Organizational Structure and Operation of the Illinois Wine Industry

Jason R. V. Franken and Kevin J. Bacon

This study examines vertical coordination in the wine industry emerging in Illinois. We find that quality matters as temporal issues related to grape perishability increase the probability of written contracts being used to procure grapes. Holdup concerns related to sourcing adequate quality grapes and at-risk investments in grape storage and winemaking equipment lead to vertical integration. In general, larger wineries must obtain some grapes from outside vineyards and sell wine predominantly through tasting rooms and distributors. Smaller wineries rely more on direct sales to retailers, festivals, and farmers' markets. Marketing outlet selection also reflects the types of wine produced.

Key Words: contract, grapes, vertical integration, wine

Quality is a key competitive factor in the wine industry (cf. Landon and Smith 1998, Dubois and Nauges 2007, Ashenfelter 2007, Castriota and Delmastro 2009), and several studies that applied organizational economics frameworks (Grossman and Hart 1986, Williamson 1975, 1979) identified quality motivations for marketing and procurement decisions in established wine regions (e.g., Goodhue et al. 2003, Fraser 2005, Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer 2009, Franken 2014). As noted by Goodhue et al. (2003), the wine industry is an ideal subject for study of vertical coordination. Grape quality is critical to wineries' reputations, and grapes' perishable nature requires close coordination between growers and wineries at harvest. In addition, there is considerable product differentiation and variation in types of grapes and wines, sizes of businesses, and vertical coordination mechanisms (i.e., in-house production and contractual and arms-length spot transactions).

Currently, the extent to which drivers of marketing and procurement decisions in established wine regions apply to emerging regions is essentially unknown. One study found that these decisions vary only with the age, varietal focus, and expansion intentions of wineries in emerging mid-South and mid-Atlantic regions (Woods, Schieffer, and Saghaian 2011). Thus, we address this gap in the literature by investigating whether drivers of organizational structure in established wine regions hold for an emerging wine market.

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We examine marketing and procurement decisions in the Illinois wine industry, which grew from twelve wineries in 1997 to 105 wineries and 175 vineyards in 2012 with a total economic impact estimated at $319 million in 2007 (MFK Research, LLC 2007, Ward, Runyen, and Kuykendall 2012).[1] Illinois currently ranks twelfth in the United States in number of wineries (Geisler and Tordsen 2013) and in the top twenty in grape-bearing acres and gallons of wine produced (MFK Research, LLC 2007). As an emerging wine producing state, Illinois accounted for less than 1 percent of U.S. wine production of 752.4 million gallons in 2012. California produced more than 85 percent and New York and Washington were responsible for about 3 percent each with the remaining states accounting for less than 1 percent (U.S. Department of the Treasury 2013).

We analyze responses to a 2012 survey of Illinois wineries conducted by Western Illinois University (WIU) and a 2012 census of Illinois wineries and vineyards conducted by the U.S. Department of Agriculture (USDA), providing insight into these businesses' procurement and marketing practices. Both data sets have advantages and disadvantages, and our study benefits from using both. The USDA census provides a representative sample of the state's wine industry but offers only proxies for key conceptual variables, whereas the WIU survey provides more direct measures of these variables for a smaller sample of lower volume but otherwise similar wineries. While some inferences are based on the relatively small WIU sample, complementarity of the USDA data reinforces these conclusions, allowing this study to contribute to a growing line of research on emerging wine regions. The results suggest that drivers of grape marketing and procurement practices observed in long-established regions hold in Illinois and also provide insight into the wine distribution methods used there. The latter results reflect challenges that new and/or small businesses face in acquiring shelf space in mainstream retail stores and are especially interesting in the context of rural development and local food movements.

Conceptual Model and Hypotheses

Grape Procurement

The literature on organization of winegrape supply chains draws heavily on organizational economics in general and on transaction cost economics in particular (Goodhue et al. 2003, Fraser 2005, Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer 2009). Building on the theoretical literature and empirical studies of established wine regions, we develop hypotheses and summarize the corresponding relationships in a conceptual model represented by Figure 1. Essentially, "for a very simple transaction . . . uncertainty is relatively unimportant and spot market transactions are a good solution. However, for

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[1]   Economic impact studies should be viewed with some healthy skepticism since they are often commissioned to legitimize a particular political position and thus may stretch the economic value of an industry by defining it as broadly as possible and applying various multipliers (Crompton 2006). The study by MFK Research, LLC (2007), for example, considered wine sales by wineries, distributors, restaurants, and other retailers; tourism; winegrape sales; federal and state tax revenues; vineyard development; charitable contributions; advertising and marketing; winery services; wine research, education, and consulting; and wages for employees in all types of businesses plus "indirect" and "induced" economic impacts.

the more complicated, specialized transactions . . . more sophisticated modes of governance are required" (Spanjer 2009, p. 3253). That is, moving from left to right in Figure 1, we illustrate a spectrum or continuum of increasingly sophisticated governance modes that enable closer coordination of the winegrape supply chain.

Goodhue et al. (2003) found that California growers with more experience, more acreage, and/or higher-quality (i.e., higher-priced) grapes were significantly more likely to use written contracts. Fraser (2005) found that written contracts were more likely to be used for larger vineyards and by more experienced growers in Australia. For larger producers and those raising higher-quality grapes, the value of potentially appropriable quasi-rents is sufficient to justify the costs associated with contracts. Both studies found that wineries had more influence on production practices under contracts for higher-quality grapes; contracts for lower-quality grapes relied more on quality metrics and financial incentives. Building on this research, Franken (2014) found that perceived difficulty or uncertainty associated with measuring grape quality decreased the probability of informal verbal agreements and increased reliance on formal written contracts for winegrapes in California. According to the organizational economics literature (Mahoney 1992), when measuring quality is difficult, uncertain, or costly, contract provisions can stipulate *best practices* that have proven effective in delivering a desired level of quality if their use is easily verified (i.e., the task is programmable). If, on the other hand, quality is difficult to measure and production practices do not correlate with quality or are not easily verified, in-house production may be necessary. Therefore, we hypothesize:

> *Hypothesis 1:* Measurement difficulty is positively associated with sophistication of procurement.

Along a similar vein, Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer (2008, 2009) found that Spanish wineries' choices to predominately grow rather than buy grapes was positively related to wine quality, various types of

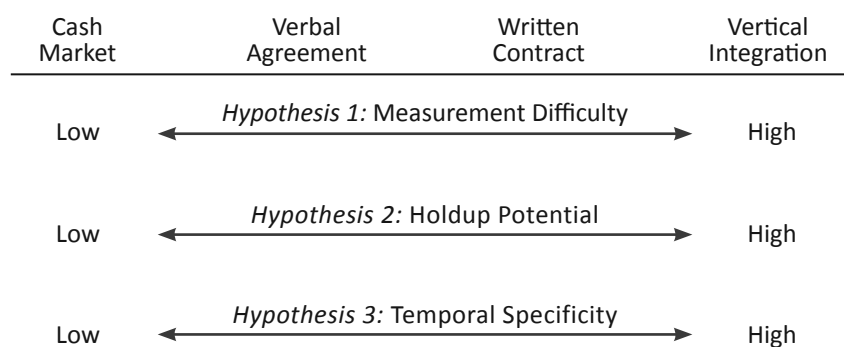| Cash Market	Verbal Agreement	Written Contract	Vertical Integration
Low	*Hypothesis 1:* Measurement Difficulty ← →		High
Low	*Hypothesis 2:* Holdup Potential ← →		High
Low	*Hypothesis 3:* Temporal Specificity ← →		High

Figure 1. Conceptual Model of a Winegrape Supply Chain: Summary of Hypotheses

Sᴏᴜʀᴄᴇ: Adapted from Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer (2008).

uncertainty, and investments in specialized assets dedicated to grape growing.[2] According to transaction cost economists, these assets have limited salvage value for alternative uses. Consequently, such investments tend to lead to vertical integration (ownership of consecutive stages in the supply chain) as a mechanism by which to protect the value of the investments from appropriation via holdup—exploitative, self-interested actions by opportunistic trade partners (Williamson 1975, 1979).

As noted by Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer (2008), a grower may cultivate certain grape varietals for a particular vintner. Those vines may take three years to bear usable fruit, and unless suitable safeguards are in place, the vintner can take advantage of the grower's need to sell grapes at that time. On the other hand, a grower who has sufficient alternative outlets for those grape varietals can take advantage of a vintner's need for timely delivery of a particular type and quality of grape to initiate fermentation and make productive use of specialized winemaking equipment. Similar arguments have been made to explain contracting and vertical integration decisions associated with investments in genetics, equipment, and facilities in other agricultural industries (e.g., Hennessy and Lawrence 1999, Martinez 2002, Franken, Pennings, and Garcia 2009). While a detailed contract can protect against holdup risks at intermediate levels of asset specialization (Joskow 1987), vertical integration is necessary at extreme levels (Mahoney 2005).

> *Hypothesis 2:* The potential for holdup is positively associated with vertical integration.

In addition to holdup problems stemming from specialized investments, the organizational economics literature recognizes holdup potential associated with temporal specificities such as product perishability (e.g., Williamson 1975). In the context of the wine industry, Goodhue et al. (2003) found that grape perishability compounded by the relatively small number of wineries in the San Joaquin Valley motivated greater use of formal contracts by growers in that region. That is, with fewer buyers of perishable grapes, a winery could potentially renege on an informal agreement with a grower or accept delivery only at a price that is lower than the one previously arranged. Similarly, a winery might prefer formal written contracts that require timely harvest and delivery of perishable grapes and mechanisms by which to rectify deviance from those conditions.

> *Hypothesis 3:* Temporal specificity is positively associated with contracting.

While existing studies of established wine production regions offer support for these hypotheses, little is known about their relevance for emerging production regions. Woods, Schieffer, and Saghaian (2011) offered a descriptive summary of integration and sourcing strategies of wineries in the mid-South

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[2]   Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer (2009) measured wine quality by differentiation of *reserva* and *crianza* wines from *guarantee of origin* wines. The authors suggested that a lack of statistical significance for investments in specialized assets used to support winemaking reflected the fact that wineries' revenues came increasingly from wine tourism in addition to winemaking.

and mid-Atlantic states (including Kentucky) and six contiguous states: Ohio, Indiana, Tennessee, Virginia, Missouri, and Illinois. Consistent with findings for more established regions (e.g., Franken 2014), the extent to which grape production was outsourced in those states varied with winery age and, to a lesser extent, with the varietals grown, which may reflect quality considerations and/or specialized investments by growers. An ordinary least squares regression indicated that wineries' intentions to expand production and a focus on French varietals were associated with greater use of informal interactions (i.e., winemakers sharing market information and viticultural expertise with growers and assisting them with financing and varietal and site selection). The authors suggested that more sophisticated analyses of make-or-buy decisions and the degree of integration could provide additional insights and noted that "the standards for interaction within this regional value chain are still forming" (Woods, Schieffer, and Saghaian 2011, p. 83). Thus, we examine our hypotheses for the emerging wine industry in Illinois (Figure 1).

Wine Distribution

Although considered to be a key element in the marketing mix (Coughlan et al. 2006), distribution channels have received relatively little attention from analysts in recent years compared to other elements such as prices, products, and promotion. This study and another published in this special issue (Sun et al. 2014) examine distribution decisions for wineries in emerging regions. According to Dodd (1995), newly established wineries in nontraditional regions have difficulty accessing local retailers. Sun et al. (2014) suggests that such wineries rely on direct sales to circumvent legitimacy issues and skepticism from local distributors. In another study, Dodd (1999) found that direct distribution was the most effective approach for wineries in nontraditional regions since wineries can control the quality of their wine products and associated services provided in tasting rooms. New wineries also tend to rely on tasting rooms because that channel yields higher margins than the costly three-tier (intermediated) distribution channels traditionally used by large wineries (Kolyesnikova 2007). Because participation in intermediated channels is expensive, economies of scale are important, and a winery must produce a relatively large volume for the intermediated channel to be profitable.

> *Hypothesis 4:* Winery age and size are positively associated with intermediated distribution channels and negatively associated with direct sales.

Sun et al. (2014) also argues that a winery's decision to integrate vertically upstream (grape procurement) and horizontally (inter-winery collaboration) may reflect a focus on producing high-quality wines that will increase distributors' interest in handling the wines. Their study relates measures of integration to wine distribution decisions. We directly examine the effect of a focus on quality.

> *Hypothesis 5:* Winery emphasis on quality is positively associated with intermediated distribution.

Research Design

Research Context

A survey conducted by WIU provided data on relative proportions of grapes sourced through Illinois wineries' own vineyards, arms-length spot/cash transactions, and informal and formal contracts. Mailing addresses for 86 wineries were obtained from the Illinois Grape Growers and Vintners Association's (IGGVA's) *Illinois Wineries Guide*. That list contained 98 business addresses because some of the wineries have more than one location. The survey instrument was not pretested, but survey items were adapted from prior surveys used in studies by Goodhue et al. (2003), Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer (2009), and Franken (2014). The one-page survey was mailed first in February and again in April 2012. The survey was accompanied by a letter addressed to the winery owner that requested the owner's voluntary and anonymous response. Six of the surveys were returned "address unknown" because some wineries appeared to have gone out of business, a fact confirmed for two of the businesses. Exit and entrance is not surprising in a young, growing industry such as this one. A report based on the USDA census data indicated that there were 105 wineries operating in Illinois in 2012 (Ward, Runyen, and Kuykendall 2012). Twenty-five surveys were returned by wineries that use grapes as inputs, resulting in a 31 percent response rate, and seventeen complete responses qualified for the analysis. We combine the results of this small-scale survey with the more extensive census data on all known vineyards and wineries in Illinois conducted between January 1 and March 31, 2012, by the state field office of USDA's National Agricultural Statistics Service (NASS) in cooperation with IGGVA.

Measures of Vertical Coordination

A list of variables and corresponding summary statistics computed from the WIU survey and USDA census data are reported in Table 1. To ensure the anonymity and privacy of respondents, USDA prohibits release of summary statistics that could reveal identifying or confidential information. For instance, most industry participants would recognize the industry leader but might not know the actual size of that company's operation. Reporting maximum statistics on size from the census could reveal that information. We measure procurement methods using five variables—*Grow*, *Formal Written Contract*, *Informal Oral Contract*, and *Spot*—reflecting the percentage of grapes sourced via each method with *Grow* representing use of the winery's own grapes (Figure 2). The WIU survey collected procurement information for grapes used in red and white wine separately since some grape varietals grow better in Illinois than others (Southern Illinois University 2008). We do not report the disaggregate results since the only statistically significant difference in procurement method, on average, was for sourcing grapes from the winery's own vineyard (52.50 percent for red and 48.25 percent for white).

   The WIU survey responses indicate that Illinois wineries, on average, procure 7 percent of the grapes used in production by spot transactions, 30 percent by informal oral agreements, and 13 percent by written contracts and that the wineries grow 50 percent of the grapes used. These findings are similar

to reported averages for various grape varietals of 9–14 percent for spot transactions, 27–33 percent for contracts (informal and formal), and 56–59 percent for estate grapes in a multi-state survey of emerging wine markets that included Illinois (Woods, Schieffer, and Saghaian 2011). According to the USDA census, wineries rely on their own vineyards for about 45 percent of the

Table 1. Summary Statistics

| Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Western Illinois University Survey					
Grow	22	0.50	0.43	0	1
Formal Written Contract	22	0.13	0.25	0	1
Informal Oral Contract	22	0.30	0.36	0	1
Spot	22	0.07	0.21	0	1
Years	24	8.04	5.19	1.5	25
Cases All	19	1,413.58	1,490.37	99	5,000
Cases Red	18	430.50	364.37	32	1,000
Cases White	18	611.28	832.15	40	3,000
Cases Blend	17	318.00	414.18	5	1,500
Measurement Ease	23	4.30	0.70	3	5
Buy Quality	22	3.09	1.15	1	5
Timing	21	3.81	1.29	1	6
Perishability	21	3.57	1.21	1	5
Suppliers	21	3.43	1.12	1	5
Return	21	3.24	1.30	1	5
USDA Census					
Vineyard Responses					
Winery (Yes = 1, No = 0)	131	0.41	0.49	—	—
Years	127	12.22	15.51	—	—
Acres	131	6.18	7.79	—	—
Permanent Storage (Yes = 1, No = 0)	131	0.34	0.47	0	1
Winery Responses					
Grow	71	0.45	0.41	—	—
Years	71	10.45	18.60	—	—
Cases	71	3,017.43	6,983.21	—	—
Barrel (Yes = 1, No = 0)	71	0.44	0.50	0	1
Red (Yes = 1, No = 0)	71	0.86	0.35	0	1
White (Yes = 1, No = 0)	71	0.85	0.36	0	1
Fruit (Yes = 1, No = 0)	71	0.55	0.50	0	1
Expand (Yes = 1, No = 0)	71	0.35	0.48	0	1
Tasting Room	68	0.69	0.28	0	1
Distributor	68	0.04	0.08	0	0.40
Direct to Retailer	68	0.18	0.23	0	1
Offsite	68	0.09	0.15	0	0.71
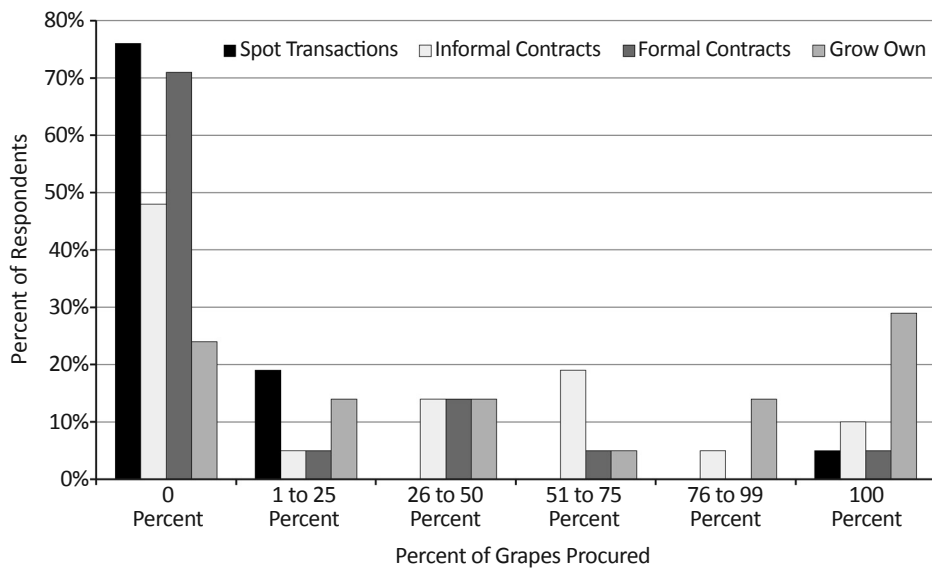
Figure 2. Grape Procurement Methods

Source: 2012 survey conducted by Western Illinois University.

grapes used (26 percent of the wine produced; the remainder is comprised of grapes from other vineyards, bulk wine, and juice).

In addition to providing information on upstream integration by wineries, the USDA census informs on downstream integration decisions by grape growers. Previous studies have not addressed this issue for emerging markets (Woods, Schieffer, and Saghaian 2011). We assess downstream integration using *Winery*, a binary dummy variable that equals 1 if a responding vineyard is part of a winery and 0 otherwise. As shown in Table 1, only 41 percent of the state's winegrape growers also operate wineries.

The census also shows the extent to which wineries use various distribution channels. We examine four types of outlets: intermediated distribution channels (*Distributors* and *Direct to Retailers*) and direct sales to consumers (*Tasting Room* and *Offsite*). About 92 percent of Illinois wineries sell through onsite tasting rooms and 66 percent sell directly to retailers. Relatively few market through distributors (27 percent), and about half use offsite venues such as festivals and farmers' markets (56 percent). On average, 69 percent of the state's wine is sold through winery tasting rooms and 18 percent is sold directly to retailers; distributors and offsite venues each comprise less than 10 percent of sales (Table 1).

The availability of these marketing channels varies with individual state laws. Three-tier systems in which wineries sell to state-licensed distributors that sell to retailers are common. Illinois allows other channels that apparently are intended to assist relatively small wineries after distributors showed little interest in handling their wines (Southern Illinois University 2008). Legislation allows Illinois wineries that obtain a winery shipper's license to ship up to twelve cases per year to any single adult resident in the state, and wineries producing less than 25,000 gallons of wine annually can apply for an exemption that allows them to directly distribute up to 5,000 gallons of wine annually to

retail outlets. Wineries in Illinois also can purchase a special-use-permit liquor license that allows them to sell wine, in addition to holding sample tastings, at festivals and other special events (State of Illinois Liquor Control Commission 2013).

Measures of Control Variables

Both the WIU and USDA data measure the scale and tenure of the firms (Table 1). *Years* is how long a company has been in business and approximates experience or tenure. Means of eight years in the WIU survey and ten years in the USDA census indicate that the wineries sampled in the surveys are similar in this sense. The slightly longer average vineyard tenure reported in the census is consistent with the typical two- to three-year lag between planting and harvest of usable grapes. As in other studies (Goodhue et al. 2003, Fraser 2005), vineyard size is measured by the variable *Acres*. The small mean reflects the USDA's definition of a commercial vineyard as at least one acre of grapes. The sample thus consists of numerous small vineyards and some that are substantially larger. *Cases* measures winery size based on annual wine sales for the WIU data and annual production for the USDA data. Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer (2009) measured the size of wineries in Spain by the logarithm of their capacity. Given the small size of wineries in emerging regions, there is no need to account for the more complex, nonlinear relationships observed between winery size and grape procurement methods in established regions. Though the average sales statistic in the WIU survey is notably lower than the average production level in the USDA census (Table 1), the WIU survey includes some wineries that are larger and some that are smaller than the average for the USDA census.

While some of the largest Illinois wineries are not represented in the WIU survey data, the sample appears to be fairly representative of the numerous small wineries of particular interest in this growing market. According to MFK Research, LLC (2007), 80 percent of Illinois' wineries produce less than 2,100 cases per year. In the WIU survey, 76 percent of respondents sold no more than 2,100 cases annually and 48 percent sold less than 1,000 cases. On average, the wines produced by WIU respondents consisted of 43 percent white, 30 percent red, and 22 percent blushes/blends, compared to 34 percent white, 49 percent red, and 17 percent nongrape wine in the USDA census (Ward, Runyen, and Kuykendall 2012).[3] Shoemaker, Campbell, and Bartanen (2006) reported a mix of 47 percent white, 34 percent red, and 16 percent other fruit. We computed binary dummies from the USDA data on types of wines produced and found that more than 85 percent of Illinois wineries produce red and white wine and about 55 percent produce wine from other fruits. We also constructed a binary dummy variable from the census data to control for winery expansion

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[3] An anonymous reviewer suggested that the blend/blush terminology could have been confusing for survey respondents since blush wines are not necessarily blends and blends may consist of two red varietals. Such confusion could bias the responses and may account for small differences in relative production levels reported by our study and others. There are three primary ways to produce rosé (pink) wine: skin contact, saignée (limited skin contact), and blending. Clearly, some red wines are blends of varietals but are still red wines. With blush/blend listed together in the WIU survey, it was clear that there were three categories: reds, whites, and wines that do not look like either. USDA's census categories of red, white, and "other fruit" may be more problematic for respondents producing rosé wines. Even so, relative levels of production by wine type are fairly similar across survey instruments.

intentions, which recent research suggests may impact winery integration strategies in emerging wine markets in the mid-South and mid-Atlantic states (Woods, Schieffer, and Saghaian 2011). As indicated by the mean statistic, about 35 percent of Illinois wineries intend to expand in the future.

Measures of Conceptual Variables

Theoretical constructs are operationalized by adapting survey items from previous studies of transaction costs in the wine industry (Goodhue et al. 2003, Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer 2009, Franken 2014). Several WIU survey items were designed specifically to measure theoretical determinants of marketing/procurement decisions. The variable *Measurement Ease* represents survey responses (on a Likert scale of 1–5 in which 1 = strongly disagree and 5 = strongly agree) to the statement "The quality attributes of grapes are easily measured." The responses ranged from 3 to 5 with an average of 4.30, indicating that Illinois winery operators view grape quality as fairly easy to measure (Table 1). Relevant quality attributes, on the other hand, were perceived as more difficult to measure by participants in Franken's (2014) study of the winegrape supply chain in California; for a comparable question, the responses ranged from 2 to 5 with an average value of 3.70. The difference may reflect greater attention to quality attributes that are objectively measured (e.g., sugar content in brix and acidity in pH) and less attention paid to attributes that are subjectively measured (i.e., color and flavor) in emerging wine regions.

Factor analysis (Bollen 1989, Hair et al. 1995, Thompson 2004) of other survey items limits error in measurement of conceptual variables like holdup concerns and temporal specificities noted in hypotheses 2 and 3. The process capitalizes on common correlation. For instance, notable correlation (0.38 or more) among survey items about the ability to source adequate quality grapes (*Buy Quality*), find alternative suppliers (*Suppliers*), and earn satisfactory returns on winemaking equipment and facilities (*Return*) may reflect potential for holdup. Survey items regarding timely delivery of grapes (*Timing*) and their perishability (*Perishability*) also appear to be related (correlation of 0.63). Following convention, such relationships are summarized as a smaller, more parsimonious set of variables (eigenvectors called factors) that possess characteristic roots (eigenvalues) greater than one, thereby conserving degrees of freedom and improving power against Type II error in subsequent regression analyses (Thompson 2004). The analysis yields two factors. *Temporal Specificity* is comprised of impacts of not having grapes when they are ready or when they are needed, and *Holdup* consists of availability of grapes of adequate quality and alternative suppliers and the ability to realize a return on winemaking equipment and facilities if existing suppliers became unavailable (Table 2).[4] The Kaiser-Meyer-Olkin measure of sampling adequacy, 0.51, is just above the minimum acceptable level of 0.50 (Dziuban and Shirkey 1974, Budaev 2010). Hence, resulting factors should be interpreted with some caution. Still, Cronbach (1951) alphas of 0.82 for *Temporal Specificity* and 0.65 for *Holdup* indicate that these measures are fairly reliable since values in excess of 0.70 are ideal (Streiner and Norman 1995).

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[4]   The *Measurement Difficulty* and *Holdup* variables are reverse-coded in relation to the items in the original survey for subsequent regression analysis so that higher values reflect greater measurement difficulty and holdup potential, which allows us to more directly test hypotheses 1 and 2.

Table 2. Factor Analysis

Survey Item	Factor 1 Loading Temporal Specificity	Factor 2 Loading Holdup
13: Easy to buy quality grapes	–0.28	**0.55**
14a: Timing of grape delivery matters	**0.74**	0.18
14b: Grape perishability matters	**0.98**	–0.21
15a: Alternative suppliers available	0.29	**0.96**
15b: Return on equipment/facilities	0.01	**0.57**
Eigenvalues	1.97	1.84
Cronbach's α	0.82	0.65
(Standardized)	(0.82)	(0.65)

Note: Maximum likelihood extraction and Varimax rotation of factors are employed. The Kaiser-Meyer-Olkin measure of sampling adequacy = 0.51.

In a few cases, the USDA data provide relevant proxies for theoretical constructs that we can use for comparison. For instance, binary dummy variables denoting investment in permanent (i.e., fixed or adjacent) cold storage facilities for vineyards' grapes (*Permanent Storage*) and wineries' use of oak fermenting barrels (*Barrel*) may present similar potential for holdup related to return on investment in these durable and dedicated (if not specialized) assets. While some wineries supplement or replace barrels with stainless steel tanks containing wood staves or chips to reduce production costs, some wine consumers prefer traditional barrel fermentation (Ṕerez-Magariño, Ortega-Heras, and González-Sanjosé 2011). Hence, barrel usage may also reflect an emphasis on quality. In fact, wine aging via wood pieces is considered taboo by traditionalists because it was not recognized as an enological practice and was even considered fraudulent in the European Union prior to 2005. Controlled experiments reveal significant visual and chemical differences in wines aged in the two systems (del Álamo et al. 2008, Gaya et al. 2010).

Empirical Results

Following prior studies that examined binary and continuous measures of adoption (Goodhue et al. 2003, Fraser 2005) and proportional use (Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer 2009, Franken 2014) of marketing and procurement methods in winegrape supply chains, we report binary probit and Tobit regression results to facilitate comparison. As an anonymous reviewer pointed out, when data are available on proportional use of all relevant marketing and procurement methods, more accurate estimates may be achieved through joint modeling procedures such as seemingly unrelated regression (SUR). We discuss the sensitivity of results to this alternative modeling procedure. Results of regression models of various marketing/procurement decisions are presented in the order in which they occur in the winegrape supply chain. Growers' decisions to integrate downstream into wine production are examined first, followed by wineries' grape procurement decisions. Finally, we consider the wine sales outlets chosen.

Table 3. Marginal Effects for Binary Probit Regressions for Vineyard Integration into Wine Production, 2012 USDA Census of Illinois Vineyards and Wineries

	Marginal Effect	**Standard Error**
Years	0.0027	(0.0034)
Acres	0.0165**	(0.0076)
Permanent storage	0.3273***	(0.0901)
R-square	0.1182	
Observations	127	

Notes: The dependent variable for the binary probit regressions equals 1 if the vineyard is also a winery and 0 otherwise. *, **, and *** denote statistical significance at a 10 percent, 5 percent, and 1 percent level respectively.

Vineyard Vertical Integration Decisions

We examine grape growers' decisions to integrate downstream into wine production using the USDA census data and present marginal effects from corresponding probit regressions in Table 3. The significantly positive coefficient on *Acres* indicates that adding ten acres of grapes to a vineyard increases the probability that the vineyard integrated into wine production by more than 1 percent. Though small in magnitude, this effect is qualitatively consistent with prior findings of tighter coordination of grape and wine production among larger grape-growing operations (Goodhue et al. 2003, Fraser 2005).[5]

The USDA census does not offer proxies for the concepts of measurement difficulty and temporal specificity of interest in this study (hypotheses 1 and 3) but does allow us to investigate the holdup effects identified in hypothesis 2. The significantly positive coefficient on *Permanent Storage* indicates that the probability of vineyard-winery integration increases 33 percent when a vineyard possesses affixed cold storage facilities for grapes. While storage capacity clearly facilitates wine production, this result also may reflect holdup concerns. Theoretically, storage can be provided by either the winery or the grower. Consider a grower who does not own a winery but stores grapes to supply wineries. Even when frozen, grapes decay and lose value when stored for extended periods (Brown 1975, Zahavi et al. 2000). Knowing that the grower would have to find alternative buyers for stored grapes, an opportunistic winery could refuse to take the grapes at the time or price to which they originally agreed. Regardless of whether the grapes are ultimately delivered to the original winery or to another, the grower risks receiving a lower price for the grapes and a smaller return on investment in the fixed storage facility, and that investment may be difficult to redeploy (e.g., sell) relative to mobile facilities. Vertically integrating into wine production may ensure a return on the investment in cold storage facilities. Alternatively, such storage facilities may simply be a necessary adjunct to wine production, and the result for *Permanent*

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[5]   Goodhue et al. (2003) and Fraser (2005) found that relatively large grape growing operations were more likely to use written contracts to market grapes so a similar effect of vineyard size on the probability of integration with a winery is not surprising.

Storage may be driven by scale advantages of having one large storage facility at a winery instead of several smaller facilities provided by each grower.

Winery Grape Procurement Decisions

Tables 4 and 5 present the marginal effects of regressions for various grape procurement methods. Because of the limited response to the WIU survey and relative use of procurement methods represented by the responses (Figure 2), in some cases only the adoption decision (probit) or the proportional use decision (Tobit) is relevant. The efficacy of seemingly unrelated regression for jointly estimating proportional use of procurement methods is similarly limited by the small size of the WIU sample. The only consistent effects detected using this procedure are the impacts of winery size that are also apparent in reported results.

Winery size exhibits significant effects consistent with prior work (Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer 2009) that found that vertical integration faces diseconomies of scale involved with securing large quantities of grapes. A 100-case increase leads to around a 1–2 percentage point decrease on average in self-sufficiency for grape inputs (Table 4), a 2 percentage point increase in grapes obtained via informal (verbal/handshake) contracts, and a nearly significant (p-value = 0.107) 2 percent rise in the probability of grapes being purchased through spot transactions (see Table 5). Larger wineries require greater quantities of grapes. At some point, the wineries cannot meet their needs with grapes from their own vineyards because of unavailability of ground on which to expand and inefficiencies associated with the cost of managing and monitoring grape production over a broad geographic expanse (Fernández-Olmos, Rosell-Martínez, and Espitia-Escuer 2008). The variables representing wine type also significantly influence a winery's reliance on its own vineyards for grapes (Table 4). Here, the significance of *Red* in regressions using USDA data corroborates the finding that Illinois wineries rely more on grapes from their own estate vineyards for red wine than for white wine production according to mean differences in WIU data noted in the variable measurement section.[6] Reliance on spot and informal contract procurement of grapes for red wine decreases with *Years* (Table 5).

Notably, the results of our regressions are somewhat inconsistent with the results of prior research on emerging wine regions by Woods, Schieffer, and Saghaian (2011) since we found no significant association between wineries' intentions to expand production (*Expand*) and our measures of vertical integration. In contrast to Franken's (2014) findings for California's well-established wine regions, *Measurement Difficulty* is not statistically significant in the regressions considered here, lending no support for hypothesis 1. There is some support for hypothesis 2 as holdup concerns (*Holdup*) lead to greater self-reliance in supplying grapes for white wine in particular, and *Barrel* has a similarly significant effect (Table 4). Relatively expensive barrel fermentation (as opposed to tanks) could represent a greater concern about holdup related to the value of investment in equipment or an emphasis on quality. Our results indicate that barrel use increases reliance on in-house grape production by

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[6]   Correlation of 0.6099 between the *Red* and *White* dummy variables is less than the common rule of thumb (e.g., greater than 0.80) for a value indicative of multicollinearity (Mason and Perreault 1991).

Table 4. Marginal Effects for Regressions of Reliance on In-House Grape Production

	Results of WIU Survey			Results of USDA Census	
	Red	**White**	**All Grapes**	**All Grapes**	
	Tobit	Tobit	Tobit	Probit	Tobit
Years	0.0488 (0.0321)	0.0203 (0.0289)	0.0312 (0.0298)	0.0052 (0.0103)	0.0004 (0.0040)
Cases	−0.0012*** (0.0004)	−0.0003** (0.0001)	−0.0002** (0.0001)	-2.78×10^{-5}** (1.00×10^{-5})	−0.0001*** (-1.98×10^{-5})
Measurement difficulty	−0.3031 (0.2055)	−0.0876 (0.1523)	−0.0915 (0.1565)	—	—
Temporal specificity	−0.0968 (0.1179)	−0.1330 (0.0950)	−0.1529 (0.0957)	—	—
Holdup	0.1051 (0.1272)	0.1931* (0.1094)	0.1553 (0.1076)	—	—
Barrel	—	—	—	0.1953 (0.1250)	0.3746** (0.1761)
Red	—	—	—	0.6574*** (0.1802)	0.8414*** (0.3234)
White	—	—	—	0.0667 (0.2184)	−0.0547 (0.3046)
Fruit	—	—	—	0.1395 (0.1230)	0.0711 (0.1616)
Expand	—	—	—	−0.0234 (0.1382)	−0.1389 (0.1743)
R-square	0.2832	0.2962	0.2764	0.3472	0.0445
Observations	15	16	17	71	71

Notes: The dependent variable for the binary probit regression equals 1 if any grapes are sourced from the winery's own vineyard and 0 otherwise. The dependent variable for the Tobit regressions equals the percentage of grapes sourced from the winery's own vineyard. *, **, and *** denote statistical significance at a 10 percent, 5 percent, and 1 percent level respectively. Standard errors are shown within parentheses.

37 percent.[7] In line with hypothesis 3, we find that greater concern about temporal specificity related to the ability to source grapes when they are needed and when they are ready (grape perishability) significantly increases the probability that formal written contracts are used (Table 5). *Holdup* and *Temporal Specificity* also spur greater use of informal contracting (Table 5), which typically entails development of familiarity and trust through continued relationships.

Winery Distribution Decisions

We analyze wineries' choices of sales outlets and proportional use of those outlets by applying probit and Tobit models, respectively, to the USDA data

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[7]   Replacing the *Barrels* dummy variable with the barrel-to-tank capacity ratio yields qualitatively similar results.

Table 5. Marginal Effects for Regressions of Grape Procurement Methods, 2012 WIU Survey

	Red		White		All Grapes	
	Probit	Tobit	Probit	Tobit	Probit	Tobit
Spot or Cash Market						
Years	−0.0575* (0.0348)	—	−0.0305 (0.0413)	—	−0.0321 (0.0419)	—
Cases	0.0005* (0.0003)	—	0.0001 (0.0002)	—	0.0002 (0.0001)	—
Measurement difficulty	0.1248 (0.1702)	—	−0.0417 (0.2007)	—	0.1601 (0.2090)	—
Temporal specificity	0.0339 (0.0955)	—	−0.0244 (0.1197)	—	0.0980 (0.1383)	—
Holdup	0.0337 (0.0821)	—	0.0716 (0.1370)	—	−0.0875 (0.1345)	—
R-square	0.2198	—	0.0739	—	0.1649	—
Observations	15		16		17	
Informal Oral Contracts						
Years	—	−0.1042*** (0.0389)	−0.0070 (0.0187)	−0.0129 (0.0403)	−0.0488 (0.0379)	−0.0459 (0.0370)
Cases	—	0.0015*** (0.0004)	0.0005 (0.0004)	0.0003* (0.0002)	0.0002 (0.0001)	0.0002** (0.0001)
Measurement difficulty	—	0.0266 (0.1782)	0.0271 (0.0835)	−0.2165 (0.1987)	−0.0612 (0.1758)	−0.1880 (0.1745)
Temporal specificity	—	0.2554* (0.1353)	−0.0228 (0.0488)	0.0760 (0.1320)	0.1415 (0.1355)	0.1695 (0.1116)
Holdup	—	0.0252 (0.0894)	0.0740 (0.0944)	−0.1147 (0.1320)	0.2835** (0.1369)	−0.0250 (0.1135)
R-square	—	0.6845	0.3196	0.1888	0.3555	0.3007
Observations	15	15	16	16	17	17
Formal Written Contracts						
Years	—	—	0.0127 (0.0217)	—	0.0513 (0.0532)	—
Cases	—	—	0.0001 (0.0002)	—	−2.94×10⁻⁶ (0.0001)	—
Measurement difficulty	—	—	0.0253 (0.1333)	—	−0.0273 (0.1756)	—
Temporal specificity	—	—	0.3308* (0.1781)	—	0.3889* (0.2335)	—
Holdup	—	—	0.0372 (0.1217)	—	0.0538 (0.1578)	—
R-square	—	—	0.4207	—	0.6061	—
Observations	15		16		17	

Notes: The dependent variable for the binary probit regressions equals 1 if any grapes are sourced using the stated procurement method and 0 otherwise. The dependent variable for the Tobit regressions equals the percentage of grapes sourced using the stated procurement method. *, **, and *** denote statistical significance at a 10 percent, 5 percent, and 1 percent level respectively. Standard errors are shown within parentheses.

Table 6. Marginal Effects for Probit and Tobit Regressions of Wine Sales, 2012 USDA Census of Illinois Vineyards and Wineries

	Tasting Room		Distributor	
	Probit	**Tobit**	**Probit**	**Tobit**
Years	0.0003	−0.0008	0.0250	0.0023*
	(0.0013)	(0.0020)	(0.0220)	(0.0013)
Cases	1.69×10^{-5}**	8.00×10^{-6}	0.0001**	1.06×10^{-5}**
	(1.00×10^{-5})	(5.85×10^{-6})	(5.00×10^{-5})	(4.12×10^{-6})
Barrel	0.0194	−0.0434	−0.2236	0.0003
	(0.0367)	(0.0892)	(0.2010)	(0.0746)
Red	0.0035	0.0510	0.3846**	0.1761
	(0.0479)	(0.1377)	(0.1711)	(0.1319)
White	−0.0237	0.0879	−0.4386	−0.1691
	(0.0340)	(0.1433)	(0.2366)	(0.1191)
Fruit	−0.0006	−0.1407*	−0.1199	0.0085
	(0.0291)	(0.0811)	(0.1634)	(0.0664)
Expand	−0.0229	0.0136	0.1432	−0.0016
	(0.0440)	(0.0872)	(0.2044)	(0.0743)
R-square	0.0820	0.0903	0.3680	0.3524
Observations	68	68	68	68

	Direct to Retailer		Offsite	
	Probit	**Tobit**	**Probit**	**Tobit**
Years	0.0068	0.0006	0.0035	−0.0002
	(0.0115)	(0.0020)	(0.0071)	(0.0013)
Cases	-4.75×10^{-5}*	-3.88×10^{-5}**	-2.34×10^{-5}	-2.32×10^{-5}*
	(3.00×10^{-5})	(1.72×10^{-5})	(2.00×10^{-5})	(1.30×10^{-5})
Barrel	0.1569	0.1494*	−0.3611**	−0.1119*
	(0.1368)	(0.0880)	(0.1415)	(0.0614)
Red	0.0482	−0.0966	−0.1372	−0.0017
	(0.2236)	(0.1309)	(0.2168)	(0.1030)
White	−0.1797	−0.1568	0.5880***	0.2467**
	(0.1749)	(0.1380)	(0.1502)	(0.1110)
Fruit	0.0808	0.0637	−0.0940	0.0746
	(0.1295)	(0.0778)	(0.1347)	(0.0553)
Expand	−0.0976	−0.1159	0.1418	0.0676
	(0.1429)	(0.0849)	(0.1430)	(0.0603)
R-square	0.1399	0.2462	0.1709	0.4623
Observations	68	68	68	68

Notes: The dependent variable for the binary probit regressions equals 1 if any sales are made through the stated distribution channel and 0 otherwise. The dependent variable for the Tobit regressions equals the percentage of sales made through the stated distribution channel. Offsite denotes festivals and farmers' markets. *, **, and *** denote statistical significance at a 10 percent, 5 percent, and 1 percent level respectively. Standard errors are shown within parentheses.

(Table 6). Variation in Illinois wineries' typically heavy reliance on tasting room sales (see Table 1) is difficult to explain; the R-square values for tasting room sales are the smallest of the sales outlets analyzed (Table 6). Prior research on emerging wine regions has indicated that wineries that intend to expand production have more interactions with growers (Woods, Schieffer, and Saghaian 2011), but expansion intentions have no significant effect on downstream relationships in our results.

Outlet choice is predominantly driven by the size of the winery. Production of an additional 1,000 cases of wine increases the probability of wine being sold through tasting rooms by 1–2 percent and through distributors by 10 percent. It decreases the probability of direct sales to retailers by about 5 percent. The latter two effects and the significantly positive effect of winery age on the proportion of wine sold through distributors are consistent with hypothesis 4. The negative influence of size on direct sales to retailers stems from Illinois' law that allows only smaller wineries with annual production below 25,000 gallons to directly distribute up to 5,000 gallons of wine to retail outlets annually (Southern Illinois University 2008). While it is theoretically feasible for the average Illinois winery to sell all of its annual production (3,017 gallons; see Table 1) directly to retailers, some portion is typically sold through other channels (e.g., winery tasting rooms).

The marginal effects for the *Red* and *White* dummy variables in the distributor and offsite models are consistent with relatively more red wine being paired with meals at restaurants and purchased from retailers supplied by distributors and the relatively greater popularity of lighter and sweeter white wines that are served chilled on warm days at summer festivals and farmers' markets (Table 6). Barrel-aged wines, which traditionalists may associate with higher quality, are more frequently sold directly to retailers, perhaps to restaurants and other specialized retailers. While the effect of barrel-production opening doors to other retail outlets is consistent with hypothesis 5, there is no evidence of a similar effect on distributors' willingness to handle those wines. These points parallel the strategies of some French wineries that avoid major retailers in favor of specialized retailers to build their reputations via exclusivity (Guibert 2006). In other cases, wineries in France and Italy partner with certain distributors and retailers to develop tailor-made wines designed to satisfy specific consumer segments (Couderc and Marchini 2011). In the context of local food movements, smaller start-up wineries in emerging regions of the United States may find that the most effective way to build reputation is by direct marketing to local retailers (e.g., restaurants) and to consumers at local events and festivals. Such a strategy also seems pertinent for other regional small-business entrepreneurs (e.g., sausage/butcher shops and artisan cheese producers) who may initially have difficulty finding space on the shelves of major retailers. More stringent legal restrictions limit distribution choices for wineries in other states as established entities leverage their positions in the distribution channel and lobby to influence the regulatory environment (Rickard 2012).

Again, as pointed out by an anonymous reviewer, the reported results have the potential to lead to inaccurate inferences since equations that represent interrelated decisions were not estimated jointly. Here, the percentage of wine sold through all of the potential outlets should sum to 100 percent because selling wine through one outlet prohibits that wine from being sold through another outlet. A sensitivity analysis that applied seemingly unrelated

regression to continuous measures of the percentage of wine marketed through each outlet yields results that are mostly qualitatively similar to the Tobit results presented here (i.e., in the sign and significance of the effects). For instance, the influence of winery size is similar, and there is evidence that offsite sales (e.g., farmers' markets and festivals) are proportionally greater for white wine and less for barrel-fermented wine. Hence, the results are qualitatively robust to choice of estimation method.

Conclusions

Emerging industries may operate quite differently from more established ones, and the limited literature on vertical coordination in emerging wine regions indicates few similarities with established regions, suggesting that further inquiry is warranted. This study examines vertical coordination for an emerging wine industry in Illinois using data from surveys conducted by WIU and USDA in 2012. The USDA survey offers a large, representative sample but requires use of proxies for theoretically relevant concepts that are measured more directly by the WIU survey of a smaller sample. These data sets together provide a more complete picture of the factors that influence marketing and procurement decisions in this emerging wine region.

The results of this study are mostly intuitive and in line with organizational economics theories on vertical coordination and prior studies of established wine regions. However, some of the results deviate from those of earlier studies. For instance, difficulties associated with measuring relevant attributes of grape quality appear to impact grape procurement decisions for California wine producers, but no such effects are apparent here. The difference may be a reflection of greater attention paid to objectively measured quality attributes (e.g., sugar content in brix and acidity in pH) than to subjectively measured attributes such as color and flavor in the still developing Illinois wine industry.

More generally, the results corroborate earlier findings that quality matters, as evidenced by the importance of temporal issues associated with grape perishability. Specifically, greater concern for these temporal issues increases the probability that formal written contracts are used to procure grapes. Holdup concerns related to investments in winemaking equipment and the availability of quality grapes and alternative suppliers have similar positive effects on a winery's reliance on its own vineyards. Notably, relative reliance on a winery's own vineyard and outside suppliers is largely driven by the winery's size with larger wineries requiring additional grapes from outside suppliers. As a caveat, we note that several of these effects are inferred from analysis of a rather small sample, and further research of these questions in emerging wine regions is warranted to confirm or refute the findings reported here.

Winery size is also a major determinant of the market outlets used; larger wineries are substantially more likely to rely on distributors. Red wine production is associated with a greater reliance on distributors, while white wine production is associated with greater reliance on events such as festivals and farmers' markets. Barrel-aged wines, which may be perceived as being of higher quality, are more frequently sold directly to retailers that may be primarily restaurants and other specialized retailers. These results may reflect pairing of barrel-fermented red wines with meals at restaurants or sales through other retailers and the popularity of lighter, sweeter chilled white wines on warm days at summer festivals and farmers' markets. These

results appear to be consistent with expanding interest in local food and are interesting in the context of rural development. Smaller start-up wineries and other entrepreneurial small businesses (e.g., sausage/butcher shops and artisan cheese producers) that lack the volume or performance history needed to capture the interest of major retailers may benefit from building reputations through direct marketing to local retailers such as restaurants and to consumers at local events. Worthwhile avenues for future research include work that contributes to a greater understanding of the challenges faced by small businesses in placing their products in front of consumers and the impacts of legal restrictions on the sales outlet options available.

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