Exporting Uncertainties: Do Firms React Symmetrically To Better And Worse Expected Conditions?

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As exchange rates, demands and marginal costs of production evolve, producers face the decision of whether to sell their products in the external or internal market. This study explains the movement in and out of the export market of wine manufacturing in Chile as compared to variations in the exchange rate. Analyzing the period from 2000 to 2007, both the entry rates and the exit rates are explained using the Simulated Method of Moments to by targeting and matching key moments to the data. The estimation produces standard errors that prevent from concluding that the reaction is asymetrical when facing better or worse expected conditions.

1 Introduction

Industrial exporters are highly valued. They help to generate gains in trade through both comparative advantage effects and reallocation of resources at the sector level (Melitz (2003), Bernard, Eaton and Kortum (2003)). In addition, because their market portfolio is diversified, they are better positioned to maintain production and employment when there is a domestic recession (Berman, Berthou and Hericourt.(2015)). Finally, with the experience gained from interaction with their buyers, exporters can facilitate the adoption of new technologies and generate efficiency gains (Grossman, Helpman (1991), Westphal (2002)). Therefore, in order to incentivize exporting behavior, researchers and policymakers need to understand firms' decisions of whether to participate in export markets.

A large literature in international trade has focused on modeling firms' export decisions. This decision to export depends on a firm's expectation of the profits it will earn when serving a foreign market, and in this regard, exchange rates, regulation, increased competition, entry costs to the export market and fixed costs of exporting have proven to be relevant (Liu(1991), Pavcnik(2002), Bergoeing et al.(2003), Álvarez et al.(2005), Das et al.(2007), Bergoeing et al.(2010), Blum et al.(2013)).

Also, we have learned that firm heterogeneity matters because brings dynamics through comparative advantage (Melitz, 2003), previous exporting status has its role (Das et al. 2007) and that information quality also affects estimates of profits (Dickstein et al. 2018), however, no previous studies have explored the effect of different scenarios on that decision.

The objective of this study is to explore the reaction of manufacture firms to both favorable and unfavorable changes in their expected profits from exporting. Knowing the conditions faced by producers allows us to better understand their behavior and, therefore, to think about and design policies that promote their development. For those producers who do not currently export, the findings of this study may become relevant information when deciding whether or not to export.

2 Model

The model used for the estimations is based on the one proposed by Das, Roberts and Tybout (2007), incorporating the estimation strategy of Simulated Methods of Moments used by Eaton, Kortum and Kramarz (2011) and the information counterfactual comparison developed by Dickstein and Morales (2018).

This model includes three determining aspects of the responses to the supply of plants in external markets. First, there is uncertainty about future market conditions, which affects plant estimates of whether profits will be sufficient to cover entry costs. Second, entry costs depend on the previous export status, so plants that already export can increase their volume at marginal production costs, while those that do not have to pay entry costs. Third, there is heterogeneity among plants in the expected export earnings, so depending on the distribution of export earnings, there may be several or few plants close to the threshold of indifference as to whether to export or not.

2.1 Firms problem

Using a simple version of Das et al.(2007), firms will solve the following maximization problem

$$\max_{y_i^d, y_i^f} \mathbb{E}_t \sum_{\tau=t}^{t+H} \beta^{t-1} [\pi_\tau^d(y_i^d, \cdot) + \pi_\tau^f(y_i^f, \cdot)] \tag{1}$$

meaning that they choose quantities (y_i) to maxmize the expected discounted (β) domestic and foreign profits (π^d, π^f). Then, if we asume that the production function is Cobb-Douglas on firm characteristics z_i and exchange rate e_t, the *log* of gross potential instantaneous exports profit for firm i will also be linear on those arguments, so

$$\ln \pi_{it}^f = \varphi_0 z_i + \varphi_1 e_t + v_{it} \tag{2}$$

where v_{it} is an error term that captures all the ideosyncratic shocks and e_t follows an AR(1) process described by,

$$e_t = \rho e_{t-1} + v_e \tag{3}$$

with $v_e \sim N(0, \sigma_e^2)$. Then for a foreign elasticity η_i, and because revenues and costs relate as $R_{it}^f(1 - \eta_i^{-1}) = C_{it}^f$, we can rewrite (2) as,

$$\ln R_{it}^f = \ln \eta_i + \varphi_0 z_i + \varphi_1 e_t + v_{it} \tag{4}$$

If we assume that the ratio of foreign demand elasticities to domestic demand elasticities is $(1 + \delta)$, we can write the costs as,

$$C_{it} = C_{it}^f + C_{it}^d = R_{it}^f(1 - \eta_i^{-1}) + R_{it}^d(1 - (1 + \delta)\eta_i^{-1}) \tag{5}$$

2.2 Entry and fixed costs

If we assume there is path dependence, according to previous status of exporting s_{it-1}, fixed costs of exporting γ_f, entry costs γ_s firm's utility can be written as,

$$u(\cdot) = \begin{cases} \pi_{it}^f(e_t, z_{it}) - \gamma_f + \varepsilon_{1it} & \text{if } s_{it} = 1 \text{ and } s_{it-1} = 1 \\ \pi_{it}^f(e_t, z_{it}) - \gamma_f - \gamma_s z_{it} + \varepsilon_{2it} & \text{if } s_{it} = 1 \text{ and } s_{it-1} = 0 \\ 0 & \text{if } s_{it} = 0 \text{ and } s_{it-1} = 0 \end{cases}$$

The optimal decision of the firm will be characterized by the policy function that solves the Bellman Equation described by

$$V_{it} = \max_{s_{it} \in [0,1]} [u(e_t, z_{it}, \varepsilon_{it}, s_{it-1}|\theta) + \beta \mathbb{E}_t V_{it+1}] \tag{6}$$

that incorporates the value of not having to pay an entry cost if the firm is already exporting and summarizes the parameters under θ. This solution takes the form of,

$$s_t^* = u(e_t, z_{it}, \varepsilon_{it}, s_{it-1}|\theta) + \beta \left[\mathbb{E}_t\{V_{t+1}|s_{it} = 1\} - \mathbb{E}_t\{V_{t+1}|s_{it} = 0\}\right] \tag{7}$$

Summarizing the model, entry costs and fixed costs (ε_{it}), and exchange rate (e_t) follow exogenous processes. With exogenous plant characteristics (z_i) they determine export profits (R_{it}^f) and the export status (s_{it}).

3 Data

In order to estimate parameters and perform the symmetry test and information counterfactuals, this study uses data from the Chilean Anual Industrial Survey (ENIA) from 1995 to 2007. This survey documents all manufacturing plants that hire 10 or more workers. Observed variables include domestic and foreign revenue, inputs consumption and firm specific characteristics like location, industry, size, etc.

The industry selected is the wine manufacturing (ISIC3 code 1552). The wine manufacuring industry in Chile is the 5th world largest, producing between 4% and 5% of world supply. Also, represents 16.5% of Chile's agricultural exports and 0.5% of its GDP, averaging 6.2% annual growth between 1998 and 2020.

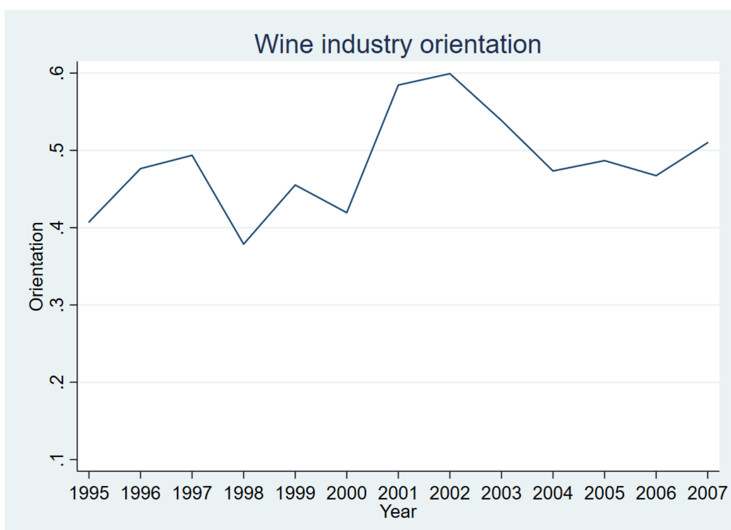
Due to foreign competition, Chilean manufacturing plants have been forced to produce more efficiently, especially those belonging to tradable goods sectors. Wine manufacturing in Chile exhibits this evolution in production efficiency for the studied period, as shown in table 1, where in addition to growing the number of hectares planted and volume, the average production per hectare increased.

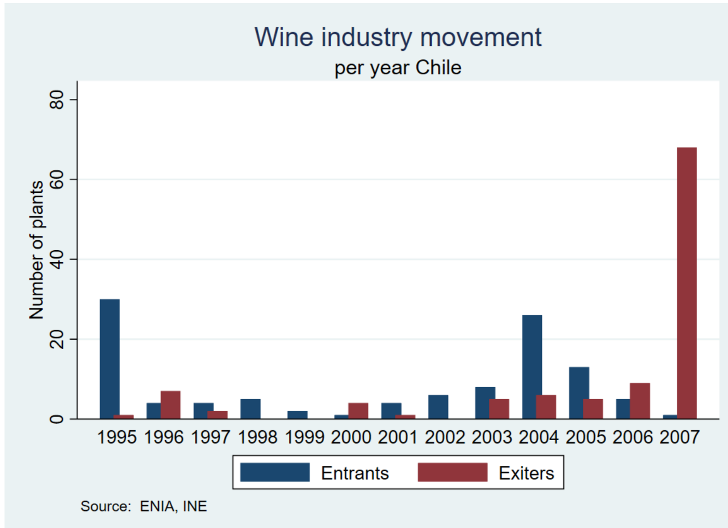
Table 1. Evolution of productivity of the wine industry in Chile

Year	2000	2001	2002	2003	2004	2005	2006	2007
Surface[1]	103	107	109	110	112	114	117	118
Production[2]	642	545	562	668	630	789	845	828
Litres/ha	8,886	9,251	9,363	9,590	9,605	9,322	9,498	9,566
Growth[3]	-	4%	6%	8%	19%	2%	6%	23%

Source: SAG Chile. (1)Thousand Hectares (2)Millions of litres (3) Volume

This sector is ideal for the exercise because has a strong export orientation, with an average over 40% in the sample years, and exhibits entry and exit dynamics in the sample years.





4 Estimation strategy

The estimation is made through Simulated Method of Moments (SMM) because equation (4) can not be estimated linearly as R^f_{it} may not be positive or different from zero.

Four parameters are estimated: ρ the AR component in the exchange rate, σ_e the variance of the process that the exchange rate follows, φ_0 the characteristics parameter and φ the exchange rate parameter.

The algorithm is as follows:

- Simulate exchange rate e_t with equation (3) and a initial value of e_0
- Simulate firm characteristics z_i from a normal distribution as the data shows it distributes normally
- Simulate foreign profits π^f using

$$\pi^f_t = \hat{z}_i^{\varphi_0} \hat{e}_t^{\varphi_1} + v_f$$

- Simulate foreign revenues R^f with given values of η_i using

$$\hat{\pi}^f \eta_i = \hat{R}^f$$

- Simulate domestic profits π^d using

$$\pi^d_t = \hat{z}_i^{\varphi_0} + v_d$$

- Simulate domestic revenues R^d with given values of η_i, s_p using

$$\hat{\pi}^d \eta_i (1 + \delta) = \hat{R}^d$$

- Simulate total revenues R^T with $\hat{R}^f$ and $\hat{R}^d$ using
$$R^T = \hat{R}^f + \hat{R}^d$$
- Simulate inputs use C_{it} with $\hat{R}^f$, $\hat{R}^d$, η_i and δ using
$$C_it = \hat{R}^f(1 - \eta^{-1}) + \hat{R}^d(1 - [(1+\delta)\eta_i]^{-1}$$
- Simulate exporting status s_t with $\hat{\pi}^f$ using the rule,
$$s_t = 1 \quad \text{if} \quad \hat{\pi}^f > 0$$
- Simulate previous exporting status s_{t-1} with s_t
- Simulate entry rate with s_t and s_{t-1}
- Simulate exit rate with s_t and s_{t-1}
- Simulate permanence rate s_t and s_{t-1}

Then, the moments targeted to match with the data are

1. Mean of e_t
2. Variance of e_t
3. Mean of z_i
4. Export intensity or orientation defined as
$$Or = \frac{R^f}{R^T}$$
5. Ratio Inputs use to Revenues
$$M = \frac{C_{it}}{R^T}$$

After estimating the parameters it is possible to get the standard errors of those estimates by computing the Jacobian matrix.

5 Results

After implementing the algorithm in section 4, there are issues in the convergence of the program. The best results that got convergence were

Parameter	Estimate	Std.error
ρ	0.7008	0.9265
σ^2	1.098	65.76495
φ_0	0.6449	7.7874
φ_1	2.1240	13.1226

The apparent problems might be related to the simulation of the firm characteristics z_i that later is used to simulate revenues and profits. Several specifications to simulate this variable were tried but none was successfull.

This results prevent to make carefull comments on the research question as standard errors indicate that there is something missmatched in the estimation.

6 Conclusion

Exchange rates, fixed costs and entry costs are known to be important source of uncertainties that firms face when deciding whether to export or not. Understanding firms reaction to those uncertainties opens the door for improving policies and also for money making opportunities.

In this paper a SMM approach is used to estimate parameters that could help to understand this reactions. However, specification and estimation issues prevent to estimate correctly or get credible estimates for the model, thus making it not able to fully address the research question so far.

Further research should focus on deriving a better specification specifically regarding the firm characteristics. Also, there might be other approaches that are more effective than SMM for estimating this model.

7 References

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