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# **Gains to French champagne makers from tariff liberalization**

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# Gains to French champagne makers from tariff liberalization

Bo Xiong, John Beghin, Stéphan Marette<sup>^</sup>

(PRELIMINARY DRAFT---PLEASE DO NOT QUOTE)

## Abstract

Using firm-level survey and export data from 2004 to 2007, we estimate the impact of import tariffs in major non-EU markets on the export performance of the French champagne industry. We use the fractional logit regression to deal with three prominent features of trade data: high frequency of zeros, heteroskedasticity, and endogeneity of the importer size. Controlling for the difference in productivity across firms, the substitution between champagnes and other sparkling wines, and other sources of trade costs, we find that an average champagne exporter would gain 0.6 percent more in export revenue if the import tariff is one percent lower. We also find that tariff liberalization has heterogeneous impacts on firms of different productivity levels.

**Keywords:** champagne, firms, zero trade, tariff, fractional logit regression

**JEL classification:** Q17, F14

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## 1. Introduction

The Champagne region of France has a long reputation for producing quality sparkling wines. While new wine producers in America, South Africa, and Australia gained international competitiveness over the past two decades (Anderson, Norman, and Wittwer, 2003), France remained as the world's leading exporter of sparkling wines. In both 2011 and 2012, the export volume of French champagnes was over 100,000 tons, with a FOB price more than €20 per liter (EUROSTAT). In comparison, 554,000 tons of sparkling wines were traded cross country borders 2011, with an average CIF price below €7 per liter (COMTRADE).

Markets outside of the EU are important to the French champagne industry. The share of the export value to non-EU countries varied between 30% and 50% over the past decade. In major importing countries of sparkling wines, the import of French champagnes constitutes a large share. In Figure 1, we compare the import value of French sparkling wines with the import value of other sparkling wines in major importing countries over the period 2004-2007.<sup>1</sup> The United States is the largest non-European importer of sparkling wines. In an average year, the United States spends over 650 million dollars on imports of sparkling wines, of which more than 500 million are spent on French champagnes. Japan is the second largest importer of sparkling wines outside of the EU, with an annual import value around 300 million dollars. Other major importers include Singapore, Australia, Russia, Canada, and New Zealand. Note that for all top importing countries of sparkling wines, except for Russia, imports of French champagnes

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<sup>1</sup> We use sparkling wines from France to approximate champagnes from France because (1) there is no product designation for champagne in the Harmonized System; and (2) France's export of sparkling wines is dominated by the champagne industry. The EU custom data suggests that the export value of champagnes (NC 22041011) accounts for over 91% of France's total export value of sparkling wines (HS 220410).

account for more than half of the total import expenditure. This stylized fact clearly illustrates the global competitiveness of French champagnes in the world market for sparkling wines.

[Insert figure 1 here]

Import tariffs remain divergent across the major importing countries outside of the EU. In Figure 2, we present the ad valorem tariff rates imposed on French sparkling wines in the selected destination markets in 2006.<sup>2</sup> The Singapore market is duty-free for French champagnes. United States, Canada, Australia, and New Zealand levy a value tax less than 5%. However, the ad valorem rate for French sparkling wines is about 10% in Japan, and 20% in the Russian Federation.

[Insert Figure 2 here]

What is the size of the gain to the French champagne industry from tariff liberalization in major destination markets? Previous research on tariff liberalization is based on the theory of representative firms and uses country-level trade statistics.<sup>3</sup> However, the development of the new trade theory and the related empirical work highlight the importance of firm-level heterogeneity in explaining trade patterns (e.g., Melitz, 2003; Bernard et al., 2007; Chaney, 2008). In particular, Helpman, Melitz, and Rubinstein (2008) show that the estimates using country-level data could be severely biased when the productivity difference across firms is not controlled for.

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<sup>2</sup> Tariff information is only available at the HS-6 level in all publically available data sources (e.g., MapMap, TRAINS). We take the year 2006 for example because the tariffs exhibit little time variation from 2004 to 2007.

<sup>3</sup> See Baier and Bergstrand (2001) for an application of the gravity equation model to tariff liberalization among OECD countries. See Hertel (1999) for the introduction of the Global Trade Analysis Project to analyze trade policies using sectoral data cross countries.

In this article we use firm-level data to estimate the impact of import tariffs on the French champagne exports. We contribute to the literature by proposing a new estimator that deals with three stylized features of trade data: high frequency of zeros, heteroskedasticity, and endogeneity of the size of the importer. By investigating the export performance of 76 French champagne makers in top non-EU markets over the period of 2004-2007, we establish four robust findings. First, champagne is a luxury commodity among sparkling wines, with an average importing country's demand increasing more than proportionally to the country's total import expenditure on sparkling wines. Second, champagne products are highly substitutable with themselves. Champagne is also substitutable with other sparkling wines, but to a less degree. Third, champagne makers with higher value-addition per employee export significantly more. Fourth, a ten percentage reduction in the ad valorem tariff rate would increase the trade revenue of an average French exporter by nearly six percent.

The rest of the article is organized as follows. We provide a conceptual model for the champagne trade in Section 2. We describe the data in Section 3. In Section 4 we review challenges in estimation and propose the preferred estimator. We discuss the results in Section 5 and conclude in Section 6.

## **2. The conceptual framework**

### *2.1. Features of the champagne industry*

Compared to other wine business, the champagne industry has two distinct features. First, individual champagne makers are the major players in the export market. Crozet, Head, and Mayer (2012) document that wholesale agents merely contribute to 13% of all champagne exports in 2005. Therefore, by examining the export data, we

explain the behavior of champagne makers instead of wholesale agents. Second, the quality of champagne does not vary significantly with weather or yield. In fact, most champagne products are made of blended wines from different years and they are usually non-vintage (CIVC, 2010, p. 4). The stability of quality within each champagne-marking firm allows us to use firms' fixed effects to control for the quality differences.

## 2.2. *The conceptual model*

We use a simple partial equilibrium model to characterize the French champagne export at the firm level. The model is closely related to Melitz (2003), Helpman, Melitz, and Rubinstein (2008), and Chaney (2008), yet without the imposition of functional forms.

### 2.2.1. The import demand

We assume that each country's expenditure on imported sparkling wines is separable from other purchases.<sup>4</sup> A representative importer in the country spends the total expenditure on imports of French champagnes and other sparkling wines. We characterize the importing country  $j$ 's demand, in value term, for champagne made by firm  $i$  in France in year  $t$  as:

$$(1) v_{ijt} = D(p_{ijt}, p_{jt}^f, p_{jt}^{row}, v_{jt}),$$

where  $v_{ijt}$  is the firm-level demand in euros,  $p_{ijt}$  is country  $j$ 's import price of firm  $i$ 's champagne,  $p_{jt}^f$  is country  $j$ 's import price of champagne made by an average French firm,  $p_{jt}^{row}$  is country  $j$ 's import price of sparkling wines from other countries,  $v_{jt}$  is the country  $j$ 's total expenditure on foreign sparkling wines. Intuitively, we explain the firm-

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<sup>4</sup> The assumption of separability is commonly adopted in the literature of food demand. See Deaton and Muellbauer (1980) for more discussions.

level demand by the own price, the prices of potential substitutes (including other sparkling wines in France, or Cremant, and sparkling wines made in other countries, e.g., Cava from Spain, Prosecco and Moscato d'Asti from Italy), and the importing country's total expenditure on foreign sparkling wines.

### 2.2.2. The firm-level supply

Since most champagne makers in France are directly involved in the export market (see Section 2.1.), we assume that the export market for champagne is monopolistically competitive, in the sense that each champagne-making firm faces a down-ward sloping demand and it competes with other firms in brand and quality. Facing the demand in (1), firm  $i$  charges a mark-up price:

$$(2) \quad p_{ijt} = \alpha_i c_{it} t_{jt} / \varepsilon_{ijt},$$

where  $\alpha_i$  is the quality of champagne made by firm  $i$ ,  $c_{it}$  is firm  $i$ 's unit cost,  $t_{jt}$  is the variable cost of trade between country  $j$  and France (e.g. the cost of transportation, the import tariffs), and  $\varepsilon_{ijt}$  is the standard mark-up that hinges on the elasticity of demand implied by (1).

### 2.2.3. The champagne export in equilibrium

Substituting (2) into (1), we define a profit function for firm  $i$  as

$\pi_{ijt} = f(p_{jt}^f, p_{jt}^{row}, v_{jt}, \alpha_i, c_{it}, t_{jt})$ . Note that  $\varepsilon_{ijt}$  is absent from  $f(\cdot)$  because it is a function of all demand determinants in (1). Denoting  $fc_{jt}$  as the fixed cost of exporting to country  $j$ , the champagne-making firm  $i$  exports to country  $j$  if and only if  $\pi_{ijt} > fc_{jt}$ . Therefore, we characterize firm  $i$ 's export value to country  $j$ , in equilibrium, as

$$(3) \quad v_{ijt}^* = g(p_{jt}^f, p_{jt}^{row}, v_{jt}, \alpha_i, c_{it}, t_{jt}, fc_{jt}).$$



In summary, (3) provides a general functional form that explains the export performance of French champagne makers. Note that  $v_{ijt}^*$  takes non-negative values and it reduces to zero if the potential profit from exporting does not compensate for the entry costs. In other words, by estimating (3) we co-find the intensive and the extensive margins of trade.<sup>5</sup>

### **3. The data**

#### *3.1. Data sources*

We use four data sources. The firm-level export data are from the French customs. For each export transaction, we observe the SIREN code of the exporting firm, the 8-digit CN product code, the FOB value, and the destination market. We retrieve the champagne export data from 2004 to 2007 by selecting CN code 22041011, “champagne, with protected designation of origin.”

We access firm-level characteristics using the EAE survey data from the French national statistical agency (INSEE).<sup>6</sup> For each responsive enterprise, we observe its annual sale, number of employees, value added, and other accounting information. We match the survey and custom data using firms’ SIREN codes.

We use tariff data in the Market Access Map (MacMap) database from the International Trade Centre. To focus on major non-EU markets, we select the top 20 importing countries of sparkling wines that have tariff information available in MacMap and have consistent unit import values in COMTRADE.<sup>7</sup> For each of the 20 markets, we retrieve the ad valorem tariff (based on the world unit value) for “sparkling wine of fresh

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<sup>5</sup> Although the disentanglement of the two margins of trade is of interest, the empirical identification is difficult. See Helpman, Melitz, and Rubinstein (2008) for an example of using excluded variables in the Heckman two-step procedure.

<sup>6</sup> The same data source is used in Chevassus-Lozza and Latouche (2012).

<sup>7</sup> See Appendix A for the full list of the selected importing countries.

grapes,” or HS code 220410, imported from France.<sup>8</sup> We also include other sources of trade costs, such as geographical distance, ethnic language, and colonial relationship, from the CEPII database.

We use the COMTRADE data from the United Nations to compute the unit import values in the selected importing countries. For each market, we construct two CIF prices (one for sparkling wine imported from France, the other for sparkling wine imported from elsewhere) by taking the ratio of import values over import volumes. Since COMTRADE import values are in US dollars, we use the USDA annual euro/dollar exchange rate to convert the CIF prices to euros.<sup>9</sup> Finally, we get the “numbers of documents to import” series from the World Bank Indicators as a measurement of the entry costs in the selected markets.<sup>10</sup>

Next we form the data sample. We select champagne makers based on the following three criterion. First, the firms responded to the EAE survey throughout the period 2004-2007. Second, the firms identified “bubbly (including champagne)” as their main activity.<sup>11</sup> Thirdly, the firms are located in the Champagne-Ardenne region (with geography code 21). The screening process leaves us with 76 champagne exporters. Therefore, our data sample consists of 76 French champagne-making firms that export, or potentially export, to 20 non-EU countries from 2004 to 2007.

### *3.2. Data features*

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<sup>8</sup> Tariff data in MacMap are available since 2005. Since import duties exhibit limited time variation from 2005 to 2007, we use the 2005’ rates to approximate the tariff rates applied in 2004.

<sup>9</sup> The exchange rate data is available at <http://www.ers.usda.gov/data-products/agricultural-exchange-rate-data-set.aspx#UYfwk7WG1z4>

<sup>10</sup> The “numbers of documents to import” series are available from 2005. Since the series exhibit little time variation, we assume that the same custom procedure applied in 2004 as in 2005 in each importing country.

<sup>11</sup> The corresponding activity code is 159F in surveys from 2004 to 2006, and 1102A in the 2007 survey.

Zero export records account for 76% of all 6080 observations in our data sample.<sup>12</sup> The high frequency of zeros is a common feature in trade data. Compared to Crozet, Head, and Mayer (2012), the portion of zeros is relative small in our data sample because we focus on top importing countries and firms with export experience. In other words, we aim to identify the impact of tariff liberalization on the intensive margin of trade, as opposed to the extensive margins of trade. Nevertheless, the prevalence of zero trade requires careful treatment in the stage of estimation.

Accumulated evidence in the literature of heterogeneous firms and international trade suggests that productivity is a key determinant to a firm's export performance. In a case study of Colombian manufacturing plants, Roberts and Tybout (1997) found that entry costs in foreign markets prohibited some plants from exporting. Bernard et al. (2007) documented that global trade is highly concentrated to large and productive firms, with the top 10% of trading firms contributing 95% of the total value of global trade.

To control for the productivity difference across the 76 champagne makers, we compute the value added per employee for each firm in each year.<sup>13</sup> In Figure 3 we show the distribution of the measurement of productivity across the 76 firms over the four consecutive years. It is clear that the productivity gap is significant across champagne makers. Most champagne makers are unproductive. A few firms are exceptionally productive. In fact, the distribution in Figure 3 mimics a Pareto shape, as postulated by the new trade theory.

[Insert Figure 3 here]

#### **4. The method of estimation**

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<sup>12</sup>  $6080 = 76 \text{ firms} * 20 \text{ destinations} * 4 \text{ years}$ .

<sup>13</sup> We avoid using the total factor productivity (TFP) as the measurement because: (1) the champagne production function is unknown; and (2) omitted factors of production can lead to biased TFP estimates.

In this section we first review several caveats in the estimation of (3), or the gravity-like models in general. Then we propose the fractional logit regression to deal with the empirical issues.

#### *4.1. Caveats in the choice of estimator*

##### 4.1.1. Zero trade flows

The treatment of zeros is a heating debate in international trade. Conventional treatments include the Heckman two-step procedure (Heckman, 1979) and the threshold Tobit model (Eaton and Tamura, 1994).<sup>14</sup> Silva and Tenreyro (2006) propose the Poisson Pseudo Maximum Likelihood (PPML) estimator that accommodates zeros and heteroskedasticity. Martin and Pham (2008) illustrate that the PPML model fails to address sample selection issues. In a reply, Silva and Tenreyro (2011) show that the PPML estimator permits both the intensive and extensive margins of trade.

##### 4.1.2. Heteroskedasticity

Since most studies of international trade form data samples by pooling trade statistics from multiple countries, heteroskedasticity is another concern. While heteroskedasticity does not undermine the consistency of estimates given correctly specified models, Silva and Tenreyro (2006) warn that the common practice of taking the logarithmical transformation of trade flows can lead to mis-specified models in the presence of heteroskedasticity. Xiong and Chen (2012) suggest a model selection strategy leading to the most appropriate estimator, in the presence of both missing trade and heteroskedasticity.

##### 4.1.3. Endogeneity of the importer size

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<sup>14</sup> Helpman, Melitz, and Rubinstein (2008) extended the Heckman procedure to control for firm-level heterogeneity when data is only available at country-level.

Another under-discussed yet important issue is the endogeneity of the size of the importer. In our context, since champagne import accounts for a large share in a country's total import of sparkling wines (recall Figure 1), unobservable factors driving an importing country's demand for French champagnes are likely to affect the country's total expenditure on sparkling wines as well. The possible endogeneity of the size of the importer can lead to biased estimates. Although the instrumental variable (IV) approach is a standard remedy to the problem, the subjectivity in the selection of instruments and the poor performance of the IV approach in finite samples are well recognized in the literature.

#### 4.2. The fractional logit regression model

We propose the fractional logit regression (FLR) model (Wooldridge, 2010) to deal with all three problems mentioned above. Specifically, we divide both sides of (3) by the size of importer, or  $v_{ijt}$ , to get

$$(4) \quad s_{ijt} \equiv v_{ijt} / v_{jt} = h(c_{jt}, \alpha_{jt}, t_{jt}, p_{jt}^f, p_{jt}^{row}, v_{jt}, fc_{jt}),$$

where  $s_{ijt}$  is country  $j$ 's import of champagne from firm  $i$  as share of the country's total expenditure on imported sparkling wines. Note that  $s_{ijt}$  is bounded between 0 and 1 by construction. We choose the logistic functional form for  $h(\bullet)$  and rewrite (4) in its stochastic version as

$$(5) \quad E\{s_{ijt}\} = 1 / (\exp(-X_{ijt}\beta) + 1),$$

where  $X_{ijt}$  is the vector stacking all explanatory variable in  $h(\bullet)$  and  $\beta$  is a vector of parameters of conformable size.

We execute the FLR estimator by conducting the logistic regression for (5) and constructing the robust standard errors (Papke and Wooldridge, 1996).<sup>15</sup> Next we show that the FLR estimator deals with the problems of zero trade, heteroskedasticity, and endogeneity. First, it is evident that the FLR estimator accommodates zero trade flows. Originally devised to model binary variables, the logistic regression naturally allows the dependent variable to take zero values. Second, the FLR estimator is robust to heteroskedasticity. Note that the first-order conditions, from which one derives the point estimates for the logistic regression, depend solely on the correct specification of (5).<sup>16</sup> Therefore, the FLR estimator is consistent as long as (5) is correctly specified, regardless of the second or higher moments of the shares  $s_{ijt}$ . Third, the FLR estimator alleviates the endogeneity problem with the size of the importer. In fact, any unobservable factors that influence the imports of champagne and other sparkling wines to the same degree would have negligible impacts on the shares  $s_{ijt}$ . Nevertheless, the unobservable demand shifters do not necessarily affect all types of sparkling wines proportionally. To check whether the practice of using shares as the dependent variables deals with the endogeneity issue satisfactorily, we also conduct specification tests after fitting the models in the next section.

## 5. The results and discussions

We derive the regression equation (6) by explicitly listing all the variables in (5):

$$(6) \quad E\{s_{ijt}\} = \text{Logit}(\beta_0 + \beta_1 \ln(v_{jt}) + \beta_2 \ln(p_{jt}^f) + \beta_3 \ln(p_{jt}^{row}) + \beta_4 va_{it} + \beta_5 \ln(1 + tar_{jt}) + \beta_6 \ln(dist_j) + \beta_7 lang_j + \beta_8 col_j + \beta_9 docs_{jt} + \sum_m \alpha_m F_m + \sum_n \chi_n Y_n).$$

<sup>15</sup> Stata users can simply use the “logit” command with the “robust” option to execute the FLR.

<sup>16</sup> The first-order conditions in matrix form can be written as  $X \otimes \{s - 1 / (\exp(-X\beta) + 1)\} = 0$ .

$va_{it}$  is firm  $i$ 's the value addition per employee (as measurement of productivity).  $tar_{jt}$  is country  $j$ 's ad valorem tariff rate on sparkling wines.  $dist_j$  is the distance between country  $j$  and France.  $lang_j$  is a dummy variable taking the value 1 if French is an ethical language in country  $j$ .  $col_j$  is a dummy variable taking the value 1 if country  $j$  was colonized by France in history.  $docs_{jt}$  is country  $j$ 's required number of documents to import in year  $t$ .  $F_m$  and  $Y_n$  are firm-specific and year-specific fixed effects.

We do not include in (6) the importers' fixed effects suggested by Anderson and van Wincoop (2003) because we need the variation across importing countries to help identify the impacts of tariffs. We also exclude firm-level characteristics other than productivity (e.g., the number of employees, capital stock) because those characteristics exhibit limited time variation over the course of four years and they have no explanatory power in the presence of firms' fixed effects.

### 5.1. The baseline results

We fit (6) with the FLR estimator and derive the marginal effects of various export determinants on the percentage change in the export revenue. In comparison, we also conduct the PPML estimator in which the export value is used as the dependent variable, and the Heckman two-step procedure in which the export value in logarithmical scale is the left-hand-side variable. We compile the results from all three models and present them in Table 1.<sup>17</sup>

[Insert Table 1 here]

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<sup>17</sup> For both the OLS and PPML models, the estimated coefficients directly translate into the marginal effects. For the FLR model, we derive the marginal effects using the Delta method. The estimated coefficients from the FLR model are available in Appendix B.

As shown in Table 1, the marginal effects vary greatly across methods of estimation, which highlights the importance of the choice of estimator. As we will discuss later, the fractional logit regression is the only model surviving the Ramsay specification test. Therefore, we base our discussions on the results from the FLR model. The expenditure effect is estimated to be 1.388, which means that, if an importing country increases its total expenditure on imported sparkling wines by 10%, the country's champagne imports from France will rise by nearly 14%. In other words, French champagne is a luxury variety among all types of sparkling wines.

Now we discuss the substitution patterns, both within French champagnes and between champagnes and sparkling wines produced in other countries. The cross-price elasticity within France is estimated to be 0.806, suggesting that a typical champagne maker would lose 8% in its export revenue if its domestic competitors jointly lower their prices by 10%. However, the cross-price elasticity between champagne and other types of sparkling wines is much lower (0.319), which indicates that sparkling wines produced in other countries only substitute for French champagnes to a limited degree. This finding is consistent with the widely-held perception that the special quality and taste of champagne cannot be easily replicated elsewhere.<sup>18</sup>

Turning to the impact of firm-level productivity, we find that firms with higher value added per employee export significantly more. Specifically, we estimate that a firm's export revenue would increase by 2.9% if the firm manages to increase its value added per worker by 10,000 euros. The positive association of productivity and export performance is also found by previous studies. The importance of difference in

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<sup>18</sup> For example, the *New York Times* wine critic Eric Asimov stated that “but when talking about sparkling wine, let's be honest: There is Champagne and there is everything else. The others are good, but they're not Champagne.” (*New York Times* wine critic, 14 December, 2005)



productivity across firms in explaining trade patterns warns against the conventional approach of inferring the effects of trade liberalization using country-level statistics.

The import duty is a significant trade barrier for French champagne exporters. We estimate that an average French champagne maker would gain 5.71% more in revenue if the ad valorem rate is 10% lower.<sup>19</sup> In the next subsection, we shed more light on the effects of tariff liberalization by investigating the impacts of tariff liberalization on champagne makers of different productivity levels.

The impacts of other trade cost terms, except the distance effect, are as expected. We find that countries further away from France import more champagne. The selection of the top 20 importers might have contributed to the puzzle. A closer look at the distance variable suggests that Australia and New Zealand might have driven the positive distance effect. Despite far away from France, the two countries rank the top importers of champagne (recall Figure 1).

In order to compare the FLR model with the PPML and the Heckman models, and to check if the FLR satisfactorily deals with the endogeneity of the importer size, we conduct the Ramsey specification test for all three estimators. The test is implemented in two steps. First, we generate the linear prediction from the original regression. Second, we compute the square term of the linear prediction and use it as an extra explanatory variable in the auxiliary regression. We reject the null hypothesis that the original specification is correct if the extra explanatory variable has explanatory power in the

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<sup>19</sup> Note that the estimated tariff effect is a short-run effect. The new trade theory in general equilibrium predicts that tariff liberalization would lead to factor reallocation within the industry in the long run. See Bagoulla et al. (2010) for an application to the agricultural input markets in France under globalization.

auxiliary regression.<sup>20</sup> As shown in Table 1, the test results strongly reject the PPML estimator and the Heckman two-step procedure, but fail to reject the FLR specification. Therefore, we conclude that the FLR estimator is the appropriate method of estimation for our application.

### *5.2. Which firms benefit most from tariff liberalization?*

Who would gain most from a potential tariff cut? Productive firms or unproductive ones? Prediction from trade theory is not clear-cut. On the one hand, most non-exporting firms are more constrained by the fixed costs of selling to a new market (e.g., establishing marketing channels, developing brand names in a new destination, etc.), than by the marginal cost of export, including import tariffs. Therefore, it could be the case that productive firms benefit more from tariff liberalization. On the other hand, productive firms are usually associated with better quality and more recognized brands. Therefore, the demand for champagnes made by productive firms is presumably less sensitive to price changes, which implies that the size of gain from a tariff cut can be limited for productive firms.

To answer the question empirically, we classify the 76 French champagne makers into three categories, based on their productivity levels. Table 2 shows the percentages of firms falling into each category. To investigate the heterogeneous impacts of tariff cuts on different types of firms, we fit another FLR model in which we allow each type of firms to respond to import tariffs differently. We report the associated results in Table 2.

[Insert Table 2 here]

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<sup>20</sup> The specification test was first devised by Ramsey (1969). Silva and Tenreyro (2006) extended its application to the PPML estimator.

We find in Table 2 that all types of firms would gain from the tariff liberalization. However, the tariff effect is only statistically significant for firms of medium productivity, or those with value added per employee ranging between 150,000 to 250,000 euros. This result can be rationalized by the two accounts mentioned above. That is, unproductive firms are more constrained by fixed entry costs than by the import duty. For highly productive firms with top quality products and established brand names, the inelastic demand for their champagne products limits the gains from the tariff liberalization. Therefore, it is those French champagne exporters that manage to overcome the entry costs of exporting and face relatively elastic demand reap the most benefits from a potential tariff cut in the major importing countries of sparkling wines.

## **6. Conclusions**

Using firm-level data from France, we estimate the impact of tariffs in top non-EU importing countries on the export performance of French champagne makers. We use the fractional logit regression model to deal with zero trade records, heteroskedasticity, and endogeneity of the importer size. We establish four robust findings. First, French champagne is a luxury variety among all sparkling wines. Second, champagne products of different firms are substitutable among themselves, as well as with other types of sparkling wines. Third, we estimate that a 10 percent reduction in import tariffs in major importing countries would increase an average French champagne exporter's revenue by nearly 6 percent. Finally, we show that the gains from the potential tariff liberalization is more pronounced for champagne makers that are productive enough to overcome the entry costs of export but remain facing relative elastic demand.

Our case study demonstrates the usefulness of the fractional logit regression model in dealing with the endogeneity of the importer size, which is ignored in other conventional estimators. It is likely that the bias due to the endogeneity of the importer size permeates to other studies of empirical trade as well. Therefore, future research should consider the FLR model as a candidate estimator and select the most appropriate method of estimation based on data features.

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**Table 1. Marginal effects on the log of French champagne export values**

	<b>FLR</b>	<b>PPML</b>	<b>Heckman, two-step</b>
ln(total import value)	1.388 (0.037)	0.645 (0.102)	0.791 (0.044)
ln(price of French sparkling wine)	0.806 (0.100)	0.495 (0.337)	0.373 (0.126)
ln(price of other sparkling wine)	0.319 (0.080)	0.527 (0.260)	0.175 (0.081)
value added per employee, 1000 euros	2.900 (0.943)	4.308 (2.456)	3.163 (1.004)
ln(1+ tariff rate)	-0.571 (0.227)	-1.554 (0.793)	0.429 (0.242)
ln(distance)	0.483 (0.143)	-0.121 (0.259)	0.522 (0.116)
Colony	0.840 (0.185)	0.905 (0.314)	1.109 (0.164)
French speaking	0.341 (0.200)	-0.929 (0.259)	-0.234 (0.179)
Documents to import	-0.025 (0.026)	-0.090 (0.059)	excluded
<b>Ramsey specification test</b>			
P value	0.561	0.000	0.000
H <sub>0</sub> : model is correctly specified	Accepted	Rejected	Rejected

Note: firms' fixed effects and yearly dummy variables are included in all the regressions but omitted from the table for brevity. Standard errors are in parenthesis.



**Table 2. Gains from tariff liberalization, heterogeneous effects across firms**

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<b>Types of firms, by productivity</b>	<b>Unproductive</b>	<b>Productive</b>	<b>Highly productive</b>
value added per employee, 1000 €	less than 150	between 150 and 250	more than 250
frequency in sample	54%	29%	17%
gains from 1 percent tariff cut	-0.140 (0.287)	-1.319 (0.334)	-0.334 (0.315)

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Note: Estimates are derived from the extended FLR model in which three types of firms are assigned different slopes for the tariff variable.

## Appendix A

**Table A. The selected importing countries of sparkling wines, made of fresh grapes**

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Australia	Costa Rica	Korea, Rep.	Peru
Brazil	Cote d'Ivoire	Lebanon	Russian Federation
Canada	Ecuador	Malaysia	Singapore
China	Hong Kong, China	New Zealand	South Africa
Colombia	Japan	Paraguay	United States

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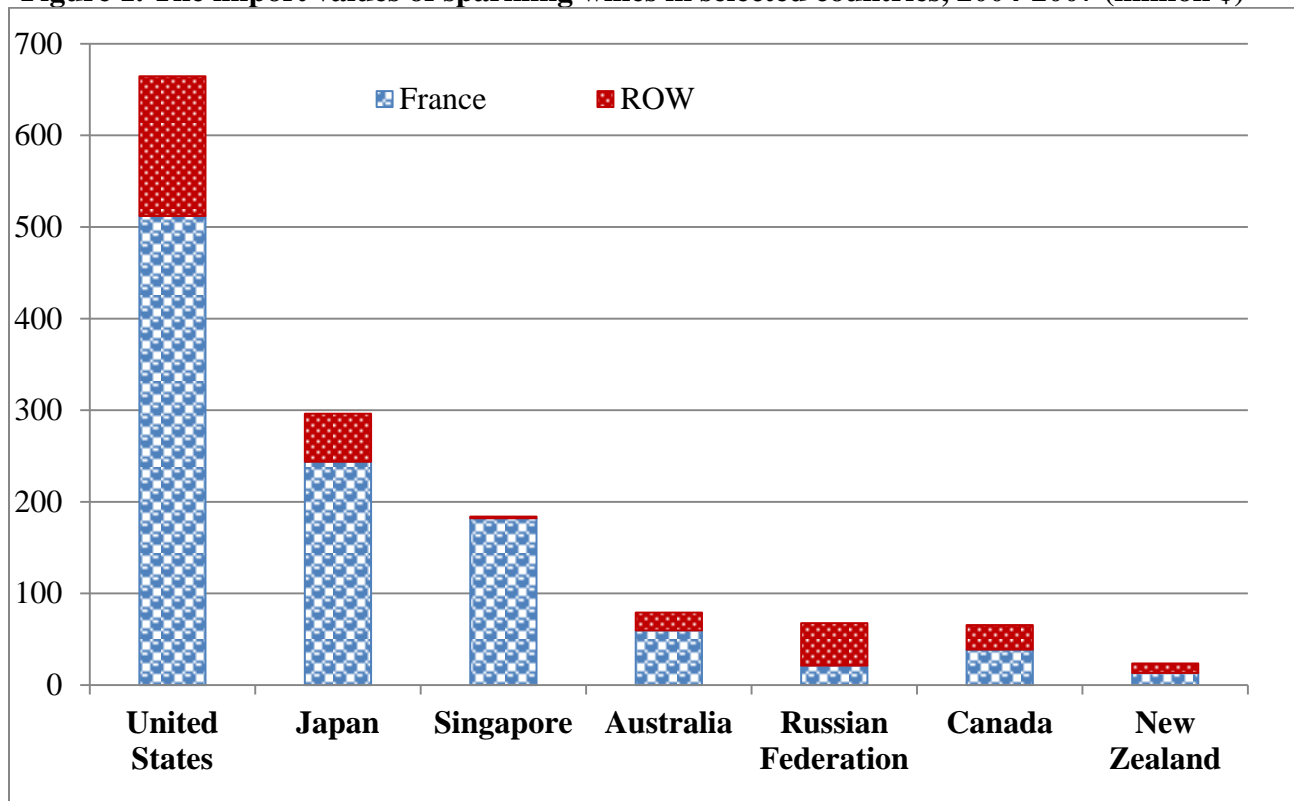
Note: the 20 countries are top importers of sparkling wines from 2009 to 2011, with tariff information available in MacMap and with consistent unit import values in COMTRADE.

## Appendix B

<b>Variable</b>	<b>Coefficient</b>	<b>Standard Error</b>
ln(total import value)	0.512	0.049
ln(price of French sparkling wine)	1.062	0.132
ln(price of other sparkling wine)	0.421	0.106
value added per employee, 1000 euros	3.820	1.243
ln(1+ tariff rate)	-0.752	0.299
ln(distance)	0.637	0.188
Colony	1.107	0.243
French speaking	0.449	0.263
Documents to import	-0.033	0.035
Firms' fixed effects		yes
Years' fixed effects		yes
# of observations		6080
Pseudo R square		0.591

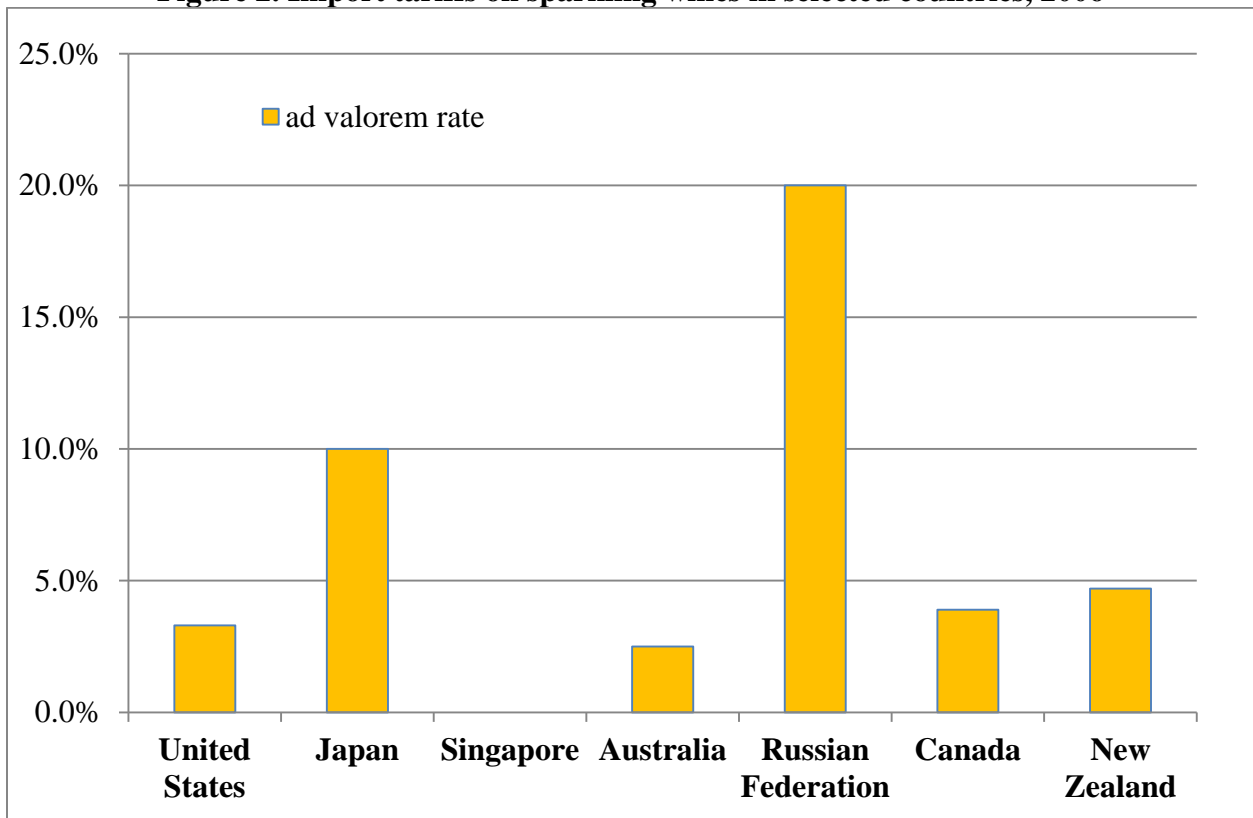
Note: the estimates of the fixed effects of firms and years are omitted from the table for brevity.

**Figure 1. The import values of sparkling wines in selected countries, 2004-2007 (million \$)**



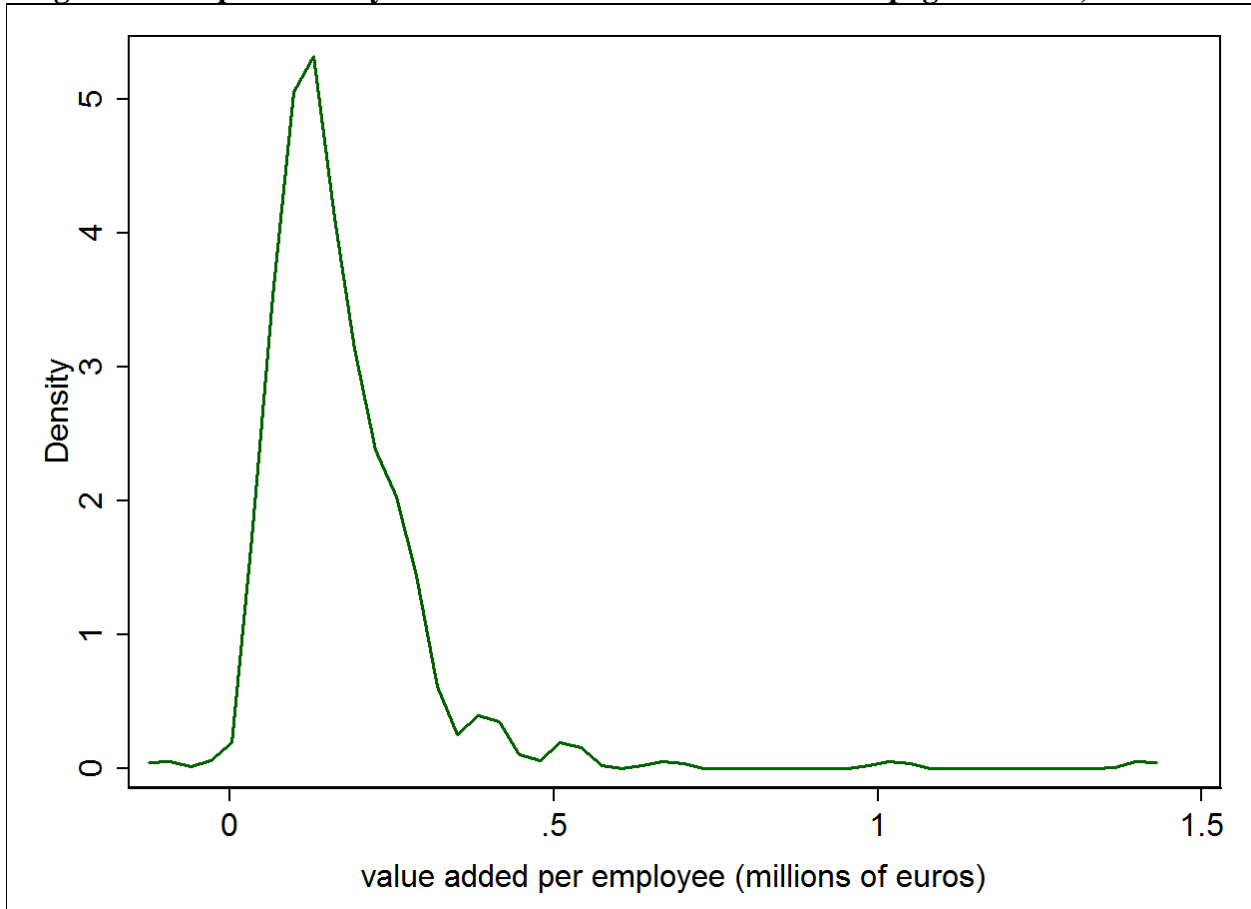
Source: COMTRADE.

**Figure 2. Import tariffs on sparkling wines in selected countries, 2006**



*Source: MacMap.*

**Figure 3. The productivity distribution across the French champagne makers, 2004-2007**



*Source: authors' calculation based on the EAE surveys.*