Wine Trade and the Economics of Import Duty and Excise Tax

Drawbacks

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Abstract

In 2003, the United States changed import duty and excise tax policy for table wine allowing for wine produced in the United States to be used as matching eligible exports for “substitution” drawback purposes. The implementation of the new wine drawback regulation has been controversial largely because imports that are matched with commercially interchangeable exports of wine effectively pay only one percent of the excise tax in the United States. These imports compete in the U.S. market with wine produced in the United States that pay the entire excise tax. This paper examines the effects of this new trade policy on the U.S. wine trade. We show that the degree to which the excise tax and duty drawback stimulates imports or exports depends on the relative volume of accumulated imports of commercially interchangeable wine not yet claimed by eligible exports at the time of importing compared to the expectations of future exports of commercially substitutable wine. The wine drawback policy has at times mostly benefited imports and at times mostly benefited exports. It has subsidized wine trade both into and out of the United States at the U.S. taxpayers’ expense.

This anti-local policy subsidizes trade relative to domestic consumption of domestically

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produced wine, with complex consequences within the wine industry. Results from our conceptual model and econometric estimation show that the wine drawback policy contributed significantly to growth in both wine imports and exports, especially for bulk wine.

_Key words:_ International trade policy, trade subsidy, wine trade, substitution drawback.

1. **Introduction and Background on the Issue**

Composed primarily of water, wine is bulky and, like certain food products, most wine tends to be consumed near the regions where it is produced. Nonetheless, because wine grape production favors certain locations, wine trade has a long history. In the past two decades, wine trade has become increasingly important for both wine producing and consuming countries.\(^1\) Therefore, wine-related policy changes implemented by a major player in wine trade have a potential to shift the global wine markets significantly.\(^2\)

Drawback is a common international trade policy that refunds duties paid on imported goods if subsequently the same (or equivalent) goods are exported.\(^3\) Drawbacks are routinely applied when the identical goods transit through a jurisdiction with minimal transformation and when inputs are used in the manufacture of subsequently exported products.

In 2003, the United States changed import duty and excise tax drawback policy for table wine to extend beyond these common cases.\(^4\) It allowed for U.S. produced wine to be used for drawback purposes as the matching eligible exports to similar imported wine. The im-

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\(^1\) From 2000 to 2014, the world wine trade, considered as the sum of exports from all countries, increased from 12Mhl to 26Mhl (OIV Statistical Report on World Vitiviniculture, 2015). Of course, some international trade crosses national borders, such as within the EU, without traveling very far. Moreover, since some regions specialize in certain wine specifications, wine exhibits significant counter trade in which importers are also exporters.

\(^2\) The United States is the largest consumer, fourth largest producer, third largest importer (the largest importer of extra-EU wine trade), and a large exporter of wine (OIV Statistical Report on World Vitiviniculture, 2015).

\(^3\) Drawbacks in the United States have a long history, dating back to the Second Act of Congress, July 4, 1789, which allowed drawback on duties paid on merchandise imported into the United States if that merchandise was re-exported within a year (U.S. Congress, 1789).

\(^4\) Table wine is defined as still wine of alcohol content of not over 14%.
plementation of the new wine drawback regulation has been controversial. The main reason for the controversy is that imports that are matched with commercially interchangeable exports of wine effectively pay only one percent of the federal excise tax in the United States, whereas the U.S. produced wine that competes in the United States pays the entire excise tax. Interestingly, wine drawback is an “anti-local” policy in a sense that it subsidizes table wine trade in and out of the United States at the expense of the U.S. local producers marketing locally.

More specifically, the “Substitution Unused Merchandise Drawback” (wine drawback) policy implemented in 2003 allows importers of table wine into the United States to receive a refund of 99% of both their import duty and the U.S. federal excise tax payments if within three years (now five years) they subsequently export commercially interchangeable wines produced in the United States.\(^5\) Commercial interchangeability for wine is defined as: still wine of the same color, with less than 14% alcohol by volume, having a price difference less than 50 percent between the imported wine and the exported wine. Exports to countries with which the United States has free trade agreements, such as Mexico and Canada, do not qualify as eligible to offset imports for duty and excise tax drawbacks. The wine drawback rules were initially promulgated by administrative action. The rules were codified in the 2008 Farm Bill after they had begun to be widely used. The wine drawback policy effectively makes the domestic excise tax part of trade policy.

The emergence of this wine drawback law was met with demands of other products to be eligible for substitution drawbacks. For example, in March of 2009, Foster’s Wine Estates Americas filed a wine drawback claim for wines with alcohol content of 14 percent and more by volume; however, the U.S. Customs and Boarder Protection did not honor the refund claiming that the wine drawback refund is for table wine only.\(^6\)

The “substitution” unused merchandise drawback phenomenon has not been studied like

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\(^6\) Cross Ruling h223836 http://rulings.cbp.gov/detail.asp?ru=h223836&ac=pr
the manufacturing drawback and imported product unused merchandise drawback. The perceived rationale for a manufacturing drawback is to encourage production and exports by allowing manufacturers to access imported inputs at world prices if the finished goods are exported. This allows exports to be more competitive in foreign markets than otherwise if input costs had been increased by duties or taxes. In addition, drawbacks allow for rejected merchandise to drawback duties paid on imports that are either sent back or destroyed and allow “unused” imports to be either re-exported or otherwise not to enter the domestic market. These features facilitate the normal business practice of manufacturing industries and allow port and transportation industries to supply services for transit. The substitution unused merchandise drawback does not conform to these rationales of drawbacks.

Nonetheless, the logic is similar to the other drawbacks. The substitution drawback can be said to facilitate economies of commerce by allowing a firm that both imports and exports to reduce transaction costs of segregating, tracing and monitoring of interchangeable goods when some are produced domestically and some are imported and subsequently some are marketed domestically and some are exported. The argument is that if the domestically produced interchangeable good is exported it is “as though” the imported good is re-exported.

The United States has a specific import duty of up to 14 cents per liter which varies by origin and container size of imported wine. Table wine imports from Australia and Chile have different import duty schedules because of the free trade agreements signed respectively in 2005 and 2004 with the United States.

The refund of the excise tax is potentially important because the United States has an excise tax of 28 cents per liter for all table wine sold domestically. The excise tax and import duty combined constitute about six percent of the average unit value of bottled wine imports and 28 to 37 percent of the unit value of imported bulk wine. Table 1 reports the import duty and excise tax as a share of unit value for 2003 and 2015 by import source origin.

Depending upon the import source, the average duty per liter and thus the potential duty refund differs. Also significant distributional impacts among table wine importers and
exporters depend on the ability to secure matching commercially interchangeable table wine.

In particular, the availability of eligible imports relative to the matching exports creates three main scenarios: 1) Accumulated imports eligible for wine drawback are zero or very low compared to expected future eligible exports, meaning the wine drawback refund reduces the effective price of imports, since imports need to provide little or no additional incentive to secure eligible exports to use for a qualified drawback. 2) Accumulated imports are positive but are similar in volume to expected eligible exports; in this scenario, importers and exporters would expect to divide the wine drawback. 3) Accumulated imports are large relative to eligible exports. In this scenario, importers must transfer to the exporters the drawback as an incentive to secure eligible exports, and the exporters obtain most of or all of the drawback. For example, in 2015, there was a large backlog of accumulated imports. We estimate that the bulk wine exporters received the wine drawback refund which was $55 million assuming most bulk wine exports, except for the exports to Canada, received the drawback.

As mentioned above, the Trade Facilitation and Trade Enforcement Act of 2015 which became law on 24 February of 2016 extended the period in which eligible exports may be matched with imports from three years to five years. The primary beneficiaries of the extension of the period are expected to be the firms that conduct wine trade: both imports and exports, especially those with accumulated imports that had not yet been matched with exports and those firms expecting exports that can now receive incentives from the drawback.

The impacts of the wine drawback are complex and differ through time, by imported source country, wine type, container size used and export destination. This paper has three objectives: (1) we provide a framework to understand the impacts on wine trade; (2) we establish that the wine drawback caused significant changes in U.S. wine trade, and (3) we estimate the magnitude of effect on U.S. wine imports and exports.

Several other drawback related issues are deferred to further research. These include impacts on grape producers and incidence of the drawback policy within the wine industry.
Moreover, we raise but do not investigate implications of extending the substitution drawback available for table wine to other products that pay federal excise tax in the United States. Such products include other wine and other alcohol products. We expect the extension of drawbacks could have significant implications for the U.S. and global trade in these products. On conceptual grounds, it is unclear to us why table wine is special and other alcohol products are not eligible for this form of drawback.

2. Literature

2.1. International Trade Policy Context

A large and largely settled literature considers the main effects of policy changes involving import duties and excise taxes under a broad set of market competition scenarios using homogeneous goods and various organizational settings. Feenstra (2004) conveniently summarizes the most influential studies and findings in a few sections of his widely cited textbook. However, all these studies consider trade policy change scenarios that affect either imports only, exports only, or only production and exports. This paper explains the effects of a policy that subsidizes the trade flow of goods both imports and exports.

Feenstra highlights how Grinols and Wong (1991) and Ju and Krishna (2000) summarize the literature on partial tariff reforms, when a country moves from one situation with restricted trade to another, and lay out conditions under which government through lump-sum transfers can compensate individuals for the change in prices, and balance the government budget. The welfare impact of tariff reforms depends on two effects: (1) impact of the reform on terms of trade and (2) the impact on efficiency. These papers lay the groundwork for the hypotheses developed below since the analysis of wine drawback is essentially an analysis of partial tariff reform. However, these papers look at simple tariff reforms that are one dimensional. Wine drawback legislation is a partial tariff reform with heterogeneous effects in multiple dimensions.
2.2. Drawbacks

As far as we have been able to determine, this U.S. policy of allowing drawbacks of excise tax for imports based on the export of a domestic substitute is unique compared to other U.S. trade policies or wine trade policy in other countries. Thus, there is no other literature examining the sort of trade policy investigated here.

As noted, about 240 years ago, Adam Smith devoted a chapter to explain the concept and impacts of duty drawbacks. His exposition used the example of wine duty drawbacks to illustrate the effects. However, the drawbacks described by Smith did not apply to the excise tax (Smith, 1776). After Smith, the empirical literature on drawbacks is relatively thin.

Panagariya (1991) provides a conceptual analysis of the welfare impacts of import duty drawbacks on inputs used in manufacturing for a small country. He finds that input duty drawbacks are welfare improving in many cases but not under all conditions of substitution between imports of final goods and domestically produced goods. Panagaryia (1991) mentions examples in developing countries but does not conduct any empirical analysis of an actual case.

The literature on regional trade agreements and impacts on trade policy describes ‘trade creation’ versus ‘trade diversion’ in the context of free trade areas and customs unions. De La Cruz et al. (2011) analyze the effects on Mexican industries of the duty drawback policy changes when NAFTA was created. The authors show that both consumption and trade of some goods were diverted from one country to another less efficient country.

The study by De La Cruz et al. (2011) is useful when thinking about trade creation versus trade diversion as we expect the wine export patterns of drawback-eligible countries will diverge from the export patterns of drawback ineligible countries. However, it still does not address the substitution component of the drawback policy.

Cadot et al. (2003) examine the effects of import manufacturing duty drawbacks from a political economy perspective for intermediate goods. They argue that when exporters draw
back all of the import duty paid, they have no incentive to lobby against high import duties on inputs. Cadot et al. (2003) argue that lack of incentive to push back against import duties on inputs results in higher rates of protection on intermediate goods heavily used in export industries, penalizing non-exporting users of such goods. Cadot et al. (2003) are relevant to this work because it suggests that the U.S. producers who are not engaged in wine trade could be the ultimate losers. However, they focus on implications of manufacturing drawback which has different economic incentives than the substitution unused merchandise drawback.

Sumner et al. (2011) are the first to describe the substitution unused merchandise drawback policy for wine and provide a preliminary simulation analysis. The report provides some simple simulation results for the case considered here but conducts no econometric analysis to test or measure the impact of the drawback.

2.3. International Wine Trade

Descriptive studies of wine trade have not considered the implications of wine drawbacks to explain current international wine trade patterns. Anderson and Wittwer (2013) suggest that real exchange rate changes over the period 2007-2011 altered substantially the global wine export shares of the Old World and the United States versus the New World’s exporters and especially Australia. They also assign importance to the continuing growth of China as an important wine importer.

Mariani et al. (2012) describe the trends and complexities of issues on global wine trade, focusing on the period 2000-2011. Goodhue et al. (2008) discuss California wine industry dynamics and trends in the context of the global wine trade. None of these papers consider the effects of import duty and excise tax drawbacks in explaining wine trade patterns of the United States.

Fuller and Alston (2012) estimate own price elasticities ranging from -2.6 to -9.5 depending on the price of grapes for California wine grapes. They attribute the high elasticities
partly to the role of the international wine trade. This paper is primary focused on estimating demand for wine grapes not on international wine trade per se.

3. Data Motivation and Outline

The motivation of this paper is based on the observation that in 2003, the United States began a program to refund import duties and excise taxes for table wine under the wine drawback policy and, after the implementation of the wine drawback policy, the U.S. imports and exports of bulk wine both grew rapidly.

Figure 1 depicts that up to 2003 the United States imported and exported very little wine in the bulk category. However, both bulk wine imports and exports increased dramatically after 2003 the same time the wine drawback policy was introduced. From 2003 to 2008, bulk wine exports increased by about 400%, while bulk wine imports increased by 1,000%.

Figure 2 shows that the United States has long been a net importer of bottled wine and while the imports of the bottled wine increased at about 2% annually since the introduction of the wine drawback policy the bottled wine exports stayed constant.

Additionally, the 2014 data of Canadian imports of bulk wine reveal that Canada imported about 103 million liters of bulk wine and only a little over 10% of it was from the United States. According to a newsletter dated October 22nd, 2015 by the World Bulk Wine Exhibition, S.L. the United States is not even in the top three import – source countries, the top three import – source countries being Australia, Chile, and Spain. (Worldbulkwine.com)

Figure 3 depicts the Canadian imports of bulk wine by major import source countries from 2000 to 2015. We see that the Canadian imports from the United States are essentially flat for the entire period, while the Canadian imports from the rest of the world increased by 75% in the sixteen year period.

In what follows, we present the conceptual framework used to study the effects of wine drawbacks on various bilateral and aggregate U.S. trade patterns.\textsuperscript{7}

\textsuperscript{7}Our framework can be readily adapted to other products that have import duties and pay excise tax
This analysis guides the development of a set of hypotheses summarizing the effects of wine drawbacks on the U.S. wine import and export quantities with various trade partners. Then, using bilateral and aggregate U.S. wine trade data combined with exchange rates, transportation costs and other explanatory variables we empirically test these hypotheses. Finally, using accumulated drawback-eligible imports as an instrument we estimate the wine drawback effect on the U.S bilateral and aggregate trade.

4. Conceptual Model Behind the Data Analysis

To better understand the empirical strategy and add structure to the framework, we describe the effects of the wine drawback on a competitive firms’ decision of producing and trading wine. This section uses the profit expression of a representative firm engaged in producing and trading wine in and out of the United States to derive a set of hypotheses regarding the impacts of wine drawback policy on the U.S. wine trade.

4.1 The Basic Set Up

Consider two broad classes of wine: wine produced in the United States $W_u$ and wine imported into the United States, $W_{md}$. The U.S. produced wine, $W_u$, can be sold in two broad markets: the U.S. market, $W_{ud}$, or the export market, $W_{ux}$. Thus the U.S. wine quantity produced is the sum of the wine marketed domestically and the U.S. wine exported: $W_u = W_{ud} + W_{ux}$, and the quantity of wine sold in the United States is the sum of U.S. wine marketed domestically and imported wine: $W_d = W_{ud} + W_{md}$.

At a given time, a competitive firm in the United States can be engaged in either or all of the three types of activities. (1) Produce table wine domestically and market it domestically.

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8The investigation of the drawback in the context of firms with market power is pursued in our additional research on the implications of the wine drawback.
(2) Produce wine domestically and export it. (3) Import wine into the United States and market it domestically.

Before the introduction of the wine drawback policy, the profit of such firm was given by

$$\pi = (P_{ud} - T)W_{ud} - C(W_{ud})$$

$$+ P_x W_{ux} - C(W_{ux})$$

$$+ (P_{md} - T - D)W_{md} - C(W_{md}).$$

The expression (1) has three parts each corresponding to the profits obtained from the activities listed above. The price of U.S. produced wine sold in the domestic market is denoted by $P_{ud}$, $T$ is the per liter federal excise tax paid, $C(W_{ud})$ is the cost of producing and marketing U.S. wine in the U.S. market, $P_x$ is the price the U.S. wine fetches in the export market net of transportation costs and taxes in foreign countries. The cost of producing U.S. wine and marketing in export market is denoted $C(W_{ux})$, $P_{md}$ is the price of imported wine at the U.S. border, $D$ is the import duty paid and $C(W_{md})$ is the cost of producing the imported wine and marketing domestically.

In the context of the wine drawback policy, we treat the quantity of the U.S. wine produced as exogenous. This is a reasonable simplification for two reasons. First, planting and pulling vines is a process that occurs over a long period, during which wine drawback can switch from favoring imports at the domestic producers’ expense to favoring exports and incentivizing domestic wine production. Second, the drawback refund is relatively small incentive for vine planting decision, although, a large share of bulk wine import price and given that the wine is already produced is an important incentive for exporting.

Using the exogeneity of the U.S. wine production $W_{ud} = W_u - W_{ux}$, the partial derivative of the profit expression (1) with respect to $W_{ux}$, which is equal to the partial derivative with respect to $(-W_{ud})$, gives the equilibrium condition for an interior solution of exporting
versus marketing domestically.

\[
\frac{\partial \pi}{\partial W_{ux}} = \frac{\partial \pi}{\partial (-W_{ud})} = -(P_{ud} - T) + C'(W_{ud}) + P_x - C'(W_{ux}) = 0. \tag{2}
\]

We rewrite (2) as

\[
P_x - C'(W_{ux}) = (P_{ud} - T) - C'(W_{ud}) \tag{3}
\]

The equation (3) shows that in an interior equilibrium the marginal profit of exporting wine produced in the United States must be equal to the marginal profit of marketing that wine domestically.

The partial derivative of the profit expression with respect to \( W_{md} \) represents the equilibrium condition for an interior solution for the quantity of wine imported.

\[
\frac{\partial \pi}{\partial W_{md}} = (P_{md} - T - D) - C'(W_{md}) = 0, \tag{4}
\]

in the interior equilibrium the marginal revenue of importing wine is equal to the marginal cost of imports.

The drawback policy requires that the same entity exports the wine that is interchangeable with the imports for which a drawback is claimed. Although this entity receives the full drawback it is useful analytically and empirically to separate the full drawback into two parts, the share that provides an incentive for additional imports and that share that provides and incentive for additional exports. In fact, conceptually and empirically in some cases, one may consider a firm that imports wine to create a trading entity with a firm that produces wine domestically and may export wine. We then consider the share of the drawback paid to the domestic producer that forms the exporting part of the entity or kept by the importing part of the entity.
4.2 The Benchmark Case: The Introduction of the Wine Drawback

After the introduction of the wine drawback policy the profit function becomes:

\[
\pi = (P_{ud} - T)W_{ud} - C(W_{ud}) + (P_x + \delta(T + D))W_{ux} - C(W_{ux}) + (P_{md} - T - D + (1 - \delta)(T + D))W_{md} - C(W_{md}).
\] (5)

The U.S. wine sold domestically still pays the full amount of the federal excise tax, the U.S.
wine exports can potentially receive some or all of the import duty and excise tax paid by
the matched imports. Imported wine still pays the import duty and the excise tax in the
United States but there is a potential for a refund of some or all of the import duty and
excise tax paid.

In expression (5), \(\delta\) is the share of the wine drawback refund paid to the exporters, \((T+D)\)
is the per unit full drawback amount, \((1-\delta)\) is the share of the wine drawback refund kept by
the importers. The parameter \(\delta\) depends on the availability of exports relative to imports of
commercially interchangeable wine not yet claimed for wine drawback. Recall, the drawback
amount is expected to be split between the importers and exporters (0 > \(\delta\) > 1) if the
imports and exports are expected to be roughly equivalent.

Taking the partial derivatives of the profit expression (5) with respect to \(W_{ux}\) and \(W_{md}\)
we obtain equilibrium conditions, similar to (3) and (4), for interior solutions of to export or
market the U.S. produced wine domestically, and whether how much wine to import given
the existence of the wine drawback policy.

\[
\frac{\partial \pi}{\partial W_{ux}} = -(P_{ud} - T) + C'(W_{ud}) + P_x + \delta(T + D) - C'(W_{ux}) = 0.
\] (6)

\[
\frac{\partial \pi}{\partial W_{md}} = P_{md} - T - D + (1 - \delta)(T + D) - C'(W_{md}) = 0.
\] (7)
We rewrite the first order conditions as

\[ P_x + \delta(T + D) - C'(W_{ux}) = (P_{ud} - T) - C'(W_{ud}), \text{ and} \]

\[ P_{md} - \delta(T + D) - C'(W_{md}) = 0. \]

With the wine drawback policy in place, equation (8) shows that in an interior equilibrium profits from exporting table wine and marketing it domestically are equal. Equation (9) shows that in the equilibrium revenues from importing are equal to the cost of importing. Comparing the first order conditions in (3) and (4) to (8) and (9) we see that for any given value of \( \delta \in [0, 1] \), \( \delta \) either increases the import and or increases the export quantity. This observation leads to our first hypothesis.

**Hypothesis 1.** The U.S. table wine trade, the import and export quantities, with the major wine trading partners increased due to the wine drawback policy.

### 4.3 Table Wine Trade Differentiated by Shipment Mode

Next, we recognize that the United States trades wine in bulk and bottled form and explore how the wine drawback affects the U.S. wine trade. Let the U.S. wine exported in bulk be denoted as \( W_{ux}^{blk} \), and bottled exports be denoted as \( W_{ux}^{bot} \) such that \( W_{ux} = W_{ux}^{blk} + W_{ux}^{bot} \). Let the bulk wine imports be denoted as \( W_{md}^{blk} \) and the bottled wine imports be denoted as \( W_{md}^{bot} \), such that \( W_{md} = W_{md}^{blk} + W_{md}^{bot} \). We assume all of the U.S. produced wine marketed in the domestic market is packaged, and \( W_{ud} = W_u - W_{ux}^{blk} - W_{ux}^{bot} \).

The profit expression of a competitive firm selling bottled and bulk wine after the intro-
duction of the wine drawback policy is expanded to:

\[
\pi = (P_{ud}^{bot} - T)W_{ud}^{bot} - C(W_{ud}) + (P_x^{bot} + \delta^{bot}(T + D^{bot}))W_{ux}^{bot} - C(W_{ux}^{bot}) + (P_x^{blk} + \delta^{blk}(T + D^{blk}))W_{ux}^{blk} - C(W_{ux}^{blk})
\]

(10)

A firm can obtain profit from five activities: produce and sell bottled wine in the U.S. market, export bottled wine, export bulk wine, import bottled wine and market it domestically, and import bulk wine and after bottling market it domestically. In expression (10), \( P_{ud}^{bot} \) is the price of the U.S. produced bottled wine in the domestic market, \( T \) is the same for all table wine, \( \delta^{bot} \) is the exporters’ share of potential wine drawback for bottle wine traded, \( \delta^{blk} \) is the exporters’ share of potential wine drawback for bulk wine traded, \( D^i \) is the per unit import duty paid, where \( i \) is either bulk (blk) or bottled (bot).

4.4 Wine Drawback Impacts When Table Wine is Shipped in Bulk and Bottle

We take the partial derivative of the profit expression (10) with respect to \( W_{ux}^{blk} \) and \( W_{ux}^{bot} \) and obtain the equilibrium conditions for the quantity exported in bulk and or bottled form.

\[
\frac{\partial \pi}{\partial W_{ux}^{bot}} = -(P_{ud}^{bot} - T) + C'(W_{ud}) + P_x^{bot} + \delta^{bot}(T + D^{bot}) - C'(W_{ux}^{bot}) = 0
\]

(11)

\[
\frac{\partial \pi}{\partial W_{ux}^{blk}} = -(P_{ud}^{bot} - T) + C'(W_{ud}) + P_x^{blk} + \delta^{blk}(T + D^{blk}) - C'(W_{ux}^{blk}) = 0
\]

(12)

Taking the partial derivative with respect to \( W_{md}^{blk} \) and \( W_{md}^{bot} \) we obtain the equilibrium.
conditions for the quantity imported in bulk and or bottled form.

\[ \frac{\partial \pi}{\partial W_{\text{bot}}^{\text{md}}} = P_{\text{md}}^{\text{bot}} - \delta^{\text{bot}}(T + D^{\text{bot}}) - C'(W_{\text{md}}^{\text{bot}}) = 0, \quad (13) \]

\[ \frac{\partial \pi}{\partial W_{\text{blk}}^{\text{md}}} = P_{\text{md}}^{\text{blk}} - \delta^{\text{blk}}(T + D^{\text{blk}}) - C'(W_{\text{md}}^{\text{blk}}) = 0. \quad (14) \]

Equations (11) and (12) give the equilibrium conditions for the interior solution for exports of bottled and bulk wine. Similar to the expression (8), the profits from exporting wine is equal to the profits from marketing domestically. Equations (13) and (14) give the equilibrium conditions for the interior solution for imports of bottled and bulk wine. Similar to the expression (9) the revenues from importing wine, both bulk and bottled are equal to the costs of importing.

Comparing expressions of (11) with (13), and (12) with (14) we see that for any given \( \delta^{\text{bot}} \) and \( \delta^{\text{blk}} \) the introduction of the wine drawback policy increases both exports and imports of both types of table wine. This is particularly true for bulk wine since the drawback refund constitutes a larger share of bulk wine import price. This analysis leads to an additional hypotheses.

**Hypothesis 2.** The U.S. bulk table wine trade, the import and export quantities, with the major wine trading partners increased due to the wine drawback policy.

Subtracting (12) from (13) and after some manipulations we obtain,

\[ P_{x}^{\text{bot}} + \delta^{\text{bot}}(T + D^{\text{bot}}) - C'(W_{ux}^{\text{bot}}) = P_{x}^{\text{blk}} + \delta^{\text{blk}}(T + D^{\text{blk}}) - C'(W_{ux}^{\text{blk}}). \quad (15) \]

The same condition before the introduction of the drawback is

\[ P_{x}^{\text{bot}} - C'(W_{ux}^{\text{bot}}) = P_{x}^{\text{blk}} - C'(W_{ux}^{\text{blk}}). \]

The United States has been a large net importer of bottled wine for a long time and
importantly before and after the introduction of the wine drawback policy. Since the quantity of bottled wine imports exceeded exports, the wine drawback always acted as an export subsidy for bottled wine trade, meaning $\delta_{\text{bot}} = 1$ for all $t$.

If $\delta_{\text{blk}} = 1$ also, wine drawback acts as an export subsidy for bulk wine as well, and because of the matching feature of wine drawback policy, bulk wine imports stay the same or increase. In this scenario, the wine drawback incentivizes the U.S. wine producers to import wine in bulk, package and market it domestically, while exporting U.S. bulk wine to be packaged and market abroad. Thus, wine drawback subsidizes bulk wine trade both in and out of the United States.

However, if $\delta_{\text{blk}} < 1$ and in particular if $\delta_{\text{blk}} = 0$, the wine drawback acts as export subsidy for bottled table wine and an import subsidy for bulk table wine. The wine drawback decreases the share of bulk wine exports relative to bottled wine exports and increases the share of bulk wine imports relative to bottled wine imports. Essentially, when $\delta_{\text{bot}} = 1$ and $\delta_{\text{blk}} = 0$ the wine drawback induces wine producers to import bulk wine, bottle and market it in the United States and then export U.S. produced bottled wine. In both of these scenarios, wine drawback acts as a trade subsidy and against the consumption of locally produced wine.

Subtracting (14) from (13) we obtain

$$P_{\text{blk}} - \left[\delta_{\text{blk}} (T + D_{\text{blk}}') + C'_{\text{blk}}(W_{\text{blk}})\right] = P_{\text{bot}} - \left[\delta_{\text{bot}} (T + D_{\text{bot}}') + C'(W_{\text{bot}})\right].$$

(16)

The corresponding condition before introducing the wine drawback policy is

$$P_{\text{blk}} - [D_{\text{blk}} + C'(W_{\text{blk}})] = P_{\text{bot}} - [D_{\text{bot}} + C'(W_{\text{bot}})].$$

(17)

Since $\delta_{\text{bot}} = 1$ for all $t$, the wine drawback does not subsidize the imports of bottled wine. For the values of $\delta_{\text{blk}} < 1$ and to the extent of the substitutability between trading wine in bulk and bottled form, the wine drawback increases the quantity of bulk wine imports and might decrease the bottled wine imports into the United States. This analysis leads to our
third hypothesis.

Hypothesis 3. The ratio of bulk wine import quantity over bottled wine import quantity increased due to the wine drawback.

4.5 Bulk and Bottled Table Wine Trade Differentiated by the Trade Partner

We add another layer of detail to the analysis by recognizing that there are two broad destinations for wine exports: Europe, represented by the Eurozone countries and the United Kingdom, and the other major destinations (Canada, China, Hong Kong, and Japan), and there are two broad sources of wine imports into the United States: the Eurozone countries and the other major sources (Argentina, Australia, Chile, New Zealand and South Africa).

Before moving forward, there are three important facts to include. 1) Within the Eurozone, the countries that produce most of the wine grapes and process them into wine are different from the countries that are net importers and large consumers of wine.\(^\text{10}\) 2) The U.S. wine trade, both with the other major export destinations and other import source countries, is mostly in one direction.\(^\text{11}\) 3) For U.S. exports to the Eurozone, the specific country that receives the exports and the country of the ultimate consumption of that wine differ.\(^\text{12}\) The importance of these three points justifies the treatment of the Eurozone as a separate wine trading partner.

Let the U.S. bulk table exports to the Eurozone countries and United Kingdom be denoted as \(W_{ue}^{blk}\) and the bulk wine exports to the other major destinations as \(W_{wo}^{blk}\), such that \(W_{ux}^{blk} = W_{ue}^{blk} + W_{wo}^{blk}\). Similarly, let \(W_{ue}^{bot}\) denote the quantity of the U.S. bottled wine.

\(^{10}\)France, Italy, and Spain are the largest wine producers both by volume and value in the Eurozone while Germany is the largest net importer (OIV Statistical Report on World Vitiviniculture, 2015).

\(^{11}\)Based on the U.S. table wine trade data, the United States imports almost no wine from Canada, China, Hong Kong or Japan, just as the United States exports little wine to Argentina, Australia, Chile, New Zealand and South Africa. The U.S. wine trade with the Eurozone countries flows both ways.

\(^{12}\)This is particularly true for the U.S. bulk wine exports, which can land in Italy, be bottled there and then be shipped to Holland or Germany for consumption. The same is not true for other major export destinations and other major import sources. The United States does not ship bulk wine to Australia to get bottled there and then to be shipped to Japan for consumption.
exports to the Eurozone countries and United Kingdom, and $W_{bot}^{u}$ denote the quantity of the U.S. bottled wine exports to the other major destinations such that $W_{ux}^{bot} = W_{ue}^{bot} + W_{uo}^{bot}$, and

$$W_{ue}^{bot} + W_{uo}^{bot} + W_{ue}^{bot} + W_{uo}^{bot} = W_{ux}^{bot} + W_{ux}^{bot} = W_{ux}.$$ 

Similarly, we define $W_{ed}^{blk}$ as the bulk wine imports into the United States that are produced in the Eurozone and $W_{od}^{blk}$ as the bulk wine imports into the United States sourced from the other major importing countries, such that $W_{md}^{blk} = W_{ed}^{blk} + W_{od}^{blk}$. Let the Eurozone bottled wine imports into the United States be denoted by $W_{ed}^{bot}$ and bottled wine imports into the United States from the other major source countries be denoted as $W_{od}^{bot}$, such that $W_{md}^{bot} = W_{ed}^{bot} + W_{od}^{bot}$, and

$$W_{ed}^{bot} + W_{od}^{bot} + W_{ed}^{bot} + W_{od}^{bot} = W_{md}^{bot} + W_{md}^{bot} = W_{md}.$$ 

The quantity of the U.S. wine marketed domestically becomes

$$W_u - W_{ue}^{blk} - W_{uo}^{blk} - W_{ue}^{bot} - W_{uo}^{bot} = W_{ud}.$$ 

We multiply the exports of both bulk and bottled table wine to other destinations by $0 < \theta < 1$ when we introduce the potential drawback refund, to account for the fact that exports to Canada are ineligible for the wine drawback. Because the import duty differs by the source country we introduce the weighted average per unit import duty paid for bottled wine imports

$$D_{avg}^{bot} = \frac{D_{e}^{bot} W_{ed}^{bot} + D_{o}^{bot} W_{od}^{bot}}{W_{ed}^{bot} + W_{od}^{bot}},$$

and bulk wine imports

$$D_{avg}^{blk} = \frac{D_{e}^{blk} W_{ed}^{blk} + D_{o}^{blk} W_{od}^{blk}}{W_{ed}^{blk} + W_{od}^{blk}},$$

where $D_{j}^{i}$ is the import duty paid, where $i$ can be either bulk or bottled, and $j$ can be
imported from Eurozone (e) or other sources (o).

The profit expression of a competitive firm after the introduction of the wine drawback policy becomes:

\[
\pi = (P_{\text{bot}}^{\text{ed}} - T)W_{\text{ed}} - C(W_{\text{ed}}) \\
+ P_{\text{bot}}^{\text{ue}}W_{\text{ue}}^{\text{bot}} - C(W_{\text{ue}}^{\text{bot}}) + P_{\text{bot}}^{\text{uo}}W_{\text{uo}}^{\text{bot}} - C(W_{\text{uo}}^{\text{bot}}) \\
+ \delta^{\text{bot}}T(W_{\text{ue}}^{\text{bot}} - \theta W_{\text{uo}}^{\text{bot}}) + \delta^{\text{bot}}D_{\text{avg}}^{\text{bot}}(W_{\text{ue}}^{\text{bot}} + \theta W_{\text{uo}}^{\text{bot}}) \\
+ P_{\text{ue}}W_{\text{ue}}^{\text{blk}} - C(W_{\text{ue}}^{\text{blk}}) + P_{\text{uo}}W_{\text{uo}}^{\text{blk}} - C(W_{\text{uo}}^{\text{blk}}) \\
+ \delta^{\text{blk}}T(W_{\text{ue}}^{\text{blk}} - \theta W_{\text{uo}}^{\text{blk}}) + \delta^{\text{blk}}D_{\text{avg}}^{\text{blk}}(W_{\text{ue}}^{\text{blk}} + \theta W_{\text{uo}}^{\text{blk}}) \\
+ (P_{\text{bot}}^{\text{ed}} - T - D_{e}^{\text{bot}})W_{\text{ed}}^{\text{bot}} - C(W_{\text{ed}}^{\text{bot}}) + (P_{\text{bot}}^{\text{od}} - T - D_{o}^{\text{bot}})W_{\text{od}}^{\text{bot}} - C(W_{\text{od}}^{\text{bot}}) \\
+ (1 - \delta^{\text{bot}})T(W_{\text{ed}}^{\text{bot}} + W_{\text{od}}^{\text{bot}}) + (1 - \delta^{\text{bot}})(D_{e}^{\text{bot}}W_{\text{ed}}^{\text{bot}} + D_{o}^{\text{bot}}W_{\text{od}}^{\text{bot}}) \\
+ (P_{\text{bot}}^{\text{ed}} - T - D_{e}^{\text{blk}})W_{\text{ed}}^{\text{blk}} - C(W_{\text{ed}}^{\text{blk}}) + (P_{\text{bot}}^{\text{od}} - T - D_{o}^{\text{blk}})W_{\text{od}}^{\text{blk}} - C(W_{\text{od}}^{\text{blk}}) \\
+ (1 - \delta^{\text{blk}})T(W_{\text{ed}}^{\text{blk}} + W_{\text{od}}^{\text{blk}}) + (1 - \delta^{\text{blk}})(D_{e}^{\text{blk}}W_{\text{ed}}^{\text{blk}} + D_{o}^{\text{blk}}W_{\text{od}}^{\text{blk}})
\]

(18)

In this case a representative firm may have profits engaging in either or all of the nine activities: produce and sell wine in the United States, export bottled wine to Eurozone – United Kingdom region, export bottled wine to other destinations, export bulk wine to Eurozone – United Kingdom, export bulk wine to other destinations, import bottled wine from Eurozone, import bottled wine from other source countries, import bulk wine from Eurozone, and import bulk wine from other source countries. The prices of the U.S. produced bottled and bulk wine in the Eurozone and United Kingdom markets are denoted by \( P_{\text{ue}}^{\text{bot}} \) and \( P_{\text{ue}}^{\text{blk}} \) respectively, and \( P_{\text{uo}}^{\text{bot}} \) and \( P_{\text{uo}}^{\text{blk}} \) are the prices of the U.S. produced bottled and bulk wine in the other export destinations. The price of Eurozone country imports of bulk wine at the U.S. boarder is \( P_{\text{ed}}^{\text{blk}} \), and \( P_{\text{od}}^{\text{blk}} \) is the price of the bulk wine imported from the other source countries at the U.S. boarder.
4.6 Wine Drawback by Bulk and Bottled Shipments and Different Trading Partners

We first establish the effects of wine drawback policy on the pattern of U.S. table wine export quantities. Taking partial derivatives of the profit function with respect to $W_{bot}^{ue}, W_{bot}^{uo}, W_{blk}^{ue},$ and $W_{blk}^{uo}$ we obtain four equilibrium conditions.

\[
\frac{\partial \pi}{\partial W_{bot}^{ue}} = -(P_{ud} - T) + C'(W_{ud}) + P_{ue}^{bot} - C'(W_{ue}^{bot}) + \delta_{bot}^{ue} (T + D_{avg}^{bot}) = 0, \quad (19)
\]

\[
\frac{\partial \pi}{\partial W_{bot}^{uo}} = -(P_{ud} - T) + C'(W_{ud}) + P_{uo}^{bot} - C'(W_{uo}^{bot}) + \theta \delta_{bot}^{uo} (T + D_{avg}^{bot}) = 0, \quad (20)
\]

\[
\frac{\partial \pi}{\partial W_{blk}^{ue}} = -(P_{ud} - T) + C'(W_{ud}) + P_{ue}^{blk} - C'(W_{ue}^{blk}) + \delta_{blk}^{ue} (T + D_{avg}^{blk}) = 0, \quad (21)
\]

\[
\frac{\partial \pi}{\partial W_{blk}^{uo}} = -(P_{ud} - T) + C'(W_{ud}) + P_{uo}^{blk} - C'(W_{uo}^{blk}) + \theta \delta_{blk}^{uo} (T + D_{avg}^{blk}) = 0, \quad (22)
\]

These four equilibria conditions provide the decision rules for selling wine domestically and exporting, by export mode and destination. Combining (19) with (20), and (21) with (22) we obtain equilibrium conditions of exporting bottled and bulk wine to the Eurozone – United Kingdom or the other destinations.

\[
P_{ue}^{bot} - C'(W_{ue}^{bot}) + \delta_{bot}^{ue} (T + D_{avg}^{bot}) = P_{uo}^{bot} - C'(W_{uo}^{bot}) + \theta \delta_{bot}^{uo} (T + D_{avg}^{bot}), \quad (23)
\]

\[
P_{ue}^{blk} - C'(W_{ue}^{blk}) + \delta_{blk}^{ue} (T + D_{avg}^{blk}) = P_{uo}^{blk} - C'(W_{uo}^{blk}) + \theta \delta_{blk}^{uo} (T + D_{avg}^{blk}). \quad (24)
\]

The corresponding equilibrium conditions prior to the introduction of the wine drawback policy would be $P_{ue}^{bot} - C'(W_{ue}^{bot}) = P_{uo}^{bot} - C'(W_{uo}^{bot})$ and $P_{ue}^{blk} - C'(W_{ue}^{blk}) = P_{uo}^{bot} - C'(W_{uo}^{bot})$.

Since $\theta$ is less than one because exports to Canada are not eligible for wine drawback, both bottled and bulk wines for any given $\delta$ are more profitable to export to the Eurozone – United Kingdom region than to the other destinations. This difference is the largest for Canadian bulk table wine exports relative to the bulk table wine exports to the Eurozone –
United Kingdom region because the wine drawback refund is relatively large share of bulk table wine unit value and among other export destinations only the exports to Canada are not eligible for wine drawbacks. This is the case when $\theta = 0$, and $\delta_{blk} (T + D_{avg}^{blk}) > \delta_{bot} (T + D_{avg}^{bot})$. Based on this analysis we can bring forward another two hypotheses.

Hypothesis 4a. The ratio of the quantity of bulk wine exports to the Eurozone countries over the quantity of bulk wine exports to Canada has increased due to the wine drawback.

Hypothesis 4b. The ratio of the quantity of bulk wine exports to the United Kingdom over the quantity of bulk wine exports to Canada has increased due to the wine drawback.

Next, from the combination of equations (19),(21) and (20),(22) we obtain the equilibrium conditions by export destinations of exporting in bulk and bottled form.

\[ P_{ue}^{bot} (1 - \frac{C'(W_{ue}^{bot})}{P_{bot}^{ue}}) + \delta_{bot} (T + D_{avg}^{bot}) = P_{ue}^{blk} (1 - \frac{C'(W_{ue}^{blk})}{P_{blk}^{ue}}) + \delta_{blk} (T + D_{avg}^{blk}), \]  

(25)

\[ P_{uo}^{bot} (1 - \frac{C'(W_{uo}^{bot})}{P_{bot}^{uo}}) + \theta \delta_{bot} (T + D_{avg}^{bot}) = P_{uo}^{blk} (1 - \frac{C'(W_{uo}^{blk})}{P_{blk}^{uo}}) + \theta \delta_{blk} (T + D_{avg}^{blk}). \]  

(26)

The equilibrium conditions prior to the introduction of wine drawback policy are

\[ P_{ue}^{bot} (1 - \frac{C'(W_{ue}^{bot})}{P_{bot}^{ue}}) = P_{ue}^{blk} (1 - \frac{C'(W_{ue}^{blk})}{P_{blk}^{ue}}) \]

for exports to the Eurozone or United Kingdom, and

\[ P_{uo}^{bot} (1 - \frac{C'(W_{uo}^{bot})}{P_{bot}^{uo}}) = P_{uo}^{blk} (1 - \frac{C'(W_{uo}^{blk})}{P_{blk}^{uo}}) \]

to other export destinations.

Since $\delta_{bot} = 1$, and

\[ \frac{T + D_{avg}^{blk}}{P_{ue}^{blk}} > \frac{T + D_{avg}^{bot}}{P_{ue}^{bot}}, \]
the full tax (excise tax plus the import duty) is a large share of unit price for bulk wine. Thus the wine drawback incentivizes the bulk wine exports relative to bottled wine exports to the Eurozone countries or to the United Kingdom for

\[\delta_{blk} > \frac{T + D_{avg}^{bot} P_{ue}^{blk}}{T + D_{avg}^{blk} P_{bot}^{ue}}.\]

From (23) and (24) we established that the wine drawback incentivized wine export diversion from other export destinations towards the Eurozone countries and the United Kingdom and for a given \(\delta > 0\), the incentive is relatively stronger for bulk wine. Based on this derivation we arrive to our next two hypotheses.

**Hypothesis 5a.** The ratios of exports of bulk wine quantity to bottled wine quantity to the Eurozone countries has increased due to the wine drawback.

**Hypothesis 5b.** The ratios of exports of bulk wine quantity to bottled wine quantity to the United Kingdom has increased due to the wine drawback.

Finally, we take the partial derivative of the profit expression (18) with respect to the import quantity of bulk wine from the Eurozone region, combine it with the partial derivative of the profit expression with respect to the export quantities of bulk wine to the Eurozone – United Kingdom region to obtain hypothesis similar to the hypotheses 3 for the Eurozone – United Kingdom.

\[\frac{\partial \pi}{\partial W_{ed}^{blk}} = \delta_{blk} \frac{\partial D_{avg}^{blk}}{\partial W_{ed}^{blk}} (W_{ue}^{blk} + \theta W_{uo}^{blk}) + P_{ed}^{blk} - \delta_{blk} (T + D_{e}^{blk}) - C'_{u}(W_{ed}^{blk}) = 0 \quad (27)\]

The first component of this equation shows the change in the average duty rate and the total duty that exporters can potentially claim. The importers’ choice of the import source country and thus the import duty rate affects the exporters per unit duty refund.

Combining expressions (21) with (27) we see that for any given value of \(\delta^i\) the U.S. bilateral trade with the Eurozone in bulk wine is incentivized by the wine drawback policy.\(^{13}\)

\(^{13}\)We do not have a similar hypothesis for bottled wine trade because if hypothesis 5a is true then there
This analysis leads us to our final hypothesis.

Hypothesis 6. The U.S. bulk wine trade, the sum of import and export quantities, with the Eurozone countries increased due to the introduction of the wine drawback policy.

4.7 Summary of Hypotheses

We conclude this section summarizing the main conceptual hypotheses. The introduction of the wine drawback policy could have:

1) Increased the U.S. table wine trade, the import and export quantities, with the major wine trading partners.
2) Increased the U.S. bulk wine trade, the import and export quantities, with the major wine trading partners.
3) Increased the ratio of bulk wine import quantity over bottled wine import quantity, with the major wine trading partners.
4) Increased the ratio of bulk wine exports to Eurozone countries over the quantity of bulk wine exports to Canada.
5) Increased the ratio of bulk wine exports to the United Kingdom over the quantity of bulk wine exports to Canada.
6) Increased the ratio of exports of bulk wine quantity to bottled wine quantity to the Eurozone countries.
7) Increased the ratio of exports of bulk wine quantity to bottled wine quantity to the United Kingdom.
8) Increased the U.S. bulk wine trade, the sum of import and export quantities, with the Eurozone countries.

The empirical model is designed to analyze the wine drawback effects on variables of interest in the eight hypotheses.

is a possibility of declining bottled wine exports to the Eurozone.
5. Data on Wine Imports and Exports used in Econometric Tests and Estimation

The empirical model consists of two parts. First, for each of the left-hand side variables mentioned above we test whether there is a structural break in the time series on January 2003, at the time of the introduction of the wine drawback policy. Second, we use panel data to quantify the time and trade partner specific wine drawback effects. This section describes the data used for the econometric estimation.

In order to test these hypotheses and estimate the effect of the wine drawback policy we use monthly volumes of table wine imports and exports by country and mode of shipment. The United States Census Bureau compiles monthly data for import quantities and unit values by port of entry, package form and by source of import, and monthly export quantities and unit values by exit port, country of destination, and package form. Both import and export data series are from January 2000 to December 2015. Recall the main source countries for table wine imports are Argentina, Australia, Chile, Eurozone countries, New Zealand and South Africa. While the main export destinations are Canada, China, Eurozone, Hong Kong, Japan and the United Kingdom. We have U.S. monthly bilateral table wine trade by container size for all of these countries.\(^{14}\)

Table 2 summarizes the underlying data. We can see that there is a large variability in month to month table wine trade variables. The variability is particularly high for bulk wine trade, which only in part can be explained by the growth in bulk wine trade.

We manipulate the table wine import and export quantities and construct the dependent variables mentioned in the hypotheses. For the all U.S. table wine trade with each of the major trading partners, we sum bulk and bottled import quantities from each of the major import source countries and sum the bulk and bottled export quantities from each of the

\(^{14}\)In 2015, almost all (99 percent) of both bulk and bottled table wine import volumes were from these six source countries. In 2015, 95 percent of bulk and about 80 percent of bottled U.S. table wine exports were to these main export destinations.
export destinations. Thus, we make use of 2,304 month-trade partner pairs of observations for twelve trade partners, Eurozone counted once as an import source and once as an export destination, for 192 months.

For the U.S. bulk table wine trade with each of the major trade partners, we used bulk wine import quantity from each of the major import source countries and bulk export quantities from each of the export destinations. This variable also has 2,304 month-trade partner pairs of observations. For the ratio of bulk to bottled wine imports, we sum the imports in bulk by month and divide it by the imports of bottled also summed by month, a total of 192 observations. The other dependent variables stay unchanged.

The ratio of bulk table wine exports to Eurozone countries over the quantity of bulk table wine exports to Canada and the ratio of bulk table wine exports to United Kingdom over the quantity of bulk table wine exports to Canada are constructed by dividing the bulk table wine exports to the respective trade partners by each other. In the similar manner, we construct the ratio of exports of bulk table wine quantity to bottled table wine quantity to the Eurozone countries and to the United Kingdom. Finally, the U.S. bulk table wine trade with the Eurozone countries is the sum of bulk table wine import and export quantities the Eurozone countries.

The all U.S. table wine trade with all major partners is constructed by summing imports of bulk and bottled table wine quantities from all major wine import source countries and the exports of bulk and bottled table wine quantities to all the major wine export destinations. The all U.S. table wine trade with all major partners has 192 monthly observations from January 2000 to December 2015. The U.S. bulk table wine trade with all major partners combines the import quantities from the major bulk table wine import countries and export quantities of bulk table wine to all major export destinations, a total of 192 monthly observations. Table 3 provides a summary of the above-mentioned variables.
6. Time Series Properties of the Panel Data and Tests of Structural Breaks

First, we analyze the time series for each of the eight hypotheses, a total of 192 observations for each series. We consider the DF-GLS test proposed by Elliott, Rothenberg, and Stock (1996), which tests the stationarity of each of the series around their mean. The time series is transformed via a generalized least squares (GLS) regression before performing the test. All of the eight-time series exhibit unit root for up the maximum lags included using the Schwert criterion.

6.1 Tests for a Single Structural Break

In this subsection, we report on two tests on structural break. First, we test for an unspecified single break in the time series variables. For each of the series, we calculate supremum Wald statistics consistent with Andrews (1993). We refer to Hansen (1997) for the p-values of these statistics. Next, we test the existence of a break specifically on January 2003 for each of the time series using a Chow test.

Table 4 shows the date of unspecified break and the $\chi^2$ value of the Wald test of existence of break on January 2003.

The structural breaks on the dates in the first column are all statistically significant at 1 percent. Two points are interesting about these results. First, the breaks for all of the series occurred after January 2003. This outcome confirms that there was really not much going on before 2003. Second, with the exception of the total U.S. table wine trade with all major partners, all of the series have a break within two years after the introduction of the wine drawback. Some lag in the response to a policy change is expected and can be due to the time it takes to learn and adapt to a new policy. Thus, we interpret this evidence as consistent with the introduction of wine duty drawback policy.

It is worth noting that all of the series have a statistically significant structural break on
January 2003; however, this result is not robust, particularly to dates around January 2003 which also can be attributed to the learning lag.

In the next section, we test for the structural break at January 2003 using in addition to the time series properties the cross-sectional properties of the panel data.

6.2 Known Common Structural Break Using Panel Data

We use the panel feature of the data to combine information from the time series dimension with that obtained from the cross-sectional dimension. Inference about a break in the pattern of responses over time can be made more precise by taking account of the cross-section dimension. The analysis in this paper is mainly based on the seminal contributions in the field of analysis of unit roots in panel data Levin and Lin (2002).\textsuperscript{15} In the earliest stages of the development of this theory, economists used it to study wages in unionized and non-unionized industries Breitung and Mayer (1994) and to study purchasing power parity Frankel and Rose (1996).

In the recent years, unit root tests in panel data were used, to study causality between energy consumption and economic growth Constantini and Martini (2010), and U.S. house prices and possible price bubbles Clark and Coggin (2011).

To apply these methods we use a linear model

\[ Y_{it} = \alpha_i + \beta t + u_{it}, \text{ with} \]  

\[ Y_{it} = \begin{cases} 
\alpha_i + \beta t + u_{it} & \text{if } t < \text{Jan } 2003 \\
\alpha_i + (\beta + \gamma)t + u_{it} & \text{if } t \geq \text{Jan } 2003.
\end{cases} \]

In equation (28), \( Y_{it} \) is either the all U.S. table wine trade with each major partner, U.S. bulk table wine trade with each major partner, or U.S. bulk wine trade with the Eurozone countries. For each of these equations, \( t \) is a linear time trend, \( \gamma \) represents the break in

\textsuperscript{15}Levin and Lin (2002) was available as a working paper in 1992 and garnered much attention.
the time trend and $\alpha_i$ is a wine trade partner specific intercept.\footnote{We do not conduct similar analysis for the variables that contain a ratio of import or export quantities because breaks of the same sign in denominator and numerator can result to a no break in the ratio.} We assume a common linear time trend, $\beta$, for all trade partners and test for an existence of a break $\gamma$ on January 2003. The error term $u_{it}$ is error term such that $E(u_{it}) = 0$, for all $i$ and $t$ with possibly heteroskedastic variance.

The null and alternative hypotheses are $H_0 : \gamma = 0$ no break, versus $H_1 : \gamma \neq 0$ a break. We test for a known common structural break for each of the $Y_{it}$ on January 2003. Imposing a common break for all series is more restrictive compared to the random breaks. However, if the breaks are indeed common, as a result of a single event, such as a policy shift, Bai (2010) proved that imposing a single break yields more precise estimate. We conduct a separate test for each of the three dependent variables $Y_{it}$ in equation (28).

Table 5 reports the results. For the all U.S. table wine trade with each major trade partner and the U.S. bulk table wine trade with each major partner I used all of the month-trade partner pairs of observations in the panel, a total of 2,304 observations. For the U.S. bulk table wine trade with Eurozone countries, we use 192 observations.

The results suggest existence of a statistically significant common break for each of the trade partners for series of the all U.S. table wine trade and the U.S. bulk table wine trade with the Eurozone countries. We find no break on January 2003 for the U.S. bulk wine trade with major partners. The restriction of a common structural break using panel data and the gradual adaptation to a policy change with complicated consequences can account for these results.
7. Additional Data on Explanatory Variables and the Measure of the Incidence of the Drawback Used to Estimate Quantitative Effects of Wine Drawbacks

One objective of this paper is to understand the change in trade patterns caused by the introduction of the wine drawback policy. Of course, the wine drawback policy is only one of the several causal factors affecting table wine trade. Therefore, this section introduces additional explanatory variables that are commonly used in trade literature. Pasley and Wei (2001) established that among so-called border effects on international trade, distance, unit shipping costs, and exchange rate variability, collectively explain a substantial portion of the observed international trade patterns. In addition to exchange rates and transportation costs, we include lagged variables, monthly dummy variables, and variables to account for the U.S. Free Trade Agreements with Australia and Chile.

7.1 Real Exchange Rates

The appreciation of one country's currency relative to another country's currency has two important economic implications. First, it makes the exports (including wine) from the first country to the second country less affordable. Campa and Goldberg (2005) provided evidence of partial pass-through of exchange rate into import prices. Second, it also makes the exports of the first country more expensive relative to the exports of a third country in the second country. For example, if the U.S. dollar appreciates relative to the currencies of all other wine producing countries then a bottle of the U.S. wine will cost more in Germany than before, and a similar bottle of Australian wine will be relatively cheaper than the bottle of U.S. wine in Germany. Chen and Rogoff (2002) established a strong and stable influence of the U.S. dollar price of the export commodity on the floating real exchange rates of the exporting countries.
We use indices of monthly bilateral average relative real exchange rates for each import source and export destination country for the time period of January 2000 to December 2015 from (source Bank for International Settlements). Each country’s real exchange rate is indexed such that it averages 100 over the base year. The real exchange rate of Argentina falls from 259 to 79 over the 16 years. South Africa’s real exchange rate fluctuated and is down to 59 by the last year.

7.2 Transportation Costs

Transportation costs in the context of the wine drawback policy and the U.S. wine trade are important for two reasons. First, the importance of transportation costs relative to the value of the wine being transported, and to the extent to which they alter relative prices given that transportation costs are per a unit of quantity basis. Hummels and Skiba (2004) extended the Alchian and Allen result that a per unit transportation cost lowers the relative price of and rises the demand for, high-quality goods, to deriving a relationship between per unit and ad valorum trade costs and the quality composition of trade.

Second, transportation costs are an alternative form of import tariff barriers from farther places relative to locally produced wine. Transportation costs are among the main reasons why, with the wine drawback policy in place, the United States does not import all of the wine consumed in the United States and exports all of the U.S. produced wine. While other factors such as quality differences also prevent this from happening, for the more homogenous product such as the bulk wine, transportation costs are the main reason. Yue et al. (2006) examined the tariff equivalence of transportation costs and their effects on international trade. Bianco et al. (2016) provided an empirical investigation of the impact of trade and non-trade barriers that in part focused on transportation costs for the world wine trade.

Before we elaborate how the transportation cost variable is constructed, we discuss the

17 The BIS real effective relative exchange rates are calculated as nominal effective exchange rates, geometric weighted average of bilateral exchange rates, adjusted by relative consumer prices. The most recent weights are based on trade in the 2011-2013 period, with 2010 as the indices’ base year.
technological changes that affected how the United States trades wine. The first major technological change occurred in late 1990s when the wine industry adopted flexitank technology which was used by chemical shippers from the early 1990s to transport non-hazardous liquid shipments (Gilliis, 2010). The wide adaptation of flexitanks by the wine industry can explain the increase in bulk wine trade relative to bottle wine trade. However, flexitanks were widely available before the introduction of the wine drawback policy in 2003 and they still do not explain the large increases in both imports and exports of bulk wine.

Bulk wine can also be shipped packaged in bag-in-the-box containers, typically holding 5 liters. A standard dry 20ft container can fit 3,000 boxes, a total of 15,000 liters of wine, compared to 24,000 liters if shipped in a flexitank (exportfactory.es). The constraint in shipping bulk wine in 5 liter bag-in-the-box containers is the number of pallets one can put in a container. While less wine is shipped per container this still can be a profitable choice in the case when transportation costs are relatively small compared to particularly high packaging costs in the destination country.

Ideally, we would like to obtain bilateral transportation cost time-series dataset to account for variation in the U.S. wine trade due to various changes in shipping costs. There are numerous sources for current bilateral shipment rates; however, detailed reliable time-series dataset fit for our empirical analysis was not available.

Limao and Venables (2001) obtained quotes from shipping firms for standard 40ft container and estimate that an extra km by sea adds $190 to transportation costs, compared to $1,380 by land. This analysis does not account for backhaul effect which is important for table wine trade. Alternatively, the U.S. Census provides data on U.S. imports and exports at the 10 digit Harmonized System by country, and entry port, by weight and volume at f.o.b. and c.i.f. bases. The ratio of f.o.b. value to c.i.f. yields an ad valorem estimate of bilateral transport cost. Hummels (2001) found a wide variance in freight rates over commodities and across countries in 1994. For this reason, we refrain from using this method.

We use the interaction of two variables to capture the most important drivers of trans-
portation costs in bilateral trade which is in line with the general international trade literature (Hummels, 2007). The first variable is the current price of a standard container shipment between the ports of interest. There are multiple websites that provide these quotes.

We obtain the data from worldfreightrates.com. This website is particularly convenient because it provides a range of current market shipping rates for various commodity groups shipped by a sea vessel and by a truck. We use the midpoint of a range for shipping rates as a point of reference. In addition, the shipping rates for different agricultural commodity groups do not vary systematically; therefore, we use food (perishable) and $30,000 as our representative container. Table 6 presents the market rates for shipments of the U.S. wine exports to the ports of major export destinations and the U.S. imports from the ports of major source countries.

Table 6 has two general facts that are consistent with our expectations. First, the rates for U.S. exports are cheaper than the U.S. imports. Second, rates to ship from the port of San Francisco to Asian markets are 3 to 4 times cheaper than shipping to Europe. Both of these facts are because of the back-haul effect. We believe that accounting for the backhaul effect is important for our analysis. For the U.S. wine imports from Eurozone countries, we use the average of the mid-point of the shipping rates from Le Havre, France, Livorno, Italy and Valencia, Spain. For exports to the Eurozone countries, we use the average of the midpoints of the shipping rates to Hamburg, Germany and Livorno, Italy.

For wine shipments to Canada, we use Modesto, California as the departing point because we do not ship wine by sea to Canada. We use the truck shipping rates to Vancouver and Toronto with weights of one-third and two-thirds respectively to account for the size of the markets. This portion of the transportation cost variable provides a cross-sectional variation of the transportation costs.

The second variable to account for the transportation costs is an index of the monthly average Brent Crude oil prices. The index is set to be 1 on May, 2016 to make sure that the transportation costs are consistent with the current market rates. The bunker fuel used to
power the ship’s engines is a residual derived from crude oil. The bunker oil costs account for approximately half of the operation costs of ocean freight; therefore, Brent Crude oil prices serve as a good approximation for the shipping industry operation costs.

The variable that we use to account for the transportation costs of importing and exporting wine is

\[ TC_{ij}^t = 0.5 \text{ShippingCost}_{j}^i + 0.5 \text{ShippingCost}_{j}^i \times \text{BrentIndex}_t, \]

where shipping cost represents the current shipping rate from port \( i \) to port \( j \) and \( \text{BrentIndex}_t \) represents the index of Brent Crude oil prices.\(^{18}\) Including \( \text{BrentIndex} \) allows having a transportation cost variable that has both across trade partner and across time variation.

### 7.3 Free Trade Agreements

The import duties for bulk wine applicable to the countries with free trade agreements with the United States have been reduced each year. Table 7 shows the staged reduction in tariffs for bulk and bottled wine imports from Australia and Chile. We note that the import duty decreased gradually for bulk wine trade after signing the free trade agreements for both countries and went to zero in 2015. The import duty for bottled wine from both Australia and Chile stayed at the pre-free trade agreement level until 2014 and then went to zero in 2015.

### 7.4 Maximum Unclaimed Drawback-Eligible Bulk Wine Imports

Before we start the econometric estimation of the impacts of wine drawback on the U.S. wine import and export quantities we must introduce the concept of “maximum, unclaimed, accumulated drawback-eligible bulk wine imports” (\( ACIM \)). No data is available on the

\(^{18}\)These shipping cost variables are not ideal. A better variable would be an index of monthly bilateral cost of ocean transport that includes costs of loading and unloading of goods at the ports as well as other costs such as the insurance of the shipment. However, to our knowledge, such an index is not available.
amount of wine drawbacks actually obtained by either exporters or importers. To circumvent this problem, we construct proxy variable to represent the anticipated share of wine drawback likely to be obtained by the bulk table wine exporters. \( ACIM \) is the first step in creating the variable \( \delta_{blk} \) described in section 4.

For a given month \( t \in [\text{Jan2003}, \text{Dec2015}] \), \( ACIM \) represents an estimate of the amount of bulk wine imports accumulated in the United States that are yet to be claimed by drawback-eligible exports. To construct \( ACIM \), we use aggregate U.S. bulk wine trade data and four rules both consistent with wine drawback regulation and necessary to maximize the wine drawback refund: (1) the earliest imports are the first to be claimed by the exporters.\(^{19}\) (2) No negative carryover of imports is allowed.\(^{20}\) The minimum available imports are zero. (3) The first exports eligible for wine drawback are from January 2003, but the first imports eligible for wine drawback are from January 2000. (4) Once the accumulated imports are zero it takes 36 months of positive accumulated imports before any of the imports can potentially “expire” for wine drawback purposes. In constructing \( ACIM \) we assume that all bulk wine meets the price comparison match (import and export unit values are within 50% of each other), and color is not a binding constraint. This means that \( ACIM \) is an upper bound of accumulated imports. We set January 2003 to be the first period after the introduction of wine drawback, thus, January 2000 is period (-35).\(^{21}\)

Since importers have up to three years (in the data relevant to this paper) to find eligible matching exports to claim the wine drawback and assuming the earliest imports get matched first (rule 1) then for a given period \( t \), the amount of drawback-eligible imports that can

\(^{19}\)The first in – first out rule ensures that no drawback-eligible unclaimed bulk wine imports “expire” because of inefficient matching with eligible exports.

\(^{20}\)According to the wine drawback regulation, over period of our data, imports had up to three years to find eligible exports to match, thus imports always have to occur before the matching exports.

\(^{21}\)Note, once the wine drawback policy was in place, the bulk wine imports of prior three years (January 2000 to December 2002) were, in theory, unclaimed and eligible for drawback. However, prior to the wine drawback policy, the United States imported very little wine in bulk and the stock of eligible imports would have been drawn to zero quickly. Therefore, we assume zero accumulated imports on January 2003.
potentially be no longer available for wine drawback, “expire”, is

$$\sum_{-35}^{-35+t} W_{md}^{blk} - \sum_{0}^{t} W_{ux}^{blk}.$$ 

Following the rules described above, there can be two possibilities. First, for a given month \(t\) the previous month’s accumulated imports are non-positive, \(ACIM_{t-1} \leq 0\). Then we set \(ACIM_{t-1} = 0\), because negative accumulated imports are not allowed (rule 2). Since the \(ACIM_{t-1} = 0\), according to the wine drawback regulation and rule 4, eligible imports will not expire for the next 36 months, thus

$$\sum_{-35}^{-35+t} W_{md}^{blk} - \sum_{0}^{t} W_{ux}^{blk} = 0 \quad \text{for} \quad t = t - 1, \ldots, t + 35.$$

The accumulated imports for time \(t\) are

$$ACIM_t = W_{md_{t-1}}^{blk} - W_{ux_t}^{blk}.$$ 

In the second case, when we start with positive accumulated imports for the previous month, \(ACIM_{t-1} > 0\), if

$$\sum_{-35}^{-35+t} W_{md}^{blk} - \sum_{0}^{t} W_{ux}^{blk} \leq 0,$$

the accumulated imports for time \(t\) are equal

$$ACIM_t = ACIM_{t-1} + W_{md_{t-1}}^{blk} - W_{ux_t}^{blk}.$$ 

The accumulated bulk wine imports are equal to the accumulated imports from the previous period plus the difference between previous period’s bulk wine import quantity and this period’s bulk wine export quantity.
However, if
\[
\sum_{-35}^{-35+t} W_{md}^{blk} - \sum_{0}^{t} W_{ux}^{blk} > 0,
\]
this period’s accumulated drawback-eligible bulk wine imports are reduced by the amount of bulk wine imports no longer eligible for wine drawbacks.

\[
ACIM_t = ACIM_{t-1} + W_{md_{t-1}}^{blk} - W_{ux_{t-1}}^{blk} - \left( \sum_{-35}^{-35+t} W_{md}^{blk} - \sum_{0}^{t} W_{ux}^{blk} \right).
\] (29)

Based on the accumulated import variable $ACIM_t$ we construct the proxy for $\delta_{blk}$, the share of the wine drawback refund obtained by the bulk wine exporters, where

\[
\delta_{blk} = \begin{cases} 
1 - |\varepsilon| & \approx 1 \quad \text{if } ACIM_t > \sum_{t-12}^{t-1} W_{ux}^{blk} \\
\sum_{t-12}^{t-1} W_{ux}^{blk} \frac{ACIM_t}{ACIM_t} & \approx 0 \\
|\varepsilon| & \approx 0 \quad \text{if } ACIM_t = 0,
\end{cases}
\] (30)

where $\varepsilon$ is a small number close to zero.\(^{22}\)

If the accumulated imports at a given month are greater than the sum of bulk wine exports of the previous twelve months then $\delta_{blk} \approx 1$.\(^{23}\) If the accumulated imports for a given month are positive but less than the sum of bulk wine exports of the previous twelve months than $\delta_{blk} = \sum_{t-12}^{t-1} W_{ux}^{blk} \frac{ACIM_t}{ACIM_t}$. If $ACIM_t = 0$, then $\delta_{blk} \approx 0$ when the accumulated imports are zero the potential exports have little to no chance of securing eligible imports.

Empirically to avoid cases where exporters are sure of obtaining the drawback or the importers are sure of obtaining the drawback, we introduce $\varepsilon$ a random variable with mean zero and variance of 0.005. We subtract $|\varepsilon|$ when $\delta_{blk} = 1$ and add $|\varepsilon|$ when $\delta_{blk} = 0$.

Figure 4 plots $\delta_{blk}$ for the period of January 2003 to December 2015. Initially, the exports of bulk wine were larger than imports of bulk wine and the exporters’ share of wine drawback

\(^{22}\) $\delta_{blk}$ is constructed based on $ACIM$ which is based on import and export quantities. However, any given month’s supply shocks are uncorrelated with $\delta_{blk}$ by construction.

\(^{23}\) A given bulk wine exporter is almost convinced of being able to secure eligible imports for the wine drawback refund.
was close to zero. Because of the large import quantities in recent years, there is a large backlog of unclaimed bulk wine imports accumulated in the United States and the bulk exporters can be confident in securing imports for their additional exports.\textsuperscript{24}

### 7.5 Summary Statistics

Table 8 provides summary statistics for the all U.S. table wine and bulk table wine exports and imports for the main sources and destinations. Exports of bulk table wine averaged about 1.6 million liters per month to these destinations. All table wine exports averaged about 3.9 million liters per month indicating that bulk wine was a little less than half of total exports. Imports are larger than exports and dominated by bottled imports. Bulk table wine imports average 1.9 million liters of the total of 10 million liters.

Table 8 also includes the summary statistics for the explanatory variables included in the model. The U.S. exporters of bulk wine receive an average drawback of 0.07 as a proportion of the export unit value. This is low because the drawback is zero for the first 35 months (because the data in the regression models begins in February 2000), it is zero for exports to Canada and export unit values to Asian destinations are quite high. The importers of bulk wine into the United States receive an average drawback of 0.24 as a proportion of the import unit value for bulk wine. The U.S. import unit values are quite low from all sources. Moreover, the drawback is zero for only the first 24 months because the import regression models include a 12-month lag so the data begin in January 2001.

Finally, table 8 also includes summary statistics for the exchange rate and the transport cost variable.\textsuperscript{25} The relative real exchange rate averages are similar because both sets of samples include euro. The maximum for the export sample, 1.24, corresponds to U.K.

\textsuperscript{24} The effects of the new legislation extending the period of finding drawback-eligible exports from three years to five will make imports harder to expire thus keeping $\delta_{blk}$ close to 1 longer.

\textsuperscript{25} We do not include in our estimations variables accounting for income, population or supply-side shocks such as weather because we are estimating the changes in import and export quantities and not the consumption or production of table wine. Income and population do not affect differently the imports and exports of table wine relative to the domestically produced table wine. Supply shocks may affect exports and imports but they are in the error term.
on October 2007. The maximum of the import sample, 2.279, corresponds to Argentina in January 2000. The minimum of the export sample, 0.563, corresponds to Canada on January 2002, and the minimum of the import sample, 0.507, corresponds to South Africa on December of 2001.

The transportation cost variable has a mean of $1,743 for export sample and $2,756 for import sample for shipping a standard 20ft. container. The U.S. exports are on average cheaper because of the backhaul effect. The maximum of transportation costs for the export sample, $5,407, is to Eurozone and the maximum for the import sample, $8,585, is from South Africa. Both maximums occurred on July of 2008 when the oil prices peaked. As expected, the minimums of transportation costs occurred on December 2001 when the oil prices bottomed. The export sample minimum, $339, corresponds to China, and the import sample minimum, $619, corresponds to imports from Chile and Argentina.


We estimate the impact of the wine drawback policy on all U.S. wine and bulk wine exports to major export destinations. Then we estimate the impact of wine drawback on all U.S. wine imports and bulk wine imports from each major source. We have two import regressions and two export regressions.

8.1 Econometric Specifications

The main variable of interest is defined as

\[ X_{it} = D_{03t} D_{Can_t} \delta_{it} \frac{T + D_{avg_t}^{blk}}{UV_{it}}. \]
The first component, $D_{03}$, is a dummy variable that is zero before January 2003, and 1 after. The second component, $D_{Can}$, is the Canada dummy that is zero for Canada and 1 for the other major export destinations. We include $D_{Can}$ in $X_{it}$ the exports to Canada are excluded for drawback purposes and our variable reflects that fact.

The last component of $X_{it}$, $\delta_{blk} \frac{T + D_{avg}}{UV}$, is the exporters' share of the wine drawback. In this component the variable $\delta_{blk}$ is multiplied by the value of the wine drawback savings relative to the export unit price where $T$ is the per liter federal excise tax and $D_{avg}$ is the average import duty paid by a bulk wine importer for that month, as discussed in section 4. The variable $UV$ is the unit value of the bulk wine exports to the trade partner $i$ at month $t$. The variable $X_{it}$ is interpreted as the ratio of the bulk table wine exporters' portion of the wine drawback refund over the unit value.

We argue that this explanatory variable is exogenous in the export quantity equation because it is based on regulatory components, historical imports relative to exports and the unit value which is exogenous because the U.S. wine exports are price takers in the global market. Although the U.S. is a significant exporter of bulk wine U.S. exports comprise a small share of wine exports and of wine quality demanded in the markets to which U.S. wine is shipped. We further argue that measurement error in quantity exported is small and therefore the potential bias from that source is small as well.

We specify the dependent variable in log terms. In addition to the variables discussed above, we include lagged dependent variable in the regression. The export regressions have the following form

$$
lnY_{it} = \alpha + \beta_1 lnY_{it-1} + \beta_2 X_{it} + \beta_3 REXrate_{it} + \beta_4 TC_{it} + \beta_5 M_t + u_{it}. \tag{31}
$$

In equation (31), the $lnY_{it}$ is either the natural logarithm of all U.S. table wine export quantity or the U.S. bulk wine export quantity to each of the major wine export destinations, $lnY_{it-1}$ is the logarithm of a one month lagged variable, $REXrate$ is the relative real ex-
change rate variable, $TC$ is the transportation cost. The vector of monthly dummy variables controlling for the seasonality effects is denoted by $M$.

The error term $u_{it} = \mu_i + v_{it}$ with $\mu_i \sim IID(0, \sigma^2_\mu)$ and $v_{it} \sim IID(0, \sigma^2_v)$. Because of the lagged variable, OLS is biased and inconsistent even if $v_{it}$ are not serially correlated, since $Y_{it}$ and $Y_{it-1}$ are both correlated with $\mu_i$. Fixed Effects estimator is biased in small sample but consistent for $T \to \infty$ because the within transformation gets rid of $\mu_i$; however, $Y_{it-1}$ is, by construction, correlated with $\pi_i$. The Random Effects estimator is biased and inconsistent.

Anderson and Hsiao (1981) suggested first differencing and using an IV method. The results of this procedure lead to consistent but not necessarily efficient estimates. The inefficiencies stem from two main reasons. First, Anderson and Hsiago (1981) does not use all of the available moment conditions. Second, it does not take into account the differenced structure of the residual disturbances $\Delta v_{it}$.

Arellano and Bond (1991) proposed more efficient estimation procedure. Their argument was that additional efficiency can be obtained if the orthogonality conditions existing between lagged of $Y_{it}$ and $v_{it}$ are used. We closely follow the procedures in Arellano and Bond (1991) to conduct our analysis.

For export regressions, we use 1,140 month-trade partner observations. Since we include a one month lagged variable, we lose an observation for each of the trade partners. As noted, variable $X_{it}$, can be interpreted as equivalent to a percentage price increase received by the bulk wine exporters, which yields a percentage change in the quantity of bulk wine exports.

One might argue in favor of various functional forms, in particular that the left-hand side variable could be in absolute form. The logarithmic form of the dependent variable implies a constant percentage increase in the quantity of bulk wine exports per percentage increase in the price received by bulk wine exporters due to the wine drawback across destinations and years.

For all U.S. table wine import quantity and U.S. bulk table wine import quantity regres-
sions, the variable that we are interested in is

\[ I_{it} = D_{03} (1 - \delta_{blk}^{it}) \frac{T + D_{blk}^{avg}}{UV_{it}}. \]

The importers’ share of wine duty drawback refund relative to the import unit value, \( I_{it} \), has three main components. The first component is \( D_{03} \), a dummy variable, that is zero before January 2003, and 1 after. The second component is the importers’ share of the wine duty drawback, \( (1 - \delta_{blk}^{it}) \), which is equal to 1 minus the exporters’ share of wine drawback. The third component is the value of total tax relative to the unit value of the imported bulk table wine \( \frac{T + D_{blk}^{avg}}{UV} \).

The import regressions have the following form

\[ \ln Y_{it} = \alpha + \beta_1 \ln Y_{it-1} + \beta_2 \ln Y_{it-12} + \beta_3 I_{it} + \beta_4 REXrate_{it} + \beta_5 TC_{it} + \beta_6 M_{it} + u_{it}. \] \( (32) \)

In equation (32), the \( \ln Y_{it} \) is either the natural logarithm of all U.S. table wine import quantity or the U.S. bulk table wine import quantity from each of the major wine import source countries. Unlike the export regressions, in import regressions we include a one month lagged variable, \( \ln Y_{it-1} \), and a one year lagged variable, \( \ln Y_{it-12} \).

The reason for including a longer, yearly lagged variable for the import regressions and not for the export regressions has to do with two facts. First, imports have to occur before exports for the wine drawback matching purposes. The last year’s imports if unclaimed compete for the same exports as the current period’s imports. However, this period’s exports can only be matched with this period’s bulk wine imports and bulk wine imports that will occur up to three years in the future. Second, imports are sourced from places with different wine production schedules. Wine grapes are harvested in August - October period in the Northern Hemisphere and in February - April in the Southern Hemisphere. Unlike imports, the U.S. wine grapes are harvested the same period every year (August - October). Therefore, the inclusion of a one year lagged variable, in addition captures the difference in production
8.2 Estimation Results and Interpretations

Table 9 summarizes the main estimation results for the two export and two import regressions.

Column 1 of table 9 presents the results of the regression of U.S. bulk table wine exports to each of the major export destinations. The one month lagged dependent variable is statistically significant and has a magnitude of 0.69, which is large enough to warrant the inclusion of it in the regression model but not close enough to unity to suggest that the regression specification should be in first differences of the dependent variable.

The coefficient of the exporters’ share of drawback refund is 1.877 which is statistically significant suggesting that bulk wine exporters increase average monthly exports to each of the major export destinations, with the exception of Canada, by 1.877 percent for a percentage increase that the bulk wine exporters receive as wine drawback.

The relative exchange rate is positive but not statistically significant. The transportation cost variable is statistically significant but has a positive value of 0.134 rather than a negative value. This can be explained by the fact that the United Kingdom and the Eurozone countries are the largest markets for the U.S. bulk wine and almost all the bulk wine is shipped from the port of San Francisco. The transportation costs from San Francisco to the ports of Europe are the highest; both because of the longest distance relative to the markets in Asia and because of the backhaul benefit. Some of the monthly dummy variables that control for seasonality are statistically significant.

Column 2 of table 9 represents the results of all U.S. table wine exports to each of the major export destinations. The one month lagged variable is statistically significant at 0.716 which is in an expected range.

The coefficient of the exporters’ share of drawback refund obtained by bulk wine exporters has positive value of 0.696. This coefficient is smaller in the all U.S. table wine regression
relative to the regression of bulk table wine exports because the U.S. bottled wine exports, the other part of the all U.S. table wine exports, have a different exporters’ share of wine drawback which as mentioned above is always equal to one. Thus, the bottled wine exporters always get the wine drawback and they do not consider shipping in bulk in order to obtain the drawback.

Transportation costs have a negative but not statistically significant coefficient. The relative real exchange rates have a statistically significant coefficient of 0.651. The positive coefficient of the real exchange rate suggests that the U.S. exporters are incentivized by the weaker dollar.

Turning to imports, column 3 of table 9 presents results for the regression of the U.S. bulk table wine imports from major import source countries. Both the one month lagged and the one year lagged variables are statistically significant with coefficients of 0.495 and 0.299 respectively. As already discussed, we include the one year lagged variable to account for the fact that some imports from the past still compete with the current imports for the same eligible exports and because the production periods for imported wine differ.

The bulk wine importers share of the wine drawback refund has a coefficient of 0.551 and is statistically significant indicating that a percentage increase in the price that the bulk wine importers receive due to the wine drawback increases the bulk wine imports by 0.551 percent.

The relative real exchange rate is negative as expected but insignificant. The transportation cost variable has a statically significant coefficient of 0.31. The United States imports a lot of bulk wine from South America, that has lower transportation costs, but it also imports a significant amount of bulk wine from Eurozone countries, South Africa, New Zealand and Australia through the port of San Francisco, with relatively higher transportation costs.

The last column of table 9 has the results of the all U.S. table wine imports from each major source country. The one month and one year lagged variables have magnitudes of 0.749 and 0.031 respectively and are statistically significant. The importers’ share of drawback
refund is 0.07 but it is statistically insignificant.

The results of table 9 mean that a unit increase in per unit revenue due to the wine drawback refund destined for exporters incentivizes the U.S. bulk table wine exports on average by 1.88 percent. Similarly, a unit increase in per unit revenue due to the wine drawback refund destined for importers increases bulk table wine imports by 0.55 percent. These results support and quantify the increase of bulk table wine trade relating to hypothesis 2. These results are economically significant as well. For example, if bulk wine exporters expected to receive 10 cents more at the mean, they will increase bulk exports by about 330 thousand liters per month to each of the major export destinations (about 14 containers). Similarly, if bulk wine importers expected to receive 10 cents more at the mean, they will increase bulk imports by about 97 thousand liters per month from each of the major import sources (about 4 containers).

The equivalent effect on the U.S. total table wine trade is 0.7 percent if exporters receive the drawback and 0.07 percent (statistically insignificant) if importers receive the refund. The results for the U.S. total table wine trade relate to hypothesis 1 in section 4. We find support for hypothesis 1 for exports but not for all wine imports. We interpret this as indicating that the per unit drawback is not sufficiently important quantitatively for the higher-priced bottled wine imports to significantly affect the total of wine imports into the United States.

9. Summary and Conclusions

Economists have paid little attention to assessing the empirical trade impacts of drawback policy. We fill this void for wine by developing a series of hypotheses about how the substitution drawback policy of the United States affects table wine trade. In particular, we develop a conceptual model that describes the effects of the wine drawback on table wine trade by package size and trade partner. The development of the conceptual model yields
eight hypotheses describing the effects of wine drawback on eight variables related to table wine trade.

We first test the hypotheses that structural breaks occurred in U.S. wine trade on January 2003 using time series on wine imports and exports. The test statistics indicate that all of the variables have a significant structural break corresponding to the initiation of the drawback policy.

We test for a unique unknown single break in each of the wine trade variables associated with each of the hypotheses. The test for a unique unspecified break reveals two interesting findings. First, the breaks in all of the time series occurred after January 2003. This indicates that from 2000 to 2003, before the introduction of the wine drawback, there was little action in table wine trade. Second, seven of the eight variables, the exception being aggregate U.S. table wine trade, have the statistically significant break within two years of the introduction of the wine drawback policy. While major free trade agreements with Australia and Chile were signed within two years after the introduction of the wine drawback, these free trade agreements had only begun to be implemented for wine and cannot account for changes in U.S. bulk wine exports to Eurozone countries and the United Kingdom relative to the bulk wine exports to Canada.

We also test for a common single structural break on January 2003, for U.S. all table wine, and for U.S. bulk table wine trade with each of the major trade partners. The test confirms a statistically significant common structural break for U.S. all table wine trade with each of the major trade partners for January 2003. However, we reject the existence of a common structural break on January 2003 for U.S. bulk wine trade with each of the major trade partners.

We next estimate econometrically the significance and magnitude of the impact of the wine drawback policy on all U.S table wine and the bulk table wine trade with each of the major trade partners using panel data. The econometric model accounts for the pattern of both time series and cross-section properties of the error terms, but does not estimate
separate parameters for each destination of exports or source of imports.

Our empirical model reveals that a unit increase in per unit revenue caused by the bulk wine drawback increased the average monthly bulk wine exports by 1.88 percent when the accumulated unclaimed imports implied that the wine drawback would accrue to bulk wine exporters. Similarly, a unit increase in per unit revenue caused by the bulk wine drawback amount increased the average monthly bulk wine imports by 0.55 percent, when the accumulated unclaimed imports implied that the wine drawback would accrue to bulk wine importers. Due to a large backlog of unclaimed bulk wine imports in the United States in 2015, we expect that the U.S. bulk wine exporters anticipate they will receive the wine drawback refund. For 2015, the wine drawback refund was $55 million assuming all of the bulk wine exports except for the exports to Canada received the drawback.

This paper documents that the substitution drawback for wine that was implemented in 2003 is an important factor explaining the patterns in the U.S. wine imports and exports. We find strong evidence of the impact of the drawback in U.S. aggregate wine trade data. The increases in the quantity of exports and imports constitute a large share of the average monthly exports or imports for major wine trading partners suggesting that a significant share of the U.S. bulk table wine trade and bottled table wine trade is attributable to the wine drawback policy.

We are investigating two promising areas of future research. First is the analysis of the wine drawback policy effects when the wine trading firms have market power. The largest wine firms do most of the international trade in wine. This is particularly true for bulk wine. The second natural next step is to extend the current analysis to consider the effects of the wine drawback policy on U.S. grape growers, consumers, and other market participants.

Also, work utilizing wine drawback refund transaction level data can draw a more precise picture of the wine drawback effect on the U.S. and global wine trade. Extending the drawback to other alcoholic beverages that also pay federal excise tax may be useful for a greater understanding of how this particular trade policy can reshape U.S. trade.
References


Panagariya, A. (1992) “Input tariffs, duty drawbacks, and tariff reforms”, *Journal of


Figure 1: Annual U.S. Bulk Wine Import and Export Quantities, 2000-2015

Source: U.S. Census Bureau.
Note: The black dash-line indicates the start of the wine drawback program.
Figure 2: Annual U.S. Bottled Wine Import and Export Quantities, 2000-2015

Source: U.S. Census Bureau.
Note: The black dash-line indicates the start of the wine drawback program.
Figure 3: Canadian Imports of Bulk Wine From the U.S. and ROW, 2000-2015

Source: United Nations Comtrade Database.
Note: The black dash-line indicates the start of the wine drawback program. United Nations Comtrade database only differentiates at 6 digit HTS level. At this level bulk wine is not differentiated by the alcohol volume. Therefore, the Canadian import quantities of bulk wine contain the import quantities of fortified bulk wine. This is the reason why the Canadian import quantities of bulk wine from the United States are slightly larger than the U.S. export quantities of bulk table wine to Canada.
Source: Authors’ calculations based on the U.S. Census Bureau data.
Note: The line depicts $\delta^{blk}$ which in the paper represents bulk wine exporters’ share of wine drawback refund. $\delta^{bot}$ is equal to 1 throughout the period.
<table>
<thead>
<tr>
<th>Import Duty and Excise Tax Rates</th>
<th>Bottled Wine HTS (22042150)</th>
<th>Bulk Wine HTS (22042960)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MFN Importers</td>
<td>Australia, Chile</td>
</tr>
<tr>
<td>Import Duty Rate</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Excise Tax</td>
<td>28.27</td>
<td>28.27</td>
</tr>
<tr>
<td>Total</td>
<td>34.57</td>
<td>34.57</td>
</tr>
<tr>
<td>Share of Unit Value</td>
<td>0.07</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Source: Customs and Boarder Protection and authors’ calculations.
Note: The share of unit values are calculated based on the import unit values of the bottled and bulk wine for the respective years. MFN is most favored nation.
Table 2: U.S. Imports and Exports by Container and Region, Monthly, January 2000 to December 2015.

<table>
<thead>
<tr>
<th>U.S. Imports From</th>
<th>Obs.</th>
<th>Bulk 1,000L</th>
<th>Bottled 1,000L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (Std)</td>
<td>Mean (Std)</td>
</tr>
<tr>
<td>Argentina</td>
<td>192</td>
<td>2,461 (3,245)</td>
<td>2,745 (1,584)</td>
</tr>
<tr>
<td>Australia</td>
<td>192</td>
<td>3,195 (3,112)</td>
<td>10,417 (3,300)</td>
</tr>
<tr>
<td>Chile</td>
<td>192</td>
<td>2,804 (4,134)</td>
<td>4,640 (796)</td>
</tr>
<tr>
<td>Eurozone</td>
<td>192</td>
<td>1,243 (1,210)</td>
<td>28,868 (5,575)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>192</td>
<td>487 (738)</td>
<td>1,455 (916)</td>
</tr>
<tr>
<td>South Africa</td>
<td>192</td>
<td>313 (732)</td>
<td>545 (245)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U.S. Exports to</th>
<th>Obs.</th>
<th>Bulk 1,000L</th>
<th>Bottled 1,000L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (Std)</td>
<td>Mean (Std)</td>
</tr>
<tr>
<td>Canada</td>
<td>192</td>
<td>1,215 (481)</td>
<td>2,254 (821)</td>
</tr>
<tr>
<td>China</td>
<td>192</td>
<td>103 (194)</td>
<td>469 (427)</td>
</tr>
<tr>
<td>Eurozone</td>
<td>192</td>
<td>4,256 (2,890)</td>
<td>3,312 (1,566)</td>
</tr>
<tr>
<td>Honk Kong</td>
<td>192</td>
<td>134 (190)</td>
<td>373 (321)</td>
</tr>
<tr>
<td>Japan</td>
<td>192</td>
<td>675 (449)</td>
<td>1,418 (991)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>192</td>
<td>3,400 (2,570)</td>
<td>5,559 (2,353)</td>
</tr>
</tbody>
</table>

Source: United States Census Bureau.
Note: The data for the Eurozone countries refer to the wine trade data of all countries wine trade data of all countries that are currently Eurozone members.
Table 3: Summary Statistics of Dependent Variables Used in the Structural Break Tests

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Obs.</th>
<th>Mean (Std)</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. all table wine trade with each major partner</td>
<td>2,304</td>
<td>6,860 (8,594)</td>
<td>0</td>
<td>43,409</td>
</tr>
<tr>
<td>U.S. bulk table wine trade with each major partner</td>
<td>2,304</td>
<td>1,688 (2,554)</td>
<td>0</td>
<td>16,866</td>
</tr>
<tr>
<td>U.S. bulk wine trade with Eurozone</td>
<td>192</td>
<td>5,468 (3,606)</td>
<td>149</td>
<td>15,925</td>
</tr>
<tr>
<td>Ratio of bulk and bottled table wine import quantities</td>
<td>192</td>
<td>0.2 (0.189)</td>
<td>0.002</td>
<td>0.818</td>
</tr>
<tr>
<td>Ratio of bulk export quantities to Eurozone over bulk export quantities to Canada</td>
<td>192</td>
<td>4.16 (3.59)</td>
<td>0.021</td>
<td>22.901</td>
</tr>
<tr>
<td>Ratio of bulk export quantities to UK over bulk export quantities to Canada</td>
<td>192</td>
<td>3.5 (3.34)</td>
<td>0.008</td>
<td>19.01</td>
</tr>
<tr>
<td>Ratio of bulk and bottled table wine exports to Eurozone</td>
<td>192</td>
<td>1.78 (1.5)</td>
<td>0.006</td>
<td>7.513</td>
</tr>
<tr>
<td>Ratio of bulk and bottled table wine exports to UK</td>
<td>192</td>
<td>0.78 (0.68)</td>
<td>0.002</td>
<td>7.515</td>
</tr>
<tr>
<td>U.S. all table wine trade with all major partners</td>
<td>192</td>
<td>82,315 (20,194)</td>
<td>37,207</td>
<td>126,101</td>
</tr>
<tr>
<td>U.S. bulk wine trade with all major partners</td>
<td>192</td>
<td>20,258 (13,929)</td>
<td>1,922</td>
<td>52,485</td>
</tr>
</tbody>
</table>

Source: United States Census Bureau and authors' calculations.
Note: The quantity variables are in 1,000L.

<table>
<thead>
<tr>
<th>Description</th>
<th>Date of the single break</th>
<th>$\chi^2$ Break on January 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total U.S. bulk wine trade with all major partners</td>
<td>Mar-04</td>
<td>293.83</td>
</tr>
<tr>
<td>Ratio of bulk to bottled wine import</td>
<td>Sep-04</td>
<td>105.71</td>
</tr>
<tr>
<td>Ratio of bulk exports to EZ over bulk exports to Canada</td>
<td>Jun-04</td>
<td>67.36</td>
</tr>
<tr>
<td>Ratio of bulk exports to UK over bulk exports to Canada</td>
<td>Oct-03</td>
<td>189.78</td>
</tr>
<tr>
<td>Ratio of bulk to bottled exports to EZ</td>
<td>Jun-04</td>
<td>178.97</td>
</tr>
<tr>
<td>Ratio of bulk to bottled exports to UK</td>
<td>Oct-03</td>
<td>336.79</td>
</tr>
<tr>
<td>Total U.S. bulk wine trade with EZ</td>
<td>Apr-04</td>
<td>13.63</td>
</tr>
<tr>
<td>Total U.S. table wine trade with all major partners</td>
<td>Oct-11</td>
<td>28.95</td>
</tr>
</tbody>
</table>

Source: Authors’ estimations.
Note: EZ is Eurozone. Trade means both imports and exports.
Table 5: A Common Structural Break on January 2003 Using Panel Data, $\chi^2$ statistics and P-Values.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>$\chi^2$ Test Statistics (P-Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. all table wine trade with each major partner</td>
<td>2,304</td>
<td>7.31 (0.007)</td>
</tr>
<tr>
<td>U.S. bulk table wine trade with each major partner</td>
<td>2,304</td>
<td>1.96 (0.162)</td>
</tr>
<tr>
<td>Total U.S. bulk wine trade with Eurozone</td>
<td>192</td>
<td>13.63 (0.000)</td>
</tr>
</tbody>
</table>

Source: Authors’ estimations.
### Table 6: Market Rates for 20 ft. Standard Shipping Container with Perishable Food Worth $30,000.

<table>
<thead>
<tr>
<th>Source Port</th>
<th>Destination Port</th>
<th>Min</th>
<th>Mid-Point</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U.S. Imports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valparaiso, Chile</td>
<td>San Francisco, US</td>
<td>679</td>
<td>715</td>
<td>751</td>
</tr>
<tr>
<td>Valparaiso, Chile</td>
<td>New York, US</td>
<td>559</td>
<td>588</td>
<td>618</td>
</tr>
<tr>
<td>Adelaide, Australia</td>
<td>San Francisco, US</td>
<td>1,054</td>
<td>1,110</td>
<td>1,165</td>
</tr>
<tr>
<td>Adelaide, Australia</td>
<td>New York, US</td>
<td>2,689</td>
<td>2,831</td>
<td>2,973</td>
</tr>
<tr>
<td>Cape Town, South Africa</td>
<td>San Francisco, US</td>
<td>2,630</td>
<td>2,768</td>
<td>2,907</td>
</tr>
<tr>
<td>Cape Town, South Africa</td>
<td>New York, US</td>
<td>2,553</td>
<td>2,687</td>
<td>2,821</td>
</tr>
<tr>
<td>Wellington, New Zealand</td>
<td>San Francisco, US</td>
<td>1,521</td>
<td>1,601</td>
<td>1,681</td>
</tr>
<tr>
<td>Le Havre, France</td>
<td>San Francisco, US</td>
<td>1,387</td>
<td>1,460</td>
<td>1,533</td>
</tr>
<tr>
<td>Le Havre, France</td>
<td>New York, US</td>
<td>1,073</td>
<td>1,130</td>
<td>1,186</td>
</tr>
<tr>
<td>Livorno, Italy</td>
<td>San Francisco, US</td>
<td>2,196</td>
<td>2,311</td>
<td>2,427</td>
</tr>
<tr>
<td>Livorno, Italy</td>
<td>New York, US</td>
<td>1,716</td>
<td>1,807</td>
<td>1,897</td>
</tr>
<tr>
<td>Valencia, Spain</td>
<td>San Francisco, US</td>
<td>2,275</td>
<td>2,394</td>
<td>2,514</td>
</tr>
<tr>
<td>Valencia, Spain</td>
<td>New York, US</td>
<td>1,773</td>
<td>1,866</td>
<td>1,959</td>
</tr>
<tr>
<td><strong>US. Exports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Francisco, US</td>
<td>Shanghai, China</td>
<td>372</td>
<td>391</td>
<td>411</td>
</tr>
<tr>
<td>San Francisco, US</td>
<td>Hong Kong, Hong Kong</td>
<td>426</td>
<td>448</td>
<td>471</td>
</tr>
<tr>
<td>San Francisco, US</td>
<td>Tokyo, Japan</td>
<td>455</td>
<td>479</td>
<td>503</td>
</tr>
<tr>
<td>San Francisco, US</td>
<td>Hamburg, Germany</td>
<td>1,546</td>
<td>1,628</td>
<td>1,709</td>
</tr>
<tr>
<td>San Francisco, US</td>
<td>Livorno, Italy</td>
<td>1,619</td>
<td>1,705</td>
<td>1,790</td>
</tr>
<tr>
<td>San Francisco, US</td>
<td>London, UK</td>
<td>1,558</td>
<td>1,640</td>
<td>1,722</td>
</tr>
<tr>
<td>Modesto, US</td>
<td>Vancouver, Canada</td>
<td>493</td>
<td>519</td>
<td>545</td>
</tr>
<tr>
<td>Modesto, US</td>
<td>Toronto, Canada</td>
<td>1,333</td>
<td>1,404</td>
<td>1,474</td>
</tr>
</tbody>
</table>

Source: May 2016 quotes from Worldfreightrates.com
Table 7: Staged Duty Reductions Due to FTAs, 2000 to 2015 for Australia and Chile

<table>
<thead>
<tr>
<th>Year</th>
<th>Australia</th>
<th>Chile</th>
<th>Australia</th>
<th>Chile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cents per Liter of Bulk Wine</td>
<td>Cents per Liter of Bottled Wine</td>
<td>Cents per Liter of Bulk Wine</td>
<td>Cents per Liter of Bottled Wine</td>
</tr>
<tr>
<td>2000</td>
<td>14.0</td>
<td>14.0</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2001</td>
<td>14.0</td>
<td>14.0</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2002</td>
<td>14.0</td>
<td>14.0</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2003</td>
<td>14.0</td>
<td>14.0</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2004</td>
<td>14.0</td>
<td>12.8</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2005</td>
<td>11.7</td>
<td>11.7</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2006</td>
<td>10.5</td>
<td>10.5</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2007</td>
<td>9.4</td>
<td>9.4</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2008</td>
<td>8.3</td>
<td>8.3</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2009</td>
<td>7.1</td>
<td>7.1</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2010</td>
<td>6.0</td>
<td>6.0</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2011</td>
<td>4.8</td>
<td>4.8</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2012</td>
<td>3.7</td>
<td>3.7</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2013</td>
<td>2.6</td>
<td>2.6</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2014</td>
<td>1.4</td>
<td>1.4</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>2015</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: USITC website.
Note: Despite the free trade agreements, the reduction in tariffs only applied to bulk wine after 2014. Starting 2015, bulk wine and bottled wine imports from Australia and Chile enter duty free.
Table 8: Summary Statistics for Dependent and Explanatory Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Export Sample</th>
<th>Import Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (Std. Dev.)</td>
<td>Min</td>
</tr>
<tr>
<td>U.S. Bulk table wine exports in 1,000L</td>
<td>1,633 (2,274)</td>
<td>0</td>
</tr>
<tr>
<td>U.S. all table wine exports 1,000L</td>
<td>3,867 (3,693)</td>
<td>0</td>
</tr>
<tr>
<td>U.S. Bulk table wine imports in 1,000L</td>
<td>1,855 (2,869)</td>
<td>0</td>
</tr>
<tr>
<td>U.S. all table wine imports 1,000L</td>
<td>10,161 (10,881)</td>
<td>108</td>
</tr>
<tr>
<td>Drawback refund expected by exporters (ratio)</td>
<td>0.069 (0.108)</td>
<td>0</td>
</tr>
<tr>
<td>Drawback refund expected by importers (ratio)</td>
<td>0.237 (0.288)</td>
<td>0</td>
</tr>
<tr>
<td>Relative Exchange Rate (ratio)</td>
<td>0.948 (0.147)</td>
<td>0.563</td>
</tr>
<tr>
<td>Transportation Cost $ per 20ft container</td>
<td>1,743 (1,245)</td>
<td>339</td>
</tr>
<tr>
<td></td>
<td>2,756 (1,730)</td>
<td>619</td>
</tr>
</tbody>
</table>

Observations: 1,140 1,074

Sources: Author calculations based on data from the U.S. Census Bureau, BIS, and worldfreightrates.com.

Note: Export regressions miss 12 observations because we include a one month lagged variable in the regressions and we instrument for six trade export destinations. The import regressions miss 78 observations because in addition to a one month lagged variable we include a one year lagged variable and we instrument for six import sources.
## Table 9: Regression Estimates of Wine Drawback Effects on the U.S. Wine Exports and Imports

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>U.S. bulk table wine exports to each major export destination</th>
<th>U.S. all table wine exports to each major export destination</th>
<th>U.S. bulk table wine imports from each major import source countries</th>
<th>U.S. all table wine imports from each major import source countries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficients (Std.error)</td>
<td>Coefficients (Std.error)</td>
<td>Coefficients (Std.error)</td>
<td>Coefficients (Std.error)</td>
</tr>
<tr>
<td>Ln(One month lag)</td>
<td>0.686 (0.029)</td>
<td>0.716 (0.023)</td>
<td>0.495 (0.029)</td>
<td>0.749 (0.022)</td>
</tr>
<tr>
<td>Ln(One year lag)</td>
<td></td>
<td>0.300 (0.029)</td>
<td></td>
<td>0.031 (0.005)</td>
</tr>
<tr>
<td>Drawback refund expected by exporters</td>
<td>1.877 (0.410)</td>
<td>0.696 (0.214)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drawback refund expected by importers</td>
<td></td>
<td></td>
<td>0.551 (0.218)</td>
<td>0.073 (0.040)</td>
</tr>
<tr>
<td>Relative exchange rates</td>
<td>0.600 (0.328)</td>
<td>0.651 (0.180)</td>
<td>-0.521 (0.337)</td>
<td>-0.073 (0.060)</td>
</tr>
<tr>
<td>Transportation cost</td>
<td>0.134 (0.0646)</td>
<td>-0.239 (0.0335)</td>
<td>0.311 (0.0673)</td>
<td>0.051 (0.0126)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.868 (0.307)</td>
<td>1.409 (0.202)</td>
<td>0.464 (0.368)</td>
<td>1.796 (0.175)</td>
</tr>
<tr>
<td>Wald χ²</td>
<td>1,517</td>
<td>1,291</td>
<td>1,485</td>
<td>3,455</td>
</tr>
<tr>
<td>Observations</td>
<td>1,140</td>
<td>1,140</td>
<td>1,074</td>
<td>1,074</td>
</tr>
</tbody>
</table>

Source: Authors’ estimations.
Note: Standard errors presented in parentheses. The model includes monthly dummy variables that account for the variation due to the seasonality some of which have coefficients statistically different from zero.