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The impact of direct to consumer shipping laws on the number and size distribution of U.S. wineries

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Abstract

The changing legislative landscape of the U.S. wine market provides a scenario to examine the effect of regulation on the size distribution of firms. Using the variation across states and time in the sum of in-state and out-of-state adult populations between 2002–2017, and a difference in difference-style empirical model, I examine how restrictions on Direct to Consumer (DTC) sales impact the number of establishments and the employment at wineries. I find that the expansion of the potential wine market by 10 M adults caused about a 3.5% increase in the number of wineries. While reduced DTC restrictions explain growth in the number of wineries, I find no effect of lessened restrictions on the number of winery employees, though there is evidence of a lagged effect. Additionally, I find that the growth of smaller wineries substantially outpaces that of larger wineries when regulations are lessened. These results suggest that regulatory barriers in particular industries may allow states to maintain an artificial size distribution.

Keywords: direct to consumer; DTC; employment; regulation; size; wine

JEL Classifications: H73; K29; L11; L43

1. Introduction

Alcohol has a peculiar past in the United States. Regulatory vestiges of Prohibition have long outlived the 13 years in American history where the manufacturing and sale of intoxicating liquors were prohibited under the Eighteenth Amendment. Indeed, the three-tier system of distribution—the requirement that producers of alcohol sell their liquor through a distributor and a retailer before ultimately reaching the end consumer—arose from the skepticism of alcohol that notably manifested between 1920 and 1933. Whereas few regulations prevent producers of other goods from bypassing distributors and retailers today, the sale of wine and other alcohol is much more strictly regulated.

Broadly speaking, the term Direct to Consumer (DTC) typically refers to the process of bypassing a middleman to sell a good directly to the end customer. In specific

contexts, this term might manifest itself in terms of going directly from a producer to the consumer without the need for a brick-and-mortar store. In the context of this article, specifically,¹ DTC may consist more generally of an abbreviated supply chain, whereby for historical reasons—often perhaps centered around consumer safety—regulations at one time prevented direct sale to consumers. Instead, regulations necessitated an added layer to the market, typically a brick-and-mortar retailer and formal distribution channels. While e-commerce wine is increasing in popularity, the typical way in which consumers interact with commercial wineries today is still through this three-tier system, namely, a distributor bringing the wine from the winery to the brick-and-mortar establishment and the consumer purchasing the wine from the establishment.

Aspects of these regulations changed in 2005 when the Supreme Court decision *Granholm v. Heald* ruled that states could not discriminate in allowing wineries of particular states (including in-state wineries) to ship directly to its residents without also allowing wineries from all states to do so. As a result of *Granholm v. Heald*, there was a tremendous rush across states to comply with the ruling, with the number of states that have removed DTC regulations climbing from 18 in 2002 to 43 in 2019.

Given the unique nature of regulations present in the wine market but not in other markets, an analysis of the DTC wine market affords us an opportunity to understand how DTC affects the labor market. Because there is undoubtedly selection bias and challenges in observing firm behavior in the market for unregulated products, the variation in regulatory behavior across states and time, largely influenced by a Supreme Court decision, makes this study a palpable way to understand the causal effects of DTC through changes in the laws that exogenously affect market size.

A study into the effects of DTC regulations in the wine market on labor market outcomes is important for at least three reasons. First, an understanding of how reduced trade restrictions affect the wine market for DTC sales is important to understand *per se*. According to data from the County Business Patterns (CBP), in 2018, over 57,000 individuals were employed at over 3,000 wineries.² In 2019, the U.S. wine market had an estimated \$72 B in total value (Wine Analytics, 2020). Moreover, in 2019, DTC channels comprised over 10% of the nearly \$30 B in off-premise wine sales that were reported to have occurred during the year (Savos ShipCompliant, 2020). Thus, given the size of the market potentially affected by DTC restrictions, these laws deserve individual scrutiny. While some scholars anticipated the effects of *Granholm v. Heald* (McFadden, 2006), others have endeavored to study the effect of the removal of DTC restrictions on wine prices and selection in particular states (Ellig and Wiseman, 2013; Wiseman and Ellig, 2004, 2007). To my knowledge no empirical national study of the impact of these laws on labor markets has been completed, post-*Granholm v. Heald*. Second, analysis of the wine market offers an opportunity that is generalizable to other markets where restrictions have historically prevented purchase of the good from the producer, like in pharmaceutical sales (Seal et al., 2016), or where e-commerce is increasingly common. Moreover, findings from this study should help inform policymakers about effective

¹As well as to related areas of commerce that are highly regulated, for example, pharmaceuticals.

²NAICS 312130.

regulation more generally. Third, given the nature of DTC regulations surrounding the *Granholm v. Heald* decision, this study offers an opportunity to contribute to the literature on regulatory capture theories. Subsequent research may also explore this scenario through the rent-seeking literature.

Owing to the “Ashenfelter Dip” phenomenon (Ashenfelter, 1978) and potential policy endogeneity, in this paper I estimate the average treatment effect of DTC restrictions by exploring changes in the labor market of state s due to changes in the laws of s ’s states. I provide a further description in Section III. This exogenous variation in the size of the potential market allows me to study how the size distribution of wineries is in part shaped by regulations that act as barriers to entry into the wine market and thus may distort the natural distribution of winery size.

I find that the expansion of the potential wine market³ by 10 million adults, through the removal of DTC regulations, explains about 3.5% of the growth in the number of wineries between 2002–2017. While decreased DTC restrictions explain growth in the number of wineries, I find no effect of decreased restrictions on the number of employees at wineries, though there is suggestive evidence of a lagged effect. In particular, I estimate that as much as 8% of the employment growth at wineries occurs two years after market expansion, due to decreased regulation. In addition, I find that the growth of small and medium wineries substantially outpaces that of large wineries when regulations are lessened. This suggests that regulatory barriers, namely restrictions on DTC sales, may be maintaining an artificial size distribution in the number of wineries.

The rest of the paper is organized as follows: Section II outlines in greater detail the history of DTC regulations and their current status in the wine market today. Using the set-up established in the history section, I formalize a reduced form empirical model in Section III to anticipate how DTC regulations impact labor market outcomes, as described in Section IV. After describing the data in Section V and interpreting the results in Section VI, I discuss the implications for future and related policy in Section VII.

II. Background

A. Historical setting

In 1986, following the three-tier system of alcohol distribution that became prominent after the repeal of the Eighteenth Amendment, California passed the first “Reciprocity” legislation, which would come to define the progression of wine distribution for the next 20 years. Counterintuitive on its face, this legislation leveraged the size of California by preventing California consumers from purchasing wine directly from a winery located in any other state that restricted the direct purchase of California wine. The ultimate aim of this move was to break down the restrictions across the country that prevented DTC (Riekhof and Sykuta, 2005). For instance, if a state like Ohio did not allow its residents to purchase wine directly from California wineries, then this “Reciprocity” legislation would prevent Californians

³Explained in greater detail in Section III, the potential wine market is the sum of in-state and out-of-state populations.

from directly purchasing Ohio wine. In 1986, the population of California was nearly 3x larger than the population of Ohio, and so legislation was aimed to disproportionately affect non-California wineries. The hope was that other states would change their DTC policies, allowing California wineries to directly ship to their consumers.

Between 1986 and 2001, 12 other states followed California's lead by passing legislation to become Reciprocal States.^{4,5} Within reciprocal agreements, the additional effort to distribute directly to consumers was minimal: wineries were not required to obtain a license or pay additional taxes to ship to consumers within the group of 13 Reciprocal States. However, wineries located in states outside of these 13 were not permitted to ship directly to consumers in these 13 states.

Between 1996 and 2003, nine other states adopted a form of DTC shipping laws whereby wineries from all states could directly ship to consumers in their state, given a (typically) small permit fee and taxes.⁶ The key differences between the Permit State DTC legislation and the Reciprocal State legislation were: First and primarily, the DTC restrictions removed in Permit States were extended to wineries in every state. The same was not true for Reciprocal States, where only wineries within another Reciprocal State had the privilege of direct shipping to their consumers. Second, Permit States required that wineries obtain a permit in order to ship to consumers in their state. Third, while wineries and consumers located in Reciprocal States were not required to pay sales or excise taxes from wine purchased within the 13-state agreement, generally, Permit States required taxes to be paid by the winery and consumer (both in-state and out-of-state).

A third kind of DTC that existed prior to the *Granholm* decision was a group of states that disallowed out-of-state wineries from shipping directly to their consumers but did allow in-state wineries to do so.⁷ Wineries from these states were thus able to sell to consumers in Permit States and to consumers in their own state, but could not sell to consumers in Reciprocal States or in states that outlawed DTC all together. This genre of policy ultimately formed the most visible basis of the case argued at the Supreme Court.

In May 2005, the Supreme Court of the United States ruled that reciprocal agreements and in-state protection were in violation of the Commerce Clause of the Constitution. States were permitted to regulate the sale of alcohol, but they had to apply the regulations equally. In the majority opinion of *Granholm v. Heald*, Justice Anthony Kennedy opined, "...the object and effect of the laws are the same: to allow in-state wineries to sell wine directly to consumers in that State but to prohibit out-of-state wineries from doing so, or, at the least, to make direct sales impractical from an economic standpoint."

⁴Indeed, many Reciprocal States' legislations read similarly to Iowa's 1996 statute 123.87, found in the Appendix.

⁵These additional 12 states were Colorado, Hawaii, Idaho, Illinois, Iowa, Minnesota, Missouri, New Mexico, Oregon, Washington, West Virginia, and Wisconsin.

⁶By comparison, legislation allowing DTC in permit states reads similarly to South Carolina's 2004 statute 61-4-747, via Act 40, found in the Appendix.

⁷These states were: Florida, Indiana, Maine, Massachusetts, Michigan, New Jersey, New York, North Carolina, Ohio, and Texas.

Some Reciprocal States transitioned quickly to become a Permit State,⁸ while other formerly Reciprocal States transitioned much more slowly.⁹ Table 1 shows the number of states that allowed DTC from at least one other state over time. Column (1) of Table 1 shows the progression over time of Reciprocal States transitioning to become Permit States, from 13 in 2002 to 0 in 2011. The impetus for this change was the *Granholm* decision in 2005. Column (2) shows the number of Permit States, which grows both from transitioned Reciprocal States and from an increase in states that passed DTC legislation.¹⁰

On one hand, there is evidence that the sale of alcohol over the internet may increase access to minors (Williams and Ribisl, 2012), and so states may be operating to reduce public health risk;¹¹ on the other hand, the regulation that wineries must ship through a distributor may act as a means of market power for large wineries, at least in theory. Indeed, Mullins (2009) found that only a minority of small wineries sell wine through a distributor, while the majority of large wineries have distributor representation.

B. The prevalence of DTC

While DTC is not a new phenomenon, its practice is increasingly valuable for wineries, and its popularity continues to grow among consumers as travel and shipping become easier and less expensive.¹² The Federal Trade Commission (FTC) released a report in 2003 used in the Supreme Court case that stated that DTC transactions made up 3% of total wine sales between 1994–1999 (FTC, 2003). More recent estimations put the percent of the total \$30 B of off-premises wine sold through DTC channels at 10% (Savos ShipCompliant, 2020). This demonstrates that while DTC is a relatively minor part of total wine sales, it is still a substantial and growing portion of the wine market.

III. Empirical model

For a hypothetical winery in state s in year t , where DTC restrictions do not exist, the winery's potential wine market is comprised of both in-state customers and out-of-state ($\neg s$) customers.¹³ That is,

$$\underbrace{\text{TotalMarket}_{s,t}}_{\text{Total Potential DTC Market}} = \underbrace{\text{InState}_{s,t}}_{\text{In-State Adult Population}} + \underbrace{\sum \text{OutState}_{\neg s,t}}_{\text{Out-of-State Adult Population}}. \quad (1)$$

⁸For example, Minnesota was among the first states to transition in 2005.

⁹For example, New Mexico was the last state to transition in 2011.

¹⁰Three states do not require permits or fees. For ease of nomenclature, Alaska, Minnesota, and Florida are still referred to as Permit States throughout this article.

¹¹Indeed, I find that a 10 million-person increase in the total potential market caused a 1.3% increase in the number of motor accidents where a non-zero amount of alcohol was involved. Details of this can be found in the Appendix.

¹²See Ellig and Wiseman (2013) for an additional analysis of shipping costs.

¹³The potential wine market includes organic population growth, as it is the sum of in-state and out-of-state adult populations by year.

Table 1. Number of states that allowed DTC from wineries in at least one other state

| Year | Reciprocal state | Permit state | Total |
|------|------------------|--------------|-------|
| 2002 | 13 | 5 | 18 |
| 2003 | 13 | 9 | 22 |
| 2004 | 13 | 9 | 22 |
| 2005 | 12 | 14 | 26 |
| 2006 | 8 | 23 | 31 |
| 2007 | 4 | 28 | 32 |
| 2008 | 2 | 31 | 33 |
| 2009 | 2 | 33 | 35 |
| 2010 | 1 | 34 | 35 |
| 2011 | 0 | 35 | 35 |
| 2012 | 0 | 36 | 36 |
| 2013 | 0 | 37 | 37 |
| 2014 | 0 | 37 | 37 |
| 2015 | 0 | 38 | 38 |
| 2016 | 0 | 42 | 42 |
| 2017 | 0 | 42 | 42 |
| 2018 | 0 | 43 | 43 |

Notes: Reciprocal States refer to the 13 states that allowed DTC among themselves. Non-Reciprocal States refer to states that allowed some form of limited DTC (e.g., a license or permit was required). Post *Granholm* decision, all Reciprocal States eventually transitioned to becoming permit states.

When DTC restrictions are present in the wine market, the equation must be modified by either eliminating the In-State portion of the right-hand side (in the case where the winery's state prohibits DTC¹⁴) or by removing a state's adult population from the out-of-state sum (in the case where another state prohibits DTC¹⁵). This variation in the size of the market over time, as states pass laws to allow DTC shipping, allows me to model the effect of market expansion on several outcome variables.

Before examining the change in the size distribution of wineries, I begin my analysis by examining the effect of expanded wine markets on winery count and employment at the aggregated state level, to determine the impact that expanded markets have on the wine industry at large. I use the variation in market size over time for wineries located in different states to infer the causal impact of removing DTC restrictions on the number of wineries and employment at them. In particular,

¹⁴For example, consider the case of Alabama wineries. The total potential market available to these wineries is exactly equal to the Out-of-State population, since Alabama prohibits DTC. Alabama wineries cannot directly ship to residents of Alabama, but they can ship to states like California.

¹⁵For example, the reverse is true here: the total potential market for California wineries is equal to the sum of its population and the sum of all other states that permit DTC. This excludes Alabama, for instance, which prohibits DTC.

I operationalize this model with state and year fixed effects in the following way. These fixed effects difference out any state-level unobservable time-invariant characteristics and national time trends, respectively.

$$\ln(y)_{s,t} = \alpha + \beta_1 TotalMarket_{s,t} + X\beta + \sigma_s + \tau_t + \epsilon_{s,t} \quad (2)$$

The two outcomes y that I model are state-level establishment count and employment. The log-linear aspect of this model implies that a 1 million-person increase in the potential market for a winery in state s in year t is associated with a $100 * \beta_1$ -% change in the outcome variable.

A. Policy endogeneity

Threats to causality in this model rely on the possibility that $cov(TotalMarket, \epsilon) \neq 0$. This might arise if there exists some unobserved, time-varying characteristic that influences the Total Market available to a winery in state s . As noted earlier, a commonly discussed scenario of policy endogeneity is related to the phenomenon called the “Ashenfelter Dip” (Ashenfelter, 1978). If a state’s policy were to change simultaneously with, or in response to, changes in the wine market, then the “Ashenfelter Dip” would be an important critique and consideration.

Because the total potential market is comprised of the sum of the in-state and out-of-state adult populations, an expansion of the market occurs both through decreased DTC restrictions by state s itself—that is, increasing the In-State portion of Equation (1)—or through decreased regulations by other states—that is, increasing the Out-of-State portion of Equation (1). A congruent effect of the “Ashenfelter Dip” would be that changes in state DTC policy would result from changes in the industry. I argue that changes in the in-state potential market may be related to an unobserved characteristic of the state, but that changes in the out-of-state potential market are implausibly related to unobserved characteristics of the state’s wine industry. To render this latter statement plausible would suggest, for example, that the removal of DTC restrictions in California are related to an idiosyncrasy of Ohio’s wine industry. As a result, for robustness, I also tried a similar model where $TotalMarket_{s,t}$ is replaced only with the Out-of-State portion of the Total Market equation. This specification removes all possibility of policy endogeneity and yields the unbiased, causal effect of DTC restrictions on the wine labor market. Moreover, because the results from restricting the full potential market to the out-of-state potential market are unperturbed,¹⁶ there is strong suggestive evidence that the full model gives a causal estimate of the effect of market expansion due to decreased DTC restrictions on winery establishment count and employment.

B. Winery size distribution

Next, I delve into a particular hypothesis of this article, namely, that decreased DTC restrictions disproportionately benefit small- and medium-sized wineries, relative to large-sized wineries. This hypothesis draws on the observations that small wineries

¹⁶See Table 3, Column (6).

are less likely to have distributor representation (Mullins, 2009), in part due to regulation (Santiago and Sykuta, 2016), and that DTC comprises a large portion of a small winery's revenue (Peden, White, and McMillan, 2018). This hypothesis is in line with theoretical expectations outlined later.

Because the effect of market expansion via the removal of DTC restrictions may be different for small-, medium-, and large-sized wineries, I model the expansion of markets on the number of wineries of size j in a given state s at time t . Using a difference-in-difference-style framework, which supposes that the trends in the log-number of firms for each group are similar and would have remained similar without any change in market size, I operationalize the model as follows:

$$\ln(y)_{jst} = \alpha + \beta_1 M_{s,t} + \beta_2 (\text{small} * M)_{j,s,t} + \beta_3 (\text{med} * M)_{j,s,t} + \mathbf{X}\beta + \rho_{j,s} + \tau_t + \epsilon_{j,s,t}, \quad (3)$$

where M is the size of the potential market for a winery in state s at time t , as calculated by Equation (1); and y is one of the outcome variables described earlier. The interaction terms can be interpreted as the “premium” that each size category derives from an increase in the size of the market available to a winery in that state relative to large wineries. Tangibly, the coefficients of interest in this equation are β_2 , and β_3 , which will reveal any potential differences in how the number of wineries in state s for small and medium wineries relative to large wineries differs as the market expands as a result of the removal of restrictions preventing DTC. As in the previous set of models, the time fixed effects remove the effect of a secular, national trend in the number of wineries; the state-by-size fixed effects capture any time-invariant idiosyncratic differences of a particular size category in a given state.

IV. Theoretical expectations

In this section, I outline and provide justification for several theoretical expectations that arise from my empirical model.

A. Size distribution of wineries

Firms chase economic profits. Conventional economic theory says that where economic profit exists, firms will enter in an effort to extract some of the available profit. In a perfectly competitive market, firms enter until economic profit is driven down to zero, and the firm can cover the cost of its factors of production but is unable to extract additional profit. However, when market barriers exist, the flow into markets is frustrated, and the market is characterized by monopolistic power, that is, the long-run ability to extract positive economic profit. In the case of DTC regulations, which require that wineries sell wine through a distribution channel, this is a clear barrier to entry.

Because large wineries are much more likely to be represented by a distributor than are small wineries (Mullins, 2009), and because DTC sales comprise a larger portion of a small winery's sales than those of a large winery (Peden, White, and McMillan, 2018), we expect that regulations that require wine to be purchased

through the three-tier system will disproportionately harm small wineries. Hence, the removal of DTC regulations will disproportionately benefit small wineries. Moreover, if we assume that the probability of distributor representation is positively associated with winery size, then we would expect that the benefits from reduced DTC restrictions are inversely related to winery size.

This expectation should manifest itself as an increase in the number of wineries. As the number of potential customers expands for a winery in a given state, the opportunity for profit will drive the number of wineries up, and in particular in the strongest way for small wineries that lack distributor representation. These observations form the basis for my empirical model.

B. Wineries from established states

Another potential effect is that wineries from established states may prosper disproportionately as a result of the removal of DTC restrictions. A state that has very little production initially may be unlikely to see much immediate benefit from DTC since the reputation of the wineries has not progressed to a large consumer base. Past research has documented a perceived stigma against wines from unestablished states (Costanigro, McCluskey, and Goemans, 2010). Instead, when a state with many established wineries, like California, gains access to a large [potential] market, one might expect its wineries to flourish. Indeed, there is some evidence that a more favorable market may not benefit those with deficient reputations in the same way that those with already-positive reputations can withstand detrimental changes in the environment (Levin, 2009).

To illustrate this point: Several states maintain good, detailed records of DTC licenses issued to wineries. For the State of Ohio, since the inception of the “S” permit¹⁷ in 2007 until summer 2022, there have been a total of 1,494 licenses issued. Of these 1,494 licenses, 887 (i.e., 60%) were issued to California wineries to ship directly to Ohio (State of Ohio Department of Commerce, 2020). In 2007 alone, when the license first began, 133 “S” permits were issued to California wineries (67%), 19 Ohio wineries (10%), and 48 wineries from other states. As of 2020, in Wisconsin, California wineries occupy nearly 53% of all permits issued. While California is by far the largest producer of wine, its wineries also appear to be taking advantage of expanded wine markets, whereas other states may not be, at least initially.

On the other hand, as states allow for increased direct commerce, wineries from states that are not traditional producers may catch up to wineries from established wine states.¹⁸ This traction might be small in absolute terms, but the rate of change for a small-producing state could still be high. Peden, White, and McMillan (2018) show in a Silicon Valley Bank report that DTC in 2018 was even more important for non-traditional wine states, as it constituted a larger part of the winery’s revenue.

¹⁷The “S” permit is Ohio’s DTC permit, created in 2007.

¹⁸In 2002, according to Wine Statistics from TTB, the top 10 wine-producing states were: California, New York, Washington, Vermont, Oregon, Texas, Ohio, Indiana, Florida, and Virginia.

Table 2. Summary statistics

| Variable | Group | 2002–2005 | 2014–2017 | % Change |
|--------------------------------------|-----------------------|-----------|-----------|----------|
| Total establishment count | Small winery | 3,657 | 9,470 | 159 |
| | Medium winery | 1,807 | 3,923 | 117 |
| | Large winery | 167 | 169 | 1 |
| Total employee count | Small winery | 12,334 | 31,057 | 152 |
| | Medium winery | 52,585 | 107,912 | 105 |
| | Large winery | 45,287 | 61,998 | 37 |
| Share of establishment | Top 10 states | 78% | 71% | -7 |
| | Top 3 states | 66% | 56% | -10 |
| | California | 53% | 42% | -11 |
| Share of employment | Top 10 states | 90% | 81% | -9 |
| | Top 3 states | 83% | 70% | -13 |
| | California | 73% | 59% | -14 |
| Mean potential market (millions) | Reciprocal States | 92.4 | 220.4 | 139 |
| | Non-Reciprocal States | 30.1 | 220.4 | 632 |
| Total production (millions of cases) | | 511 | 698 | 37 |
| Share of production | Top 10 states | 98% | 93% | -5 |
| | Top 3 states | 97% | 89% | -8 |
| | California | 87% | 80% | -8 |
| Mean sales tax rate | | 0.05 | 0.05 | 0 |
| Mean excise tax (\$/gal) | | 0.73 | 0.78 | 5 |
| Mean adult population (millions) | | 4.36 | 4.96 | 60 |

Notes: Small wineries have 1–9 employees; medium wineries have 10–99 employees; large wineries have 100+ Employees. DTC market is the mean adult population available to wineries in all states within Reciprocal or non-Reciprocal States over that time period.

This fact provides some evidence that wineries in non-traditional states are taking advantage of reduced DTC restrictions.

V. Data

The data for this analysis come from a variety of sources, which are discussed next. [Table 2](#) gives a summary of the key variables, with comparisons between the sets of years 2002–2005 and 2014–2017.

A. Production data

Production data is retrieved from Wine Statistical Releases, produced monthly by the Alcohol and Tobacco Tax and Trade Bureau (TTB). [Table 2](#) shows that overall wine

production increased by 37% between 2002–2005 and 2014–2017, but that the share of production among the top 10 wine-producing states, top 3 wine-producing states, and California declined by 5–8 percentage points over the same years.¹⁹

B. DTC market

The market size variable is generated as discussed in the Empirical Model section to reflect the potential consumer base that is afforded to each winery when DTC restrictions are removed.²⁰ This, then, allows for differentiation between the adoption of DTC by a state like South Dakota and a state like Pennsylvania.²¹ Furthermore, it allows for an intuitive interpretation of the differences between Reciprocal States (whose distribution populations were comprised of the populations of the 13 states plus the populations of the Permit DTC States); a state that could distribute only to Permit States; and a state that only allowed in-state wineries to distribute to consumers (prior to *Granholm*). Ultimately, the DTC market variable gives a continuous representation of the total market, internal and external, to which a winery from a given state could distribute, which, when interacted with, allows me to distinguish between California gaining access to South Dakota and South Dakota gaining access to California. Table 2 shows that the DTC market expanded most rapidly for non-formerly Reciprocal States. While formerly Reciprocal States saw an increase in the DTC market of over 100%, non-formerly Reciprocal States saw a much larger increase of over 600%.

Figure 1 expands on this observation in Table 2, by showing the comparison of the mean DTC market between formerly Reciprocal and non-Reciprocal States, defined in 2004, as a time series. As expected, non-Reciprocal States see the bulk of the growth in the DTC market, as they were eventually granted access to California and 12 other states that were not available to them prior to *Granholm v. Heald*.

C. Employment and establishment count

The raw data for the employment and establishment count variables come from the CBP, which is produced annually by the U.S. Census Bureau (2002–2017b). The dataset provides establishment count and employment data by NAICS and by winery size. While the raw data provide an accurate establishment count by winery size regardless, CBP redacts information about employment in instances where there are very few wineries of a certain size category in a state. For a smaller NAICS industry, like wineries, this occurs more frequently than in larger industries. In situations where this occurred, employee count was imputed by taking the midpoint of the range of employees under which the winery was classified, and multiplying it by the number of wineries in that size class.²² Both Establishment Count and

¹⁹In 2002, according to Wine Statistics from TTB, the top 3 wine-producing states were: California, New York, and Washington.

²⁰Particular notes about the law coding can be found in the Appendix.

²¹When South Dakota adopted DTC in 2016, it provided an additional 648,427 adult residents, compared to the additional 10,113,090 residents that Pennsylvania had when it adopted DTC in the same year.

²²Details of this imputation are described in the Appendix.

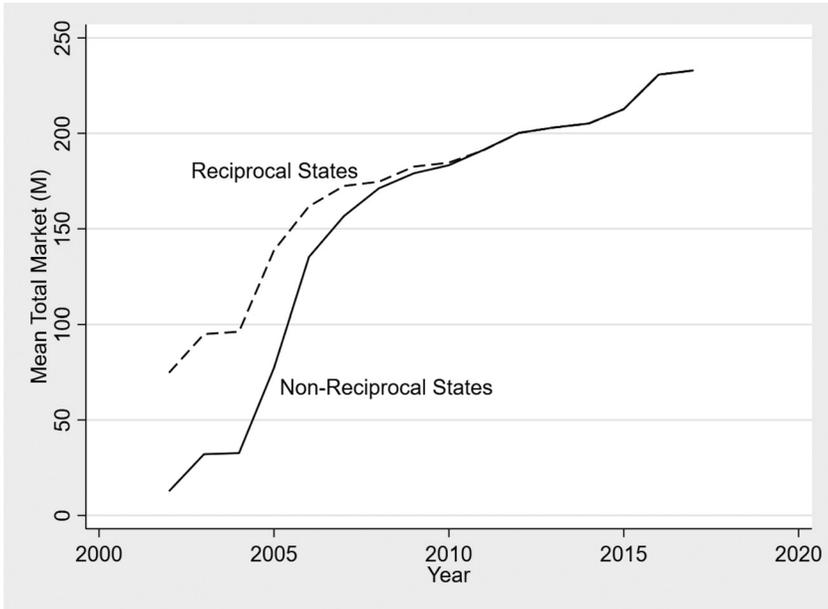


Figure 1. Average potential market (in millions) for formerly-reciprocal and Non-Reciprocal States.

Employee Count are used as dependent variables to examine the effect of increased DTC market on their rates of change. Because CBP reports nine size categories, the nine categories are collapsed into three groups: small wineries, medium wineries, and large wineries.

Table 2 also shows that the growth in the number of small wineries (1–9 employees) and medium wineries (10–99 employees) substantially outpaced the growth in large wineries (100+ employees). Small and medium wineries saw faster rates of change in employment, too, as compared to large wineries. Between 2002–2005 and 2014–2017, small and medium wineries saw growth rates of 159 and 117%, respectively, for establishment count, versus 1% growth in large wineries. Small wineries also saw 152% growth in total employment, while medium wineries saw a 105% change in employee count. Large wineries saw only a 37% increase in employment. This is the total measure of how many employees worked in small, medium, and large wineries, which can be an indicator of either (or both) an increase in the number of establishments or more employees hired. However, both the share of employment and the share of establishments in the top 10 wine-producing states in 2002, the top 3 wine-producing states in 2002, and California saw declines of approximately 7–14 percentage points between 2002–2005 and 2014–2017.

D. Controls

As I argued earlier, provided that the Conditional Independence Assumption is met, the total potential market variable should be identified without controls. However, I

also control for a number of in-state time-variant factors. The results vary little. In particular, I add controls for numerous types of tax revenue collected by the state in a given year, as reported by the U.S. Census Bureau (2002–2017a) dataset;²³ state unemployment through the Federal Reserve of Philadelphia (n.d.);²⁴ the political party of the state governor; and DTC permit fees.

VI. Empirical results

To begin, I first analyze the impact of decreased DTC regulations on the total number of wine establishments and employment at wineries at the aggregate state level.

A. Total wineries and total employment

Table 3 demonstrates the results of the impact of decreased regulations on the number of wineries, and Table 4 shows the results for employment.

Analyzing the results from Table 3, we see that an expansion of the potential market by 10 million people is associated with approximately a 3.5% increase in the number of wineries.²⁵ Column (1) shows this relationship without any controls. This coefficient estimate is remarkably consistent with the estimate from our preferred specification in Column (2), which adds controls. The estimate is also similar to that in Column (6), which includes only the out-of-state portion of the potential market as described in Equation (1). Shown in Table 2, the average state Adult Population between 2014–2017 was about 5 million people. Thus, using my estimate of a 3.5% increase in the number of wineries per 10 million people, this estimate yields upwards of a 2% increase in wineries for each additional state that removes DTC restrictions.

Because this design is a quasi-difference in difference, I include several robustness checks in Columns (3)–(7). Column (3) examines the effect of expanded markets on the total number of non-winery establishments and reveals a null effect, as expected. This implies that the expanded markets primarily affected the wine industry, with a null effect on the number of establishments overall. Columns (3) and (5) follow the suggestions made by Angrist and Pischke (2008, pp. 177–178) to analyze any potential pre-treatment trends through the notion of Granger Causality (Granger, 1969), in order to satisfy the parallel trends assumption of the model. Given the atypical formulation of this quasi-difference in difference design, a typical event study analysis is unclear conceptually, and so I use parametric techniques to validate the parallel trends assumption. The intuition in this set of robustness checks is to assess the

²³It has been shown that tax rates differ substantially across countries (Anderson, 2020), but data collected for this paper show small changes in sales and excise tax rates over time within states (see Table 2).

²⁴The Coincident Index is a measure comprised of four variables: nonfarm payroll employment, average hours worked in manufacturing by production workers, the unemployment rate, and wage and salary disbursements deflated by the consumer price index.

²⁵One potential concern might be that this model is capturing some effects of different trends in the consumption of wine per state. Though likely collinear with the market variable, I include total state consumption from the Wine Handbook as a covariate, and the results are unperturbed. Additionally, I recalculate the Total Market variable with Consumption instead of Adult Population and the estimates are qualitatively nearly identical and more precisely estimated.

Table 3. Aggregate effect of DTC market expansion on winery establishment count

| All industries | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---------------------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Total Market _{t+2} | | | | | -0.0025 (0.0028) | | |
| Total Market _{t+1} | | | | -0.0035 (0.0024) | -0.0015 (0.0021) | | |
| Total Market _t | 0.0030 (0.0018) | 0.0037* (0.0016) | -0.0003 (0.0002) | 0.0065* (0.0026) | 0.0061* (0.0024) | | 0.0036* (0.0017) |
| External Market _t | | | | | | 0.0035* (0.0016) | |
| Out of State Estab _t | | | | | | | 0.0002 (0.0003) |
| Observations | 701 | 701 | 701 | 701 | 651 | 701 | 701 |
| Number of states | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Controls | No | Yes | Yes | Yes | Yes | Yes | Yes |

Notes: Clustered standard errors: * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

The dependent variable for all models is $\log(\text{establishment count} + 1)$. Total Market (in millions) refers to the sum of the adult population in states where a winery could potentially ship directly. For robustness, External Market in model (6) excludes the population from the state. The dependent variable for (3) is $\log(\text{establishment count} + 1)$ for NAICS 10 (all industries) less wineries. Permit fees, coincident indexes, state governors' political parties, year and state fixed effects, and various total state tax collections are included in models (2)–(7) as controls. For robustness, models (4) and (5) verify the parallel trend assumption. Column (7) includes the count of out-of-state wineries. Standard errors are clustered at the state level.

extent to which a marginal increase in a future potential market predicts establishment count in time t . By including lead terms in the total market, we should expect a near-zero and statistically insignificant estimate of the lead terms. Indeed, both Columns (4) and (5) show this, suggesting that there are parallel trends prior to treatment. Column (7) addresses the potential concern that the number of competitors from other states may matter. I include the number of out-of-state wineries as a control variable, and the coefficient estimate remains stable. Because specification (7) is similar to the preferred specification, this provides evidence that competition does not moderate the effect of expanded markets from decreased DTC restrictions. Further, it provides further evidence of the exogeneity of the potential market variable, as discussed in Section III.A.

Moving to Table 4, we see a very different story for employment. Despite a statistically significant 3.7% increase in the number of firms per 10 million new potential customers, the results from the employment models reveal, at best, delayed effects. I find no statistical effect of market expansion via decreased DTC regulations on employment for wineries, as shown in Columns (1) and (2). While the point estimate of Column (6) aligns with the point estimate of the effect in Column (2), again suggesting that unobserved state characteristics are not associated with the market size variable, the effect for both models is null. This suggests that an expansion of the potential consumer base does not increase employment at wineries overall.

Table 4. Aggregate effect of DTC market expansion on winery employment

| All industries | (1) | (2) | (3) | (4) | (5) | (6) |
|------------------------------|--------------------|--------------------|---------------------|----------------------|---------------------|--------------------|
| Total Market _t | 0.0043 (0.0027) | 0.0040 (0.0025) | -0.0000 (0.0001) | -0.0064 (0.0048) | -0.0025 (0.0035) | |
| Total Market _{t-1} | | | | 0.0112** (0.0038) | 0.0014 (0.0024) | |
| Total Market _{t-2} | | | | | 0.0077* (0.0035) | |
| External Market _t | | | | | | 0.0035 (0.0025) |
| Observations | 472 | 472 | 800 | 455 | 435 | 472 |
| Number of states | 47 | 47 | 50 | 47 | 47 | 47 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |

Notes: Clustered standard errors: * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

The dependent variable for all models is $\log(\text{employment} + 1)$. Total Market (in millions) refers to the sum of the adult population from states where a winery could potentially ship directly. For robustness, External Market in model (6) excludes the population from the state. The dependent variable for (3) is $\log(\text{employment} + 1)$ for NAICS 10 (all industries) less wineries. Permit fees, coincident indexes, state governors' political parties, year and state fixed effects, and various total state tax collections are included in models (2)–(6) as controls. Models (4) and (5) consider lags in market expansion. Standard errors are clustered at the state level.

Columns (4)–(5) follow Angrist and Pischke (2008) by including lagged terms. The results from these models suggest that employment increases may be delayed. In particular, after 1 year, the impact of decreased restrictions on employment is approximately 11% for an increase of 10 million new potential customers; after 2 years, decreased regulation is associated with approximately an 8% increase in employment. These results suggest that labor markets are slower to react than firm entry.

B. The size distribution of wineries

Now, I turn to my second set of models, by examining the effect of expanded potential wine markets through decreased DTC regulation on the size distribution of wineries. Table 5 examines the effect of decreased regulation on the size distribution of the count of wineries. Models (1) and (5) provide the most direct answer to the question, using log and inverse hyperbolic sine of establishment count as the dependent variables, respectively.²⁶ Column (1) seems to substantiate part of the Theoretical Expectations that I outlined earlier, namely, that smaller wineries will benefit to a greater degree than large wineries. I find that the effect of expanded potential DTCs has a negative effect on large wineries, while small and medium wineries appear to benefit. For an increase of 10 million potential customers, small wineries

²⁶Some have suggested that the inverse hyperbolic sine transformation of a random variable performs better than a simple $\log+1$ approach at small values of the variable (Burbidge, Magee, and Robb, 1988; Johnson, 1949). I include both transformations to show that the results are relatively unperturbed.

Table 5. Effect of decreased DTC regulations on winery size count distribution

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Total Market (TM) | -0.0036** (0.0011) | -0.0036** (0.0011) | -0.0044** (0.0014) | -0.0038** (0.0012) | -0.0038** (0.0013) |
| TM x Medium Winery | 0.0036*** (0.0005) | 0.0034*** (0.0006) | 0.0031*** (0.0005) | 0.0036*** (0.0005) | 0.0043*** (0.0006) |
| TM x Small Winery | 0.0052*** (0.0004) | 0.0054*** (0.0004) | 0.0052*** (0.0004) | 0.0052*** (0.0004) | 0.0059*** (0.0004) |
| TM x Top 10 | | 0.0008 (0.0006) | | | |
| TM x Medium x Top 10 | | 0.0008 (0.0011) | | | |
| TM x Small x Top 10 | | -0.0010 (0.0007) | | | |
| TM x Reciprocal State | | | -0.0018 (0.0011) | | |
| TM x Medium x Reciprocal State | | | 0.0032* (0.0015) | | |
| TM x Small x Reciprocal State | | | 0.0004 (0.0011) | | |
| TM x California | | | | -0.0013 (0.0010) | |
| TM x Medium x California | | | | -0.0010* (0.0005) | |
| TM x Small x California | | | | -0.0011** (0.0003) | |
| Observations | 2,204 | 2,204 | 2,204 | 2,204 | 2,204 |
| Number of states | 50 | 50 | 50 | 50 | 50 |
| Controls | Yes | Yes | Yes | Yes | Yes |

Notes: Clustered standard errors: * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

The dependent variable for models (1)–(4) is $\log(\text{establishment count} + 1)$. Total Market (in millions) refers to the sum of the adult population from states where a winery could potentially ship directly, and is abbreviated as TM for space. Reciprocal State is an indicator for whether the state was a Reciprocal State prior to *Granholm v. Heald*. Model (5) uses an inverse hyperbolic sine in place of log, for robustness. Permit fees, coincident indexes, state governors' political parties, year and size-by-state fixed effects, and various total state tax collections are included in each model. Standard errors are clustered at the state, size category level.

grow by nearly 6%-points more than large wineries, or by over 1%-point more than medium wineries. For an increase of 10 million potential consumers, large wineries, on the other hand, decline by nearly 4%.

Models (2)–(4) examine the second set of theoretical expectations, namely the impact of expanded wine markets, via decreased DTC regulation, on established wine states. In Columns (2)–(4), I interact the potential market with winery size category and an indicator of whether the state was one of the top 10 wine-producing

states in 2002, a formerly-Reciprocal State, California, respectively. The results from Column (4) show that, while small and medium wineries are still better off due to the decrease in DTC regulations, the positive effect appears to be largely experienced by wineries located outside of California. Moreover, I find no evidence that the number of wineries grew faster in formerly-Reciprocal States than if located in other states, which offers some contrast to past research that found a perceived stigma against non-traditional wine states (Costanigro, McCluskey, and Goemans, 2010). My results also show that the wine market in non-traditional wine states tends to grow no faster than the market in established wine states.

Turning to Table 6, I again find largely null effects of decreased DTC regulations on employment. I do find that for an increase in the total potential market of 10 million people, small wineries in California have a slightly positive premium compared to large wineries in California. Conversely, I find slightly negative growth in employment at small, California wineries relative to their non-California counterparts.

VII. Discussion

These results are important as the remaining states that restrict DTC wine sales consider amending their statutes. Moreover, the Supreme Court ruled in 2019 in *Tennessee Wine and Spirits Retailers Association v. Thomas* that the Tennessee law requiring liquor retailers to live in-state for at least two years before obtaining a retail permit was protectionism and unconstitutional.²⁷ The results from this article can thus help inform similar in-state protection requirements for liquor retailers across the country.

While I do not connect policies to reduce DTC restrictions with firm actions in this study in order to formally connect the notion of rent-seeking, the results of this article largely suggest that DTC regulations artificially maintained a size distribution of wineries composed of too many large wineries and too few small and medium wineries. Requiring wineries to ship through a distributor appears to act as a barrier to entry, in particular for small and medium wineries, which are infrequently represented by a distributor (Mullins, 2009) and for which direct sales make up a larger portion of their revenue (Peden, White, and McMillan, 2018). As summarized by Justice Kennedy in *Granholtz v. Heald* and Justice Alito in *Tennessee Wine and Spirits Retailers Association v. Thomas*, laws restricting DTC act as protection. In addition to rent-seeking and regulatory privilege (Mitchell, 2012), another possible motivation is to protect a sort of state “collective reputation” by disallowing entry of small wineries and thereby inflating the number of firms in the coalition (Castriota and Delmastro, 2015). Past research has also shown that the collective California wine reputation may ultimately migrate to specific wineries (Costanigro, McCluskey, and Goemans, 2010), which may offer some justification for why large wineries, presumably the best well known, seek regulatory privilege (Stigler, 1971). The findings of this article suggest that further research into rent-seeking (Krueger, 1974; Tullock, 1967, 1972, 2013) through political or regulatory privilege (Mitchell, 2012; Stigler, 1971) may be an appropriate extension.

²⁷Justice Alito, writing the majority opinion, characterized the bill as “blatantly favor[ing] the state’s residents and ha[ving] little relationship to public health and safety.”

Table 6. Effect of decreased DTC regulations on winery employment

| | (1) | (2) | (3) | (4) | (5) |
|--------------------------------|---------------------|---------------------|---------------------|-----------------------|---------------------|
| Total Market (TM) | -0.0015 (0.0028) | -0.0021 (0.0029) | -0.0060 (0.0048) | -0.0022 (0.0029) | -0.0012 (0.0031) |
| TM x Medium Winery | 0.0014 (0.0013) | 0.0023 (0.0014) | 0.0008 (0.0013) | 0.0014 (0.0013) | 0.0012 (0.0014) |
| TM x Small Winery | 0.0014 (0.0010) | 0.0020 (0.0010) | 0.0018 (0.0011) | 0.0014 (0.0010) | 0.0011 (0.0012) |
| TM x Top 10 | | 0.0038 (0.0032) | | | |
| TM x Medium x Top 10 | | -0.0050 (0.0034) | | | |
| TM x Small x Top 10 | | -0.0033 (0.0034) | | | |
| TM x Reciprocal State | | | -0.0030 (0.0040) | | |
| TM x Medium x Reciprocal State | | | 0.0039 (0.0043) | | |
| TM x Small x Reciprocal State | | | -0.0026 (0.0031) | | |
| TM x California | | | | -0.0081** (0.0029) | |
| TM x Medium x California | | | | 0.0007 (0.0013) | |
| TM x Small x California | | | | 0.0031** (0.0010) | |
| Observations | 2,307 | 2,307 | 2,307 | 2,307 | 2,307 |
| Number of states | 50 | 50 | 50 | 50 | 50 |
| Controls | Yes | Yes | Yes | Yes | Yes |

Notes: Clustered standard errors: * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

The dependent variable for models (1)–(4) is $\log(\text{employment} + 1)$. Total Market (in millions) refers to the sum of the adult population from states where a winery could potentially ship directly, and is abbreviated as TM for space. Reciprocal State is an indicator for whether the state was a Reciprocal State prior to *Granholm v. Heald*. Model (5) uses an inverse hyperbolic sine in place of log, for robustness. Permit fees, coincident indexes, state governors' political parties, year and size-by-state fixed effects, and various total state tax collections are included in each model. Standard errors are clustered at the state, size category level.

While the size distribution of establishment count appears to be artificially maintained by DTC regulations, employment, on the other hand, seems largely stable. While my findings do provide suggestive evidence that employment effects might be lagged, the mechanism as to why a lag should be expected in hiring is unclear. Lags in terms of employment reductions seem plausible, as employment contracts might be stickier; however, lags in terms of employment increases are more surprising. One hypothetical explanation might be that technology is disproportionately

used by small and medium wineries, and thus the effect on employment is less pronounced. I do not explore this possibility in this analysis.

VIII. Conclusion

This research examines the effect of decreased DTC regulations on the wine market, by specifically examining the impact on the number of wineries and the employment in wineries. It analyzes the effect of decreased restrictions both on the state-aggregated counts and on size category-specific counts. I find that a 10 million person increase in the number of potential consumers causes nearly a 4% increase in the number of wineries, but no observable impact on the number of employees at wineries. Moreover, I find that decreased DTC restrictions cause an increase of nearly 6% in the number of small wineries relative to large wineries and approximately 4% in the number of medium wineries relative to large wineries, which experienced a 4% decline per 10 million new potential customers.

The results from this study provide the first wide-scale empirical study of the effects of DTC regulations. I use plausibly exogenous variation in the potential market size to study the effect of reduced regulations on the wine industry. Because alcohol distribution is a relatively highly regulated industry, the wine environment outlined in this article also provides insights into the political economy. Though this study does not investigate any direct mechanisms, my results are suggestive of rent-seeking and regulatory privilege. By requiring wineries to sell wine through a distributor, that is, by restricting DTC, the effect is to prevent smaller wineries from accessing the complete market. Indeed, the results from this study may inform future policies and industries with similar distribution regulations. While the deregulation of DTC wine sales appears to have already benefited smaller wineries, time will tell if the progression from larger to smaller wineries is a sustained trend or a short-term phenomenon.

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Appendix

Appendix Table 1. DTC laws

| State | Reciprocal | Permit | Statute or Act |
|---------------|------------|--------|--|
| Alabama | No | — | Ala. Code §28-1-4 |
| Alaska | No | 1993 | AS §04.11.140 |
| Arizona | No | 2016 | A.R.S.§4-203.04 |
| Arkansas | No | — | Ark. Code §3-5-1704 |
| California | Yes | 2006 | California Business and Professions Code – §23661.3 |
| Colorado | Yes | 2006 | CO Liquor Code §12-47-104 |
| Connecticut | No | 2005 | Conn. Gen. Stat. §30-16(e), 30-18, 30-18a, 30-19f, 30-48(a); 12-436(b) as amended by 2005 Conn. Pub. Acts 274. |
| Delaware | No | — | Del. Code, Title 4, Chapter 5,§501(c) |
| Florida | No | 2006 | F.S. §561.545(1) |
| Georgia | No | 2008 | GA Code §03-06-1931 |
| Hawaii | Yes | 2007 | HI Rev Stat §281-33.6 |
| Idaho | Yes | 2006 | ID Code §23-1309A |
| Illinois | Yes | 2008 | P.A. 95-634; Ill. Rev. Stat. ch. 235, §5/5-1 (r) |
| Indiana | No | 2006 | IC §7.1-3-26 as added by P.L.165-2006, SEC.34. |
| Iowa | Yes | 2010 | IA Code §123.187 |
| Kansas | No | 2006 | KS §41-350 |
| Kentucky | No | — | KY Rev Stat §244.165 |
| Louisiana | No | 2003 | LA Rev Stat §26:359 |
| Maine | No | 2009 | Me. Rev. Stat. Ann. tit. 28-A, §1403-A |
| Maryland | No | 2011 | Md. Code Ann. Art. 2B, §7.5-102 |
| Massachusetts | No | 2015 | M.G.L.A. 138 §19F |
| Michigan | No | 2005 | Mich. Comp. Laws §436.1203 |

(Continued)

Appendix Table 1. (Continued.)

| State | Reciprocal | Permit | Statute or Act |
|----------------|------------|--------|-------------------------------|
| Minnesota | Yes | 2005 | MN Stat §340A.417 |
| Mississippi | No | — | MS Code §67-1-9 and 67-1-41 |
| Missouri | Yes | 2007 | MO Rev Stat §311.185 |
| Montana | No | 2013 | MCA §16-3-411 |
| Nebraska | No | 2001 | Nebraska Rev Stat §53-123.15 |
| Nevada | No | 1999 | NRS §369.464 / 369.462 |
| New Hampshire | No | 2003 | NH Rev Stat §178:27 |
| New Jersey | No | 2012 | P.L.2011, c.207 |
| New Mexico | Yes | 2011 | NM Stat §60-6A-11.1 |
| New York | No | 2005 | NYS ABCL §79-c |
| North Carolina | No | 2003 | NC G.S. §18B-1001.1 |
| North Dakota | No | 1999 | ND Code §5-01-16 |
| Ohio | No | 2007 | ORC §4303.232 |
| Oklahoma | No | 2018 | OK Stat §37A-3-106 |
| Oregon | Yes | 2008 | ORS §37A-3-106 |
| Pennsylvania | No | 2016 | Act 39 of P.L. 273 |
| Rhode Island | No | — | RI Code §3-4-8 |
| South Carolina | No | 2006 | SC Code §61-4-747 |
| South Dakota | No | 2016 | SD Codified L §35-12B-2 |
| Tennessee | No | 2009 | TN Code §57-3-217 |
| Texas | No | 2005 | Alcoholic Beverage Code Ch 54 |
| Utah | No | — | Utah Code Ann. §32B-4-401 |
| Vermont | No | 2006 | Act 140 of 2006; Title 7 VSA |
| Virginia | No | 2003 | Code of Virginia §4.1.209.1 |
| Washington | Yes | 2006 | RCW §66.20.360 |
| West Virginia | Yes | 2007 | WV Code §60-8-6a |
| Wisconsin | Yes | 2007 | Wis. Stats. §125.535 |
| Wyoming | No | 2001 | WY Stat §12-2-204 |

Notes: The DTC laws listed in this table were collected by the author and are the laws used in this analysis.

Iowa 1996 Statute § 123.87²⁸

1. “Equal reciprocal shipping privilege” means allowing wineries located in this state to ship into another state, wine, not for resale, but for consumption or use by a person twenty-one years of age or older. 2. A

²⁸State of Iowa 1996 Acts and Joint Resolution, Seventy-Sixth General Assembly, Ch. 1101, Reciprocal Shipment of Wines, H.F. 2315.

winery licensed or permitted pursuant to laws regulating alcoholic beverages in a state which affords this state an equal reciprocal shipping privilege may ship into this state by private common carrier, to a person twenty-one years of age or older, not more than eighteen liters of wine per month, for consumption or use by the person. Such wine shall not be resold. Shipment of wine pursuant to this subsection is not subject to sales tax under section 422.43, use tax under section 423.2, or the wine gallonage tax under section 123.183, and does not require a refund value for beverage container control purposes under chapter 455C. 3. The holder of a class "A" or "B" wine permit in this state may ship out of this state by private common carrier, to a person twenty-one years of age or older, not more than eighteen liters of wine per month, for consumption or use by the person.

South Carolina Statute § 61-4-747, Act 40²⁹

(A) "Notwithstanding any other provision of law, rule, or regulation to the contrary, a manufacturer of wine located within this State or outside this State that holds a wine producer and blenders basic permit issued in accordance with the Federal Alcohol Administration Act and obtains an out-of-state shipper's license, as provided in this section, may ship up to twenty-four bottles of wine each month directly to a resident of this State who is at least twenty-one years of age for such resident's personal use and not for resale. (B) Before sending a shipment to a resident of this State, an out-of-state shipper first shall: (1) file an application with the Department of Revenue; (2) pay a biennial license fee of four hundred dollars; (3) provide to the department a true copy of its current wine producer and blenders basic permit issued in accordance with the Federal Alcohol Administration Act; and (4) obtain from the department an out-of-state shipper's license. (C) Each out-of-state shipper licensee shall: (1) not ship more than twenty-four bottles of wine each month to a person; (2) ensure that all containers of wine shipped directly to a resident in this State are labeled conspicuously with the words 'CONTAINS ALCOHOL: SIGNATURE OF PERSON AGE 21 OR OLDER REQUIRED FOR DELIVERY'; (3) report to the department annually, by August thirty-first of each year, the total amount of wine shipped into the State the preceding year; (4) annually, by August thirty-first of each year, pay to the department all sales taxes and excise taxes due on sales to residents of this State in the preceding calendar year, the amount of the taxes to be calculated as if the sale were in this State at the location where delivery is made; (5) permit the department to perform an audit of the out-of-state shipper's records upon request; and (6) be deemed to have consented to the jurisdiction of the department or another state agency and the courts of this State concerning enforcement of this section and any related laws. (D) The out-of-state shipper on August thirty-first of each applicable year must renew its license with the department by paying a renewal fee of four hundred dollars and providing the department a true copy of its current alcoholic beverage license issued in another state. (E) The department may promulgate regulations to effectuate the purposes of this section. (F) The department shall enforce the requirements of this section by administrative proceedings to suspend or revoke an out-of-state shipper's license if the licensee fails to comply with the requirements of this section, and the department may accept payment of an offer in compromise instead of suspension. (G)(1) A shipment of wine from out-of-state direct to consumers in this State from persons who do not possess a current out-of-state shipper's license is prohibited. A person who knowingly makes, participates in, transports, imports, or receives such a shipment from out-of-state is guilty of a misdemeanor and, upon conviction, must be fined one hundred dollars. A shipment of wine which violates any provision of this item is contraband. (2) Without limitation on any punishment or remedy, criminal or civil, a person who knowingly makes, participates in, transports, imports, or receives a shipment as provided in item (1) of this subsection from out-of-state commits an unfair trade practice."

Employee count imputation details

While the raw data provide establishment count by the winery size regardless, CBP redacts information about employment in instances where there are very few wineries of a certain type in a state. For a smaller NAICS industry, like wineries, this occurs more frequently than in larger industries. In situations where this occurred, the employee count was imputed by taking the midpoint of the range of employees under which

²⁹2012 South Carolina Code of Laws Title 61 - Alcohol and Alcoholic Beverages, Chapter 4 - BEER, ALE, PORTER, AND WINE, Section 61-4-747.

the winery was classified and multiplying it by the number of wineries in that size class. For example, if a state had 4 establishments with establishment sizes of 1–4 employees, the imputation method would yield 10 employees for the winery size category. For the largest size category, where there is no upper bound, the sum of all employees in smaller size categories was subtracted from the total employees reported that worked in NAICS 312130 (wineries). This provided an estimate of the largest wineries.

Note about law coding

A few specific notes about how laws were considered. First, Massachusetts encountered a court battle, *Family Winemakers of California v. Jenkins*, well-documented in Ellig and Wiseman (2012), in which the courts decided their faux-DTC law to be unconstitutional as it acted as a barrier to inter-state trade while still allowing intra-state trade between Massachusetts wineries and consumers. As a result, Massachusetts' law was declared unconstitutional in 2010, and it was not enforced from 2010 and 2015. After speaking directly with the Massachusetts Alcoholic Beverages Control Commission General Counsel and consulting with several advisory websites, it was decided to treat this as if there had been no DTC law during these years. More practically, this means that Massachusetts' population was excluded from the DTC market between 2010 and 2015, and Massachusetts' population in the DTC market for other states was not counted until its true DTC law passed in 2015. Second, when collecting the data for each state, where it was obvious, the law change was recorded in the year where it took effect. For example, if a law was passed in 2005 but did not take effect until 2006, the law was recorded as 2006. For example, Michigan passed DTC in December of 2005. The following year was used to record the law in a more conservative manner. Third, except for Massachusetts, I ended in-state privilege after 2005, because from what I can tell, this was disallowed even before states passed new laws. For robustness, I also continued in-state privilege until the DTC law was passed, and the results did not significantly change. Finally, where there was confusion about the law, I defaulted to the Wine Institute's definition about the status of DTC.

Alcohol-related accidents

Appendix Table 2. Aggregate effect of DTC market expansion on alcohol related accidents

| | Log(Auto accidents with some alcohol) |
|------------------|---------------------------------------|
| Total market | 0.0014* (0.0007) |
| Observations | 849 |
| Number of states | 50 |
| Controls | Yes |

Notes: Clustered standard errors: * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

Total market refers to the sum of the adult population from states where a winery could potentially ship directly. Permit fees, coincident indexes, state governors' political parties, state and year fixed effects, and various total state tax collections are included. The dependent variable was collected by the author from the annual report entitled "Traffic Safety Facts, Alcohol Impaired Driving Estimates," produced by the U.S. Department of Transportation National Highway Traffic Safety Administration. Standard errors are clustered at the state level.

Size categories

Because CBP data give nine size categories, a regression with state, size, and year FE was run to determine the proper cutoff points for small, medium, and large wineries. To select the best model, a regression was run with log of establishment count regressed on the nine different size categories and interaction terms between the size categories and the DTC market variable.

I group the wineries into the following size categories: 1–9 employees are considered small wineries; 10–99 employees are considered medium wineries; and 100+ employees are considered large wineries. For

sensitivity, I tried different combinations of small, medium, and large wineries, as shown in Appendix Tables 9 and 10. The results for establishments are qualitatively similar: small wineries always receive a greater premium than medium wineries for an expanded potential market. Large wineries always experience a small negative premium. The results for employment are also qualitatively similar, regardless of the grouping. Generally, no effect of reduced DTC regulations is observed on employment, except for a small positive effect in small wineries in several models.

Appendix Table 3. Sensitivity to size grouping for establishment count

| | 5–249 | 10–249 | 20–249 | 50–249 | 100–249 |
|------------------------------|-----------------------|-----------------------|------------------------|-----------------------|-----------------------|
| Total Market _t | –0.0028* (0.0010) | –0.0034** (0.0011) | –0.0034*** (0.0008) | –0.0017* (0.0008) | –0.0014 (0.0007) |
| Total Market x Small Winery | 0.0051*** (0.0004) | 0.0054*** (0.0004) | 0.0055*** (0.0004) | 0.0055*** (0.0003) | 0.0055*** (0.0003) |
| Total Market x Medium Winery | 0.0048*** (0.0004) | 0.0037*** (0.0005) | 0.0027*** (0.0005) | 0.0009** (0.0003) | 0.0002 (0.0002) |
| Observations | 2,211 | 2,200 | 2,194 | 2,189 | 2,174 |
| Number of states | 50 | 50 | 50 | 50 | 50 |
| Controls | Yes | Yes | Yes | Yes | Yes |
| | 5–99 | 10–99 | 20–99 | 50–99 | |
| Total Market _t | –0.0029* (0.0011) | –0.0036** (0.0011) | –0.0035*** (0.0009) | –0.0018* (0.0008) | |
| Total Market x Small Winery | 0.0048*** (0.0004) | 0.0052*** (0.0004) | 0.0053*** (0.0004) | 0.0053*** (0.0004) | |
| Total Market x Medium Winery | 0.0046*** (0.0005) | 0.0036*** (0.0005) | 0.0025*** (0.0005) | 0.0006** (0.0002) | |
| Observations | 2,215 | 2,204 | 2,198 | 2,193 | |
| Number of states | 50 | 50 | 50 | 50 | |
| Controls | Yes | Yes | Yes | Yes | |

Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

The dependent variables for these models is $\log(\text{establishment count} + 1)$. Total Market (in millions) refers to the sum of the adult population from states where a winery could potentially ship directly, and is abbreviated as TM for space. Permit fees, coincident indexes, state governors' political parties, year and size-by- state fixed effects, and various total state tax collections are included in each model. Standard errors are clustered at the state, size category level. Column labels refer to the number of employees that are grouped as medium.

Appendix Table 4. Sensitivity to size grouping for employee count

| | 5–249 | 10–249 | 20–249 | 50–249 | 100–249 |
|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Total Market _t | 0.0010 (0.0017) | -0.0011 (0.0023) | -0.0037 (0.0024) | -0.0001 (0.0022) | 0.0009 (0.0024) |
| Total Market x Small Winery | 0.0012 (0.0010) | 0.0025* (0.0011) | 0.0028* (0.0010) | 0.0026* (0.0010) | 0.0025* (0.0010) |
| Total Market x Medium Winery | 0.0026* (0.0012) | 0.0020 (0.0013) | 0.0016 (0.0015) | -0.0008 (0.0017) | -0.0024 (0.0016) |
| Observations | 2,307 | 2,307 | 2,307 | 2,307 | 2,307 |
| Number of states | 50 | 50 | 50 | 50 | 50 |
| Controls | Yes | Yes | Yes | Yes | Yes |
| | 5–99 | 10–99 | 20–99 | 50–99 | |
| Total Market _t | 0.0006 (0.0024) | -0.0015 (0.0028) | -0.0041 (0.0028) | -0.0010 (0.0028) | |
| Total Market x Small Winery | 0.0001 (0.0009) | 0.0014 (0.0010) | 0.0017 (0.0011) | 0.0015 (0.0010) | |
| Total Market x Medium Winery | 0.0019 (0.0012) | 0.0014 (0.0013) | 0.0012 (0.0014) | -0.0013 (0.0012) | |
| Observations | 2,307 | 2,307 | 2,307 | 2,307 | |
| Number of states | 50 | 50 | 50 | 50 | |
| Controls | Yes | Yes | Yes | Yes | |

Notes: Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

The dependent variables for these models is $\log(\text{Employee count} + 1)$. Total market (in millions) refers to the sum of the adult population from states where a winery could potentially ship directly, and is abbreviated as TM for space. Permit fees, coincident indexes, state governors' political parties, year and size-by-state fixed effects, and various total state tax collections are included in each model. Standard errors are clustered at the state, size category level. Column labels refer to the number of employees that are grouped as medium.