estimator that can account for both exogenous and endogenous spillover effects.

Using data on the socio-economic and demographic compositions of voting districts, as well as the estimated bliss points of each member of the Texas House of Representatives, we estimate the probabilistic voting model. Our empirical model defines voter types based on religious affiliations, classifying voters into "wet" and "dry" types.[6] We validate the model using the estimated bliss points of members of the Texas Senate, which we do not use in estimating the model. We find that there are statistically significant and economically

[4]For a comprehensive survey and analysis of probabilistic voting models see Coughlin (1992).

[5]This scenario mirrors the logic of the Downsian (1957) model, where candidates primarily seek to win elections and therefore position themselves ideologically to appeal to the electorate. These assumptions are more problematic when there are strong party platforms, ideologically motivated politicians, or other factors such as candidate identity or valence that influence voter behavior.

[6]Garcia-Jimeno, Iglesias and Yildirim (2021) study the role of information networks and collection action during the Temperance Crusade in 1873-74. They also highlight the importance of religious organizations such as the Women's Christian Temperance Union in the push for prohibition.

meaningful differences in the preferences of dry and wet religious types. Minorities, higher-income voters, and voters from more densely populated areas prefer wet policies. Spillover effects appear to be endogenous and significant. One feature of the probabilistic voting model is that politicians do not have to assign equal weight to each voter type. We strongly reject the hypothesis of equal treatment of voter types. Our estimates imply that politicians assigned higher weights to wet voters than to dry voters. These weights reflect differences in voter preferences and voter mobility. These findings are robust to a large number of changes in our sample and model specification.

The Texas Legislature ultimately decentralized important aspects of liquor policies to local governments. As a result, liquor policies were determined by local public referenda that pit a status quo policy against an alternative policy (Romer and Rosenthal, 1978). We obtained the dates and vote tabulations for all countywide local option elections that took place between 1937 and 1952.[7] In addition to observing how a county voted in a given referendum, our analysis requires that we know a county's status quo liquor policy when the referendum takes place. We observe counties' Pre-Prohibition liquor statuses, allowing us to track each of the 254 counties' liquor policies over time. We study the outcome of 302 referenda at the county level between 1937 and 1952.

We extend the probabilistic voting model to generate predictions of vote shares in local public referenda. We then show how to identify and estimate the unobserved policy positions of the status quo and the proposed alternative from the observed vote shares of the public referenda. Hence, we can jointly analyze historical roll data and referenda voting records on the same important policy dimension, which has rarely been done before. This allows us to determine whether the preferences of voters and representatives aligned during this era.

[7]These data were previously used by Strumpf and Oberholzer-Gee (2002). Coate and Conlin (2004) also collected data on these referenda for a later period.

Within this framework, testing whether the voting behavior of legislators is consistent with the vote shares in public referenda boils down to evaluating whether the same preference specification of the probabilistic voting model can explain both the bliss points of legislators as well as the referenda vote shares.

Our empirical findings suggest that voting behavior in referenda aligned with the roll call voting behavior of the legislators. The status quo reflects policies that were in effect at the end of the Prohibition Era. The estimate of the status quo indicates that liquor policy at the end of Prohibition was not as heavily tilted toward the preferences of dry voters as policies at the beginning of Prohibition. This is consistent with the notion that Prohibition Era policies had lost their popularity with the majority of voters. Our estimates also confirm that the policies adopted in many counties as a consequence of decentralization in the Post-Prohibition Era reflected a large shift toward the preferences of wet voters.

We then compare voters' welfare under different policy regimes. Our model allows for spillover and peer effects in the determination of policy preferences. Our estimates suggest that these spillover effects are statistically significant and thus affect the welfare implications of our model. Despite the presence of spillover effects, we find that decentralized policies that were adopted in the Post-Prohibition Era significantly improved voters' welfare. This is primarily due to the fact that decentralization gave states an opportunity to account for heterogeneity in voter preferences, as suggested by Oates (1972). In particular, policy decentralization led to large welfare gains, especially in densely populated counties with large shares of high-income and minority voters who favored wet policies. At the same time, it did not affect much the counties that chose to stay with the dry status quo. We also show that the shift in policies from strong enforcement in the early 1920s to weak enforcement in the late 1920s significantly increased voters' welfare. However, these welfare gains were muted due to the existence of spillover effects.

Recall that the probabilistic voting model only allows us to characterize voters' and legislators' preferences in an abstract liquor policy space. To gain additional insights into the impact of these policy changes and to compare our welfare measures to more traditional consumption-based welfare measures, we construct a function that maps policies from the abstract liquor policy space into average alcohol consumption. Not surprisingly, there were no official statistics on alcohol consumption compiled during the Prohibition Era. Our empirical analysis is based on rarely used data that were collected by Warburton (1932) at the end of the Prohibition Era from a wide variety of sources. These data provide estimates of alcohol consumption and prices during the Prohibition Era.[8] We find that liquor policies at the beginning of the Prohibition Era reflected an extreme leaning toward the preferences of dry voters and implied an average consumption of about 0.3 gallons of pure ethanol per capita. By the end of the Prohibition Era, policies had significantly moderated, reflecting an average consumption of about 1.6 gallons of pure ethanol. Post-Prohibition Era policies, which allowed counties to choose their preferred policies, corresponded to an average ethanol consumption of 1.85 gallons per capita. A large majority of legislators preferred policies that implied an average pure ethanol consumption between 1.5 and 2 gallons per capita. Finally, we estimate a demand function for alcohol during the Prohibition Era which allows us to construct more traditional welfare measures like consumer surplus. This analysis confirms our hypothesis that the bulk of the gains achieved by decentralization were not driven by large increases in the average alcohol consumption, but by targeting local policies to the tastes of the local constituencies.

[8]Warburton (1932) is a comprehensive data source that has rarely been used in empirical economics. One prominent exception is Miron and Zwiebel (1991) who also estimate alcohol consumption during the prohibition era, extending Warburton's analysis by incorporating data from the Post-Prohibition Era.

The rest of the paper is organized as follows. Section 2 provides a brief literature review and discusses our contributions. Section 3 discusses the institutional background and introduces our data set. Section 4 develops the theoretical framework for our analysis. Section 5 discusses the identification and estimation of our model. Section 6 presents the main empirical results. Section 7 explores the welfare implications of our work, and Section 8 concludes.

2. Literature Review

Our paper is related to various parts of the literature on political economy and public economics. A seminal empirical paper on fiscal federalism and policy decentralization is Strumpf and Oberholzer-Gee (2002). They show that states with high preference heterogeneity and strong voting minorities were more likely to decentralize liquor policies after the end of the Prohibition Era. Our research differs from this paper in several important ways. First, Strumpf and Oberholzer-Gee (2002) focus on strategic bargaining within a state legislature. In contrast, we primarily focus on local elections and referenda which we model as the outcome of a probabilistic voting model with sincere voting. Second, Strumpf and Oberholzer-Gee (2002) estimate their model by exploiting variation in decentralization decisions across states, while we exploit variation in the preferences of legislators within a single state. Third, we use the referenda to test whether voters' behavior in referenda is consistent with the outcomes of legislative elections, while they use the referenda data to measure the heterogeneity of voters within states. Finally, our analysis allows us to ultimately compare welfare differences between centralized and decentralized decision-making, whereas Strumpf and Oberholzer-Gee (2002) are mainly interested in establishing that heterogeneity within states predicts policy decentralization.

One of the main insights of fiscal federalism is that a decentralized provision of public goods is likely to improve welfare over a centralized, uniform provision if spillovers and differences in costs among local jurisdictions are sufficiently small (Oates, 1972). Our analysis accounts for policy spillovers highlighted by Acemoglu, Garcia-Jimeno, and Robinson (2015). In our application, spillover effects may arise due to liquor purchases by customers that cross jurisdictional borders or due to spillovers in law enforcement. Drunk driving and highway accidents may also cross county boundaries. Individuals who are against liquor consumption plausibly get disutility from the very fact that others are drinking, even if they live in another jurisdiction. Preferences over liquor policies in one county may therefore depend on the policies of neighboring counties. We find that these spillovers are significant and economically meaningful. Nevertheless, we find large benefits of decentralization.

Several empirical papers have directly measured spillovers by studying changes in local liquor laws in Texas, focusing mostly on a later period between 1975 and 1996. After controlling for both county and year fixed effects, Baughman, Conlin, Dickert-Conlin, and Pepper (2001) find evidence that the sale of beer and wine may decrease expected motor vehicle accidents. They also find that the sale of higher alcohol content liquor may present a greater risk to highway safety than the sale of just beer and wine. In a related paper, Conlin, Dickert-Conlin, and Pepper (2005) find that prohibiting the sale of beer to persons under 21 increases the fraction of drug-related arrests involving juveniles more in wet counties than in dry counties. They find that local alcohol access decreases mortality associated with illicit drugs. Overall, the findings of these papers are consistent with our finding that there are potentially large benefits from decentralization even if spillovers are important. That said, our analysis differs from these papers in several ways. In our model, the bliss points of voters and politicians reflect both the benefits and costs of liquor policies. Liquor policy preferences in our model also depend on the characteristics and policies of adjacent communities, which can capture spillovers among counties. We focus on a much earlier period than most previous studies that have estimated spillovers, namely the 1930s and 1940s. In that period, there were fewer highways, and highway safety was not a major policy concern. Cars were lower quality and less reliable, and car ownership rates and miles driven per year were much lower.

Given the prevalence of policy decentralization in most developed economies, it is surprising that there are few empirical studies that have estimated the benefits of policy decentralization within an internally consistent political economy model. One exception is Calabrese, Epple, and Romano (2011). They compare the efficient decentralized allocation, the equilibrium allocation with a decentralized provision, and the equilibrium allocation with a uniform provision in a model that is calibrated to the Boston metropolitan area. By comparison, this paper develops and implements a completely different framework for measuring the benefits of policy decentralization. One important methodological contribution is that we show how to estimate the parameters of a probabilistic voting model and characterize the positions of various policies by combining data on legislator roll call votes and vote shares in local referenda. To our knowledge, this is one of the first papers that has jointly studied voting in the legislature and voting in local referenda and tested whether these voting patterns can be rationalized by an internally consistent voting model.

The decentralization theorem has been criticized since it assumes that centralization results in a uniform policy. In principle, federal governments can provide different levels of public services among states. In practice, there are often political and legal constraints on the extent to which this can happen. The theoretical literature has developed models of decentralization that have endogenized the centralized policy. Lockwood (2002) considers a model of legislative bargaining and shows that more preference heterogeneity across jurisdictions does not necessarily imply that welfare increases under decentralization. Besley and

Coate (2003) show that decentralization is desirable under the same conditions if one relaxes the assumption that the federal government is constrained to implement a uniform policy. In their model, centralization tends to generate an over-provision of public goods because voters are incentivized to elect representatives with high demand for public spending. In these models, voters do not necessarily want to elect candidates who share their policy preferences. Depending on the composition and procedures of the legislature, they may want to strategically delegate to candidates with more extreme preferences to counteract the influence of other districts. Our analysis abstracts from these strategic voting issues, but allows for spillovers or peer effects in preferences over policies. These papers are also motivated by the observation that federal government policies are not necessarily uniform. In contrast, we study an era in which it was the explicit objective of the federal government to implement a uniform policy for all states. As discussed above, both the 18th Amendment to the United States Constitution and the National Prohibition Act were intended to establish and enforce a uniform liquor policy throughout the U.S. It thus makes sense to compare decentralized policies against uniform centralized policies in our application.

When local jurisdictions' policy decisions generate inter-jurisdictional spillovers, a centralized authority can internalize these externalities more effectively. For instance, public spending in one district may confer benefits on neighboring districts, while decentralized decision-making may lead each locality to ignore these external effects, as discussed in Oates (1972) and Besley and Coate (2003). Centralization, therefore, enhances coordination across jurisdictions and mitigates under-provision of goods with spillover benefits. Similarly, centralization facilitates the adoption of uniform policy standards where such uniformity is desirable, and it enables governments to exploit economies of scale in the provision of public goods and administrative services.[9] Recent research also highlights that, when voters or jurisdictions

[9]See de Benedictis, Di Maio, and Santoni (2021) for a recent survey of the empirical evidence on economies

differ in the quality or availability of information, centralization can improve accountability by concentrating responsibility and reducing the scope for local capture. Boffa, Piolatto, and Ponzetto (2016) show that uniform provision under a centralized regime enhances welfare when a significant share of the electorate is uninformed. In contexts such as liquor regulation, however, policies are relatively straightforward, and information asymmetries are unlikely to play a major role. Economies of scale are not likely to be important, either.

Our paper is related to Canen, Kendall and Trebbi (2020), who argue that standard scaling algorithms may miss important density in the middle of the support of the ideological distribution and thus overstate the degree of polarization in the legislature.[10] Our findings are consistent with their view, but are based on a different type of argument, namely that the relationship between positions in the liquor policy space (which is identified by the scaling techniques) and positions in the alcohol consumption space (which can be objectively measured by consumption data) is potentially non-linear. Hence, differences in legislators' bliss points in the liquor policy space may exaggerate differences in preferences for alcohol consumption.

Our paper is also related to the literature on the validity of voting models using state and local data. Lott and Kenny (1999) provide compelling indirect evidence in favor of the median voter theorem by examining the growth of state governments resulting from giving women the right to vote. Similarly, Miller (2008) finds that suffrage rights for American women helped children benefit from technological innovations in health care and significantly decreased child mortality in the U.S. Epple, Romer, and Sieg (2001) and Calabrese, Epple, Romer, and Sieg

of scale in public service provision.

[10]They suggest using additional data from the whip count stage to disentangle party control from individual ideologies. Unfortunately, these data do not exist for our period. As we have seen, party control is unlikely to be an important issue in our application since all legislators belonged to the Democratic party and liquor policies were not subject to party discipline.

(2006) analyze whether observed local tax and expenditure policies are consistent with a version of the median voter theorem that accounts for endogenous household sorting within a system of jurisdictions. In contrast to these papers, we use a probabilistic voting model and directly exploit a combination of observed roll call votes and vote shares in public referenda to identify, estimate, and validate our model. A key methodological contribution of this paper is that we provide conditions guaranteeing our model of voting in legislative elections and voting in local referenda is identified up to some normalizations and can be estimated using a GMM estimator, even if the policy space is multi-dimensional and not all dimensions are observed by the econometrician. This is important because the outcomes of legislative elections are likely not determined purely by preferences over liquor policies.[11] We provide sufficient conditions such that our model can be estimated for arbitrarily large policy spaces, even if some important dimensions are not observed by the econometrician.

Our paper is also related to Coate and Conlin (2004), who estimate models of voter turnout using data from Texas liquor referenda. They find that a rule-utilitarian model provides a good explanation for the observed turnout patterns. This result is important since it provides a compelling explanation of why voters show up at the ballot box. Coate, Conlin, and Moro (2008) extend the analysis and estimate a pivotal voting model. We do not provide an explicit model of voter turnout, but our model and empirical analysis also account for imperfect voter turnout.

Finally, our paper adds to the literature on estimating game-theoretic models in political economy. Early examples of theory-based estimation in political economy include Merlo

[11]For that reason, we also collected detailed data on roll call votes on bills related to fiscal policy. In earlier versions of this paper, we also reported estimates for preferences of fiscal policies and studied how preferences over fiscal policy correlate with preferences over liquor policy. For fiscal policy, we only see votes in the legislature since there were no public referenda on fiscal issues. As a consequence, we cannot test whether the voting behavior of representatives on fiscal policy aligns with the votes of their constituents in local referenda. These additional results are available upon request from the authors.

(1997) and Diermeier, Eraslan, and Merlo (2003), who estimate dynamic bargaining models of government formation. More recently, Knight and Schiff (2010) estimate a model of social learning in presidential primaries. Iaryczower and Shum (2012) estimate a game with asymmetric information to describe the voting behavior of judges in appellate courts. Kawai and Watanabe (2013) consider models of strategic voting. Sieg and Yoon (2017, 2022) estimate dynamic games of electoral competition with asymmetric information. Aruoba, Drazen, and Vlaicu (2019) estimate a political agency model with moral hazard using governors' job approval ratings as outcome measures. Battaglini, Patacchini, and Rainone (2022) estimate a model of network formation and show that social connections are important for legislators' productivity. Our model and estimation strategy differ significantly from those papers.

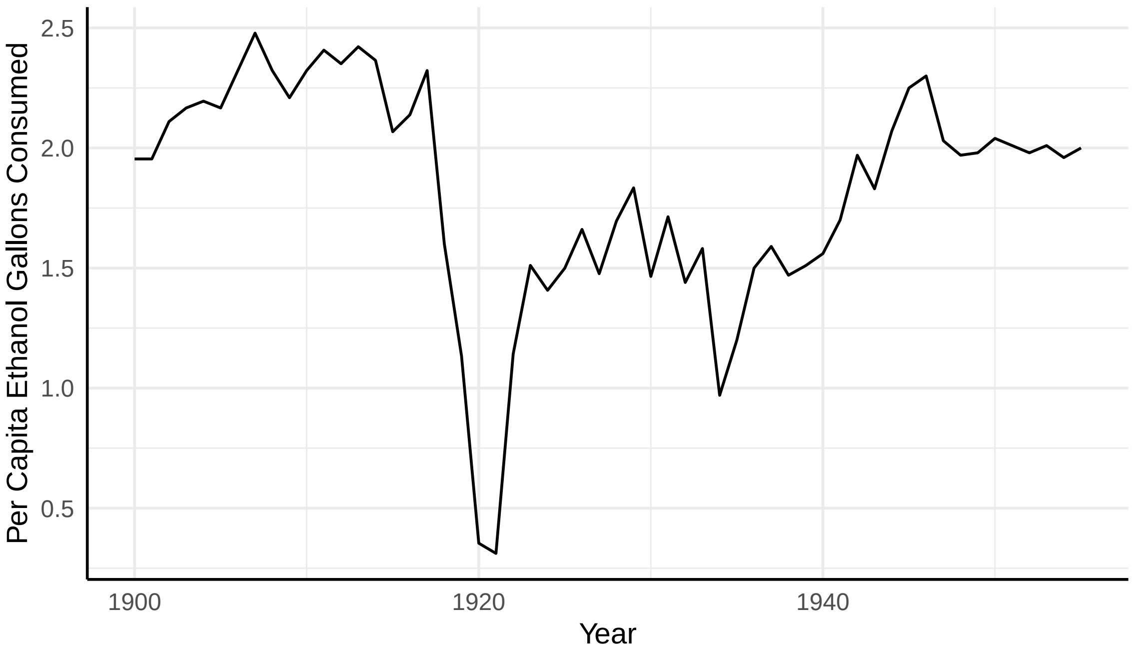
3. Data

3.1. Alcohol Consumption in the U.S. between 1900 and 1955

The overall impact of Prohibition on alcohol consumption in the U.S. is difficult to ascertain. While the federal government collected reliable data on alcohol consumption before and after the Prohibition Era, no accurate government data are available for the Prohibition Era. Perhaps more surprisingly, Warburton (1932) is the only careful economic study that was ever conducted toward the end of the Prohibition Era to determine the impact of Prohibition on alcohol consumption and a variety of other economic outcomes.

Figure 1 shows the time series of pure ethanol consumption per capita between 1900 and 1955. Our data are based on the official statistics for 1900-1920 and 1934-1955. For 1921-1930 we rely on the estimates from Warburton (1932, Table 30). These estimates were

Figure 1: U.S. Alcohol Consumption: 1900-1955



Note: This figure plots the average consumption per capita of pure ethanol in the U.S. between 1900 and 1955 using the 15 and older population as the deflator.

confirmed by Miron and Zwiebel (1991), who extended Warburton's analysis using data from the Post-Prohibition Era and conducted several sensitivity checks. Overall, their findings are essentially the same as those reported in Warburton (1932).[12] Note that alcohol consumption was fairly stable before the Prohibition Era and averaged around 2.39 gallons per capita during the period between 1911-14.[13] Using a variety of different techniques, Warburton (1932) estimated that alcohol consumption fell sharply at the beginning of the Prohibition Era to approximately 0.31 gallons in 1921, well below its Pre-Prohibition level. By the mid-1920s, however, law enforcement efforts slackened, leading to a significant rebound in alcohol

[12]Miron and Zwiebel (1991) also provide estimates for the period from 1931-33 which are used in Figure 1.

[13]Warburton (1932, p. 147) reports that the federal tax rates on beer were increased in 1917 from $1.50 per barrel to $3, and in 1919 to $6, and those on spirits from $1.10 per gallon to $3.20 in 1917, and to $6.40 in 1919. The rate on wines, which previously had borne no federal tax, was made to vary with the alcoholic content. This partially explains the large drop in alcohol consumption during World War I.

consumption that reached 1.7 gallons in 1928. The level of consumption remained the same right after the end of the Prohibition Era and averaged about 1.85 gallons between 1935 and 1955.

While the aggregate time series for pure ethanol illustrates the main trend in alcohol consumption, it conceals some important aspects of the Prohibition Era. Table 6 in Appendix A reports three time series breaking down the total pure ethanol consumption into beer, wine, and spirits consumption. Notably, Prohibition primarily succeeded in reducing beer consumption. The per capita consumption of beer was reduced by about 70 percent, from approximately 31 gallons of beer per year (or 1.25 gallons of pure ethanol) in 1911-1914 to 8.75 gallons of beer (or 0.35 gallons of pure ethanol) in 1927-1930. In contrast, the consumption of wine increased by 65 percent and pure spirits by 10 percent during the Prohibition Era. As a consequence, Prohibition led to a strong substitution from beer to wine and spirits. This was likely due to the fact that it was much easier to enforce Prohibition for large-scale beer production by shutting down commercial breweries and forcing households into illegal home production of beer.[14]

3.2. Historical Background and Institutional Design in Texas

This paper studies state and local liquor policies in Texas in the Prohibition and Post-Prohibition Eras. We focus on Texas because it was the largest state in the Union that decided to decentralize liquor policies.[15]

[14]There are no estimates of alcohol consumption at the state level for the Prohibition Era. However, more recent statistics suggest that Texas tends to be in the 5th or 6th decile of alcohol consumption among the 50 states in the U.S. As a consequence, the U.S. data also provide an accurate estimate of alcohol consumption in Texas.

[15]Ignoring data availability and sample size concerns, our analysis can, in principle, be applied to any state in the U.S. that chose to decentralize liquor policies after the end of Prohibition.

Historians characterize the 1920s through the 1940s as a period of political transition in Texas (Brown, 1984, 2019). Although the Democratic Party had dominated state politics since its independence in 1836, it lacked the centralized control typical of a disciplined party, exerting limited influence over legislative candidates or caucus behavior. Young (2021) observes that Texas Democrats gradually developed from a loose coalition into a more structured political party. This transformation occurred slowly, largely because the absence of a strong opposing party for much of Texas's history reduced the incentive to build a unified, centralized organization, instead fostering internal divisions and factional conflict. The main divisions existed between business progressives and populists, "drys" and "wets," liberals and conservatives, and pro- and anti-Klan candidates. Factionalism meant that political nominations and allegiances were often shaped by personal, regional, or factional networks rather than top-down party directives. With little viable political opposition during this period, there were few incentives to build a strong party apparatus.

The Great Depression and the New Deal further complicated Texas politics, expanding the federal government's role and prompting debates over relief programs, agricultural initiatives, and economic modernization. Cunningham (2023) argues that political culture in the 1930s was highly malleable: the state adapted to economic crises and found avenues for liberal governance under the Democratic banner, even as conservative structures—particularly those governing race, states' rights, and economic power concentrated among white landowners and the oil industry—remained entrenched. Thus, despite Democratic dominance, Texas politics was fragmented, and internal divisions outweighed inter-party competition.

Since 1876, Texas has allowed localities to determine their liquor statuses through local option elections and referenda. As discussed above, the 18th Amendment to the United States Constitution on National Prohibition was ratified in January 1919. Texans followed suit with a Prohibition amendment to the state constitution in May 1919. Prohibition remained in effect for almost 14 years until it was rescinded by the 21st Amendment in 1933. Also in 1933, Texans voted in favor of allowing the sale of 3.2 percent beer, but full-strength beer, wine, and hard liquor remained prohibited under the still-active statewide Prohibition law. The state dry law was repealed in August 1935, returning each county to its Pre-Prohibition liquor status. The statewide sale of alcoholic beverages was licensed in 1936. The first Post-Prohibition local option elections were recorded in 1937 when over 70 localities voted to change their alcohol status. By 1953, local liquor statuses were mostly constant, with an average of only 17 referenda per year between 1953 and 1958.

Texas uses a bicameral system which consists of a Senate and a House of Representatives. In this study, we primarily focus on the voting behavior of the members of the House.[16] During the relevant period, there were 150 House districts. None of the House districts cut county lines.[17] Representatives were elected from single- and multi-member districts.[18] Between 1933 and 1952, the Texas House of Representatives had 150 members from 127 districts. Of the 150 members, 115 came from single-member districts. The remaining 35 representatives came from eight two-member districts, one four-member district, and three five-member districts. The districts usually corresponded to counties or combinations thereof, with more populous counties getting more representatives.[19] Only two representatives who were in office from 1933 to 1937 were unaffiliated with a party, and one of them later became

[16]There are also 31 members of the Texas Senate. We use the data from the Senate in our validation analysis as discussed below.

[17]Texas is divided into 254 counties.

[18]Multi-member districts were used extensively from 1846 until 1975. Although the idea of equal representation surely held some conceptual appeal, it was not until 1964 that the Supreme Court insisted on the "one person, one vote" principle for state legislative districts in the landmark Reynolds v. Sims decision (Calabrese, 2000). This and other court decisions, as well as the difficulty of developing a district plan that would pass muster, led to the exclusive use of single-member districts in Texas after 1975.

[19]From time to time, flotorial districts were used. These were districts that overlapped with other districts to give representation to a county or region that otherwise would not get any.

a Democrat. All others were Democrats. Hence, the main political competition was within the Democratic party.

Table 1: Demographic and Religious Characteristics of Texas House Districts

	Mean	Std Dev
Demographics		
Population ($\times 10^5$)	0.67	0.78
Percent Male	50.45	0.92
Percent Black	15.70	13.27
Percent Hispanic	7.95	15.00
Percent Black or Hispanic	23.59	16.38
Percent White	76.38	16.38
Percent 18+	66.75	3.13
Percent 21+	60.70	3.33
Average wage income ($\times 10^3$ 1940 \$)	0.81	0.24
Median home value ($\times 10^3$ 1940 \$)	0.92	0.55
Population Density ($\times 10^2$) per square mile	0.50	0.64
Percent Renter	57.81	5.62
Percent Urban	32.40	21.68
Percent Unemployed	7.20	2.18
Percent Completed high school	24.01	7.48
Percent Some college	10.30	3.23
Dry Religions		
Percent Evangelical	0.68	1.81
Percent Baptist	39.53	17.06
Percent Methodist / Episcopal	21.46	8.96
Percent Presbyterian	3.59	2.22
Percent Mormon	0.00	0.00
Wet Religions		
Percent Lutheran	3.52	6.93
Percent Jewish	0.64	1.46
Percent Catholic	18.26	22.05

Note: This table provides descriptive statistics for the house districts in our sample.

Using the 1940 U.S. Census micro-data, we observe several socio-economic demographics characterizing the income, age, gender, and racial distributions of the districts.[20] Moreover,

[20]We use the Integrated Public Use Micro-data Series version of the complete count Census data. The 1936 Decennial Census of Religious Bodies comes from ICPSR Study #8.

we observe variables characterizing labor and housing markets such as wage income, fraction unemployed, housing wealth, and fraction renter. We also have detailed information about the different religious affiliations at the county level from the 1936 Decennial Census of Religious Bodies. We follow Garcia-Jimeno (2016) in grouping these religious affiliations into two types: "dry" and "wet". This grouping reflects the prevailing attitude of these religious groups toward liquor policies. Dry religions are Evangelicals, Baptists, Methodists, Presbyterians, and Mormons. Wet religions are Lutheran, Catholic, and Jewish.[21] We also observe the total population and land area which allows us to construct a population density measure. Table 1 provides socio-demographic characteristics at the district level for the Texas House of Representatives.

3.3. Estimating Legislator Bliss Points

We estimate the bliss points of legislators using the one-dimensional W-NOMINATE method, which is a simplified version of the multidimensional scaling techniques to political choice data developed by Poole and Rosenthal (1985, 1991). This method is based on observing roll call voting, where legislators' votes for or against bills, amendments, resolutions, and other legislative proceedings are recorded and published. Though there are important technical differences between the different scaling procedures that are advocated and commonly applied in the literature, there are two important commonalities.[22]

First, most techniques assume that alternative votes can be projected on a low-dimensional Euclidean space. For the most part, Poole and Rosenthal (1997) find that U.S. congressional

[21] Garcia-Jimeno (2016) also includes Eastern Orthodox as a wet religion, but there was no Eastern Orthodox community in Texas according to the 1936 Census.

[22] Alternative techniques are proposed, for example, by Heckman and Snyder (1997) and Clinton, Jackman, and Rivers (2004). Different estimation techniques often result in similar estimates of the ideal points. Our estimator of the probabilistic voting model can be combined with any method that provides reasonable measures of the legislators' ideal points.

voting is one-dimensional, with most of the variation in voting patterns explained by legislators' placement along a single liberal-conservative dimension. A second dimension is often added to pick up attitudes on salient issues of the period such as slavery, bimetallism, liquor policies, civil rights, and regional, social, and lifestyle issues. The scales of these dimensions are not identified and are typically normalized to be between -1 and 1. Having a position on the dominant first dimension that is close to either pole means a legislator is located at one of the extremes on the liberal-conservative ideological scale. In our application, we restrict attention to votes on liquor policies. Focusing on a single, known dimension of the policy space simplifies the analysis and avoids some of the identification problems associated with these techniques when the dimensionality of the policy space is not known ex-ante.[23] Moreover, we can easily interpret a position of minus one as the most extreme pro-liquor (wet) policy, while a position of one reflects the most extreme anti-liquor (dry) policy.

A second assumption is that legislators have symmetric, single-peaked utility functions that center on their bliss points. These bliss points represent individuals' most preferred policy outcomes. Legislators vote sincerely so that there is no legislative bargaining or vote trading. The classification algorithm is based on a probabilistic voting model. Legislators farther from the "cutting point" (in a one-dimensional model) or the "cutting line" (in a two-dimensional model) become more likely to vote in the manner predicted by the spatial model, i.e. the classification algorithm uses a probabilistic voting model to account for errors in the classification of the roll call votes. If the policy space is one-dimensional, the W-NOMINATE method is similar to a fixed-effect probit model in which legislators' bliss points and the cut-off points for each roll call vote are treated as unknown parameters. We restrict attention to roll call votes associated with bills on liquor policy. As such, we use the one-dimensional version of the W-NOMINATE procedure to estimate legislators' bliss points.

[23]See, for example, the discussion in Heckman and Snyder (1997) and Canen, Kendall and Trebbi (2020).

To apply this classification method we need to observe the voting behavior of legislators on a sufficiently large number of roll call votes. McCarty, Poole, and Rosenthal (2006) summarize the behavior of the W-NOMINATE estimator in a large number of Monte Carlo settings and suggest that at least twenty votes are necessary for obtaining reliable bliss point estimates. When removing legislators who vote less than 20 times on alcohol-related bills, we drop 78 of the 304 legislators we observed in the Texas House during our sample period. We have experimented with other roll call voting thresholds and found that including these missing legislators leads to similar results.[24]

Table 2: Roll Call Votes on Liquor Policy

Chamber	Number of Legislators	Number of Single Member Districts	Number of Roll Calls Liquor Policy	Median Liquor Votes
House	226	173	102	49
Senate	31	31	93	79

Note: This table provides descriptive statistics of the roll call votes in our sample.

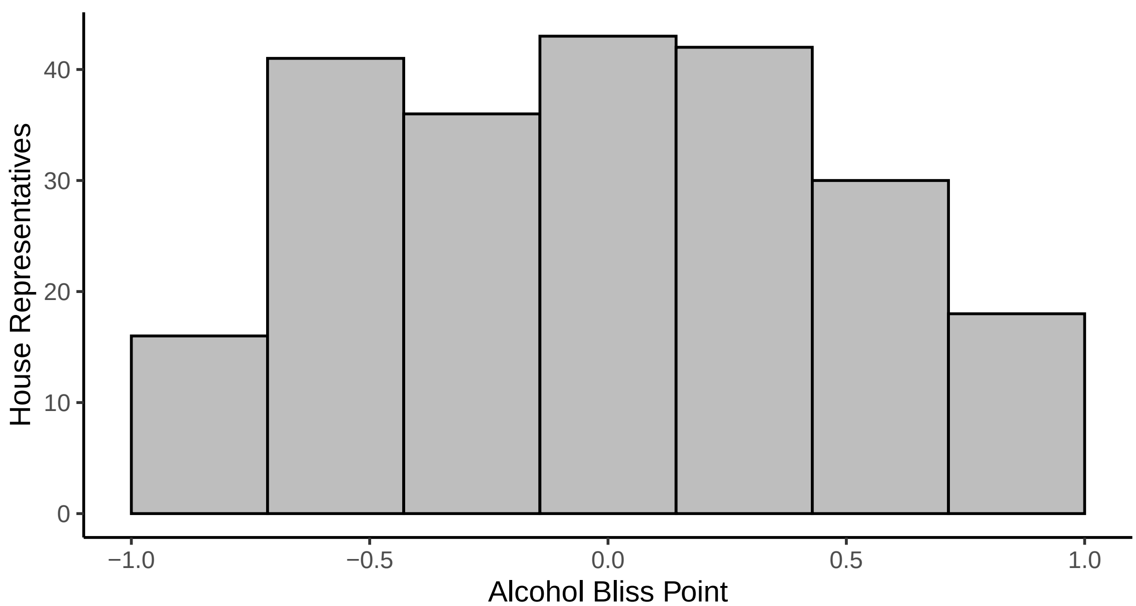
For each legislator in the House and Senate, we analyze the votes on liquor policies.[25] We identify roll call votes on this policy dimension using the journals of the House and the Senate made available by the Texas Legislative Reference Library. These journals index all proposed legislation by their policy content and contain detailed histories of each bill, including an overview of every time the legislature amends or votes to pass or table the bill. Appendix C contains a detailed discussion of the roll call votes on liquor policies included in our analysis.

[24]A roll call voting threshold of 13 votes corresponds to us dropping 28 legislators, or just under 10 percent of the total legislators. Appendix F compares our model estimates based on the two different bliss points estimates. Overall, we find that our results are materially the same regardless of which roll call threshold we use.

[25]We also analyzed voting on a fiscal dimension. Overall, we found that the correlation between the two policy dimensions is only moderate. As we discuss below, we can ignore other policy dimensions if preferences are additively separable across policy dimensions.

Table 2 shows that 226 members of the House voted at least 20 times on liquor policies during the relevant period. Moreover, 173 of these representatives came from single-member districts. This sample contains a large majority of all representatives who served in the Texas legislature during this period.

Figure 2: Distribution of House Representatives' Alcohol Bliss Points



Note: This figure shows a histogram of the estimated bliss points of the legislators in the Texas House of Representatives.

Figure 2 shows the distribution of estimated bliss points for the House representatives in our sample. We find that there was much heterogeneity in preferences over liquor policy in the House. The distribution strongly suggests that legislators' votes on liquor policies were not subject to party discipline. Instead, each legislator had the freedom to vote in accordance with his preferences and those of his constituents.

3.4. Liquor Referenda

Liquor referenda were held at either the county, justice precinct, city, or town level. Since the House and Senate districts in Texas during this period were made up of counties, we focus on the 302 county-level referenda. We also observe a number of referenda at the precinct level, which is below the county level. These sub-county referenda allowed individual precincts to adopt a different liquor policy than the rest of the county, leading to heterogeneity in the liquor policies within some counties. We analyzed in detail the precinct-level referenda that took place in our sample. We found that a large majority of the precincts that held referenda were small. In particular, there were only six counties where a sufficiently large number of precincts adopted different policies than the dry counties.[26]

We observe 122 counties holding local option elections between 1937 and 1952. These counties comprised over 48 percent of the total number of counties in Texas at the time.[27] All referenda can be broadly classified into three types: a) beer-only voted out (in), b) 14 percent beverages voted out (in); and c) all alcoholic beverages voted out (in). We observe 183 beer-only-versus-dry referenda, 38 beer-and-wine-only-versus-dry referenda, and 81 all-versus-dry referenda.

Note that there were only a small number of referenda types, and all referenda tended to regulate the alcohol content of products that can be purchased in stores. Most alcoholic products fall into one of three categories: (1) 5-6 percent (mostly beer and hard ciders), (2) 12-15 percent (mostly wine), and (3) 40-50 percent (hard liquors). The three referenda types we observe in the data followed this classification. However, it is surprising that we do

[26] We provide some robustness tests excluding these counties from our analysis below.

[27] We follow the literature, such as Strumpf and Oberholzer-Gee (2002) and Coate and Conlin (2004), and restrict the sample to the observed referenda and do not model the decision to have a referendum. It might be interesting for future research to study why certain counties decided to hold referenda and others did not.

not observe referenda that sought to regulate aspects of alcohol policy besides the allowable limit on alcohol content. Voters could have, for example, tried to directly limit alcohol consumption opportunities, either by controlling when alcohol can be purchased (e.g., by prohibiting alcohol sales on Sundays or holidays) or restricting the number of stores and bars that are allowed to sell liquor. In contrast, we see bills in the legislature that cover a much wider variety of alcohol-related policies.

Table 3 shows descriptive statistics for our sample of local referenda. The mean wet vote share was 42 percent, indicating that the majority of referenda were in favor of keeping the county dry. For counties that held multiple referenda, we compute an average vote share. The mean voter turnout was approximately 26 percent.[28]

Table 3: Local Referenda: Descriptive Statistics

	Individual Referenda		Average Referenda	
	Mean	Std Dev	Mean	Std Dev
Wet Vote Share	42.15	12.86	41.34	14.20
Turnout	25.77	12.67	25.68	10.76
Number of Referenda	302		122	
Percent of Counties that Held a Referendum	48.03		48.03	

Note: This table provides descriptive statistics of the local liquor referenda in our sample.

4. A Probabilistic Voting Model

We develop a model of political competition and representation at the district level. We adopt a standard probabilistic voting model with two candidates who compete to represent the district in the legislature.[29] To illustrate the basic issues that are encountered in the

[28] In Appendix G, we provide a more detailed analysis of voter turnout.

[29] Coughlin (1992) provides a detailed discussion of probabilistic voting theory. One of the drawbacks of probabilistic voting theory is that it assumes commitment. Citizen candidate models that are due to Osborne

analysis, we first discuss voting in legislative elections assuming no spillovers among voting districts. We then characterize voting in referenda. Finally, we extend the model to allow for spillovers or peer effects in preferences over policy among districts.

4.1. Voting in Two-Candidate Elections in a Single District

Assume there are I types of voters. Each type has a share given by s_i. A policy is a K-dimensional vector, $g = (g_1, ..., g_K)$. The policy space is a compact subspace of R^K. That is, we model the policy space as a continuous outcome space.

For empirical tractability, we assume that voter i's preferences are additively separable over the K policy dimensions and are given by:

$$u_i(g) \;=\; \sum_{k=1}^{K} u_{ki}(g_k) \;=\; \sum_{k=1}^{K} -\,\omega_{ki}\,(g_k - \theta_{ki})^2 \qquad (1)$$

where θ_{ki} is the bliss point of voter group i for the policy dimension k, and ω_{ki} is the relative weight that voter i assigns to the policy dimension k.

Two candidates a and b compete for office. Each candidate can fully commit to a policy position before the election. Voters' utilities are subject to random shocks, denoted by ϵ_{ij}, which are not observed by the candidates. Hence, the share of voters of type i that vote for candidate a is:

$$\begin{aligned} V_i^a(g_a, g_b) &= Pr\{u_i(g_a) + \epsilon_{ia} \geq u_i(g_b) + \epsilon_{ib}\} \\ &= \Phi_i(u_i(g_b) - u_i(g_a)) \end{aligned} \qquad (2)$$

and Slivinski (1996) and Besley and Coate (1997) provide one way to relax the commitment assumption.

where $\Phi_i(\cdot)$ is the distribution function of $\epsilon_{ib} - \epsilon_{ia}$. Candidate a's vote share is then:

$$V^a(g_a, g_b) \;=\; \sum_i s_i \; \Phi_i(u_i(g_a) - u_i(g_b)) \tag{3}$$

and candidate b's share is $V^b(g_a, g_b) = 1 - V^a(g_a, g_b)$.

Each candidate is maximizing her vote share. Taking derivatives with respect to g_{ka}, we obtain for each k:

$$\frac{\partial V^a(g_a, g_b)}{\partial g_{ka}} \;=\; -2 \sum_i \; s_i \; \phi_i(u_i(g_a) - u_i(g_b)) \; \omega_{ki} \; (g_{ka} - \theta_{ki}) \;=\; 0 \tag{4}$$

and a similar condition for g_{kb}.

In a symmetric Nash equilibrium, both candidates commit to pursue the same policies, implying that $u_i(g_a) - u_i(g_b) = 0$.[30] The symmetric equilibrium is thus characterized by:

$$\sum_i \; s_i \; \phi_i(0) \; \omega_{ki} \; \theta_{ki} \;=\; g_k \sum_i \; s_i \; \phi_i(0) \; \omega_{ki} \tag{5}$$

Solving this equation implies that the optimal position of each candidate for policy k is given by:

$$g_k \;=\; \sum_i \frac{s_i \; \phi_i(0) \; \omega_{ki}}{\sum_j \; s_j \; \phi_j(0) \; \omega_{kj}} \; \theta_{ki} \tag{6}$$

Once in office, a legislator has quadratic, additively separable preferences with bliss point g_k. Legislators vote sincerely on each policy proposal. Equation (6) shows that legislators' bliss points are a weighted average of voters' bliss points for each policy dimension. The weights depend on the share of each voter type (s_i), the density of the median voters ($\phi_i(0)$),

[30] With a slight abuse of notation let us denote this equilibrium policy by g.

and the relative importance of the policy dimension (ω_{ki}).

The probabilistic voting model that links legislators' bliss points to their districts' characteristics assumes that the policy space is continuous. In our application, the Texas legislature considered bills spanning several liquor policy topics, such as the manufacture, sale and distribution of liquor; the taxation of alcoholic beverages; the establishment of a state-wide monopoly over liquor production and distribution; penalties for violations; and enforcement. We need a continuous outcome space to explain the observed variation in the roll call voting on these various issues and the estimated bliss points among legislators.[31]

Our model relies on several strong assumptions. First, the probabilistic voting model predicts that both candidates take the same position on all "pliable issues," or issues on which legislators are free to take any position they want in order to appeal to their constituents. In our application, the Democratic party dominated state politics. Our model should therefore be interpreted as a theory of political competition within the Democratic party. The substantial heterogeneity we see in House Representatives' bliss points suggests the Democratic party did not exercise strong party discipline on liquor policy during the Post-Prohibition Era.

Second, the model assumes preferences are separable across policy dimensions. Non-separabilities could arise between liquor policies and enforcement. However, enforcement after the end of Prohibition was largely a local issue, not a state issue. In general, relaxing the separability assumption is challenging because it involves making additional assumptions on the exact type of non-separability. Empirically implementing the model requires being able to measure all the other relevant policy dimensions that interact with liquor policies. To our knowledge, no previous papers have estimated a multi-dimensional voting model with

[31]We can reject a model in which all legislators have only a small number of bliss points since such a model cannot explain the variation in roll call votes observed in the data.

non-separable preferences.

Third, we assume that legislators have no policy preferences of their own. As such, we assume the benefits from holding office are sufficiently high so that candidates' policy platforms converge. In a model with policy preferences, we do not necessarily obtain full convergence. Given that liquor policy was only an important topic in the state legislature between 1933 and 1937, it is difficult in our application to explore whether candidates' policies diverged. We also do not observe candidates from different parties, so we cannot conduct the standard test of whether legislators with different party affiliations from the same district pursue different policies.

Fourth, the model assumes candidates fully commit to their announced policies. This is a strong assumption, and models without commitment are more compelling. However, to keep our multi-dimensional voting model tractable, we restrict our attention to a static model and do not model the reelection incentives that help explain a lack of commitment.

Finally, note that there is limited information available on the representatives who served in the Texas legislature during the historical period we study. We only observe the roll call votes which allow us to estimate legislators' ideological positions in the liquor policy space. We lack a lot of information that is routinely available for current elections. In particular, we do not observe the characteristics of the candidates who participated in the election, and we do not observe candidates' vote shares.[32] This limits our ability to estimate richer models or study important mechanisms, like candidate-specific ideologies or valence, that have been proposed in the literature to explain differences between voters' and politicians' preferences. We therefore assume that legislators' preferences are determined by voters' preferences. However, our model accounts for the fact that legislators were not just elected

[32]It is unclear whether this information was systematically collected and stored in the Texas archives.

based on their positions on liquor policies, as there were clearly other issues, such as tax, expenditure or redistribution policies, that may have been equally if not more important to some voters.[33]

4.2. Voting in Local Referenda in a Single District

Next, we model voting in local referenda. We assume that each proposal only affects a single policy dimension k. A referendum pits a status quo, denoted by g_{ks}, against an alternative referendum policy, denoted by g_{kr}. Since preferences are additively separable, voter i prefers the alternative policy if and only if:

$$-(g_{kr} - \theta_{ki})^2 \; + \; \epsilon_{kri} \geq -(g_{ks} - \theta_{ki})^2 \; + \; \epsilon_{ksi} \tag{7}$$

where ϵ_{ksi} and ϵ_{kri} are random election shocks that impact the vote during the referendum. Hence, the share of votes in favor of the alternative policy proposed in the referendum is given by:

$$V(g_{ks}, g_{kr}) \;\; = \;\; \sum_i \; s_i \; F_{ki}((g_{ks} - \theta_{ki})^2 - (g_{kr} - \theta_{ki})^2) \tag{8}$$

where F_{ki} is the distribution function of the referendum shock $\epsilon_{ki} = \epsilon_{ksi} - \epsilon_{kri}$.

Recall that we only observe a few different referendum types in the data. If the sole purpose of the analysis was to explain the observed referenda, then a simpler model with a discrete policy space may also be appropriate. Our model does not endogenize the choice of the referenda that were placed in front of the voters. Instead, it just predicts the vote

[33]Our empirical results discussed in detail below suggest that our simple probabilistic voting model fits the data reasonably well. We view this as evidence that we cannot reject the hypothesis that legislators' preferences aligned with voters' preferences during the Post-Prohibition Era.

shares for any possible combination of status quo and alternative policy. This approach is flexible and does not impose any strong assumptions on the admissible set of policies. It is thus consistent with a model in which the admissible set of referenda is small.

4.3. Spillovers in Preferences among Districts

Following Besley and Coate (2003), we can also account for spillover or peer effects in our analysis. Consider now a model with N districts, and assume that there are spillover or peer effects in preferences. Specifically, assume that the bliss point of each voter type depends on the average policy of the adjacent voting districts. Let $\bar{g}_n = (\bar{g}_{1n}, ..., \bar{g}_{Kn})$ denote the average policies of neighboring districts. Spillover or peer effects arise if the average neighbor policy shifts the voters' bliss points, i.e., if $\theta_{kni} = \theta_{kni}(\bar{g}_{kn})$. Hence, we can incorporate spillover effects in voters' preferences as:

$$u_{in}(g_n, \bar{g}_n) \quad = \quad \sum_{k=1}^{K} - \omega_{ki} \left(g_{kn} - \theta_{kni}(\bar{g}_{kn})\right)^2 \tag{9}$$

Holding the policies of the other districts fixed, the candidates still compete against each other as described in Section 4.1, and a necessary condition for equilibrium is given by:

$$g_{kn} \quad = \quad \sum_i \frac{s_i \; \phi_i(0) \; \omega_{ki}}{\sum_j \; s_j \; \phi_j(0) \; \omega_{kj}} \; \theta_{kni}(\bar{g}_{kn}) \tag{10}$$

A Nash equilibrium in the simultaneous move game also requires that candidates' strategies are the best responses to each other so that no candidate has an incentive to deviate from her chosen policy. To compute the Nash equilibrium for the full game, we now need to solve the system of equations given in Equation (10).[34] As we discuss in detail below,

[34]Note that there are NK equations in NK unknowns.

our estimation strategy only exploits the necessary conditions in Equation (10) and does not require computing the equilibrium for the full game.

5. Identification and Estimation

Consider a sample that consists of a large number of districts, $n = 1, ..., N$. We assume that all voter types i and their shares s_{in} are observed. We consider an environment with a small number of voter types I and a large number of districts N.[35]

The intuition for the empirical strategy proposed in this paper is fairly straightforward. Recall that we can estimate the legislators' bliss points using standard scaling techniques as long as we observe a sufficiently large number of roll call votes for each legislator. Our voting model endogenizes the bliss point of a legislator who represents a voting district. In particular, equation (6) provides the crucial link between the (estimated) bliss point of the legislator and the (unobserved) preferences of the voters in the district. We also observe the vote shares in local liquor referenda. Our model characterizes how citizens vote in referenda that pit a status quo against an alternative proposal. In particular, equation (8) provides the link between the (observed) vote shares and the (unobserved) positions of the status quo and the alternative policy.

We use a sequential estimation strategy. First, we estimate the bliss points of each legislator using roll call data. Second, we estimate the probabilistic voting model using the first-order conditions that the legislators' bliss points must satisfy in equilibrium. Note that we use the bliss points that were estimated in the first stage as the dependent variables in the second stage. Finally, we add orthogonality conditions using the data from the referenda. We

[35]In our application, we consider a model with two types, dry and wet voters, and approximately 150 voting districts.

show that the estimation of the probabilistic voting model and the referenda voting model can be combined in a simultaneous estimator. As such, our sequential estimator has two stages. We bootstrap standard errors to account for the sequential nature of the estimation algorithm.[36]

5.1. The Model with Two Voter Types

To illustrate how we can identify and estimate the parameters of the model, let us first consider a model with two types ($I = 2$) and assume that the politicians use weights that are equal to the population shares, i.e. that the following condition holds:

$$\phi_1(0)\, \omega_{kn1} \;=\; \phi_2(0)\, \omega_{kn2} \tag{11}$$

Hence, Equation (6) simplifies to the following expression

$$g_{kn} \;=\; \sum_i s_{in}\, \theta_{kni} \tag{12}$$

The observed bliss points are just population-weighted averages of the voters' bliss points.

Let us assume that we also observe some characteristics of the district, denoted by x_{kn}, that systematically shift preferences over policies of each voter type. These are socioeconomic characteristics of the district (income, urbanization rates, etc) that are not used to define voter types, but affect district preferences. We can think about these variables as shifting the bliss points of all types in the district.[37] Let us assume that the bliss points of each voter type

[36]The model with spillovers introduces the possibility of multiple equilibria. When estimating the model, we condition on the equilibrium that generated the data. We do not use a nested fixed point algorithm in estimation, which would require the computation of equilibria and possibly an equilibrium selection rule. Multiplicity of equilibria is thus not a problem in estimation.

[37]Note that we allow these characteristics to differ by the dimension of the policy space.

satisfy:

$$\theta_{kin} \;=\; \alpha_{ki} + \beta_{ki}\, x_{kn} \;+\; \zeta_{ki}\, \bar{g}_{kn} + \; u_{kin} \tag{13}$$

where x_{kn} are some observed shift variables, $\bar{g}_{kn}$ is the mean policies in the neighboring counties, and u_{kin} is an error term. Note that this assumption is primarily made to reduce the number of voter types while still allowing for a rich set of socio-economic demographics to affect voters' preferences. In principle, one could also use the observed heterogeneity in x_{kn} to define additional voter types.

Hence, our econometric model with two types can be written as:

$$\begin{aligned}
g_{kn} \;&=\; \left(\sum_{i=1}^{2} s_{in}\, (\alpha_{ki} + \beta_{ki}\, x_{kn} + \; \zeta_{ki}\, \bar{g}_{kn}) + u_{kin} \right) \\
&=\; s_{1n}\, (\alpha_{k1} + \beta_{k1}\, x_{kn} + \; \zeta_{k1} \;\; \bar{g}_{kn} \; + \; u_{k1n}) \\
&\quad\; + (1 - s_{1n})\, (\alpha_{k2} + \beta_{k2}\, x_{kn} + \; \zeta_{k2}\, \bar{g}_{kn} + \; u_{k2n}) \\
&=\; (\alpha_{k1} - \alpha_{2k}) s_{1n} + (\beta_{k1} - \beta_{k2})\, s_{1n}\, x_{kn} + \; (\zeta_{k1} - \zeta_{k2})\, s_{1n}\, \bar{g}_{kn} \\
&\quad\; + \alpha_{k2} + \beta_{k2}\, x_{kn} + \; \zeta_{k2}\, \bar{g}_{kn} \; + \; u_{k2n} \; + s_{1n}(u_{k1n} - u_{k2n})
\end{aligned} \tag{14}$$

First, note that the model is linear in its parameters. Second, the parameters are identified and can be estimated using 2SLS if $E[u_{kin} | s_{1n}, x_{kn}, z_{kn}] = 0$. That is, we need at least one instrument to deal with the potential endogeneity of $\bar{g}_{kn}$. We need additional instruments if components of x_{nk} are also endogenous. The most obvious instruments for the average policy of the neighbors are based on the average characteristics of the adjacent communities, $\bar{x}_{nk}$.[38] We also separately adopt the IV strategy proposed by Bramoulle, Djebbari and Fortin

[38]This approach is based on Manski (1993) and relies on the fact that we have excluded $\bar{x}_{kn}$ from the outcome equation, or in the language of Manski, that there are no exogenous peer effects.

(2009), which uses the neighbors' neighbors' average policies as instruments and thus allows for both endogenous and exogenous peer effects. Finally, the model without spillovers can be estimated using OLS if $E[u_{kin}|s_{1n}, x_{kn}] = 0$ for i=1,2. The key identifying assumption is that households do not sort across voting districts in response to unobserved characteristics that affect the liquor policy ideal points of the different voter types. That assumption appears to be plausible, but it's hard to validate.[39]

More generally, we can write the probabilistic voting model as a weighted average of the two bliss points:

$$g_{kn} = w_{kn}\, \theta_{k1} + (1 - w_{kn})\, \theta_{k2} \tag{15}$$

where the weights are given by:

$$\begin{aligned} w_{kn} &= \frac{s_{1n}\, \phi_1(0)\, \omega_{k1}}{s_{1n}\, \phi_1(0)\, \omega_{k1} + s_{2n}\, \phi_2(0)\, \omega_{k2}} \\ &= \frac{s_{1n}\, \gamma_{k1}}{s_{1n}\, \gamma_{k1} + s_{2n}\, \gamma_{k2}} \\ &= \frac{s_{1n}}{s_{1n} + s_{2n}\, \frac{\gamma_{k2}}{\gamma_{k1}}} \end{aligned} \tag{16}$$

where $\gamma_{k1} = \phi_1(0)\, \omega_{k1}$ and $\gamma_{k2} = \phi_2(0)\, \omega_{k2}$. The last line of the equation above implies that only the ratio $\frac{\gamma_{k2}}{\gamma_{k1}}$ is identified. We then proceed as above and substitute equation (16) into equation (15). Note that the ratio $\frac{\gamma_{k2}}{\gamma_{k1}}$ enters the empirical model in a non-linear way. Hence, we need to estimate the parameters of the model using a nonlinear moments estimator.[40]

We only use two voter types in our application. The most important voter characteristic

[39] Note that almost all papers in the literature make a similar assumption.

[40] Note that for any known value of $\frac{\gamma_{k2}}{\gamma_{k1}}$ the remaining parameters of this model can be estimated using 2SLS. This insight suggests that there is a simple way to estimate our model. First, we pick a grid for plausible values of the parameter $\frac{\gamma_{k2}}{\gamma_{k1}}$ and estimate the remaining parameters of the model for each value of the grid. We can estimate $\frac{\gamma_{k2}}{\gamma_{k1}}$ by maximizing the goodness of fit of the model.

that affects preferences over liquor policy is religious affiliation which can be captured by two types as discussed above. In the data, we only see the marginal distribution of religious types. If we observed, for example, the joint distribution of income and religious affiliation, we could estimate a model with more types. Readers who are primarily interested in our application can skip Section 5.2, which discusses the estimation of the general model with an arbitrary number of I types, without loss of continuity.

5.2. The General Model

Next, we consider the general model with I types. The observed bliss points of the legislators can be written as:

$$g_{kn} = \left(\sum_{i=1}^{I} w_{kni} \left(\alpha_{ki} + \beta_{ki} \, x_{kn} + \zeta_{ki} \, \bar{g}_{kn} \right) \right) + v_{kn} \tag{17}$$

where

$$v_{kn} = \sum_{i=1}^{N} w_{kni} \, u_{kin} \tag{18}$$

and

$$w_{kni} = \frac{s_{in} \, \gamma_{ki}}{\sum_j s_{jn} \, \gamma_{kj}} \tag{19}$$

and $\gamma_{ki} = \phi_i(0) \, \omega_{ki}$. Assuming that $E[u_{kin}| \, s_{in}, x_{kn}, z_{nk}] = 0$ for all k, i, and n, we have

$$E[v_{kn}|x_{kn}, s_{1n}, ..., s_{In}, z_{nk}] = \sum_{i} \frac{s_{in} \, \gamma_{ki}}{\sum_j s_{jn} \, \gamma_{kj}} E[u_{kin}|x_{kn}, s_{in}, z_{kn}] = 0 \tag{20}$$

where z_{nk} is an instrument for $\bar{g}_{kn}$.

Assuming that $E[u_{kin}^2 | \, s_{in}, x_{kn}, z_{kn}] = \sigma_{ki}^2$ for all k, i, we have

$$(21) \qquad Var[v_{kn}|s_{1n}, ..., s_{In}] \;=\; \sum_i \left(\frac{s_{in}\gamma_{ki}}{\sum_j s_{jn}\gamma_{kj}} \right)^2 \sigma_{ki}^2$$

We, therefore, have the following results:

Proposition 1 *The parameters* $(\alpha_{ki}, \beta_{ki})$ *as well as the ratios,* $\frac{\gamma_{ki}}{\gamma_{k1}}$ *are identified and can be estimated using a GMM estimator. Moreover, the conditional distributions of* u_{kin} *are non-parametrically identified.*

The proof of Proposition 1 is given in Appendix D. We offer several observations. First, the proof extends the arguments made in Section 5.1. Second, recall that $\gamma_{ki} = \phi_i(0) \; \omega_{ki}$. Hence, we cannot separately identify $\phi_i(0)$ and ω_{ki}. Third, the normalization of the γ_{ki} reflects the fact that the weights associated with different types have to sum up to one:

$$(22) \qquad \sum_{i=1}^{I} w_{kni} \;=\; \sum_{i=1}^{I} \frac{s_{in} \; \gamma_{ki}}{\sum_j \; s_{jn} \; \gamma_{kj}} \;=\; 1$$

Fourth, to identify and estimate the model with spillovers we need additional instruments as discussed above. Finally, the probabilistic voting model assumes that every type of voter has different preferences which allows for a very flexible characterization of heterogeneity in preferences over policies. This approach is similar to Heckman and Singer (1984) who also use discrete types to capture unobserved heterogeneity. This approach is flexible and imposes weak distributional assumptions.[41]

[41] Alternatively, researchers have used a normally distributed, random coefficient model to capture unobserved heterogeneity.

5.3. Orthogonality Conditions Based on Referenda

We also observe a large sample with size N of votes on the same type of referendum.[42] Adding subscripts and substituting equation (13) into the utility function, we obtain:

$$
\begin{aligned}
& (g_{ks} - \alpha_{ki} - \beta_{ki} x_{kn} - \zeta_{ki}\, \bar{g}_{kn} - u_{kin})^2 \;-\; (g_{kr} - \alpha_{ki} - \beta_{ki} x_{kn} - \zeta_{ki}\, \bar{g}_{kn} - u_{kin})^2 \\
(23) \quad = \;& g_{ks}^2 + 2\,(g_{kr} - g_{ks})\,(\alpha_{ki} + \beta_{ki} x_{kn} + \zeta_{ki}\, \bar{g}_{kn}) \;+\; 2\,(g_{kr} - g_{ks})\, u_{kin} \;-\; g_{kr}^2
\end{aligned}
$$

Note that the referenda equation (23) does not just depend on the difference $g_r - g_s$, it also depends on g_r^2 and g_s^2. Hence, we can separately identify and estimate g_r and g_s.

We assume that F_{ki} is Type I extreme value distributed. Hence, we can write the vote share equation as follows:

$$
V_{kn} = E[V_{kn} | s_{1n}, ..., s_{In}, x_{kn}] + w_{kn} \tag{24}
$$

where $E[V_{kn} | s_{1n}, ..., s_{In}, x_{kn}]$ is given by

$$
\sum_i s_{in} \int \frac{\exp[(g_{ks}^2 + 2\,(g_{kr} - g_{ks})\,(\alpha_{ki} + \beta_{ki} x_{kn} + \zeta_{ki}\, \bar{g}_{kn}) \;+\; 2\,(g_{kr} - g_{ks})\, u_{ki} \;-\; g_{kr}^2)/\sigma_{ki}^{\epsilon}]}{1 + \exp[(g_{ks}^2 + 2\,(g_{kr} - g_{ks})\,(\alpha_{ki} + \beta_{ki} x_{kn} + \zeta_{ki}\, \bar{g}_{kn}) \;+\; 2\,(g_{kr} - g_{ks})\, u_{ki} \;-\; g_{kr}^2)/\sigma_{i}^{\epsilon}]}\, r(u_{ki})\, du_{ki}
$$

and σ_i^{ϵ} is the scale parameter of the election shock of voter type i. Hence, the remaining parameters of the model, $g_{ks}, g_{kr}, \sigma_i^{\epsilon}$, are identified up to a normalization that $\sigma_1^{\epsilon} = 1$. We can thus construct additional orthogonality conditions based on Equation (24) and estimate the parameters of the voting model using a GMM estimator.[43] Note that it is straightforward

[42] In practice, the number of referenda observed in the data and the number of voting districts (the number of legislators for which we can estimate bliss points) do not have to be the same. However, we use N as the sample size in both cases for expositional simplicity.

[43] See Appendix E for details.

to extend the analysis and allow for more than one type of referenda, as long as we have a large enough sample size for each type.

In summary, the estimation proceeds in two steps. First, we estimate the bliss points of politicians in the legislature using standard spatial estimation techniques. Second, we estimate the parameters of the voters' preferences as well as the positions of the status quo and the alternative policy proposed in the referendum using a GMM estimator. Note that we can identify the probabilistic voting model using just the bliss points of the legislators for each district and the voter characteristics. The only additional parameters that are identified when we incorporate the referenda data are the positions of the status quo and the alternative in the ideological space and the parameters that govern the referenda shocks.

6. Empirical Results

6.1. Parameter Estimates

As discussed above, we classify voters into two types based on religious affiliation. Type 1 voters are members of a "dry" religion and type 2 voters are affiliated with a "wet" religion. Using this classification, we estimate several specifications of our model for the liquor policy dimension. Given the sequential nature of our estimation strategy, we use a jackknife algorithm to estimate standard errors. We randomly drop one alcohol vote for each representative and reestimate the bliss points based on the leave-one-out sample. We then drop one representative-district observation and one referendum and reestimate the model on the leave-one-out samples. The estimated standard errors are based on 100 iterations of this jackknife algorithm. We start with a model specification that includes a full set of interactions.

We then estimate a constrained model restricting the slope parameters of both voter types to be the same, i.e. $\beta_1 = \beta_2$. We find that we cannot reject this restriction.[44] Hence, we focus on this parsimonious version of our model in the rest of our analysis.

Table 4 summarizes the main results of estimating the probabilistic voting model with spillovers. Column 1 reports estimates for the baseline model without spillovers. Column (2) reports the estimates for the model with exogenous spillovers. Column (3) reports IV estimates for the model with endogenous spillovers using the Manski (1993) instruments. Column (4) reports IV estimates for the model with endogenous spillovers using the instruments suggested by Bramoulle, Djebbari, and Fortin (2009). Finally, Column (5) reports IV estimates for the model with both exogenous and endogenous spillovers using the Bramoulle, Djebbari, and Fortin (2009) instruments.

We find that the coefficients of both the exogenous and endogenous spillover effects are statistically significantly different from zero at any reasonable confidence level. The estimates of the endogenous effect range between 0.31 and 0.65 with an average effect of 0.50. The standard deviation of the average neighbor policies is approximately 0.3, so a one standard deviation increase in the average neighbor policy shifts the bliss point by approximately 0.15 points on the $[-1, 1]$ scale. We thus conclude that the spillover effects are quantitatively important.

Table 4: Parameter Estimates

	(1)	(2)	(3)	(4)	(5)
			Liquor Policy		
α_1 (Intercept Dry)	3.44	3.18	2.64	2.03	1.86

[44]Detailed results are available upon request.

	(1)	(2)	(3)	(4)	(5)
	(0.30)	(0.28)	(0.29)	(0.22)	(0.22)
α_2 (Intercept Wet)	2.49	2.46	1.94	1.51	1.29
	(0.23)	(0.23)	(0.22)	(0.18)	(0.19)
β_1 (Percent Minority)	-1.02	-0.96	-0.80	-0.65	-0.65
	(0.09)	(0.08)	(0.09)	(0.06)	(0.06)
β_2 (Percent High School)	0.25	0.21	-0.06	-0.30	-0.41
	(0.09)	(0.09)	(0.11)	(0.10)	(0.10)
β_3 (Logged Mean Income)	-0.41	-0.42	-0.31	-0.22	-0.16
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
β_4 (Percent Urban)	0.25	0.30	0.15	0.08	0.00
	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)
β_5 (Population Density)	-0.29	-0.33	-0.27	-0.25	-0.21
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)
ζ_1 (Exogenous Spillovers)	–	0.35	–	–	-0.17
	–	(0.05)	–	–	(0.06)
ζ_2 (Endogenous Spillovers)	–	–	0.31	0.53	0.65
	–	–	(0.05)	(0.05)	(0.07)
γ_2/γ_1 (Weight Wet)	1.89	1.94	1.79	2.02	3.98
	(0.12)	(0.14)	(0.16)	(0.15)	(1.58)
σ_1^u (Variance Dry)	0.50	0.50	0.50	0.51	0.57
	(0.04)	(0.04)	(0.04)	(0.04)	(0.07)
σ_2^u (Variance Wet)	0.85	0.88	0.79	0.90	1.76
	(0.09)	(0.10)	(0.10)	(0.10)	(0.72)

	(1)	(2)	(3)	(4)	(5)
			Referenda		
g_{1s} (Status Quo)	0.27	0.34	0.31	0.29	0.32
	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
g_{1r} (Alternative)	-0.38	-0.39	-0.42	-0.44	-0.35
	(0.08)	(0.08)	(0.08)	(0.07)	(0.08)
σ_2^ϵ (Variance Wet)	0.54	0.98	1.00	1.56	0.75
	(0.03)	(0.09)	(0.15)	(0.24)	(0.30)
Number of Representatives	173	173	173	173	173
Number of Referenda	122	122	122	122	122
	(1)	(2)	(3)	(4)	(5)

We allow for type-specific intercepts, α_1 and α_2, in all specifications, but we constrain the slope parameters, β, of the observed socio-economic characteristics to be the same across types. As a result, the estimates of α_1 and α_2 reflect the main differences between the two types of voters. We find there are large differences in preferences between dry and wet religious types. Hence, differences in the shares of dry and wet voters across districts explain a large amount of the variation in representatives' bliss points.

Almost all the estimates of the slope parameters, β, that capture heterogeneity across districts have the expected sign.[45] Legislators from high-density, high-income districts prefer wet policies. Legislators from districts with a large share of minorities also prefer wet policies. In contrast, legislators from low-density and low-income districts prefer dry policies. These findings are similar to the ones that can be obtained from reduced-form models that regress the bliss points on the districts' characteristics.

[45]Our hypothesis was that minority, income, education, urban, and population density had a negative sign while spillovers and the difference between dry and wet religion had a positive sign.

Our estimates of the parameters identified by the referenda orthogonality conditions show that the position of the status quo policy is positive, ranging from 0.27 to 0.34. The alternative policy is negative and ranges from -0.44 to -0.35. Our estimates suggest that the status quo at the end of the Prohibition Era was tilted toward the preferences of dry voters in low-density, low-income districts where large fractions of voters were affiliated with religions that held strong views against liquor consumption. The alternative referendum position reflects the preferences of voters from high-density, high-income districts with smaller shares of dry voters.

Recall that the referenda we observe primarily regulated the alcohol content of products that could be purchased in stores. As a consequence, it is not surprising that we only observe three types of referenda in the data, which are typically classified in the literature as "beer only", "beer and wine" and "all liquor" referenda. In principle, we could separately estimate the position of the alternative policy in the $[-1, 1]$ policy space for each type of referendum as long as we have a sufficiently large number of observations. In practice, we can only reliably estimate the position of a single alternative position that is the same for all referenda. We therefore cannot reject the hypothesis that the alternative positions in the three types of liquor referenda are the same.

There are some compelling reasons why it is hard to empirically distinguish among these different types of referenda. Warburton's (1932) analysis suggests that there were few binding constraints on wine and spirits consumption by the end of the Prohibition Era. Average consumption of wine and spirits had almost reached Pre-Prohibition levels in 1930. Beer consumption, however, remained well below Pre-Prohibition levels. Large-scale production of commercial breweries did not start again until the Volstead Act was voided in 1933. These facts explain why it is hard to empirically distinguish between the policy positions associated with the different referendum types. By the end of the Prohibition Era, the main constraint that Prohibition laws imposed primarily related to the production, distribution, and consumption of beer. As shown in Table 6 of Appendix A, beer consumption almost doubled in the decade after Prohibition was lifted, while wine consumption stagnated and the consumption of spirits decreased considerably.

We also conducted a variety of additional robust checks. We (a) included the legislators from multimember districts in the analysis, (b) restricted the sample to referenda that took place before 1942 when the U.S. entered World War II, (c) restricted the sample to beer-only referenda, (d) excluded counties that had referenda are the precinct level, and (e) extended the analysis to account for imperfect voter turnout. Overall, our main findings are qualitatively and quantitatively robust to all these changes.[46]

Finally, it is useful to assess how robust the main findings of our paper are to the specification of the voter types. We have, therefore, estimated a specification of the model using income to define voter types. As discussed in detail in Appendix H, we find that the results are similar to the specification reported in the paper when we use religious affiliation to define voter types.

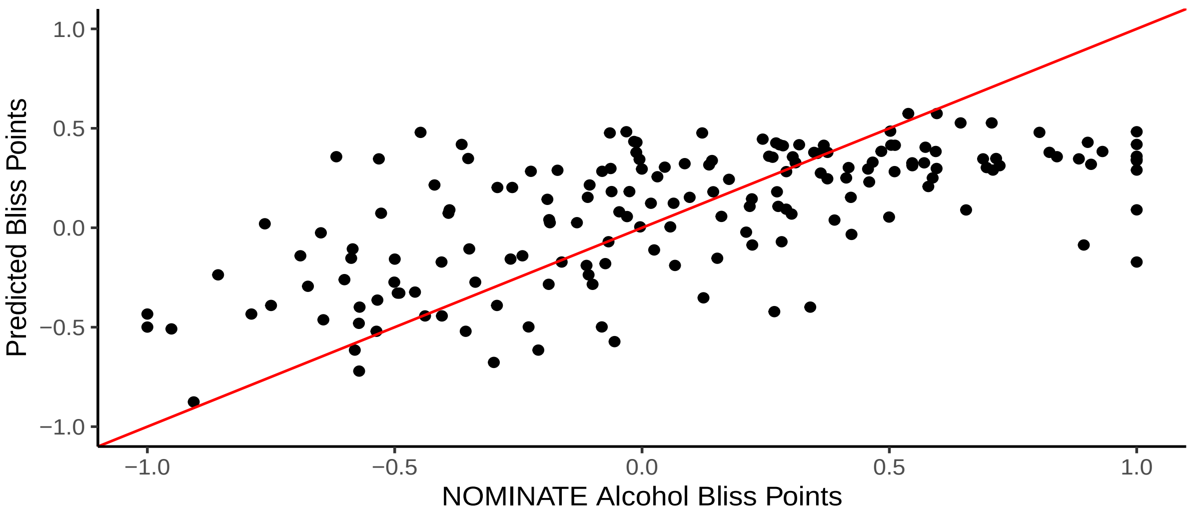
6.2. Goodness of Fit and Validation

Next, we consider the within-sample fit of our model.[47] Figure 3 plots the estimated and predicted bliss points for members of the House. Overall, the within-sample fit of our model is quite good. The correlations between the predicted and estimated bliss points exceed 0.63. Unsurprisingly, the fit is not as good for the bliss points of the more extreme politicians. Our

[46] See Appendix H for details.
[47] The model fit described in this section is based on the fourth specification in Table 4.

model tends to over-predict the bliss points of extremely wet politicians and under-predict the bliss points of extremely dry politicians.[48]

Figure 3: Within-Sample Model Fit for House Representatives' Bliss Points



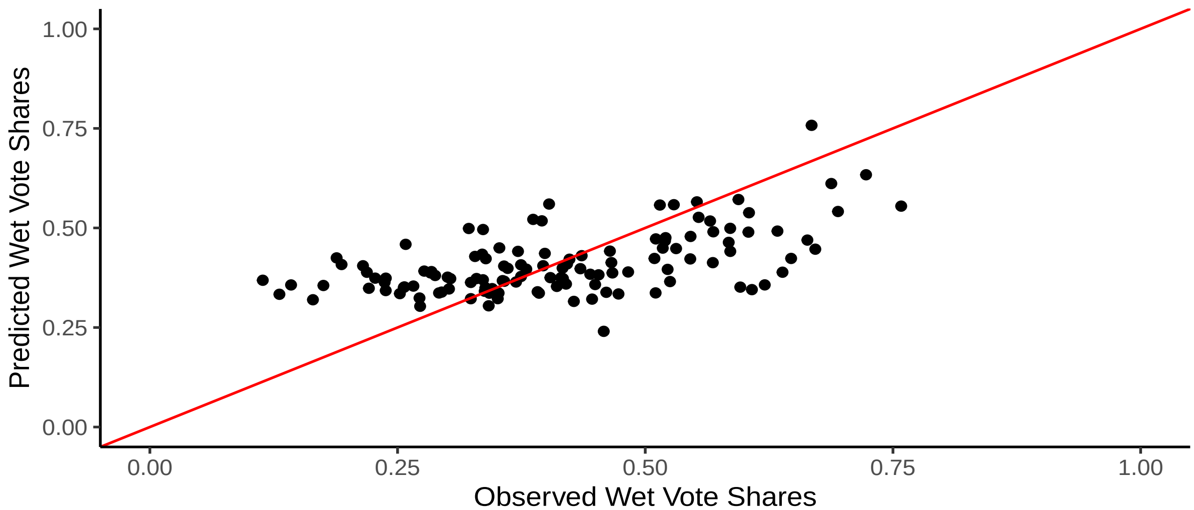
Note: The figure illustrates the estimated and predicted bliss points of members of the House of Representatives in Texas. The diagonal line is the 45-degree line.

Figure 4 plots the estimated and predicted average vote shares. We find that the correlation between the predicted and estimated vote shares is approximately 0.57. Overall, the fit is quite good, too. The main drawback is that the fit is not as good for observations with low vote shares.

To validate our model, we consider the 31 Senate districts as a hold-out sample. We also estimated the liquor policy bliss points for the senators from these districts, but we did not include them in our sample when we estimated the model. By holding out the senators when estimating our model, we can validate the model by comparing the estimated senators' bliss points with the bliss points our model predicts. We find that the correlation between

[48]This partly follows from the constraint that bliss points must fall in the interval from -1 to 1. If we relaxed that assumption, we could obtain a better fit for the observations in the tail of the distribution. However, we may then have predicted bliss points that fall outside the feasible range.

Figure 4: Within-Sample Model Fit for Referenda Vote Shares



Note: The figure illustrates the estimated and predicted vote shares for the referenda observed in our sample. The diagonal line is the 45-degree line.

the estimated and predicted bliss points of senators is 0.61. Our model thus performs as well in predicting the bliss points of the senators as it does for members of the House. We conclude that we obtain good out-of-sample predictions for the Senate. We view these results as providing strong support for the validity of our model.

7. Welfare and Policy Analysis

7.1. Welfare under Centralization and Decentralization

We use the estimated model to compare welfare under different liquor policy regimes. Since the voter utility function in equation (9) is additively separable across policy dimensions, we can construct welfare measures that are also additively separable. Recall that voter type i in county n has preferences over the kth policy dimension given by:

$$u_{kin}(g_{kn}) \;=\; -\omega_{ki}\,(g_{kn} - \theta_{kin})^2 \tag{25}$$

Assuming a utilitarian welfare function, the welfare of county n is:

$$W_{ns}(g_{kn}) \;=\; \sum_{i=1}^{I} s_{in}\, u_{kin}(g_{kn}) \tag{26}$$

where s_{in} is county n's share of voter type i. Total welfare for all N counties is then:

$$W \;=\; \sum_{n=1}^{N} p_n\, W_n(g_{kn}) \tag{27}$$

where p_n is the population share of county n.

We consider three policy regimes. The first regime is a uniform policy under weak enforcement, which corresponds to the policy enacted in the late 1920s and early 1930s. We set this policy equal to our median estimate of the dry status quo in Table 4, which is $g^w_{kn} = 0.31$. Using our model with spillover effects, we estimate the voters' bliss points under uniform weak enforcement as:

$$\hat{\theta}^w_{kin} = \hat{\alpha}_{ki} + \hat{\beta}_k x_n + \hat{\zeta}_k \bar{g}^w_{kn} \tag{28}$$

where, by construction, $\bar{g}^w_{kn} = 0.31$ is the same for all counties n.

Second, we consider the decentralized policy, denoted by g^d_{kn}, as it is observed in the data after Prohibition was repealed. Under decentralization, the mean policy of the neighboring counties is:

$$\bar{g}^d_{kn} = \frac{1}{|M_n|} \sum_{m \in M_n} g_{km} \tag{29}$$

where M_n is the set of counties m that share a border with county n. Under decentralization, we set $g_{km} = 0.31$ if the neighboring county was dry at the end of our sample in 1952 and set $g_{km} = -0.39$ if it was wet.[49] Given this measure of neighbor policies, voter type i in county n's bliss point under decentralization is:

$$\hat{\theta}^d_{kin} = \hat{\alpha}_{ik} + \hat{\beta}_k x_n + \hat{\zeta}_k \bar{g}^d_{kn} \tag{30}$$

We then calculate county n's utility setting $g^d_{kn} = 0.31$ if the county had a dry liquor policy by the end of our sample in 1952 and $g^d_{kn} = -0.39$ otherwise.

Third, we consider a uniform policy assuming strict enforcement of prohibition, denoted by g^s_{kn}. This corresponds to the policy regime that was implemented in the early 1920's. Since this policy was very close to abstinence, we set $g^s_{kn} = 0.9$. Using our model with spillover effects, we estimate the voters' bliss points under uniform strict enforcement as:

$$\hat{\theta}^s_{kin} = \hat{\alpha}_{ki} + \hat{\beta}_k x_n + \hat{\zeta}_k \bar{g}^s_{kn} \tag{31}$$

where $\bar{g}_{kn} = 0.9$ for all counties n by construction.

We then compare the relative welfare gains between these policies. For example, the gains in welfare from decentralization compared to weak enforcement are equal to $(W^d - W^w)/|W^w|$.

[49] All counties reverted to their Pre-Prohibition liquor policy when Prohibition ended and local option elections began. Hence, for counties that do not hold a referendum during our sample period, we set $g_{km} = 0.31$ if the county was dry in 1937 before local option elections began and $g_{km} = -0.4$ if it was wet.

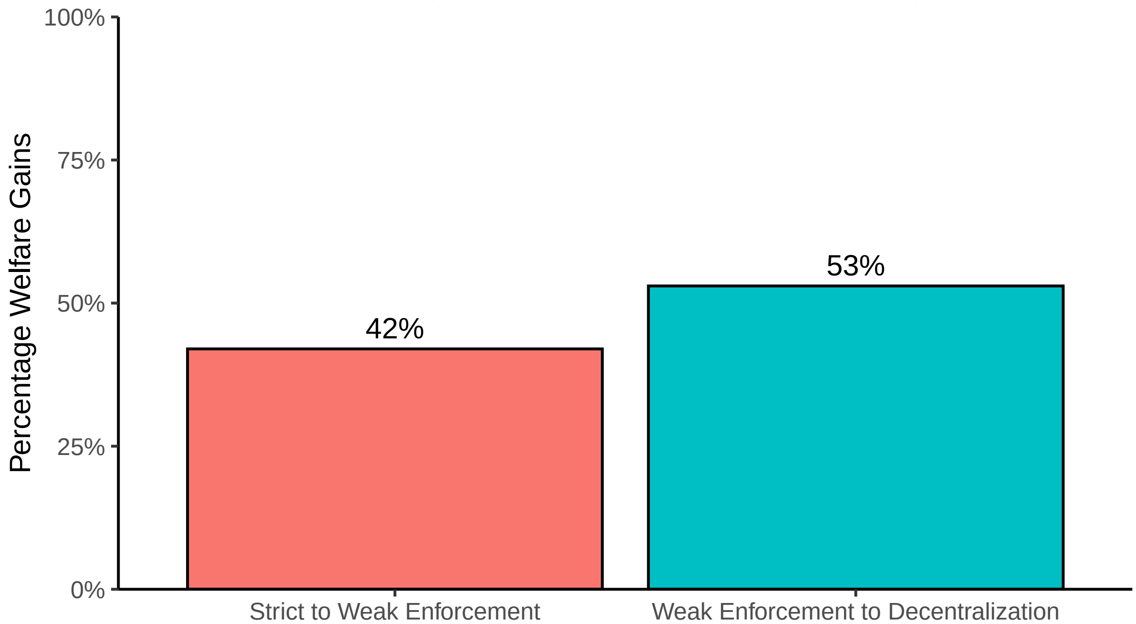
Spatial voting models of the type studied in this paper do not directly allow us to compute standard money metric welfare measures. Instead, we measure welfare in percent changes in utility, which is common practice in the literature.[50] Since the scale of the ideological space is not identified using standard roll call scaling techniques, the ideological policy space is normalized to be the interval between -1 and 1. This implicitly also normalizes the utility function.

Figure 5 summarizes the results of our welfare analysis. We find that welfare under decentralization is 53 percent higher than welfare under weak enforcement. These welfare gains primarily arise because large, more densely populated counties with large shares of minority households and wet voters benefited from adopting policies that were closer to their bliss points. The welfare of districts that preferred dry policies did not change much since they stayed with the status quo. That said, counties that stayed dry experienced small welfare losses due to spillover effects if some of the neighboring counties adopted wet policies. Similarly, wet counties that did not change liquor policies experienced welfare losses if neighboring counties switched to dry policies.

We also find that welfare under weak enforcement is 42 percent higher than under strict enforcement. Welfare gains for districts that preferred wet policies were offset by welfare losses for districts that preferred dry policies. Our model suggests that the gains outweighed the losses and, as a result, there were significant welfare gains from relaxing the enforcement of the Volstead Act in the late 1920s. Note that the welfare measures under uniform policies are strongly affected by the spillover effects. A common policy of either weak or strong enforcement significantly shifts the bliss points of all voters in all counties towards that policy. As a consequence, voters who would prefer wet policies in the absence of spillover

[50] Appendix I provides a more detailed comparison between different welfare measures.

Figure 5: Percentage Welfare Gains from Policy Changes



Note: This figure summarizes the percentage welfare gains associated with (a) a change in policy from strict enforcement to weak enforcement, and (b) a change in policy from weak enforcement to decentralization.

effects experience a significant shift toward dry policies because of the spillover effects.

The optimal policy of voter i in district n is given by $g_{kn} = \theta_{kin}$. We also construct an alternative welfare measure at the voter-county level, which compares the utility of any policy with the utility associated with the ideal policy of that voter. To illustrate this approach, we calculate voter type i's utility in county n under the decentralized policy observed in the data after Prohibition was repealed. Since the utility associated with the ideal point is normalized to be zero, the difference in utilities is then equal to the utility under the implemented policy and given by:

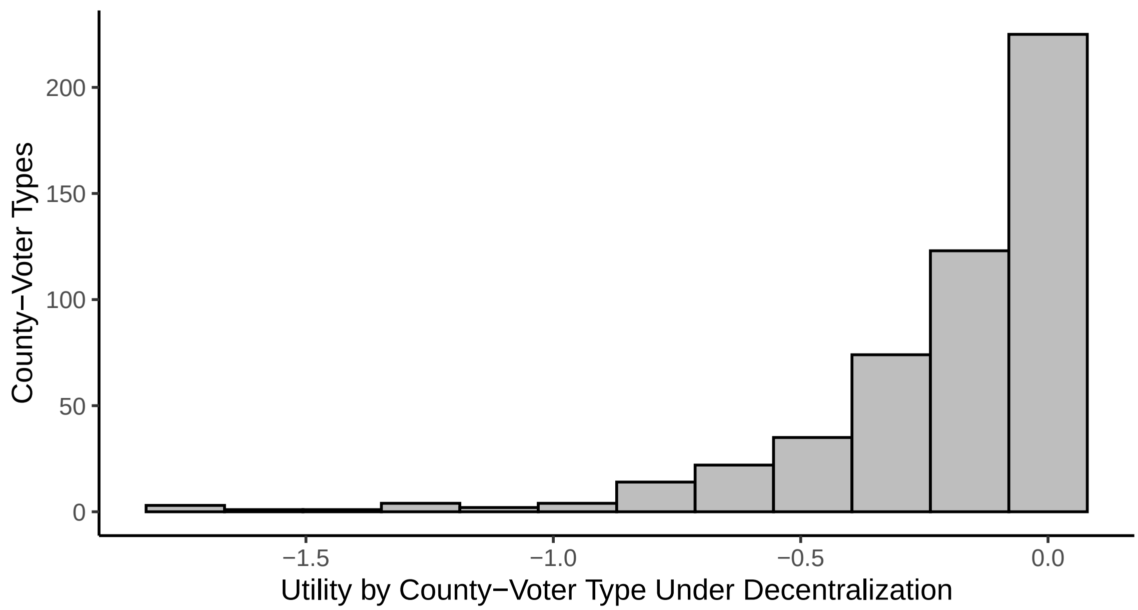
$$u_{kin}(g^d_{kn}) = -\omega_{ki}\,(g^d_{kn} - \theta_{kin})^2 \tag{32}$$

where k denotes the liquor policy dimension. Figure 6 shows a plot of the empirical distribution of county-voter type utilities under decentralization based on our estimated model.

Note that there are 254 counties in Texas. Hence, we have 508 county-voter types in our model. Note that a large majority of voter types have only small welfare losses under decentralization relative to their ideal point. However, there are some voters in the tail of the distribution for whom welfare losses are quite substantial. These findings are qualitatively similar to the ones we obtained using relative welfare measures.

We conclude that the decentralization of liquor policies generated large welfare gains despite large and significant spillover effects. Moreover, weak enforcement of the Volstead Act also led to welfare gains over a policy of strict enforcement.

Figure 6: Distribution of Welfare by County-Voter Type Under Decentralization



Note: This figure shows the distribution of utility under decentralization by county-voter type, as given in equation (32).

7.2. Mapping the Liquor Policy Space to Alcohol Consumption

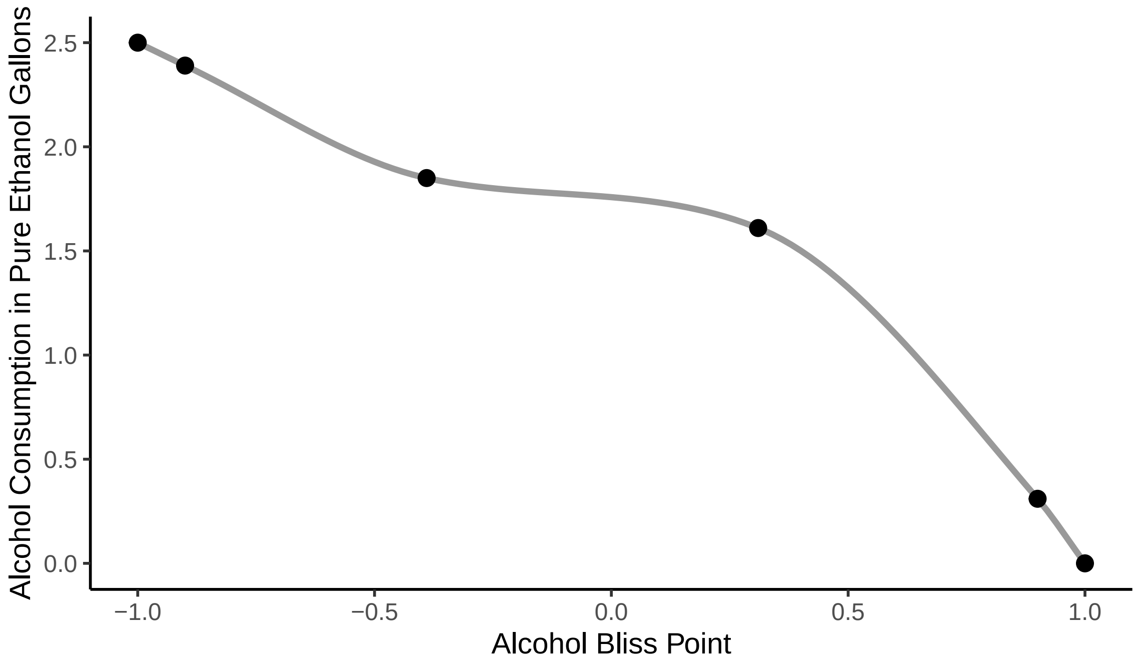
To gain additional insights into the impact of different policies on alcohol consumption and the magnitudes of the associated welfare effects, we link the estimated positions of the policies studied above to the observed levels of alcohol consumption. Our model only captures preferences over liquor policy in an abstract policy space that is normalized on the interval $[-1, 1]$. Based on alcohol consumption data and the estimates of the policy positions we considered above, we map the abstract policy space into levels of alcohol consumption.[51]

Let g denote the position of a policy in the liquor policy space and $a(g)$ the corresponding level of alcohol consumption. To construct the function $a(g)$, we assume that the most extreme dry policy position is associated with complete abstinence, $a(1) = 0$. The minimum level of alcohol consumption observed in the data is 0.31 gallons in 1921, so we set $a(0.9) = 0.31$. Alcohol consumption in 1927-1930 averaged 1.61 gallons. Our median estimate of the dry status quo at the end of the Prohibition Era is 0.31. We thus set $a(0.31) = 1.61$. Average alcohol consumption rose to 1.85 gallons during the period from 1935 to 1955. Our median estimate of the alternative referendum position is -0.39, which suggests that $a(-0.39) = 1.85$. The average consumption in 1911-14 was approximately 2.39 gallons, which we take to be roughly the most extreme wet position. Hence, we set $a(-0.9) = 2.39$. Finally, we set $a(-1) = 2.5$, which is approximately the maximum alcohol consumption observed in the data.

Figure 7 illustrates our mapping from the liquor policy space into average levels of pure alcohol consumption. We admittedly only have a few data points to construct this mapping. As such, we interpret our findings based on this mapping with some degree of caution. Nev-

[51] We discuss the historical alcohol consumption and price data in more detail in Section 3.1 and Appendix A.

Figure 7: Mapping the Liquor Policy Space into Average Pure Alcohol Consumption

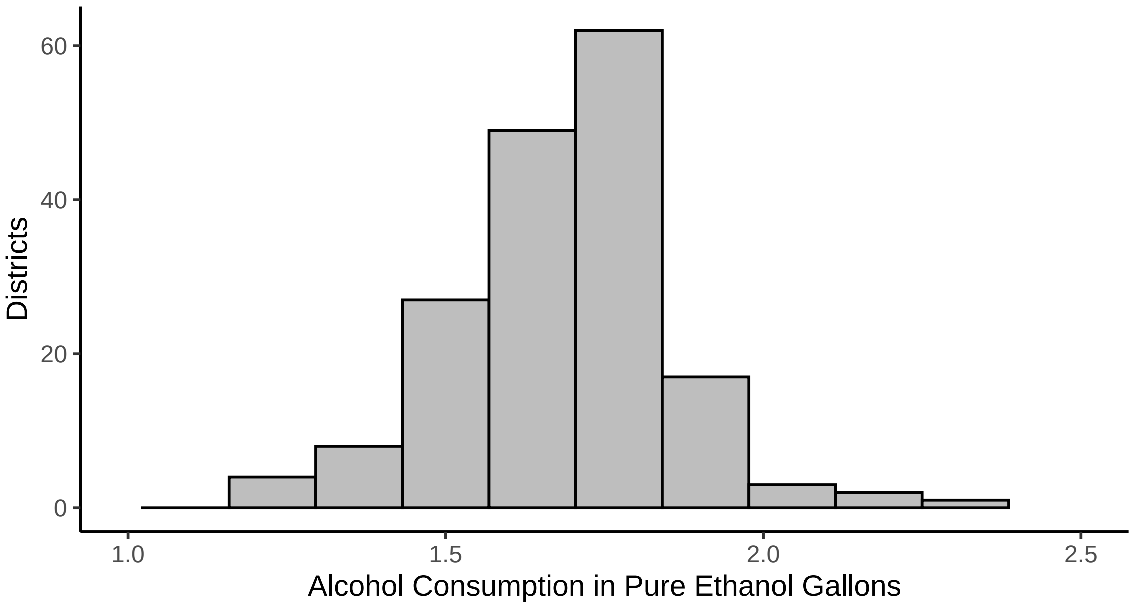


Note: This figure illustrates the relationship between policies located in the abstract policy space and per capita alcohol consumption. For interpolation, we fit a monotone cubic spline to the data.

ertheless, the mapping is useful to gain intuition on the impact of liquor policy changes on alcohol consumption and consumer welfare. The mapping shows, for example, that the average alcohol consumption between the dry status quo policy and the wet referendum policy is not very large. Specifically, the status quo at the end of the Prohibition Era translates to an alcohol consumption level of 1.61 gallons per capita, while the wet referendum policy implied an average alcohol consumption of 1.85 gallons. The difference in average alcohol consumption between the dry and the wet policies is only 0.24 gallons.

We also use this mapping to estimate the distribution of average alcohol consumption bliss points in the Post-Prohibition Era. This distribution is illustrated in Figure 8. Note that the vast majority of counties in our sample preferred liquor policies that implied average

Figure 8: Distribution of Representatives' Bliss Points in Alcohol Consumption Space



Note: This figure illustrates the distribution of House district bliss points in terms of alcohol consumption.

alcohol consumption ranging between 1.5 and 2 gallons. There are only a few counties in the tail of the distribution that preferred more extreme policies. This suggests the heterogeneity in bliss points in the liquor policy space may overstate the heterogeneity in preferences for alcohol consumption in the population.

To translate the percentage welfare gains into more traditional money-metric welfare gains, we need to know the demand function for alcohol. Using data from Warburton (1932), we estimate a constant elasticity, log-linear demand function.[52] Our estimate of the price elasticity is approximately -1.62, which is similar to Cook and Tauchen's (1982) estimate of -1.8 that was based on a more recent and longer time series of data.

[52]We estimate the model using an IV estimator. We use the sugar price index as an instrument for the price of ethanol. See Appendix A for details.

With our estimated demand function, we can compute the consumer surplus for any alcohol consumption level. Table 5 summarizes our estimates for four levels of alcohol consumption.

Table 5: Estimates of Consumer Surplus

Time Period	Per Capita Pure Ethanol Gallons Consumed	Consumer Surplus
1911 - 1914	2.39	$30.19
1920 - 1921	0.33	$14.13
1927 - 1930	1.61	$25.95
1935 - 1955	1.85	$27.37

Note: This table reports consumer surplus estimates based on our estimated alcohol demand function.

According to Warburton (1932), the price per gallon of ethanol was $24.82 in 1920 and $10.01 in 1930. This implies that the average per capita expenditures on ethanol were $8.69 in 1920 and $14.60 in 1930. In terms of average expenditures, our consumer surplus estimates are large and economically meaningful. Comparing a policy of strong enforcement at the beginning of the Prohibition Era with a policy of weak enforcement at the end of the Prohibition Era implies average alcohol consumption increased by $1.61 - 0.33 = 1.28$ gallons per capita. This increase in alcohol consumption translates into an increase in consumer surplus of $11.82, which is roughly 80 percent of average per capita alcohol expenditures in 1930.

Average alcohol consumption did not increase significantly in the Post-Prohibition Era. Increased alcohol consumption following Prohibition was primarily due to increased beer consumption. The main welfare gains achieved by decentralization were thus not driven by large increases in average alcohol consumption, but by targeting local policies to the tastes of local constituencies. We conclude that the welfare gains that were realized by the decentralization of liquor policies at the End of the Prohibition Era were large and economically meaningful. Additionally, there were large gains from relaxing the enforcement of the Volstead Act during the Prohibition Era.

8. Conclusion

We studied the decentralization of liquor policies at the end of the Prohibition Era in Texas. To do so, we extensively searched the Texas legislative archives and hand-collected new data from several rarely used historical sources. Our analysis of the roll call data shows that there was much heterogeneity in preferences over liquor policies across voting districts and counties in Texas. This is consistent with other research that documented polarization in attitudes toward liquor policies during that era (Strumpf-Oberholzer-Gee, 2002, Garcia-Jimeno, 2016). Our findings suggest that legislators' roll call voting patterns were broadly consistent with the voting patterns in local liquor referenda. Moreover, both types of votes can be rationalized within a probabilistic voting model. Voters' preferences systematically differed by income, population density, minority status, and, most importantly, religious affiliation. Our model allows for spillovers among voting districts, and we find that these spillovers were statistically significant and economically important.

The uniform policy of weak enforcement that was in effect by the end of the Prohibition Era was a strong departure from a policy of strict enforcement during the early years of Prohibition. Nevertheless, the uniform policy at the end of the Prohibition Era still shifted policy towards the preferences of small, religious districts that preferred dry policies. As a consequence, there were significant welfare losses for the larger, more densely populated districts that preferred wet policies. Despite the existence of significant spillover effects, there were large gains from policy decentralization. Decentralization allowed larger, more densely populated districts with large minorities to adopt wet policies without affecting the policies adopted in counties that preferred the dry status quo. To interpret the magnitude of these gains, we have drawn on Warburton's (1932) estimates of alcohol consumption before and during the Prohibition Era. Our analysis suggests that the gains from decentralization did not arise due to a large increase in the average alcohol consumption, but were instead due to the tailoring of policies to the preferences of local voters.

Our research raises some important questions that provide useful guidance for future research. We have argued that a desirable model of political representation needs to account for the fact that the policy space may be multi-dimensional and that important dimensions of the policy space may not be easily observed or measured by the econometrician. We also explored a second dimension which is based on fiscal roll call votes. We find that our model can explain the observed differences in roll call voting patterns on fiscal issues. Admittedly, our model assumes that preferences across dimensions are separable, which seems necessary if important other dimensions are not observed. Moreover, separability seems to be a reasonable assumption when it comes to liquor and fiscal policies which are not strongly correlated. Non-separabilities could arise between liquor policies and enforcement. However, enforcement after the end of prohibition was primarily a local and not a state issue. In general, relaxing the separability assumption is challenging since it involves making additional assumptions on the exact type of non-separability. It also requires being able to measure all the other relevant policy dimensions that interact with liquor policies. To our knowledge, no previous papers have estimated a multi-dimensional voting model with non-separable preferences. Future research should investigate these issues more carefully.

Our empirical results primarily apply to Texas. Alcohol consumption in Texas has been near the U.S. average for most of its history. Moreover, the distribution of religious affiliation within Texas is not that different from other states with significant shares of Catholic households. For example, California had an even larger share of Catholic households than Texas. The main advantage of Texas is that it has a large enough legislature and there are enough counties that had referenda which gives us enough power for the econometric analysis. In principle, our methods can be applied to any state in the U.S. that decided to decentralize liquor policy decisions to the local level. However, future research should study other applications of our framework to evaluate the external validity of our estimates.

We also acknowledge that we do not provide a complete cost-benefit analysis of policy decentralization. A more comprehensive analysis of the monetary benefits of various policies also needs to take into consideration the impact of the different policies on tax revenues. Warburton (1932) estimated that the federal government lost approximately one billion dollars of tax revenues per year during the Prohibition Era. A more comprehensive cost-benefit analysis would also need to measure producer surplus. In the case of Prohibition, a large fraction of the producer surplus was absorbed by organized crime, which was particularly problematic from a welfare perspective. We acknowledge that these issues were of paramount importance in the discussion to end Prohibition. While our estimates of the ideological policy position may be influenced by all these aspects of liquor policy, including some of the potential costs associated with enforcement, it is difficult to assign monetary values to all the relevant components that affect the distribution of economic welfare among voters. We instead only focus on voters' benefits. In particular, we do not attempt to estimate the heterogeneity in costs across voting districts. Heterogeneity in costs could arise, for example, due to different local enforcement technologies.

We have jointly analyzed legislators' roll call voting and their constituents' voting in referenda on the same salient policy issues. To our knowledge, this is one of the first papers that has accomplished this task. There are other fruitful applications that combine legislative voting with local public referenda. For example, Masket and Noel (2012) consider voting on budgetary and educational policy issues in the California legislature and the outcomes of local public expenditure referenda. Other potential applications include analyzing abortion or cannabis policies. Our model is well-suited to study a variety of such policy issues.

A. Historical Alcohol Consumption Data

A.1. Alcohol Consumption in the U.S.

Table 6 reports quantities of alcohol consumed in gallons of pure ethanol per capita. We use the total fifteen and older population to obtain the per capita quantities. For the years 1934-1950, quantities come from Slater and Alpert (2021). For the years 1921-1930, quantities are reported in Table 30 of Warburton (1932), Table 30. [53] For the years 1900-1920, quantities come from Warburton (1932), Table 1. Here, Warburton reports per capita quantities with respect to the entire U.S. population of gallons of beer, wine, spirits, and pure ethanol consumed. We convert the gallons of beer, wine, and spirits into gallons of pure ethanol using Warburton's assumed alcohol by volume measures of 4.25 percent, 14 percent, and 50 percent, respectively. We then re-weight the quantities so that they are per capita quantities relative to only the fifteen and older population. Data on alcohol consumption between 1931 and 1933 are based on Miron and Zwiebel (1991).

To estimate the demand function for alcohol during the Prohibition Era, we need to construct price data. Table 78 in Warburton (1932) contains prices per gallon of beer, wine, and spirits from 1920-1930. We convert these prices to prices per gallon of pure ethanol assuming alcohol by volumes of 4.25 percent, 14 percent, and 50 percent for beer, wine, and spirits, respectively. To construct a price of pure ethanol, we compute a weighted sum of the beer, wine, and spirits prices, where the weights of each type of alcohol's price correspond to that type's share of total alcohol consumption as reported in Table 6.

Table 7 reports the demand schedule for alcohol in the U.S. between 1920 and 1930.

[53] According to the 1930 Complete Count Census Data, the total U.S. population in 1930 was 122,777,512, of which 86,694,367 individuals were at least fifteen years of age.

Table 6: Per Capita Alcohol Consumption in Gallons of Pure Ethanol, 1900-1955

Year	Beer	Wine	Spirits	Total	Year	Beer	Wine	Spirits	Total
1900	0.97	0.08	0.91	1.95	1928	0.33	0.15	1.21	1.70
1901	0.96	0.07	0.93	1.95	1929	0.40	0.13	1.30	1.83
1902	1.03	0.12	0.95	2.11	1930	0.39	0.13	0.95	1.46
1903	1.06	0.09	1.01	2.17	1931	–	–	–	1.71
1904	1.08	0.10	1.02	2.20	1932	–	–	–	1.44
1905	1.08	0.08	1.00	2.17	1933	–	–	–	1.58
1906	1.17	0.11	1.04	2.32	1934	0.61	0.07	0.29	0.97
1907	1.24	0.13	1.12	2.48	1935	0.68	0.09	0.43	1.20
1908	1.22	0.11	0.98	2.32	1936	0.79	0.12	0.59	1.50
1909	1.15	0.13	0.93	2.21	1937	0.82	0.13	0.64	1.59
1910	1.19	0.13	1.01	2.32	1938	0.75	0.13	0.59	1.47
1911	1.25	0.13	1.03	2.41	1939	0.75	0.14	0.62	1.51
1912	1.20	0.11	1.03	2.35	1940	0.73	0.16	0.67	1.56
1913	1.25	0.11	1.07	2.42	1941	0.81	0.18	0.71	1.70
1914	1.25	0.11	1.02	2.37	1942	0.90	0.22	0.85	1.97
1915	1.11	0.07	0.89	2.07	1943	1.00	0.17	0.66	1.83
1916	1.07	0.09	0.97	2.14	1944	1.13	0.18	0.76	2.07
1917	1.09	0.08	1.15	2.32	1945	1.17	0.20	0.88	2.25
1918	0.90	0.10	0.60	1.60	1946	1.07	0.24	0.99	2.30
1919	0.48	0.10	0.55	1.13	1947	1.11	0.16	0.76	2.03
1920	0.15	0.02	0.18	0.35	1948	1.07	0.20	0.70	1.97
1921	0.06	0.06	0.20	0.31	1949	1.06	0.22	0.70	1.98
1922	0.09	0.07	0.98	1.14	1950	1.04	0.23	0.77	2.04
1923	0.12	0.13	1.27	1.51	1951	1.03	0.20	0.78	2.01
1924	0.15	0.12	1.14	1.41	1952	1.04	0.21	0.73	1.98
1925	0.18	0.12	1.20	1.50	1953	1.04	0.20	0.77	2.01
1926	0.23	0.14	1.29	1.66	1954	1.01	0.21	0.74	1.96
1927	0.28	0.15	1.05	1.48	1955	1.01	0.22	0.77	2.00

Quantities consumed are reported in gallons of pure ethanol consumed per capita with respect to the fifteen and older population.

Table 7: Estimated Demand Schedule for Pure Ethanol, 1920-1930

Year	Per Capita Gallons of Pure Ethanol	Price per Gallon in Dollars
1920	0.35	24.82
1921	0.31	17.72
1922	1.14	13.78
1923	1.51	11.03
1924	1.41	11.09
1925	1.50	11.10
1926	1.66	10.46
1927	1.48	9.92
1928	1.70	11.37
1929	1.83	10.56
1930	1.46	10.01

A.2. Estimating the Demand for Alcohol

We consider an iso-elastic demand curve of the form

$$q = A\, p^{\epsilon} e^{u} \tag{33}$$

Taking logarithms of equation (33) gives our estimating equation:

$$ln(q) = ln(A) + \epsilon\, ln(p) + u \tag{34}$$

We first estimate this equation using OLS, which ignores the potential endogeneity of the price. We also estimate an IV regression using the logged price index of sugar as an instrument.[54] Table 8 summarizes the estimates. Overall, we find that the OLS and IV results are

Table 8: Estimating the Price Elasticity of Ethanol Demand, 1920 - 1930

	Dependent variable:	
	log(Ethanol Consumption)	
	OLS	IV
ϵ	-2.018	-1.622
	(0.281)	(0.385)
α	5.210	4.214
	(0.710)	(0.971)
Observations	11	11
Adjusted R^2	0.835	0.799

fairly similar. Our preferred IV estimate of the price elasticity is approximately -1.62, which is similar to the point estimate of -1.8 reported by Cook and Tauchen (1982). Their estimate is based on the Post-Prohibition Era and obtained using a much larger data set.

[54]The sugar price index comes from Warburton (1932), Table 20, column X_3.

B. Data Sources and Quality

We used the following data sources in this paper:

- The roll call votes that we analyze to estimate the bliss points are based on documents from the Texas legislative archives. We do not use our own classification scheme to identify liquor policy votes but instead rely on those provided by archived legislative journals.

- Data on the local liquor elections in Texas were obtained from the annual reports of the Texas Alcoholic Beverage Commission.

- The demographic data that we use to characterize the composition of the voting districts in Texas and to estimate the probabilistic voting model are based on the 1940 U.S. Census and the 1936 Census of Religious Bodies. The U.S. Bureau of the Census conducted both surveys.[55]

- The data collected by Warburton (1932) are based on more idiosyncratic sources, and hence these data may be less reliable than the other data that we use. However, it is, to our knowledge, the only reliable data source available for this period. Moreover, it was assembled as part of a research effort to inform the U.S. government of the limitations of Prohibition Era policies. His estimates of alcohol consumption during the Prohibition Era were validated by Miron and Zwiebel (1991).

[55]The 1940 Full-Count U.S. Census data we use was made available through IPUMS USA based on data provided by the United States Census Bureau (Ruggles et al., 2024). We use the 1936 Census of Religious Bodies from ICPSR Study 02896 (Haines, 2010).

C. Liquor Bills Considered by the Texas Legislature

Our sample of roll call votes on liquor-related bills spans three legislatures. The regular session of the 43rd Legislature began in January 1933. Despite the active statewide Prohibition law, the state legislature considered several pieces of legislation addressing the manufacture, sale, and regulation of alcohol. Of these, House Joint Resolution no. 43 excepted vinous and malt liquors of not more than 3.2 percent alcoholic content by weight from Prohibition under the Texas state constitution and became known as the "Beer Amendment" upon its passage. This amendment was the first step towards repealing statewide Prohibition in Texas. Related legislation considered in the 43rd legislature included House Bills 122 and 168 on regulating, "the manufacture, sale, and disposition of nonintoxicating malt liquors and the places wherein the same are manufactured and sold; defining non-intoxicating malt liquors; imposing an occupation tax upon certain persons, firms, corporations, and associations of persons manufacturing and selling non-intoxicating malt liquors; defining manufacturers of such non-intoxicating malt liquors and regulating the business thereof, etc."[56] Also of note is House Joint Resolution no. 5, which would have, among other things, provided for a local option on liquor sales, which ultimately failed to pass.

The 44th Legislature began in January 1935. The session saw the passage of Senate Joint Resolution 3, which allowed voters to decide to amend the Texas state constitution to repeal statewide Prohibition and allow for a local option. It also considered Senate Joint Resolution 3a, which would have established a state-run monopoly over liquor production had voters not rejected it in a subsequent popular vote. Other alcohol-related issues voted on include

[56] The quoted language is from the text of H. B. 122. H. B. 168 was a similar bill introduced in the First Called Session of the 43rd Legislature.

those in H. B. 1[57] and H. B. 77[58]. These bills addressed regulating the manufacture, sale, trafficking, possession, and taxation of liquor. H. B. 77, known after its passage as the Texas Liquor Control Act, established the Texas Liquor Control Board in 1935, which would later become the modern Texas Alcoholic Beverage Commission.

The 45th legislative session began in 1937. Despite the newly established Texas Liquor Control Board, legislators considered several bills that would amend the Texas Liquor Control Act. H. B. No. 432 sought to authorize the use of search warrants by the Texas Liquor Control Board, "for the purpose of searching for and seizing and disposing of intoxicating liquors under certain circumstances and prescribing the rules relative thereto, and declaring an emergency." Also considered were House Bill no. 5[59], which provided alternatives to many of the issues covered in the Texas Liquor Control Act; House Bill no. 20[60], which would raise taxes on alcohol sales; and Senate Bill no. 20[61], which would restrict when and where alcohol could be sold.

The journals of each legislature allow us to follow the history of each bill, tracking each time roll call votes were taken to pass or table the bill or amendments to the bill. In estimation, we include all roll call votes on the passage of these and similar bills. We also include

[57] H. B. 1, "A bill to be entitled 'An Act regulating the manufacture, sale, importation, transportation and possession of alcoholic liquors; levying taxes; prescribing penalties for violations; repealing conflicting laws and parts of laws and amending the same; and declaring an emergency."'

[58] H. B. 77, "An Act defining the term 'open saloon'; creating a Board of Liquor Control; prescribing rules and regulations, and regulating the manufacture, sale, importation, transportation, and possession of alcoholic liquors; providing for the right of local option; etc"

[59] H. B. 5, A bill to be entitled "An Act defining the term 'open saloon'; regulating the manufacture, sale, importation, transportation and possession of alcoholic liquors; prescribing rules and regulations and the right of local option; providing for a system of permits; levying taxes; prescribing penalties for violations; repealing conflicting laws and parts of laws, and declaring an emergency."

[60] H. B. 20, To provide for an additional tax upon the sale of alcoholic liquors, etc.

[61] S. B. 20, A bill to be entitled "An Act providing for certain restrictions on the sale of wine and beer or on premises where consumed; further providing for certain and definite penalties for violations in the traffic of alcoholic beverages and in making and keeping of records of permittees and licensees; etc., and declaring an emergency."

roll call votes on amended versions of the bills. For example, in the passage of House Bill no. 20 in the 45th Legislature's Second Called Session, various amendments were proposed to raise or lower the proposed alcohol tax. Other amendments voted on would have added restrictions in the bill on the sale of alcohol and proposed punishments for violations of these restrictions.

D. Identification: Proof of Proposition 1

For expositional simplicity, consider the case in which $I = 2$ and ignore the endogenous peer effects. In the spirit of an identification at infinity result, we consider two extreme cases of the model which allows us to establish identification of (α, β). First, note that if $s_{1n} = 1$, our model reduces to the following simple regression model:

$$g_{kn} = \alpha_{k1} + \beta_{k1}\, x_{kn} + u_{k1n} \tag{35}$$

Hence $(\alpha_{k1}, \beta_{k1})$ are identified. This also implies that the conditional distribution of u_{k1n} is non-parametrically identified. So we do not need a distributional assumption for the error terms to establish identification. Similarly, if $s_{1n} = 0$ and hence $s_{2n} = 1$, we have:

$$g_{kn} = \alpha_{k2} + \beta_{k2}\, x_{kn} + u_{k2n} \tag{36}$$

Hence $(\alpha_{k2}, \beta_{k2})$ are identified. This argument easily extends to the more general case in which $I > 2$ and to account for peer effects.

Next, define the expected bliss points for each type k as:

$$\begin{aligned} \bar{\theta}_{ikn} &= E[\theta_{kin}|x_{kn}] \\ &= \alpha_{ki} + \beta_{ki}\, x_{kn} \end{aligned} \tag{37}$$

which we can treat as known, since α and β are identified. Now consider the case in which $0 < s_{in} < 1$. We can write g_{kn} as a weighted average of the expected bliss points and the error term:

$$g_{kn} = \sum_i \frac{s_{in}\gamma_{ki}}{\sum_j s_{jn}\gamma_{kj}}\, \bar{\theta}_{ikn} + v_{kn} \tag{38}$$

The easiest way to see that the γ_{ki}'s are only identified up to a normalization is to consider an imposture structure $c\,\gamma_{ki}$, where c is an arbitrary positive constant. For any value of s_{1n}, we have:

$$\frac{s_{in}c\,\gamma_{ki}}{\sum_i s_{in}c\,\gamma_{ki}} = \frac{c\, s_{in}\gamma_{ki}}{c\,\sum_i s_{in}\gamma_{ki}} = \frac{s_{in}\gamma_{ki}}{\sum_i s_{in}\gamma_{ki}} \tag{39}$$

Put differently, the weights above must sum up to one. A natural normalization is:

$$\sum_{i=1}^{I} \gamma_{ki} = 1 \qquad k = 1, 2 \tag{40}$$

Additional restrictions can be obtained if we impose some assumptions on the distribution of the error terms, For example, if $V(u_{kin}) = \sigma^2_{ik}$, then the conditional variance of the error terms is given by:

$$Var(v_{kn}|\, s_n) = \sum_i \left(\frac{s_{in}\gamma_{ki}}{\sum_j s_{jn}\gamma_{kj}} \right)^2 \sigma^2_{ki} \tag{41}$$

Hence the σ_{ki} are identified from the equation above. Q.E.D.

E. GMM Estimation

Because of the separability of the utility function, we can estimate the model separately for each policy dimension. To simplify the notation, we consider again the case in which $I = 2$[62] and ignore the endogenous peer effects. As we discussed in Section 4 of the paper, we can derive orthogonality conditions from two predictions of the model. First, consider the predictions of our model for the bliss points of legislators. For each policy dimension k, define a parameter vector:

$$\delta_{1k} = (\gamma_{k1}, \alpha_{k1}, \beta_{k1}, \alpha_{k2}, \beta_{k2}) \tag{42}$$

For policy dimension k , we obtain the following orthogonality condition:

$$h_{1k}(g_{kn}, s_{1n}, s_{2n}, x_{kn}|\delta_{1k}) = g_{kn} - \sum_i \frac{\gamma_{k1}\ s_{in} E[\theta_{kni}|x_{kn}]}{\sum_j s_{jn}\gamma_{kj}} \tag{43}$$

Next, consider the variance of the error terms. For each k, define a second parameter vector:

$$\delta_{2k} = (\sigma_{k1}, \sigma_{k2}) \tag{44}$$

Define the residuals for policy dimension k as:

$$v_{kn} = h_{1k}(g_{kn}, s_{1n}, s_{2n}, x_{kn}|\ \delta_{1k}) \tag{45}$$

[62]The estimator easily generalizes to the more general case, when $I \geq 2$.

Based on the variance of the error terms, we can define the following orthogonality condition:

$$h_{2k}(v_{kn}^2, s_{1n}, s_{2n}|\ \delta_{1k}, \delta_{2k}) \quad = \quad v_{kn}^2 - Var[v_{kn}|s_{1n}, s_{2n}, \delta_{1k}, \delta_{2k}] \tag{46}$$

where

$$Var[v_{kn}|s_{1n}, s_{2n}, \delta_{1k}, \delta_{2k}] \quad = \quad \sum_i \left(\frac{s_{in}\gamma_{ki}}{s_{1n}\gamma_{ki} + s_{2n}(1-\gamma_{k1})} \right)^2 \sigma_{kni}^2 \tag{47}$$

Here, we are exploiting that the functional form of heteroskedasticity is known.

Finally, consider the vote shares in referenda that pit the status quo against the same alternative. Define a third parameter vector as:

$$\delta_{3k} \quad = \quad (g_{ks}, g_{kr}, \sigma_{k1}^{\epsilon}, \sigma_{k2}^{\epsilon}) \tag{48}$$

We can exploit the predictions of the referenda vote shares to obtain the following orthogonality condition:

$$h_{3k}(V_{kn}, s_{1n}, s_{2n}, x_{1n}|\delta_{1k}, \delta_{2k}, \delta_{3k}) \quad = \quad V_{kn} \ - \ E[V_n|s_{1n}, s_{2n}, x_{kn}] \tag{49}$$

where

$$E[V_{kn}|s_{1n}, s_{2n}, x_{kn}] = \sum_i s_{in} \int \frac{\exp[(g_{ks}^2 + 2\ (g_{kr} - g_{ks})\ (\alpha_{ki} + \beta_{ki} x_{kn})\ +\ 2\ (g_{kr} - g_{ks})\ u_{ki}\ -\ g_{kr}^2)/\sigma_{ki}^{\epsilon}]}{1 + \exp[(g_{ks}^2 + 2\ (g_{kr} - g_{ks})\ (\alpha_{ki} + \beta_{ki} x_{kn})\ +\ 2\ (g_{kr} - g_{ks})\ u_{ki}\ -\ g_{kr}^2)/\sigma_{k}^{\epsilon}]}\ r_{ki}(u_{ki})\ du_{ki}$$

For computational convenience, we assume that the $r_{ki}(\cdot)$ are normal densities with mean zero and variance σ_{ki}^2. We can then numerically integrate the inner summand using quadrature methods. Let δ_k denote the full parameter vector:

$$\delta_k = (\delta_{1k}, \delta_{2k}, \delta_{3k}) \tag{50}$$

We can estimate all parameters jointly using a GMM framework. To see this, define

$$f_{1k}(g_{kn}, s_{1n}, s_{2n}, x_{kn}, z_{1kn}|\delta_k) = z_{1kn}\ h_{1k}(g_{kn}, s_{1n}, s_{2n}, x_{kn}|\delta_k) \tag{51}$$

where z_{1kn} is a J-dimensional vector of instruments. Note that $J \geq 5$ is a necessary condition for identification. Additional orthogonality conditions can be formed based on the variance restrictions. Similarly, define:

$$f_{2k}(g_{kn}, s_{1n}, s_{2n}, x_{kn}, z_{2kn}|\delta_k) = z_{2kn}\ h_{2k}(s_{1n}, s_{2n}|\delta_k) \tag{52}$$

and

$$f_{3k}(V_{kn}, s_{1n}, s_{2n}, x_{kn}, z_{3kn}|\delta_k) = z_{3kn}\ h_3(V_{kn}, s_{1n}, s_{2n}, x_{kn}|\delta_k) \tag{53}$$

Define $z'_{kn} = (z'_{1kn}, ...z'_{3kn})$, and $s'_n = (s_{1n}, s_{2n})$. Stacking the orthogonality conditions, we have:

$$f(g_{kn}, V_{kn}, s_n, x_{kn}, z_{kn}|\delta_k) = \begin{pmatrix} f_{1k}(g_{kn}, s_{1n}, s_{2n}, x_{kn}, z_{1kn}|\delta_k) \\ f_{2k}(g_{kn}, s_{1n}, s_{2n}, x_{kn}, z_{2kn}|\delta_k) \\ f_{3k}(V_{kn}, s_{1n}, s_{2n}, x_{kn}, z_{3kn}|\delta_k) \end{pmatrix} \tag{54}$$

and

$$E\Big(f(g_{kn}, V_{kn}, s_n, x_{kn}, z_{kn}|\delta_k^0)\Big) = 0 \tag{55}$$

where δ_k^0 is the true parameter value. The optimally weighted GMM estimator is then defined as:

$$\tilde{\delta}_{kN} = \text{argmin } \left[\frac{1}{N}\sum_{n=1}^{N} f(g_{kn}, V_{kn}, s_n, , x_{kn}, z_{kn}|\delta_k)\right]' W_{kN} \left[\frac{1}{N}\sum_{n=1}^{N} f(g_{kn}, V_{kn}, s_n, x_{kn}, z_{kn}|\delta_k)\right]$$

where W_{kN} is a consistent estimator of the optimal weighting matrix. We can estimate the optimal weighting matrix using the following estimator:

$$W_{kN} = \left[\frac{1}{N}\sum_{n=1}^{N} f(g_{kn}, V_{kn}s_n, x_{kn}, z_{kn}|\hat{\delta}_{kN})\ f(g_{kn}, V_{kn}s_n, x_{kn}, z_{kn}|\hat{\delta}_{kN})'\right]^{-1} \tag{56}$$

where $\hat{\delta}_{kN}$ is a consistent estimator.

The choice of instruments is discussed in detail in the paper. In the model without spillovers, we use the following instruments:

$$\begin{aligned}
z_{1kn} &= (1, s_{1n}, x_{kn}, s_{1n}\ x_{kn}, s_{2n}\ x_{kn}, \frac{1}{s_{1n}}, \frac{1}{s_{2n}})' \\
z_{2kn} &= (1, s_{1n})' \\
z_{3kn} &= (1, x_{1n}, s_{1n}, \frac{1}{s_{1n}}, \frac{1}{s_{2n}})'
\end{aligned} \tag{57}$$

We have conducted a Monte Carlo study and found that our estimator performs quite well using simulated data.

F. Roll Call Threshold Sensitivity Analysis

We use Poole et al.'s (2011) `wnominate` software package to estimate legislators' bliss points. The package implements a maximum likelihood estimator to estimate Poole and Rosenthal (1985) W-NOMINATE scores from a user-supplied roll call matrix. In our application, we estimate one-dimensional W-NOMINATE scores separately for members of the Texas House and Senate. We follow the authors' recommendations and use the default starting values of 0.5 for the weight parameter (`uweights`) and 15 for the signal-to-noise ratio parameter (`ubeta`). We also use the default value of 0.025 for the lopsided vote cut-off parameter (`lop`). This parameter excludes votes where the minority received less than 2.5 percent of the non-missing votes, as near-unanimous votes contain little information about legislators' bliss points. We use the recommended minimum voting threshold (`minvotes`) of 20 votes, which drops legislators who voted fewer than 20 times. As discussed below in detail, we find that our results are robust to changing the `minvotes` threshold. We set the `polarity` argument so that positive W-NOMINATE scores correspond to "dry" and negative scores correspond to "wet."

Table 9 compares our estimates based on the two different roll call thresholds. Column (1) contains the estimates of the model in Column (4) of Table 4 that are based on a threshold of 20 roll call votes. Column (2) contains estimates of the same model using a threshold of 13 votes. Overall, we find that the results in both columns are quite similar.

Table 9: Parameter Estimates: Robustness to Roll Call Threshold

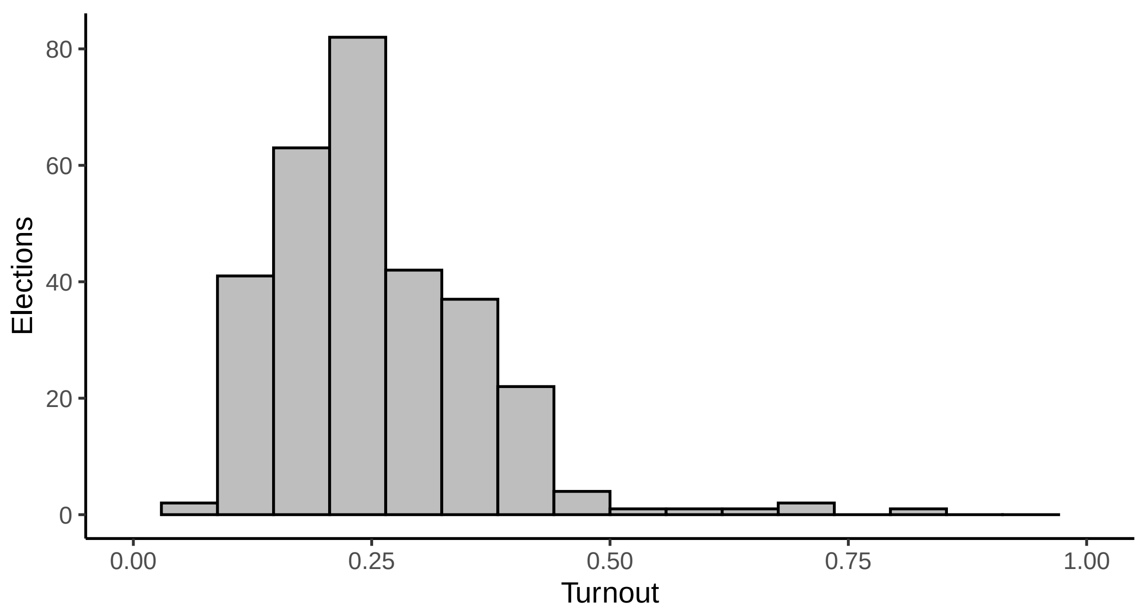
	(1)	(2)
α_1 (Intercept Dry)	2.03	1.56
	(0.22)	(0.22)
α_2 (Intercept Wet)	1.51	0.93
	(0.18)	(0.18)
β_1 (Percent Minority)	-0.65	-0.49
	(0.06)	(0.06)
β_2 (Percent High School)	-0.30	0.23
	(0.10)	(0.10)
β_3 (Logged Mean Income)	-0.22	-0.19
	(0.03)	(0.03)
β_4 (Percent Urban)	0.08	0.03
	(0.04)	(0.04)
β_5 (Population Density)	-0.25	-0.19
	(0.02)	(0.02)
ζ_2 (Endogenous Spillovers)	0.53	0.50
	(0.05)	(0.05)
γ_2/γ_1 (Weight Wet)	2.02	1.31
	(0.15)	(0.15)
σ_1^u (Variance Dry)	0.51	0.53
	(0.04)	(0.04)
σ_2^u (Variance Wet)	0.90	0.63

	(1)	(2)
	(0.10)	(0.10)
	Referenda	
g_{1s} (Status Quo)	0.29	0.22
	(0.06)	(0.06)
g_{1r} (Alternative)	-0.44	-0.65
	(0.07)	(0.07)
σ_2^{ϵ} (Variance Wet)	1.56	1.15
	(0.24)	(0.24)
Number of Representatives	173	211
Number of Referenda	122	122

G. Voter Turnout Analysis

Figure 9 shows the distribution of referendum turnout, measured as the total number of votes cast in a county referendum divided by the county's voting age population, in our sample of 302 referenda.

Figure 9: Turnout in 302 Local Referenda

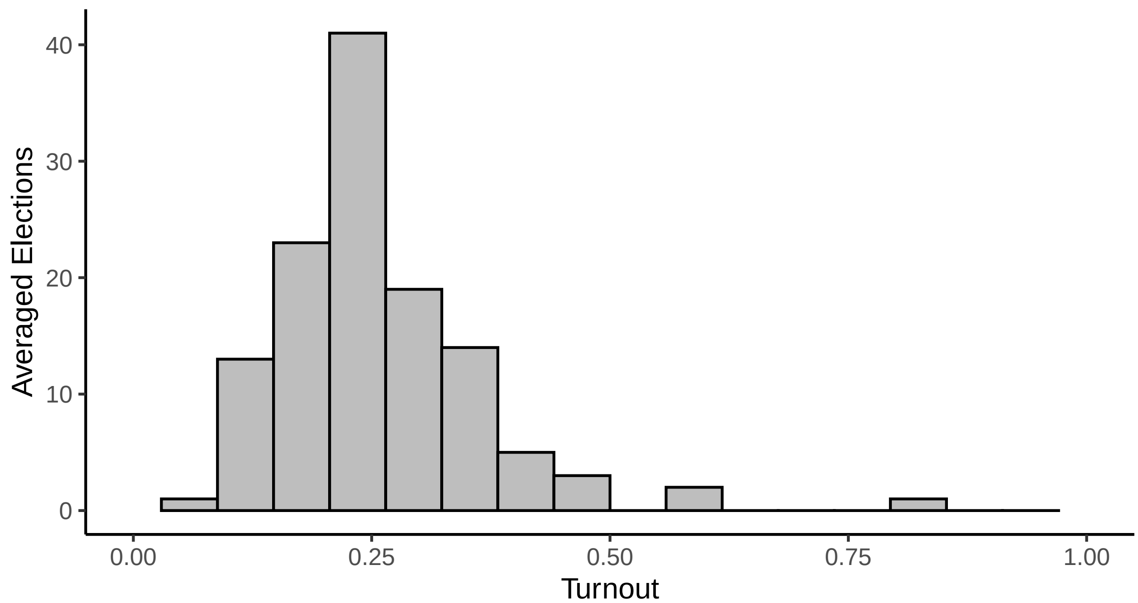


Note: This figure illustrates the distribution of voter turn-out rates in 302 local liquor referenda.

We can also combine referenda in the same county and compute an average vote share and voter turn-out rate. Figure 10 shows the same histogram on the sample of average voter turn-out at the county level that we use in our preferred estimation specification. These statistics are comparable to the ones reported in Coate and Conlin (2004), who analyze turnout during a longer time period than we do.

Table 10 shows the results of regressing turnout on the share of voter types across counties.

Figure 10: Turnout in 122 Averaged Referenda



Note: This figure illustrates the distribution of average voter turn-out in 122 counties.

Column (1) shows the regression on the full set of 302 elections, and Column (2) repeats the regression on the sample of 122 averaged elections. The share of dry religion voters in all specifications is insignificant and close to zero. We thus do not find any evidence that suggests differential voter turnout among the two types in our model.

Table 10: Turnout Regressions

	Individual Referenda	Averaged Referenda
Percent Dry Religion	−0.015	−0.049
	(0.041)	(0.049)
Percent Minority	−0.212	−0.220
	(0.052)	(0.065)
Percent High School	0.147	0.227
	(0.110)	(0.146)
Logged Mean Income	0.057	0.027
	(0.034)	(0.042)
Percent Urban	−0.155	−0.164
	(0.041)	(0.050)
Population Density (× 100)	−0.003	0.002
	(0.019)	(0.019)
Constant	−0.077	0.132
	(0.203)	(0.251)
Observations	302	122
Adjusted R^2	0.164	0.252

H. Additional Robustness Analysis

Table 11 compares several different estimators for the restricted model without spillovers. Column (1) in Table 11 contains the full set of parameter estimates when $\frac{\gamma_2}{\gamma_1} = 1$. Column (2) reports the estimates when we use a grid for $\frac{\gamma_2}{\gamma_1}$ and estimate the remaining parameters using OLS. Column (3) reports the estimates that are based on the efficient GMM estimator. We find that the parameter estimates reported in Column (2) and Column (3) are similar. We mostly see some efficiency gains reflected in the smaller estimated standard errors of the GMM estimator in Column (3) than the sequential estimator in Column (2).

Overall, we strongly reject the hypothesis of equal treatment of voter types. Our estimate of γ_2/γ_1 is approximately 2. Politicians assign higher weights to wet voters than to dry voters.

We also conducted several robustness analyses. First, we can also estimate the bliss points of 53 legislators that come from 12 multimember districts. Column (4) includes the legislators from multi-member districts in the sample. We find that the overall fit of the model improves as we use these additional data points while the parameter estimates are similar to the ones reported in Column (3).

Second, we have noted that the period in which legislators voted on liquor policies and the period for which we observe referenda do not perfectly overlap. Not surprisingly, legislators' voting typically precedes referenda. We have estimated the model using referenda that took place before the U.S. entry into World War II. One may conjecture that liquor preferences may have changed during and after World War II. Hence, Column (5) only uses referenda that took place before 1942. Overall, the results are similar across all these specifications, which is consistent with the observation that alcohol consumption was very stable between 1935 and 1955.[63]

Third, Column (6) excludes any referenda that did not pit "beer only" against dry. Overall, we find that our point estimates are similar to the ones of our preferred specification. In particular, there are no large differences in the estimates of the position of the alternative policy. That suggests that any type of "wet" policy that was considered by voters was pushing the policy significantly to the left of the policy space. Again, this finding is consistent with the observation that Prohibition primarily reduced the consumption of beer. Lifting the restrictions on beer consumption thus removed the most obvious constraint imposed by Prohibition policies.

Fourth, we also observe several referenda at the precinct level, which is below the county level. These sub-county referenda allowed individual precincts to adopt a different liquor

[63]There are no obvious structural changes in alcohol consumption during that period as can be seen from Figure 1.

policy than the county. Recall that most of the precincts that opted out are too small to affect the validity of our estimation results. There are only six counties in which a sufficiently large number of precincts adopted different policies than the dry counties. As a robustness check, we have also re-estimated the model omitting the counties in which a significant fraction of the precincts adopted a different policy than the county. Column (7) in Table 11 contains the estimates when we drop partly wet counties where a substantial number of justice precincts were dry. We find that our main findings are quite robust to the exclusion of these counties.

Our model and estimation method can, in principle, be used to make predictions about voters' behavior at the precinct level. However, it is impossible to obtain reliable maps for all these precincts in Texas in the 1930s and 40s. Moreover, the key variable in our analysis is religious affiliation. That variable is only available at the county level. As a consequence, most of the empirical papers that have studied local referenda in Texas during this period–including our study–have focused on county-level referenda, ignoring the precinct-level variation.

Fifth, we consider how robust our analysis is to assumptions regarding voter turnout. Thus far we have assumed that all citizens turn out to vote in public referenda. It is straightforward to extend the model and allow for differences in voter turnout among the types of voters.

Table 11: Parameter Estimates: Additional Robustness Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
α_1 (Intercept Dry)	3.58	3.44	4.36	3.82	3.44	3.44	3.44
	(0.31)	(0.30)	(0.15)	(0.31)	(0.30)	(0.30)	(0.30)
α_2 (Intercept Wet)	2.61	2.49	3.19	3.01	2.49	2.49	2.49
	(0.25)	(0.23)	(0.08)	(0.25)	(0.23)	(0.23)	(0.23)
β_1 (Percent Minority)	-0.95	-1.02	-0.83	-0.91	-1.02	-1.02	-1.02
	(0.08)	(0.09)	(0.05)	(0.08)	(0.09)	(0.09)	(0.09)
β_2 (Percent High School)	0.33	0.25	0.25	0.84	0.25	0.25	0.25
	(0.09)	(0.09)	(0.05)	(0.09)	(0.09)	(0.09)	(0.09)
β_3 (Logged Mean Income)	-0.45	-0.41	-0.53	-0.50	-0.41	-0.41	-0.41
	(0.04)	(0.03)	(0.01)	(0.04)	(0.03)	(0.03)	(0.03)
β_4 (Percent Urban)	0.25	0.25	0.57	0.12	0.25	0.25	0.25
	(0.05)	(0.05)	(0.08)	(0.03)	(0.05)	(0.05)	(0.05)
β_5 (Population Density)	-0.29	-0.29	-0.37	-0.14	-0.29	-0.29	-0.29
	(0.02)	(0.02)	(0.05)	(0.01)	(0.02)	(0.02)	(0.02)
γ_2/γ_1 (Weight Wet)	1.00	1.89	2.98	1.95	1.89	1.89	1.89
	–	(0.12)	(0.29)	(0.12)	(0.12)	(0.12)	(0.12)
σ_1^u (Variance Dry)	0.46	0.50	0.72	0.51	0.50	0.50	0.50
	(0.03)	(0.04)	(0.07)	(0.04)	(0.04)	(0.04)	(0.04)
σ_2^u (Variance Wet)	0.46	0.85	0.54	0.84	0.85	0.85	0.85
	(0.03)	(0.09)	(0.06)	(0.09)	(0.09)	(0.09)	(0.09)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				Referenda			
g_{1s} (Status Quo)	0.15	0.27	0.75	0.44	0.17	0.07	0.31
	(0.06)	(0.06)	(0.09)	(0.06)	(0.06)	(0.07)	(0.06)
g_{1r} (Alternative)	-0.50	-0.38	-0.52	-0.41	-0.30	-0.44	-0.38
	(0.07)	(0.08)	(0.16)	(0.08)	(0.07)	(0.07)	(0.08)
σ_2^{ϵ} (Variance Wet)	0.73	0.54	0.75	0.51	0.87	1.38	0.56
	(0.03)	(0.03)	(0.05)	(0.02)	(0.06)	(0.19)	(0.03)
Number of Representatives	173	173	173	226	173	173	173
Number of Referenda	122	122	122	122	81	90	118
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

Let us assume that the exogenous probability of voter turnout during a referendum is p_i. Define the effective or turnout-adjusted population as

$$s_i^e = \frac{p_i \; s_i}{\sum_{j=1}^{J} p_j \; s_j} \tag{58}$$

Hence the effective vote share in favor of the referendum is:

$$V(g_{ks}, g_{kr}) = \sum_i s_i^e \; F_{ki}((g_{ks} - \theta_{ki})^2 - (g_{kr} - \theta_{ki})^2) \tag{59}$$

The estimates reported in Table 11 assume that the voter turnout is the same for the two types ($p_1 = p_2$). This assumption then implies that $s_i^e = s_i$ for all i. Note that we do not have to assume that turnout is complete ($p_1 = p_2 = 1$), which is not the case in these local elections. We just have not allowed for differential attrition in turnout by type ($p_1 \neq p_2$).

We have conducted a more systematic analysis of voter turnout in our sample. The results are summarized in Table 10 in Appendix G. The table contains the estimates of models that regress turnout on the share of voter types across counties. Overall, we find that the coefficient of the share of dry religion voters is insignificant in the regression model. We thus do not find any evidence that suggests differential voter turnout among the two religious types in our model.[64]

The estimates reported in Table 11 are based on an unweighted sample. We have some missing observations in our sample. First, there are some legislators and hence districts for which we cannot estimate the bliss points. More importantly, there are a larger number of counties that never held a single liquor referendum. To address these issues, we have explored different weighting schemes (such as inverse probability weighting) both for the sample of legislators and the sample of referenda. Overall, our main findings are qualitatively and quantitatively robust to all these changes.

Finally, we assess how sensitive the main findings of our paper are to changes in the specification of the voter types. Here, we consider a specification of the model in which voter types are defined by income instead of religious affiliation. Specifically, we define the first voter type as having income below the state median income and the second type as having income above the median.[65] In this specification, religious affiliation is used as an additional regressor that shifts the bliss point of each voter type. Table 12 summarizes the parameter estimates and estimated standard errors of this specification of our model.

Overall, we find that the results are similar to the specification reported in the paper when we use religious affiliation to define voter types. As in that case, we find that higher-income, minority, wet voters in densely populated counties have stronger preferences for

[64]Coate and Conlin (2004) and Coate, Conlin, and Moro (2008) provide a more systematic analysis of voter turnout in these local referenda. They also provide some tests of structural turnout models.

[65]We also estimated a version of this model using mean income as the threshold and the results are very similar.

Table 12: Parameter Estimates: Voter Types by Income

Parameter	Estimate	Std Error
α_1 (Intercept Low Income)	0.09	0.03
α_2 (Intercept High Income)	-0.97	0.23
β_1 (Percent Minority)	-0.62	0.05
β_2 (Percent High School)	0.04	0.10
β_3 (Percent Dry Religion)	0.47	0.04
β_4 (Percent Urban)	0.06	0.04
β_5 (Population Density)	-0.22	0.02
ζ_2 (Endogenous Spillovers)	0.56	0.04
γ_2/γ_1 (Weight High Income)	0.35	0.07
σ_1^u (Variance Low Income)	0.44	0.03
σ_2^u (Variance High Income)	0.19	0.04
g_{1s} (Status Quo)	0.33	0.07
g_{1r} (Alternative)	-0.62	0.07
σ_2^ϵ (Variance High Income)	4.58	0.98

liquor than lower-income, white voters in less densely populated, predominantly dry counties. Education and the urban population coefficient are insignificant as before. Moreover, we find strong evidence in favor of endogenous spillovers. The estimated positions of the status quo associated with policy at the end of Prohibition and the alternative policy, which allows for the sale of most liquor products in the county, are also similar to the ones obtained when defining types using religious affiliation. Finally, the overall fit of the model is almost the same. We thus conclude that the findings reported in the paper are reasonably robust to alternative definitions of voter types.

I. Welfare Analysis: Additional Comments

Consider a linear transformation of the utility function:

$$\tilde{u}_{kin}(g_{kn}) = a + b\, u_{kin}(g_{kn})$$

where a and b are constant. Using a utilitarian welfare function, we then have

$$\tilde{W}_{kn}(g_{kn}) \ = a + b\, W_{kn}(g_{kn})$$

We can compare two policies, denoted by d and w, using relative or absolute differences in utilitarian welfare. In the first case, we have

$$\begin{aligned} \frac{\tilde{W}^d - \tilde{W}^w}{\tilde{W}^w} &= \frac{a + bW^d - (a + bW^w)}{a + bW^w} \\ &= \frac{W^d - W^w}{\frac{a}{b} + W^w} \end{aligned}$$

Note that the relative welfare measure is scale invariant if $a = 0$, but not invariant to additive shifts. In the second case, we have:

$$\begin{aligned} \tilde{W}^d - \tilde{W}^w &= a + bW^d - (a + bW^w) \\ &= b\left(W^d - W^w\right) \end{aligned}$$

Note that this welfare measure is invariant to additive shifts, but not scale invariant.

Finally, note that traditional money-metric welfare measures discussed in Section 7.2 are invariant to these transformations.

Data Availability

The data that support the findings of this study are openly available in OpenICPSR at https://doi.org/10.3886/E247329V1.

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