

The Economic Impact of Wineries in Kings County

by

Connor Thompson

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Approved by the Thesis Supervisor

Dr. Brian VanBlarcom Date

Approved by the Dean of Arts

Dr. Jeff Hennessey Date

Approved by the Honours Committee

Dr. Anthony Thomson Date

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Table of Contents

Chapter 1: Introduction	1
Chapter 2: Literature Review	3
2.1 Methods of Economic Impact Analysis	3
2.1.1 Economic Base Model	4
2.1.2 Keynesian Multiplier Model	5
2.1.3 Input-Output Model	6
2.2 Model Evaluations	8
2.2.1 Economic Base Model	8
2.2.2 Keynesian Multiplier Model	9
2.2.3 Input-Output Model	9
2.3 Economic Impact of the Nova Scotia Wine Industry, 2005	9
2.3.2 Other Nova Scotia Wine Industry Economic Impact Studies, 2011	12
2.5 Forecasting Wine Demand in Nova Scotia, 2025	13
Chapter 3: Methodology and Data	16
3.1 Kings County Input-Output Model	16
3.2 Allocating Data to the Input-Output Model	16
3.2.1 Winery Survey Data	16
3.2.2 Wine Retail Pricing Structure	18
3.2.3 Allocating Winery Survey Data	21
3.3 Economic Determinants of Wine Consumption	24
3.3.1 Forecasting Consumption	26
3.3.2 Applying the 2025 Forecast to the Input-Output Data	27
Chapter 4: Results	28

4.1 Interpreting Results from the Input-Output Model	28
4.2 Assumptions.....	29
4.3 Economic Impact, 2014	31
4.4 Economic Determinants of Wine Consumption	34
4.5 Forecasting Wine Consumption, 2025	37
4.6 Economic Impact, 2025	38
Chapter 6: Conclusions.....	40
Bibliography	42

List of Tables

Chapter 2: Literature Review

Table 2.1: Economic Impact of Farm Winery Industry and Grape Vineyards 2005	10
Table 2.2: Economic Impact of Farm Winery Industry and Grape Vineyards 2020	11
Table 2.3: Direct Economic Impact of Wineries in Nova Scotia, 2011	12
Table 2.4: Economic Impact of Wine and Grape Industry in Canada 2011 (Nova Scotia data)	12

Chapter 3: Methodology and Data

Table 3.1: Kings County Input-Output Model NAICS Codes	17
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Chapter 4: Results

Table 4.1: Economic Impacts of Kings County Wineries, 2014	31
Table 4.2: Economic Impact results by Sector, 2014	32
Table 4.3: Forecasted Values of Determinants of Wine Demand	37
Table 4.4: Economic Impacts of Kings County Wineries, 2025	38

List of Figures

Chapter 4: Results

Figure 4.1: Economic Determinants of Atlantic Wine Consumption	35
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Abstract

This paper quantifies the economic impact of wineries in Kings County, Nova Scotia. A Kings County input-output model is used to evaluate the economic impact in 2014, finding total impacts of \$11,977,622. The impact factors of demand for wine have on wine consumption is calculated. These impacts, and forecasted values of the factors of demand are used to estimate wine consumption in Nova Scotia in 2025. Based on this forecast, the production of wineries in Kings County in 2025 is estimated. Winery revenues are scaled proportionally with output and the Kings County input-output model forecast total impacts in 2025 to be \$17,442,048, a 46% increase from 2014.

Chapter 1: Introduction

There has been small-scale wine making in Nova Scotia since 1611 (Bell, 2014). This industry began to develop commercially in 1980, with the launch of the first commercial winery in the province, in Grand Pre. Since that time, the wine industry has grown to 20 wineries as of 2014. Of these, 6 produce dessert wines, fruit wines (non-grape fruits) or ciders, while the remaining 14 produce grape wines in varying scales, from small cottage wineries to large commercial wineries.

There has been no research conducted on the wine industry in Nova Scotia on a scale smaller than the provincial level. The first economic study of the Nova Scotian wine industry was released in 2006 with subsequent studies published in 2012 and 2013. These publications are reports prepared by consultants for the industry players. Of these three studies, one examined the economic impact of the wine and grape industry at a provincial level, one at the national level with provincial breakdowns and one examined the economic impact of the beverage alcohol industry in Nova Scotia with a breakdown by beverage type (wine, spirits and beer).

Kings County is, and historically has been, the center of Nova Scotia's wine industry. In 2005 there were eight wineries in the province including four in Kings County (Jozsa Management Economics; T.M. McGuire Ltd.; Kelco Consulting, 2006). By 2011, there were thirteen wineries in the province including six in Kings County (Frank, Rimerman + Co. LLP, 2013). Kings County wineries produce 27% of wine by volume in the province (unpublished Winery Association of Nova Scotia data).

This paper will calculate the economic impact of the wineries in Kings County, Nova Scotia in 2014 and forecast this impact in 2025. Chapter 2 will review methods of economic impact assessment. In Chapter 3, data collected from the wineries in Nova Scotia will be decomposed and allocated to the model used to assess economic impacts. A separate regression, to reveal the economic determinants of wine consumption in Atlantic Canada will also be developed. In Chapter 4, the Kings County input-output model will then be used to calculate the economic impact of the wineries in Kings County in 2014. To calculate the production of wine in Kings County in 2025 forecasted values of the economic determinants of wine demand will be applied to their respective coefficients from the regression revealing the impact each variable has on wine demand. The 2025 consumption estimate will be adjusted to reflect Kings County production. Kings County winery revenues will be adjusted proportionally with the expected change in production. These forecasted revenue figures and the same economic impact model as used previously will be used to estimate the economic impact of the wineries in Kings County in 2025. Finally, in Chapter 5 these results will be contextualized within the Kings County economy.

Chapter 2: Literature Review

This chapter investigates several methods to assess economic impacts at the sub-provincial level, reviews previous studies of the economic impact of wineries in Nova Scotia and investigates regressions assessing the economic determinants of wine demand.

2.1 Methods of Economic Impact Analysis

When investigating the economic impact of wineries in Kings County, there are many different ways these impacts can be calculated. Three will be discussed here, namely; the economic base model, the Keynesian multiplier model and the location quotient adjusted input-output model (hereafter referred to as an I/O model). These methods will be reviewed, and one will be selected to calculate the economic impact of wineries in Kings County. Before these methods are reviewed some fundamental concepts in economic impact assessment will be introduced.

Definitions

Final Demand: Demand for goods and services by the ultimate consumers.

Direct Impact: The change in final demand within a defined study area directly attributable to a particular economic activity or event.

Indirect Impact: The purchasing of inputs required to produce/provide the final good/service within the study area.

Induced Impact: The spending of profits wages and salaries within the study area by employees and owners of the companies producing/providing the final good/service and its inputs.

Total Impact: The summation of all direct, indirect and induced economic impacts within a defined study area.

North American Industry Classification System

In North America, (Canada, US and Mexico) industries are categorized by a North American Industry Classification System (NAICS) Code (Statistics Canada, 2012). These codes contain five digits, AABCD. The first two digits (AA) represent a particular sector, for example manufacturing is **31**. The next digit (B) represents a particular subsector, for example 31**2** is beverage and tobacco product manufacturing. The next digit (C) represents a particular industry group, for example 31**21** is beverage manufacturing. The last digit (D) indicates the particular industry, for example 3121**3** is wineries. This system allows the classification of industries in very broad or very specific groups, as necessary.

2.1.1 Economic Base Model

The economic base model divides the local economy into basic (exporting) and non-basic (non-exporting) industries. This division is made using location quotients, which are calculated as follows.

$$LQ = \frac{\text{percentage of Kings County income generated in industry } i}{\text{percentage of Nova Scotia income generated in industry } i}$$

All industries with a location quotient greater than one are considered to be basic industries while those with a location quotient less than or equal to one are considered to be non-basic. Non-basic industries are assumed not to export and it is assumed that a portion of basic industry income relies on inputs from non-basic

industries. Income attributable to exports for each basic industry is calculated as follows.

$$Ib_i = It_i \times (1 - 1 \div LQ_i)$$

Where:

Ib_i = basic income in industry i

It_i = total income in industry i

LQ_i = location quotient for industry i

This calculation is made across all industries and finally the income multiplier can be calculated as follows.

$$\text{Income Multiplier} = It \div Ib$$

Source: (VanBlarcom, A Comparison of Methods for Assessing the Short-Run Economic Impacts of Tourist Spending on a County Economy, 2007)

Because Kings County is a small region, the economic base model will use classifications at the sector due to data confidentiality reasons. The income multiplier calculated above is then used to reveal the indirect impacts of income generated by all basic sectors within the study area. This model calculates the indirect impacts of spending on the study area but does not reveal the impact of households, spending profits and wages and therefore cannot calculate the total impacts of the wineries in Kings County.

2.1.2 Keynesian Multiplier Model

The Keynesian multiplier model is used to obtain a Keynesian income multiplier, which will isolate the income effects of the wineries in Kings County and reveal the total income effects of revenue generated by the wineries. The income multiplier approach is as follows.

$$Y = X \times (A \div (1 - (B \times C)))$$

Where:

Y = The total income effect of wineries in Kings County

X = Revenues generated by wineries

A = Proportion of revenues remaining in the economy after first round of leakages

B = Proportion of residents income spent locally

C = Proportion of spending by residents that accrues as income in the local area

Source: (VanBlarcom, A Comparison of Methods for Assessing the Short-Run Economic Impacts of Tourist Spending on a County Economy, 2007)

The leakages referred to in this model are spending on inputs to winery production from outside Kings County. Unlike the base model, the Keynesian multiplier applies to all income generated within the study area, not just exporting industries. This model reveals „the indirect impacts of spending on the study area but does not reveal the impact of households, spending profits and wages and therefore cannot calculate the total impacts of the wineries in Kings County.

2.1.3 Input-Output Model

“Input-output (I/O) analysis attempts to quantify, at a point in time, the economic interdependencies of an economy (Hastings and Brucker, 1993).” These interdependencies are the productive linkages throughout the Kings County economy. Production requires physical inputs as well as labour. Tracing these inputs, including labour, back from final demand reveals the total impact of an economic activity.

Because Kings County is a small region, the I/O model uses classifications at the sector level due to data confidentiality reasons. Winery revenues are allocated to the appropriate sectors of the I/O model based on the NAICS industry and sector they correspond with. Within the I/O framework, economic activity is classified as either inter-industry production or final demand. Depending on their primary output, producers are assigned to a particular industry. Statistics Canada records the value of production by firms in each industry and the sources and value of the inputs used in production. This record is similar to a financial accounting framework that tracks expenditures related to production. This framework can be summarized in a matrix showing the relationship between output and inter-industry production. The values in this matrix are the inter-industry inputs (purchases) on a per dollar basis between the industry in the column heading and all other corresponding industries (rows). The I/O model uses this data to calculate the total impact of spending from a particular economic event. The model can be summarized in matrix form as follows.

$$X^* = (1 - A^*)^{-1}F^*$$

Where:

X^* = The total output vector

$(1 - A^*)^{-1}$ = The closed model total requirements matrix (Leontief inverse)

F^* = Direct impacts of the economic activity in question

Source: (VanBlarcom, A Comparison of Methods for Assessing the Short-Run Economic Impacts of Tourist Spending on a County Economy, 2007)

Location quotients show local industrial specialization relative to the larger geographic area by comparing the proportion of employment in each industry in the

sub-region with the corresponding proportion at the provincial level. Location quotients were calculated for each sector in the model, using the formula below and the matrix underlying the model was adjusted accordingly.

$$LQ = \frac{\text{percentage of Kings County employment in industry } i}{\text{percentage of Nova Scotia employment in industry } i}$$

This model is closed with respect to households. In the closed model, a household vector is included in the inter-industry matrix. Including this vector reveals the impact of wages, profits and subsequent re-spending via households on all sectors within the model. The impact of wages earned by employees on the study area is synonymous with the induced impacts. In contrast, an open model would not include a household vector in the inter-industry matrix and therefore, the impact of household spending on other sectors of the economy could not be calculated. By using a closed model, total impacts of economic activity can be calculated.

2.2 Model Evaluations

2.2.1 Economic Base Model

This model is crude when it comes to assessing economic impacts as it views exports as the sole source of economic growth. The allocation of industries to basic and non-basic categories creates simplicity but does not consider the true nature of industries, particularly, whether or not we expect exports from the industry.

Additionally, this model produces only one multiplier, hence producing results with limited detail. Finally, this model cannot calculate the induced impacts of economic activity and therefore cannot calculate the total impacts of the wine industry in Kings County.

2.2.2 Keynesian Multiplier Model

This model has a firm base in economic theory, however, it does not capture induced impacts of spending in the study area. This is a major drawback as induced impacts are necessary to calculate the total impact of spending in the study area. Once again, this model produces a single multiplier although this multiplier is calculated based on an average of sector multipliers and should more accurately reflect the true state of the economy than the base multiplier. Because of the inability of this model to reveal the induced impacts of winery revenues, it will not be used to calculate the economic impact of wineries in Kings County

2.2.3 Input-Output Model

The location quotient adjusted provincial input-output model provides the most detailed results and therefore will be the model used to estimate the economic impact of the wineries in Kings County. A much more complete picture of the Kings County economy is obtained as a result of calculating the impact of spending in each industry separately. Additionally, including a household vector in the model allows the total impacts of the wine industry to be calculated unlike the previous two models. Therefore, the I/O model will be used to calculate the economic impact of wineries in Kings County.

2.3 Economic Impact of the Nova Scotia Wine Industry, 2005

The significance of the wine industry to the Kings County economy has never been quantified. This thesis seeks to estimate the economic impact of the wine and

grape industry in Kings County. Previous research as it relates to the economic significance of the wine industry in Nova Scotia is reviewed in what follows.

2.3.1 Economic Impact of the Nova Scotia Wine Industry (2006)

(Jozsa Management Economics; T.M. McGuire Ltd.; Kelco Consulting)

This study collected data directly from wineries, grape growers and the Nova Scotia Liquor Corporation (NSLC) for the year 2005 encompassing all inputs required in the production of wine. This data was aggregated into the appropriate NAICS sector, then the provincial input-output model was used to estimate the direct and total economic impacts, summarized in Table 2.1. In 2005, 751,500L of wine was sold, valued at \$ 7,156,200.

Table 2.1

Economic Impact of Farm Winery Industry and Grape Vineyards 2005

2006 \$	Direct Impacts	Indirect and Induced	Total
GDP	\$ 3 647 000	\$ 3 333 000	\$ 6 980 000
Government Revenue	\$ 173 000	\$ 233 000	\$ 406 000
Household Income	\$ 2 204 000	\$ 2 068 000	\$ 4 272 000
Employment (Person Years)	111	57	168

Source: (Jozsa Management Economics; T.M. McGuire Ltd.; Kelco Consulting;, 2006)

Based on the 2005 results of this model, this study forecasts the economic impact of the wine industry in 2020 by developing a forecast of wine production in

Nova Scotia. This forecast relies on estimated consumption and market share data. National wine consumption measured on a per capita basis grew 4.31% annually from 1995 to 2005 while the provincial trend increased 6.55% annually. The average of these two growth rates of 5.43%, is the annual increase in wine consumption used to forecast demand in 2020. In addition to the growth in consumption, the study estimated the share of wine sold in Nova Scotia that has been produced in Nova Scotia will increase from 9.05% to 13.45% by 2020 based on growth and market share data from “The Wines of Nova Scotia: A Marketing Strategy and Three Year Action Plan (Confidential report, publication information unavailable).”

This forecasted growth in consumption and market share is used to estimate the total volume of wine production in the province in 2020. This 2020 production estimate is used to increase all the variables on which the economic impact calculation is based. These variables remain constant per liter of output and therefore increase proportionally with total output. These forecasted values and the same economic impact model as was used in 2005 are used to calculate the direct and total impacts of the wine and grape industry in 2020. The results are summarized in Table 2.2.

Table 2.2

Economic Impact of Farm Winery Industry and Grape Vineyards 2020

2006 \$	Total 2020	Total 2005
GDP	\$ 22 540 000	\$ 6 980 000
Government Revenue	\$ 1 310 000	\$ 406 000
Household Income	\$ 13 800 000	\$ 4 272 000

Employment (PY)	543	168
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Source: (Jozsa Management Economics; T.M. McGuire Ltd.; Kelco Consulting; 2006)

2.3.2 Other Nova Scotia Wine Industry Economic Impact Studies, 2011

“The Economic Impact of the Nova Scotia Beverage Alcohol Industry” (Gardiner Pinfold Consultants Inc., 2012) calculated the economic impact of the entire beverage alcohol industry with direct impacts isolated by beverage type. The direct impact of wineries in Nova Scotia in 2011 is reported in Table 2.3.

Table 2.3

Direct Economic Impact of Wineries in Nova Scotia, 2011

2011 \$	Direct Impact
Direct Impact	\$ 11 088 000
Government Revenue	NA
Household Income	\$ 5 986 000
Employment (PY)	175

Source: (Gardiner Pinfold Consultants Inc., 2012)

Like Jozsa Management Economics, T.M. McGuire Ltd. and Kelco Consulting (2006), this report uses the Nova Scotia I/O model to estimate the indirect and induced impacts of wineries in the province. Gardiner Pinfold Consultants Inc do not make any projections regarding the industry. Total impacts for the wine industry alone cannot be obtained as the I/O model used in this report includes all beverage types simultaneously, individual impacts by beverage type cannot be obtained.

“The Economic Impact of the Wine and Grape Industry in Canada 2011” (Frank, Rimerman + Co. LLP, 2013) is the final study available that investigates the economic impact of wineries in Nova Scotia. This study was conducted at a national

level but all results are reported by province. The results of this study as relevant to the province of Nova Scotia are summarized in Table 2.4.

Table 2.4

Economic Impact of Wine and Grape Industry in Canada 2011 (Nova Scotia data)

2011 \$	Direct Impact	Indirect and Induced	Total
GDP	\$ 80 940 000	\$ 59 260 000	\$ 165 567 000
Government Revenue	\$ 25 367 000	NA	\$ 25 367 000
Household Income	\$ 15 798 000	\$ 14 921 000	\$ 30 179 000
Employment (PY)	555	299	854

Source: (Frank, Rimerman + Co. LLP, 2013)

The source of data for this report is unclear however; it clearly differs from the previous two reports, as the results are significantly different. Some of this data is not compatible with similar statistics reported by Statistics Canada. The report states Nova Scotian wineries sold 5,904,000L of wine in the province (not including exports and sales to other provinces) in 2011. For the same period, Statistics Canada reports Nova Scotians purchased only 3,320,000L of wine (CANSIM 183-0006). There are significant differences in figures used by this study, and the Gardiner Pinfold Consultants Inc. report, which may explain why the reported economic impacts differ so considerably. Once again, this report does not consider the future economic impact of the wine and grape industry.

2.5 Forecasting Wine Demand in Nova Scotia, 2025

Forecasting the economic impact of the wineries in Kings County is dependent on forecasting production volumes. In the reports examined, winery revenues increased proportionally with production volumes. Therefore, a forecast

must be developed to estimate the volume of wine produced in Kings County in 2025. This calculation occurs in several steps as detailed in the following pages.

Canada is not a major wine exporter, with exports representing only 5% of all wine produced in Canada by value (CANSIM 183-0006, -0016). Additionally, there is limited interprovincial trade in Nova Scotia wine as it does not receive the same preferential mark-up outside of the province. With exports representing such an insignificant part of the demand for wine, it is clear that wine production in Nova Scotia is driven primarily by demand factors internal to Nova Scotia. Therefore, it is necessary to develop a model that can be used to estimate the demand for wine in Nova Scotia in order to forecast the volume of wine produced in Nova Scotia.

Ogwang and Cho (2009) develop a fixed effects model based on factors of wine demand that can be applied to the demand for wine in Nova Scotia. The dependent variable in Ogwang and Cho's model is the per capita consumption of wine. The explanatory variables are prices of wine, beer and spirits, income and unemployment. The model specification for the determinants of wine demand in the i^{th} province in the t^{th} year is as follows.

$$\ln WineConsumption_{it} = \alpha_i + \delta_t + \beta_1 \ln WinePrice_{it} + \beta_2 \ln BeerPrice_{it} + \beta_3 \ln SpiritsPrice_{it} + \beta_4 \ln Income_{it} + \beta_5 Unemployment_{it} + u_{it}$$

This model specification includes own prices, prices of substitutes and income, as we would expect based on microeconomic theory. All of these variables are transformed by the natural logarithm in the model, which allows the results of the model to reveal the elasticity of demand for wine with respect to these

explanatory variables. Also included in the model are provincial dummy variables, a time series variable and an error term. Interestingly, the model includes an unemployment variable which is found to have an insignificant impact on the demand for wine and spirits but a significant impact on the demand for beer. The unemployment variable is included along with the income variable, "in an attempt to capture the impact of business cycles on the consumption of alcoholic beverages (Ogwang & Cho, 2009)." The model does not include any parameters for tastes and preferences, expectations of future prices or the price of complementary goods. This model specification is consistent with other studies determining the socio-economic determinants of demand for alcoholic beverages including the ones listed below. Yu and Chen (1998) include wine, beer and spirit prices, per capita GDP and unemployment in their model to estimate demand for alcoholic beverages. They acknowledge there are conflicting hypotheses regarding the impact of unemployment but nonetheless choose to include an unemployment variable. Selvanathan and Selvanathan (2005) include wine prices, beer and spirit prices and income in their model to estimate alcohol consumption. These authors do not address unemployment when discussing their model selection so their reasoning for excluding it is unclear. However, all other variables used in their model are consistent with the previous two models discussed.

Chapter 3: Methodology and Data

3.1 Kings County Input-Output Model

Dr. Brian VanBlarcom of Acadia University developed the Kings County I/O model. This model is based on the Nova Scotia I/O model. The provincial I/O model relies on Statistics Canada data reported for the province as a whole. To create a Kings County model, the provincial model was used as a base and transformed to reflect the Kings County economy using location quotients as previously described.

3.2 Allocating Data to the Input-Output Model

3.2.1 Winery Survey Data

As mentioned previously, there were seven wineries operating in Kings County as of 2014. These wineries were contacted in an effort to gather revenue data. The survey included information on the following variables, with all respondents using 2014 data.

- Production Volume (Liters)
- Direct Sales: On premises or at farmers markets (\$)
- Sales through NSLC: Sales to NSLC, restaurants and private wine stores (\$)
- Restaurant/catering revenues (\$)
- General merchandise/clothing sales (\$)
- Other revenues (\$)

The survey results were then sent directly to a lawyer who aggregated the results and returned an aggregated data set in order to maintain anonymity. As not all wineries in Kings County responded to the survey, data from the sample that did respond was scaled to represent all data for Kings County wineries. Consistent with

previous studies, it is assumed revenues are proportional with output of wine (in liters). Wineries in the sample (S) that responded represented $\frac{S}{KC}$ of the total wine production in Kings County (KC). To estimate the total revenues in Kings County all sample revenue figures were increased by $\frac{KC}{S}$. Once the figures were adjusted to represent the study area as a whole, they were allocated to the appropriate sectors in the I/O model. The I/O model sectors are shown in Table 3.1.

Table 3.1

Kings County Input-Output Model NAICS Codes

Sector/Industry	NAICS Code	Sector/Industry	NAICS Code
Agriculture	111-112	Retail Trade	44-45
Forestry and Logging	113	Transportation	48-49
Fishing, Hunting and Trapping	114	Finance, Insurance, Real Estate	52-53
Support Activities for Agriculture/ Forestry	115	Business Services	54-56
Mining	21	Accommodation & Food Services	72
Utilities	22	Other Services	71, 81
Construction	23	Hospitals Health Care	62
Food Manufacturing	311	Education	61
Other Manufacturing	312-339, 32-33	Government (Fed/Prov/Municipal)	91

It must be noted that the survey revenue categories do not perfectly correspond with sectors in the I/O model. Therefore, a process must be carried out to decompose these revenues and allocate them to the appropriate sector according to the NAICS.

3.2.2 Wine Retail Pricing Structure

The pricing formula for wine sold in Nova Scotia is as follows (Jozsa Management Economics; T.M. McGuire Ltd.; Kelco Consulting, 2006).

$$\text{Retail Price} = ((\text{winery price} + \text{freight} + \text{excise \& customs}) \times \text{retailer mark-up}) + \text{HST} + \text{bottle deposit}$$

Winery price

Revenue the manufacturer (winery) generates once all excise taxes have been paid.

Freight

From available data and the survey conducted there is insufficient information regarding freight costs to include these costs in the model. Therefore, freight costs are assumed to be zero.

Excise and Customs

Excise tax is levied on this manufacturer cost at a rate of \$0.62 per liter for all wines with more than 7% ethyl alcohol by volume (Canada Revenue Agency, 2014). There are other excise tax rates for less alcoholic wines however, as the typical wine has an alcohol content of 12%-14.5% it is reasonable to assume all wine produced will exceed this 7% threshold. Customs are not applicable to wines produced and sold in Nova Scotia, as they are not crossing any borders to reach their market.

Retailer Mark-up

The retailer mark-up in Nova Scotia is 133% for all imported wines. However, the Farm Winery Act reduced this mark-up to 43% for all wines with at

least 85% Nova Scotia grape content (Nova Scotia Agriculture, 2007). This retail mark-up includes both the retail and wholesale trade margin, which must be separated for the purposes of the I/O model. The wholesaling responsibilities of the NSLC are outlined in the quotation below.

The NSLC also serves as a wholesaler with the exclusive responsibility to acquire and distribute beverage alcohol in Nova Scotia that makes up approximately 18 % of NSLC net sales revenue. The NSLC wholesale market involves supplying beverage alcohol products to the province's 2,100 licensed premises (restaurants, bars, lounges, and hotels licensed to sell beverage alcohol), along with private wine and specialty stores and NSLC agency stores. Of the NSLC's wholesale net sales revenue, licensees make up 58 percent, NSLC agency stores, 35 percent, and PWSS, 6 percent. (Gardiner Pinfold Consultants Inc., 2012)

In NSLC data, the retail and wholesale trade margins are published as a joint 43% mark-up. This mark-up is applied through all sales avenues in the province including NSLC stores, private winery stores and direct winery sales. The only price variation observed is a small difference in NSLC prices compared with wineries and private wine stores as the NSLC rounds prices up to the nearest \$0.99 and many wineries and private wine stores do not. For the purposes of the I/O model, the Nova Scotia aggregate industry wholesale trade margin of 17.2% in 2012 is used to separate retail and wholesale mark-ups in this 43% mark-up (CANSIM 081-0014). It is assumed that the remaining 25.8% of the mark-up (after the 17.2% wholesale trade margin is deducted) is allocated to the retail sales margin. Retail and wholesale portions of the mark-up will be allocated to their respective sectors in the I/O model.

The sole exception to this wholesale system are sales made directly by wineries on their premises or at farmers markets. These sales are not included in the NSLC wholesale process. In this case, the revenue sharing mark-up allocation is 95% to the winery and 5% to the NSLC (Nova Scotia Agriculture, 2007). This 5% will be allocated to government revenues much like a tax, as a government agency with regulatory authority is collecting revenues without providing any services.

Harmonized Sales Tax

The governments of Canada and Nova Scotia together collect a value added Harmonized Sales Tax (HST) of 15% (Canada Revenue Agency, 2010). It is assumed taxes are collected and sent to their respective governments outside of the study area. Therefore, all appropriate categories are reduced by the applicable HST rate when converting sales to local final demand.

Bottle Deposit

In Nova Scotia, consumers pay a bottle deposit of \$0.20 on all bottles over 500 mL and receive \$0.10 upon returning the bottle. As the typical bottle of wine is 750 mL this works out to a \$0.267 deposit per liter of wine. Canada has one of the highest bottle recycling rates in the world with 97% of all beer bottles sold by the members of the Brewers Association of Canada returned (Nova Scotia Liquor Corporation, 2011). It is assumed this return rate is similar for wine bottles therefore; consumers will recover \$0.097 of every \$0.10 they are eligible to. As only 6.4% of the population of Nova Scotia lives within Kings County it is expected that consumers in Kings County will receive 6.4% of the refunds in the province

(Statistics Canada, 2015). The remainder of the deposit that is not expected to be refunded to consumers is allocated to government revenue

3.2.3 Allocating Winery Survey Data

Once the winery survey data has been scaled to represent all of Kings County, it must be allocated to the appropriate categories in the I/O model. The pricing structure outlined in section 3.2.2 is used to decompose winery revenues.

Direct Sales

The direct sales reported by the wineries are the final sales to consumers. This price includes all taxes, fees and mark-ups, which must be allocated to the appropriate sectors in the I/O model. First, the bottle deposit of \$0.267/L is subtracted from total direct sales. Of this deposit, consumers are expected to recover \$0.13. The deposit will be allocated according to the portion of the Nova Scotia population living in Kings County as described previously. Once the bottle deposit has been subtracted, the 15% sales tax is deducted from the remaining sales figure. This too is allocated to government revenue and treated as a leakage from the local economy.

Once the sales tax has been deducted, the retail sales mark-up must be separated from the remaining revenue. As this is a sale by the winery, there is no wholesaler involved however these direct prices per bottle are nearly identical to NSLC prices that are marked up by 43%. Therefore, we will subtract this same retail sales mark-up from the remaining sales figure. The revenue sharing mark-up allocation dictates that the NSLC collects 5% of this mark-up. As described

previously, this 5% of the mark-up is allocated to government revenues. The remaining 95% of the retail sales mark-up shall be allocated to the retail sales sector. The final tax to be levied is the excise tax at a rate of \$0.62 per liter. The entirety of this tax is allocated to government revenues. Once the excise tax has been subtracted from the remaining sales, all that remains is the price the manufacturer receives. This figure is allocated to the food manufacturing industry of the I/O model.

Sales Through the NSLC

Sales to and through the NSLC (as a wholesaler) are reported by the wineries using the price at which the NSLC purchases the wine. This price includes the manufacturer price and excise taxes but does not include the retailer mark-up and HST. To begin, the winery price and excise tax must be separated and allocated to the appropriate sectors. The excise tax rate of \$0.62 per liter is allocated to government revenue. What remains is the manufacturer price as described by the previous formula, this is allocated to food manufacturing.

Economic impacts of the wine as it travels from the wholesaler to the final consumer must also be considered to account for the full economic impact of the wineries. The first step in this process is adding the retail mark-up. As stated previously, the retail mark-up includes both retail and wholesale trade margins. These margins must be allocated appropriately. The NSLC Distribution Center is in Bayers Lake Business Park, just outside of Halifax and therefore the wholesale margin portion of the retail sales mark-up cannot be considered a direct impact within Kings County. The NSLC does have retail stores in Kings County. The retail

sale mark up will be allocated by population. With 6.4% of Nova Scotia's population living in Kings County, 6.4% of the retail sales mark up will be considered a direct impact in Kings County. Beyond the mark-up, there is once again a 15% HST. Finally, the bottle deposit of \$0.267/L is allocated to households and the government in the same manner as done previously.

Wine Tasting Revenue

Wine tasting is a service and an experience offered by wineries. This revenue stream most closely fits in NAICS 72241 Drinking Places (Statistics Canada, 2012). This industry is included in the accommodation and food services sector in the Kings County I/O model. Like other revenues, the 15% HST is deducted and allocated to government revenue. The remainder of the revenues from wine tasting are allocated to the accommodation and food services sector.

Restaurant and catering revenues

Many wineries have on site restaurants or offer catering for special events. The revenue from these services is taxed at 15% which is allocated to government revenues with the remainder allocated to the accommodation and food services sector.

General merchandise and clothing sales

Many wineries operate retail shops where wine and a variety of merchandise can be purchased. Wine sales have already captured in the direct wine sales category. As before, the revenues are taxed at 15% with the value of the tax allocated to government revenue. The retail trade industry margin in Nova Scotia is

26.6% (CANSIM 080-0023) and this margin is used to allocate a portion of these sales to the retail trade industry. As very little wholesaling and manufacturing occurs within Kings County, all other steps in the production chain are assumed to occur outside of Kings County and therefore will not impact local final demand.

Other revenues

Finally, there are other revenues that were not captured by the other survey questions. These revenues could include venue rental fees. These revenues represented only 1.6% of total winery revenues. These transactions are taxed at 15%. The exact source of these revenues is unclear however wine sales should be captured by the direct wine sales and sales through NSLC categories. Likewise, retail sales should be captured by the general merchandise and clothing category therefore, these remaining revenues will be allocated to the accommodation and food services sector.

3.3 Economic Determinants of Wine Consumption

Separately from the I/O model, another regression to forecast the expected consumption in Nova Scotia is developed. This forecast will then be used to estimate wine production in Kings County in 2025. Canada is primarily a wine importer, being the 6th largest importer of wine globally and a very minor wine exporter, exporting only 5% of production by volume with over a third of these exports being ice-wines (Rabobank International, 2012) (MacQueen, 2014). Because of this market structure and the preferential mark-up structure wineries face in Nova Scotia, there is very little incentive to sell beyond the borders of Nova Scotia and

hence very little wine is exported from from Nova Scotia. Therefore, we can closely associate changes in consumption of wine in Nova Scotia with changes in production.

To estimate wine consumption in Nova Scotia in 2025, a regression is developed based on existing research, particularly that of Ogwang and Cho (2009). The regression is similar to the ones discussed previously, in that it uses prices, GDP per capita and unemployment to estimate per capita wine consumption. The small difference between this specification and that of Ogwang and Cho is the inclusion of a GDP per capita explanatory variable (Ogwang and Cho used income per capita). This difference is consistent with Yu and Chen (1998) and Selvanathan and Selvanathan (2005) who also use GDP per capita in the place of an income coefficient in a similar model. The model specification is as follows.

$$\ln WineConsumption_{it} = \alpha_i + \delta_t + \beta_1 \ln WinePrice_{it} + \beta_2 \ln BeerPrice_{it} + \beta_3 \ln SpiritsPrice_{it} + \beta_4 \ln GDP_{it} + \beta_5 Unemployment_{it} + u_{it}$$

Where:

WineConsumption_{it}: Measures in liters per capita (15+) per year in province *t*, year *i*

α_i : Provincial dummy variable

δ_t : Time variable

WinePrice_{it}, *BeerPrice_{it}*, *SpiritsPrice_{it}*: Price indices for the respective beverages with 2002 as a common base year

GDP_{it}: Gross Domestic Product per capita

Unemployment_{it}: Unemployment rate

This model uses annual data collected from the Atlantic Provinces (Newfoundland and Labrador, Prince Edward Island, New Brunswick and Nova Scotia) for the twenty years spanning 1994 to 2013. All data comes from Statistics Canada's CANSIM database, with the exception of the provincial dummy variables

and the time variable, which were generated independently. This is a fixed effects linear regression model using panel data whereby the regression assumes unknown variables that are not included in the regression have a constant impact on wine consumption.

3.3.1 Forecasting Consumption

Once the regression has been run and the coefficients for all the explanatory variables have been obtained, these coefficients can be combined with forecasted 2025 values for each of the explanatory variables to generate a forecast for wine consumption. A review of the forecasts for the independent variables follows.

Time

This time-trend variable is simply increased to 32 as 1994 = 1, therefore 2025 would be the 32nd year in the model.

Wine, Beer and Spirit Prices

Wine, beer and spirit prices are increased based on the average annual increases observed in the last five years of the existing data (2009-2013). Wine and spirit prices are predicted to increase at 2% per year while beer prices are predicted to increase at a rate of 1.9% annually.

Gross Domestic Product per Capita

Nova Scotia's GDP per capita in 2025 is estimated by the Conference Board of Canada in their 2014 Long-Term Economic Forecast for the province.

Unemployment

Nova Scotia's unemployment rate in 2025 is estimated by the Conference Board of Canada in their 2014 Long-Term Economic Forecast for the province.

3.3.2 Applying the 2025 Forecast to the Input-Output Data

With forecasts for all the explanatory variables, the regression coefficients from the regression of economic determinants of wine consumption can be applied to each explanatory variable to estimate wine consumption per adult (15+) in Nova Scotia in 2025.

Calculating per-capita wine consumption in 2025 is the first step in the process of forecasting Kings County wine production in 2025. The next step is to calculate total wine consumption in Nova Scotia in 2025. Using the per capita consumption estimate developed above and Statistics Canada's estimate of the population (15+) of Nova Scotia in 2025 total wine consumption in the province can be estimated. Based on unpublished data from the Winery Association of Nova Scotia, 15% of the wine consumed in Nova Scotia is produced in the province. Of all the wine produced in the province, currently 27% of it originates in Kings County. By applying these ratios it is possible to estimate the volume of wine produced in Kings County as 4.1% of all wine consumed in Nova Scotia. With the current and forecasted production figures for the study area, the inputs to the I/O model can be increased proportionally with production volume. Running these forecasted impact figures through the I/O model reveals the forecasted total economic impact of the wineries in Kings County in 2025.

Chapter 4: Results

4.1 Interpreting Results from the Input-Output Model

The I/O model calculates total economic impact by sector for all sectors shown in Table 3.1. The following results are usually reported in I/O analysis; direct impacts, indirect impacts, induced impacts, total impacts, government revenue and employment.

Direct Impacts

Direct impacts are calculated by summing the inputs to the model that apply to the Kings County economy. This is not the revenue data reported by the wineries but the data, after all adjustments are made that is found to apply to Kings County hence producing the change in local final demand.

Total Impacts

As this I/O model is closed with respect to household spending, the direct, indirect and induced impacts are contained in the model. The summation of all outputs of the model, with the exception of the household output, reveals total impacts.

Government Revenue

Government revenue is not calculated from the I/O model output as HST and the other taxes were treated as leakages from the local economy. Therefore, they are not considered to be final demand changes in Kings County resulting from the wine industry. Government revenue is calculated during the process of allocating winery

revenues to the appropriate categories of the I/O model. This captures all government revenues directly associated with the wine produced in Kings County, regardless of whether they were collected inside or outside Kings County.

Household Income

Household income calculated by the I/O model, is the total income generated in Kings County from all impacts of winery revenues. This includes income generated direct indirect and induced economic activity associated with the wineries in Kings County.

Employment

Employment figures are calculated by dividing the household income output of the I/O model by the Kings County median income. The Kings County median income is based on 2006 census data (Nova Scotia, 2014). As this is the most recent data available the Kings County median income is increased proportionally with the change in Nova Scotia median income observed from 2006 to 2014 as reported by Statistics Canada. To estimate 2025 median income a similar procedure is followed using the Conference Board of Canada's 2025 projection of median household income in the province.

4.2 Assumptions

As this paper includes a forecast, a brief summary of assumptions embedded in the projections is provided below.

The data collected from wineries is a representative sample for the whole of Kings County.

Multiple wineries operating in the study area volunteered data with the participating wineries representing 66% of Kings County wine production by volume. Reporting wineries were of varying scales with varying business models.

No Exports.

Canada is a very minor wine exporter. Interprovincial trade data is not available however only 5% of wine produced in Canada is traded internationally (CANSIM 183-0006, -0016). Additionally, Nova Scotia wineries do not receive the same preferential 43% mark-up anywhere outside of the province. This mark-up provides the wineries stronger margins and the ability to compete on price within the province. Finally, in interviews with industry players, the high costs of developing recognition outside of the province is frequently mentioned as inhibiting exports.

Nova Scotia produced wine will remain 15% of wine consumed in Nova Scotia.

This allocation could change as a result of changing local or world prices or as a result of changing consumer preferences. There is little reason to believe the pricing structure of wine in Nova Scotia will fundamentally change during this ten-year period. Likewise, there are assumed to be no fundamental changes in the price of wine produced globally during this ten-year period. The other factor that could drive a change in this allocation is a change in consumer preferences. To this end, there are currently no plans for an industry wide marketing campaign although tastes and preferences could otherwise shift.

Kings County will continue to be the source of 27% of the wine produced in Nova Scotia.

This assumption is based on the current allocation. In the short term, this figure may be below what can be expected as one winery in Kings County opened midway through 2014 and will have a full year of sales in 2015 and each year thereafter. Additionally, the Lightfoot and Wolfville Winery is expected to open in 2016, also within Kings County (Lightfoot & Wolfville Winery, 2014). This winery will produce small quantities of wine but nevertheless it will have some impact on total wine production in Nova Scotia. There are no other wineries in Nova Scotia expected to open in the near future, however wineries throughout the province could change production volumes. This 27% allocation looks to be a reasonable assumption however; it is difficult to project these changes over a ten-year period.

4.3 Economic Impact, 2014

The economic impact of wineries in Kings County in 2014 is summarized in Table 4.1.

Table 4.1

Economic Impacts of Kings County Wineries, 2014

2014 \$	
Winery Revenue	\$ 9 254 818
Direct Impact (Final Demand)	\$ 8 081 034
Total Impact	\$ 11 977 622
Government Revenue	\$ 1 802 087
Household Income	\$ 3 114 052
Employment (PY)	118

These results indicate wineries have a modest impact on the Kings County economy, their total impact represents 0.5% of total expenditures in the region (Nova Scotia, 2014). Model outputs by sector are presented in Table 4.2.

Table 4.2
Economic Impact results by Sector, 2014

Sector / Industry	Output (Expenditures)	Share of Total Output
Agriculture	\$488,475	4.1%
Forestry and Logging	\$18,639	0.2%
Fishing, Hunting and Trapping	\$388,944	3.2%
Support Activities for Agriculture and Forestry	\$58,193	0.5%
Mining	\$31,373	0.3%
Utilities	\$135,631	1.1%
Construction	\$104,521	0.9%
Food Manufacturing	\$6,042,650	50.4%
Other Manufacturing	\$215,168	1.8%
Wholesale Trade	\$178,650	1.5%
Retail Trade	\$1,324,775	11.1%
Transportation	\$27,851	0.2%
Finance, Insurance, Real Estate	\$863,723	7.2%
Business Services	\$123,555	1.0%
Accommodation and Food Services	\$1,800,897	15.0%
Other Services	\$65,230	0.5%
Hospitals Health Care	\$42,919	0.4%
Education	\$43,657	0.4%
Government (Fed/Prov/Municipal)	\$22,771	0.2%
Households	\$3,114,052	

The impacts of the wineries in Kings County are concentrated in the food manufacturing, retail trade and accommodation and food services sectors. This concentration is expected, as most of the direct impacts of the wine industry were allocated to these sectors as described in Section 3.2.3. The impact of the agricultural sector may seem modest in comparison with total impacts of an industry that refines a raw agricultural product. This finding is consistent with previous data. In 2013 the farm gate value of grapes used in the industry represented 12.0% of wine sales in Nova Scotia (Nova Scotia Agriculture, 2014). The results of the 2014 Kings County I/O model indicate an impact on the agricultural industry in Kings County of 8.4% of total wine sales. This is a reasonable finding as some of the grapes used to produce wine in Kings County may be sourced from outside of the county. Jobs created by the wine industry in Kings County are distributed throughout these industries with the highest concentrations being in the food manufacturing, retail trade and accommodation and food services sectors.

As tourists come to visit these wineries, tourist spending is primarily captured in the accommodation and food services, and retail trade sectors. Many of the people visiting wineries in Kings County do not live in Kings County and otherwise may not choose to visit. Developing the tourism potential of this industry is one of the primary goals of the Nova Scotia Wine Development Board, which was established in August of 2014 (Nova Scotia Agriculture, 2014).

4.4 Economic Determinants of Wine Consumption

Once the impacts of wineries in Kings County in 2014 are established, a regression to reveal the impact of factors of demand on the consumption of wine is developed.

$$\ln WineConsumption_{it} = \alpha_i + \delta_t + \beta_1 \ln WinePrice_{it} + \beta_2 \ln BeerPrice_{it} + \beta_3 \ln SpiritsPrice_{it} + \beta_4 \ln GDP_{it} + \beta_5 Unemployment_{it} + u_{it}$$

The results of the model are shown in Figure 4.1.

Dependent Variable: LOG(CONSUMPTION)
 Method: Panel Least Squares
 Sample: 1994 2013
 Periods included: 20
 Cross-sections included: 4
 Total panel (balanced) observations: 80

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.4429	1.7175	3.7514	0.0004
LOG(WPI)	-0.7810	0.2437	-3.2044	0.0020
LOG(BPI)	-0.6347	0.3023	-2.0992	0.0394
LOG(SPI)	0.0377	0.2508	0.1505	0.8808
LOG(GDP)	0.1203	0.0762	1.5781	0.1191
UNEMPLOYMENT	-0.2743	0.9460	-0.2899	0.7728
TIME	0.0640	0.0084	7.5977	0.0000

Effects Specification
 Cross-section fixed (dummy variables)

R-squared	0.9630	Mean dependent var	1.9517
Adjusted R-squared	0.9582	S.D. dependent var	0.3268
S.E. of regression	0.0668	Akaike info criterion	-2.4571
Sum squared resid	0.3126	Schwarz criterion	-2.1594
Log likelihood	108.2843	Hannan-Quinn criter.	-2.3377
F-statistic	202.1611	Durbin-Watson stat	1.3395
Prob(F-statistic)	0.0000		

Figure 4.1

Economic Determinants of Atlantic Wine Consumption

Data Sources:

Price Indices: CNASIM 326-0021

GDP per Capita: CNASIM 384-0038, 051-0001

Unemployment: CANSIM 282-0087

This regression uses annual data from Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland and Labrador spanning 1994 to 2013.

Wine Price Index

The price of wine is negatively correlated with the volume of wine consumed in the Atlantic Provinces. This finding conforms to basic economic theory and the results of other research that has been conducted on the topic.

Beer Price Index

The price of beer is negatively correlated with the volume of wine consumed in the Atlantic Provinces. This claim is true at both 90% and 95% levels of confidence however, the relationship is not strong enough to make the same claim with a 99% level of confidence. This relationship reveals wine and beer to be complementary goods. This is an unexpected finding and does not conform to findings by other research including that of Ogwang and Cho (2009).

Spirits Price Index

The price of spirits is not found to have a measureable impact on the consumption of wine in the Atlantic Provinces.

Gross Domestic Product per Capita

GDP per capita is not found to have a measureable impact on the consumption of wine in the Atlantic Provinces. Ogwang and Cho (2009) suggest this relationship to be a positive relationship however; the results from Figure 4.1 are not strong enough to make such a claim.

Unemployment

Unemployment is not found to have a measureable impact on the consumption of wine in the Atlantic Provinces. The literature suggests

unemployment to have a much stronger impact on beer consumption than the consumption of wine or spirits.

Time

Wine consumption is found to be increasing over time. This result is expected. The time variable could capture the impact of Atlantic Canadians' preferences shifting over time, the changing demographics or other province invariant, time variant characteristics.

4.5 Forecasting Wine Consumption, 2025

Using the coefficients of all the independent variables from the previous regression and forecasted values for Nova Scotia in 2025 it is possible to forecast wine consumption per capita (15+) in Nova Scotia in 2025. The coefficients and their forecasted values are summarized in Table 4.3.

Table 4.3

Forecasted Values of Determinants of Wine Demand

Variable	Coefficient	Forecasted Value
C	6.443	1
LOG(WPI)	-0.781	150.6
LOG(BPI)	-0.635	172.1
LOG(SPI)	0.038	154.6
LOG(GDP)	0.120	55 246
UNEMPLOYMENT	-0.274	6.30%
TIME	0.064	32

As the literature suggests GDP per capita to have a significant impact on the consumption of wine it and the other variables found to be insignificant will be

included in the estimate of per capita wine consumption in Nova Scotia in 2025. The result is forecasted consumption of 16.3L per capita, a 43% increase from the 11.4L per capita consumed in 2014 (CANSIM 183-0006). This consumption forecast is applied to Kings County using the following formula.

$$\begin{aligned}
 KC \text{ Production} &= (\text{forecast} \times \text{population}_{(15+)}) \times NS \text{ share} \times KC \text{ share} \\
 &= (16.3 \times 821,200) \times 0.15 \times 0.27
 \end{aligned}$$

The result of this equation is forecasted 2025 production in Kings County of 546,150L.

4.6 Economic Impact, 2025

Using this forecasted production figure all winery revenues are scaled proportionally with output. This is consistent with the methodology used by Jozsa Management Economics; T.M. McGuire Ltd. and Kelco Consulting in their 2006 report on the wine industry in Nova Scotia. The economic impact of wineries in Kings County in 2025 is summarized in Table 4.4 with 2014 data provided for reference.

Table 4.4

Economic Impacts of Kings County Wineries, 2025

2014 \$	2014	2025
Winery Revenue	\$ 9 254 818	\$ 13 477 048
Direct Impact (Final Demand)	\$ 8 081 034	\$ 11 767 760
Total Impact	\$ 11 977 622	\$ 17 442 048
Government Revenue	\$ 1 802 087	\$ 2 624 635
Household Income	\$ 3 114 052	\$ 4 534 744
Employment (PY)	118	161

From 2014 to 2025 winery revenues and their impacts are projected to grow 46%. As all results in this model are scaled proportionally with output the sector level results are distributed in the same manner as 2014. Presently, wineries have only a modest impact on the Kings County economy in absolute terms. Total impacts represent only half of one percent of total expenditures in the region. However, from the projections developed in this paper, the industry is expected to grow at a rate of 3.8% per year. Using data from the last five years in the province of Nova Scotia as a comparison, a growth rate of 3.8% annually would rank the wineries in the top 7% of all industries in the province by growth rate (CANSIM 304-0038). Provincially, the growth rate has been only 0.9% with the wineries outpacing this rate by a large margin. Wineries are capable of achieving such rapid growth rates, as this is still an infant industry. In absolute terms, the increase in revenues needed to achieve this growth rate is achievable because of the current scale of the industry.

Chapter 6: Conclusions

This paper has reviewed methods to calculate the economic impact of the wineries in Kings County in 2014 and 2025. A location quotient adjusted input-output model was found to provide the most detailed results and was used to calculate the economic impact of the wine industry in 2014. To calculate the economic impact of wineries in 2025, a model was developed to reveal the economic determinants of wine consumption. Forecasted values of these determinants were used to estimate wine consumption in 2025. This consumption forecast was used to forecast Kings County wine production in 2025. Based on this forecast, winery revenues were increased proportionally with the expected change in production. These forecasted revenue figures and the same I/O model as used previously were used to estimate the economic impact of the wineries in Kings County in 2025.

This thesis predicts significant growth from the wine industry in Kings County in the upcoming decade. This strong growth brings to question whether or not this industry still requires an indirect subsidy from the government in the form of a preferential retail mark-up. More fundamentally is the question of whether or not the preferential mark-up is effective at all. This preferential mark-up was introduced in 2007 and there has been no published research on its efficacy since its introduction (Withers, 2014). It is possible that the Government of Nova Scotia has internally reviewed the policy, as it has since been expanded to include small breweries and distilleries. At a certain point in the development of the wine industry, local wineries are expected to develop a dynamic comparative advantage in the Nova Scotia market, relative to global wineries. If or when the local wine

industry was to develop a comparative advantage, the preferential mark-up would subsidize an industry that is already competitive. At that point, the subsidy will not be necessary to develop the industry, as private market incentives will be sufficient to encourage development. Further research should be done to review the efficacy of Nova Scotia's preferential mark-up policy and when it should be withdrawn.

There is also an opportunity to improve some of the models applied in this thesis. If sufficient data were available, the determinants of demand for wine produced in Nova Scotia could be calculated independently of the demand for all other wine. Such a model would allow for more precision in predicting Nova Scotia production as it would replace the assumption that 15% of wine consumed in Nova Scotia will be produced in Nova Scotia as it is today.

In summary, the wineries in Kings County currently have revenues of \$ 9.25 million and represent 0.5% of total expenditures in Kings County. This industry is expected to grow at 3.8% annually between 2014 and 2025 to revenues of \$ 13.5 million. This growth rate places the wine industry among the fastest growing industries in Nova Scotia.

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