From Texas Vineyards to the Final Consumer: An Economic Impact Analysis

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ABSTRACT

This study estimates the economic impacts of the Texas wine and wine grape industry on the Texas economy through each sector of commercialization from the vineyards to the final consumer. Survey data from the state's vineyards and wineries for 1996 is used to construct an input-output model of the Texas economy and an industry impact framework using IMPLAN. Results show that the total core economic impacts of the Texas wine and wine grape industry were $85.8 million in output impacts, 1,157 jobs, $29.6 million in income impacts, and $46.6 million in total value added impacts in 1996. Much of these core economic impacts were attributable to the wine and wholesale trade sectors.

KEYWORDS: economic impacts, input-output, IMPLAN, wine, wine grapes

Texas has one of the oldest wine grape growing and wine making traditions in the United States with a history stretching back over three hundred years. At the turn of the century census figures show that Texas had 1.3 million grapevines of bearing age (the equivalent of 2,900 acres today) and the state's 20 to 30 wineries produced over 100,000 gallons of wine (Mitchell, 1997). Prohibition and the decades that followed reduced the industry to a single winery located in Val Verde County, which produced 5,000 gallons of wine from approximately twenty acres of wine grapes in 1970. A renewed interest in wine and wine grape production took hold in the early 1970's and the modern Texas wine and wine grape industry emerged in the early 1980's. Today, the Texas wine and wine grape industry has over 3,200 acres of vineyards, 28 wineries, produces between 800,000 and 1,300,000 gallons of wine annually, sells 96% of its wine in-state, and holds a 5% share of the Texas table wine market (Dodd et al., 1996a). The industry's success and promise has also attracted and sustained substantial investment from California, France, and Texas.

The objective of this study was to estimate the economic impacts of the Texas wine and wine grape industry from the vineyards to the final consumer. Texas vineyards produced $4.6 million dollars worth of wine grapes in 1996. This may be compared to $4.8

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million for oranges, $15.5 million for grapefruit, and $4.8 billion for all crops produced in Texas in 1996 (Texas Agricultural Statistics Service, 1996). The processing of Texas wine grapes by the state's wineries and ultimate delivery to final consumers substantially adds value to the Texas wine grape crop. Texas wine sales in 1996, for example, totaled $34 million at suggested retail prices in 1996 (Michaud, 1997).

The industry's role, however, may be seen as that of two closely related sectors within the context of the matrix abstraction of the Texas economy as shown in (Fig. 1). The growing of wine grapes, the production of wine, and the delivery of the finished product to final demand draws goods and services from supplying sectors who themselves draw inputs from their suppliers throughout the Texas economy in a series of backward linkages. The final value of a bottle of Texas wine is the summation of the values paid to the wine sector, the transportation, wholesale, retail, and restaurant sectors, and the state and local government sectors. The allocation of the final value of a bottle of Texas wine in this way reflects the forward linkages from the winery to the final consumer. Each of the sectors along the chain of commercialization uses it's share of the final value of Texas wine in the purchase of inputs and in the payment of wages, interest, profits, and indirect business taxes.

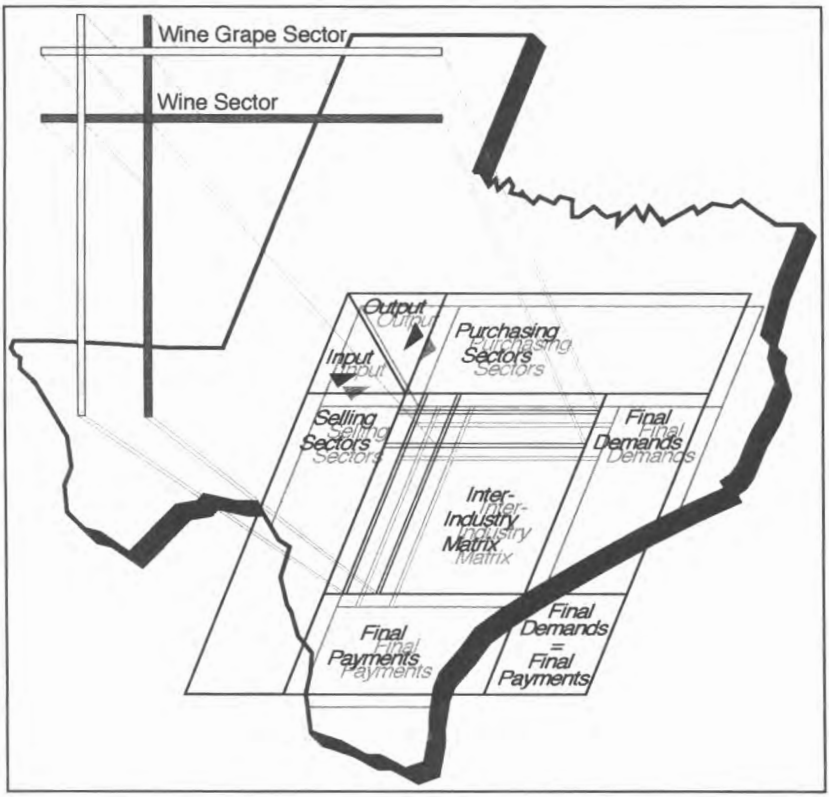

Figure 1. The Texas wine and wine grape industry within the matrix abstraction of the Texas economy.

The industry's economic impacts are of interest to the Texas Legislature, Texas tax payers, industry groups, and individuals as each of these has, directly and indirectly, invested substantial amounts of capital in the industry's development (Texas Department of Agriculture, 1986). Certain regions of the state are also particularly affected by the industry's role in the local economy. West Texas, for example, produces over 85% of the state's wine grape crop and wine grapes represent one of the few viable alternatives for agricultural diversification both on the Texas High Plains and the Trans-Pecos regions (Dodd and Michaud, 1995; Dodd et al., 1996a). For other regions of the state, such as the Texas Hill Country and the North-Central Region, the native wine and wine grape industry is also seen as an important component of regional tourism (Dodd, 1994).

Two approaches to assessing the economic impacts of regional wine and wine grape industries on state economies have been stressed in prior studies. The first is that of using an existing state level input-output model, and the second is that of modeling economic impacts using commercially available input-output modeling software. Brown (1985) and Folwell et al. (1987) are examples of the former. These studies estimated the economic impacts of the Washington wine and wine grape industry on the Washington economy based on the Washington input-output model. The latter approach was used by Johnson and Wade (1993), who estimated the economic impacts of Virginia's farm wineries on the Virginia economy based on the Impact Analysis for Planning (IMPLAN) modeling software managed by the Minnesota IMPLAN Group (MIG) (MIG, Inc., 1996). All of these studies measured the economic impacts of the wine and wine grape industries involved and made projections of future impacts based scenarios of industry growth.

The first approach mentioned above was also used in the case of Texas by Morse et al. (1992) and subsequent research by Dodd et al. (1996a; 1996b; 1994; 1993). Economic impacts of the industry on the state's economy in these studies were based on the Texas input-output model. These works estimated that the Texas wine and wine grape industry's total annual economic impact on the state's economy in recent years has been approximately $100 million in overall economic activity, 2,000 jobs, and $20 million in income. The Texas input-output model, however, uses broadly defined sectors that are closely related to the wine and wine grape sectors such as beverages and irrigated crops. The Texas input-output model is also static, being most recently updated in 1986, and does not permit alterations to the basic assumptions upon which each sector is constructed. Consequently, this model no longer corresponds to the state-of-the-art in micro-economic impact modeling and becomes less reliable with each passing year. There is, therefore, a need to re-examine the impacts of Texas wine and wine grape industry on the Texas economy.

MATERIALS AND METHODS

The modeling tool chosen to estimate the economic impacts of the Texas wine and wine grape industry on the state's economy was the IMPLAN modeling software. IMPLAN is a microcomputer based non-survey hybrid input-output model, which begins with a national model that can be scaled down to a county level using regional information. Texas county data for the 1992 base year was obtained from MIG for use with the input-output software, and was complimented with primary data gathered through surveys of the Texas wine and wine grape industry.

The central variables determining the impacts of the Texas wine and wine grape industry on the state's economy were the farmgate value of Texas wine grapes sold to

wineries, the value of juice and bulk wine originating within the state, and the value of Texas produced wines delivered to final demand at retail prices. These values were derived from price, quantity, and structural data collected from the state's grape growers, winemakers, and winery sales managers for 1996. The data were compiled using a survey format developed over the course of several years within the Texas Wine Marketing Research Institute at Texas Tech University.

Modifications to IMPLAN's regional data, production functions, by-products, and regional purchase coefficients were made to conform to the nature of the Texas wine grape and wine sectors. Survey data indicated that the Texas wine grape sector produces only wine grapes and is the state's sole producer of wine grapes. Likewise, the Texas wine sector produces only wine and is the state's sole producer of wine. The industry's wine grape and wine sectors were found to behave as separate but mutually dependent sectors having a defined pattern of commercialization.

Structural information from survey data was used to allocate values among the sectors directly involved from the vineyards to the final consumer. Each winery's wine grape, juice, and bulk wine purchases originating from within the state were modeled to reflect the direct link between the wine grape sector and the wine sector. Likewise, each winery's wine sales value at suggested retail prices was allocated among the wine, motor freight and warehousing, wholesale trade, food stores, miscellaneous retail, and eating and drinking sectors according to each winery's pattern of commercialization and the margins indicated by IMPLAN. Exports were assumed to pass through the same chain of commercialization until exiting the Texas economy at the wholesale stage before the application of excise taxes. Finally, the collection and re-spending of taxes by government for education and non-education purposes was applied at the wholesale level for excise taxes and at the retail level for sales taxes (Michaud, 1997a).

RESULTS AND DISCUSSION

In general, survey response was high in terms of the proportion of the total estimated values accounted for by respondents. From 87 to 94% of the value of wine and wine grapes was confirmed with wine grape growers and winemakers. The remainder was estimated from past responses and all available information on a case by case basis. Particular follow-up attention was given to more important producers as these largely determine the final values necessary for input-output analysis. All economic impacts derived from this analysis are termed core economic impacts, as they do not include economic activity associated with periodic investment, income tax re-spending, research activities, and tourism.

The core economic impacts of the Texas wine and wine grape industry on the Texas economy in 1996 are summarized according to the sectors involved in the chain of commercialization. These are shown in terms of output, employment, income, and total value added in Tables 1 through 4, respectively. Core output impacts, for example, totaled $85.8 million as shown in Table 1. Output impacts may be considered an overall measure of economic impacts as they include the total value of all economic activity in the state attributable to the Texas wine and wine grape industry. Employment, income, and total value added impacts as shown in Tables 2 through 4 are associated with the level of overall economic activity (Table 1).

Table 1. Core output impacts of the Texas wine and wine grape industry on the Texas economy, 1996 (1996 dollars).

Activity in the chain of commercialization	Direct ($MM)	Indirect ($MM)	Induced ($MM)	Total ($MM)
Wine grapes	$4.6	$3.6	$2.6	$10.7
Wines	$21.0	$7.9	$6.6	$35.5
Motor freight transport and warehousing	$0.6	$0.4	$0.4	$1.3
Wholesale trade	$7.1	$2.7	$5.4	$15.2
Excise tax re-spending	$0.2	$0.0	$0.3	$0.5
Food stores	$1.6	$0.2	$1.1	$2.9
Eating and drinking	$3.2	$1.1	$1.9	$6.2
Miscellaneous retail	$4.3	$1.7	$2.8	$8.8
Sales tax re-spending	$2.3	$0.0	$2.4	$4.7
Grand Total	$44.8	$17.6	$23.4	$85.8

The Texas wine and wine grape industry's core employment impacts totaled 1,157 jobs in 1996 (Table 2). Employment impacts are understood in terms of jobs associated with all economic activity throughout the economy attributable to the industry. These include both full-time and part-time positions without the use of full-time equivalencies.

The core personal income impacts of the Texas wine and wine grape industry on the Texas economy totaled $29.6 million for 1996 (Table 3). Personal income impacts include both employee compensation and proprietor's income impacts. These are shown in Table 3 and are associated with all economic activity throughout the economy attributable to the industry.

The Texas wine and wine grape industry's core total value added impacts totaled $46.6 million in 1996 (Table 4). Total value added impacts are the sum of employee compensation, proprietor income, indirect business taxes, and other property impacts. Table 4 shows the total value added impacts associated with all economic activity throughout the economy attributable, as before, to the Texas wine and wine grape industry. Direct, indirect, and induced economic impacts are shown for each sector of activity. Direct impacts represent the final value of Texas wine grapes, juice, and bulk wine inputs originating from within the state, the value of Texas wine exports, and the final value of Texas wines consumed by households in Texas. As such, the final value of Texas wines includes the application of excise and sales taxes as well as the participation of the wine, motor freight and warehousing, wholesale trade, food stores, miscellaneous retail, and eating and drinking sectors. Direct impacts, therefore, not only involve the backward linkages associated with inputs for the production of Texas wines but also the forward linkages through the economy to the final consumer.

Table 2. Core employment impacts of the Texas wine and wine grape industry on the Texas economy, 1996.

Activity in the chain of commercialization	Direct (Jobs)	Indirect (Jobs)	Induced (Jobs)	Total (Jobs)
Wine grapes	36	35	35	106
Wines	153	85	90	329
Motor freight transport and warehousing	8	4	5	17
Wholesale trade	89	36	74	199
Excise tax re-spending	8	-	4	11
Food stores	53	2	16	71
Eating and drinking	100	11	26	136
Miscellaneous retail	123	18	39	180
Sales tax re-spending	74	-	33	106
Grand Total	644	192	321	1,157

Table 3. Core personal income impacts of the Texas wine and wine grape industry on the Texas economy, 1996 (1996 dollars).

Activity in the chain of commercialization	Direct ($MM)	Indirect ($MM)	Induced ($MM)	Total ($MM)
Wine grapes	$1.2	$1.1	$1.0	$3.2
Wines	$2.7	$3.1	$2.5	$8.2
Motor freight transport and warehousing	$0.2	$0.1	$0.1	$0.5
Wholesale trade	$3.6	$1.1	$2.0	$6.7
Excise tax re-spending	$0.2	$0.0	$0.1	$0.3
Food stores	$0.9	$0.1	$0.4	$1.4
Eating and drinking	$1.4	$0.3	$0.7	$2.4
Miscellaneous retail	$1.9	$0.7	$1.1	$3.6
Sales tax re-spending	$2.3	$0.0	$0.9	$3.2
Grand Total	$14.4	$6.4	$8.7	$29.6

Table 4. Core total value added impacts of the Texas wine and wine grape industry on the Texas economy, 1996 (1996 dollars).

Activity in the chain of commercialization	Direct ($MM)	Indirect ($MM)	Induced ($MM)	Total ($MM)
Wine grapes	$1.2	$1.9	$1.6	$4.7
Wines	$8.0	$4.4	$4.0	$16.5
Motor freight transport and warehousing	$0.3	$0.2	$0.2	$0.7
Wholesale trade	$4.3	$1.6	$3.3	$9.3
Sales tax re-spending	$2.3	$0.0	$1.5	$3.7
Food stores	$1.4	$0.1	$0.7	$2.2
Eating and drinking	$1.9	$0.5	$1.2	$3.6
Miscellaneous retail	$2.7	$1.1	$1.7	$5.5
Excise tax re-spending	$0.2	$0.0	$0.2	$0.4
Grand Total	$22.4	$9.8	$14.3	$46.6

Indirect impacts represent the additional economic activity generated by the chain of backward linkages throughout the economy implied in the use of inputs by all sectors involved in the production and distribution of Texas wine to the final consumer. Induced impacts are generated by the chain of backward linkages throughout the economy implied by the spending of wages paid to labor and the re-spending of taxes paid to government associated with the economic activity generated by the industry. Total impacts are the summation of the direct, indirect, and induced impacts.

The industry's economic impact on the Texas economy may be understood in terms of the value of economic activity required to deliver Texas wine to the final consumer. For example, in order to deliver $44.8 million worth of Texas wine to the final consumer in 1996 (Table 1), a total of $85.8 million of total economic activity was required. In terms of final demand multipliers, roughly $1.91 of overall economic activity was required to deliver one dollar worth of Texas wine to final demand.

The industry's core total output impacts on the Texas economy were most strongly felt through the wine sector at $35.5 million, the wholesale sector at $15.2 million, and wine grape sector at $10.7 million. The industry's total core employment impacts were also lead by the wine sector at 329 jobs and the wholesale sector at 199 jobs. Restaurants and liquor stores followed with 136 and 180 jobs, respectively. Total core personal income impacts were led by the wine sector at $8.2 million followed by the wholesale sector at $6.7 million, the liquor stores at $3.6 million, and the wine grape sector at $3.2 million. Core total value added impacts followed the same pattern being led by the wine sector with a total of $16.5 million.

These results represent an underestimation of the industry's impacts on the Texas economy, as this analysis does not include economic activity associated with periodic investment, income tax re-spending, research activities, and tourism. Estimates made in 1986 by the Texas Department of Agriculture, for example, showed that the total cumula-

tive investment in Texas vineyards at that time stood at approximately $24.5 million while that in Texas wineries stood at nearly $35 million (Texas Department of Agriculture, 1986). In terms of input-output analysis, investment may be taken into account on a one-time-basis in the year that the actual transactions occurred. There are no reliable estimates, however, as to the value of investment in Texas vineyards and wineries for 1996.

Similarly, the re-spending of income taxes by government is not included in this analysis. In terms of input-output analysis, income taxes do not vary with output delivered to final demand and must be accounted for on a one-time-basis as a form of investment by government. Income tax information from wineries and vineyards was not available for this analysis.

The activities and benefits associated with industry related to research conducted by the state's universities and colleges were also not included in the analysis. In particular, the University of Texas, Texas A&M University, and Texas Tech University each have maintained applied wine and wine grape industry research programs, though these have been in severe decline in the past several years. Insufficient data were available for the proper assessment of the industry related economic impacts associated with these activities.

The analysis also does not include non-wine expenditures associated with Texas wine and wine grape industry tourism. Previous research in the general area of economic impact modeling and tourism activity by Douglas and Harpman (1995), Bergstrom et al. (1990), and Johnson et al. (1989) suggest that tourism can have substantial economic impacts on regional economies. Tourism expenditures, however, must be considered separately across many sectors using appropriate data gathering methods (MIG, Inc., 1996).

In the case of the Texas wine and wine grape industry, Dodd (1994) showed that the purchases of ancillary items from winery tasting rooms account for 20 cents of every dollar of tasting room sales. This would roughly be $785,000 in 1996, for example, and would increase estimates of the industry's total output impact by over $1.3 million for 1996. Outside the tasting room, the purchase of goods and services made by the estimated quarter million Texas winery visitors each year are also part of the industry's impacts on the economy. Likewise, the expenditures made by another estimated quarter million visitors attending the state's several annual wine festivals also represent substantial economic activity generated by the industry.

CONCLUSIONS

The total core economic impacts of the Texas wine and wine grape industry in 1996 were estimated at $85.8 million in output impacts, 1,157 jobs, $29.6 million in income impacts, and $46.6 million in total value added impacts. In each case, the industry's largest core economic impacts were through the wine sector and the wholesale sector. The 60% of core output impacts accounted for through these two sectors underscores the economic role of the strong distributor relationships maintained by several Texas wineries. The wine grape sector followed with about 12% of the total output impacts though it is the initiator of the industry's economic impacts on the Texas economy. In the case of total core employment, personal income, and total value added impacts, liquor stores followed the wine sector and the wholesale sector in importance. This emphasizes the significance of liquor stores for the industry in working around the patchwork wet-dry local option laws characteristic of the Texas alcohol beverage regulatory environment. Finally, the restaurant sector was shown to follow the wine, wholesale, wine grape, and liquor store sectors

in leading the industry's overall economic impacts.

With regard to projections for economic growth and given the current state of the industry, the most crucial element for the foreseeable future is the wine grape sector. Texas wine grape yields have traditionally been on the order of one-half of those of other wine producing states as discussed in Michaud (1997). Empirical evidence shows, however, that about three dozen of the state's 190 wine grape growers regularly experience yields equal to or surpassing their counterparts in other wine producing states (Michaud, 1997b). As these growers operate under similar conditions and with the same varieties as their Texas peers, this implies that higher yields may be possible overall and increase the industry's economic impacts on the Texas economy. If yields were to double, for example, and if vineyard acreage were to increase by a modest 15% over ten years, then the industry would more than double its economic impacts. This scenario would imply core economic impacts of $197.3 million in output, 2,660 jobs, $68 million in income, and $107.1 million in total value added by the year 2007.

This analysis is a conservative estimate of the industry's contributions to the Texas economy as it does not include vineyard and winery investment, income tax re-spending, research activities and benefits, or tourism expenditures. Among these, tourism expenditures associated with the Texas wine and wine grape industry may be the most promising area of future economic impact research. Texas winery tasting rooms attract an estimated quarter of a million visitors annually as suggested by Dodd (1994) and perhaps as many attend the state's numerous annual wine festivals. The presence of the Texas wine and wine grape industry is largely responsible for visitor purchases of non-wine goods and services both inside and outside the tasting room and festival environment. Tourism expenditures related to the industry, therefore, may be a substantial part of the Texas wine and wine grape industry's economic impacts on the Texas economy.

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