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ARTICLE

Wine, markups, and export behavior: Evidence from Hungary

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Abstract
The study examines the influence of markups on the export decisions and subsequent export intensity of firms within the Hungarian wine sector. Additionally, we evaluate the impact of entering and sustaining a presence in export markets on firms' markups and compare the markup levels between exporting and non-exporting firms. We find that markups have a positive impact on both the probability of exporting and the export intensity, which aligns with previous findings. We demonstrate that exporting leads to an increase in markups. We find that exporters maintain higher markups even when accounting for productivity differences. Additionally, exporting can lead to higher markups because of the learning-by-exporting phenomenon. The results have significant implications. The findings imply that markups have a significant impact on the decision-making process and performance of Hungarian wine exports. Policymakers should facilitate to increase the markups of firms in order to enhance the export of wine and promote economic growth. Wine exporting firms should enhance their productivity and implement strategic pricing strategies to increase their markups and expand their exports.

Keywords: markup; wine trade; export intensity; learning by exporting

JEL classifications: D22; F14; L11; L66; Q18

I. Introduction

In recent decades, the economic literature has increasingly focused on the significance of firms' export behavior and the markups they realize. According to current theories, firms with higher product quality and/or lower marginal costs are more likely to enter the export market and adjust their prices based on the competitive environment in the destination country (Bernard et al., 2003; Melitz and Ottaviano, 2008). Moreover, firms

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that have been exporting for a while may experience changes in their markups due to learning by exporting (Bernard et al., 1995).

This topic has become increasingly important in the food industry with the decline of protection against competition from foreign trade (Curzi et al., 2015). This shift presents an opportunity to scrutinize the relationship between export behavior and markups, an area that lacks sufficient empirical evidence due to its recent emergence, methodological complexities, and limited availability of data. Current knowledge indicates that higher markups enhance export market participation and intensity, that exporting firms achieve higher markups, and that exporters generally have higher markups than non-exporters (Jafari et al., 2023). Specific evidence from the wine industry suggests that while tariffs are heterogenous across export destinations, the effect on markups is smaller for higher quality exports (Chen and Juvenal, 2022). Additionally, export behavior positively impacts financial performance (Lessoua et al., 2020).

In this paper, we specifically focus on wine exports. Recent studies have investigated dimensions of wine exports, adding depth to our understanding of this complex market. Back et al. (2019) examined how the additional production costs associated with Fair Trade certification are reflected in wholesale and retail prices in the context of South African wine exports to the United States, with a particular focus on price margins and asymmetries along the supply chain. Bargain (2020) analyzed French wine exports to China, emphasizing regional diversification and competition within France and highlighting the strategic responses of various French regions to the Chinese market. Thomé et al. (2023) examined the structure and competitiveness of the international wine market, providing insights into market dynamics and competitive strategies. Puga et al. (2022) explored bilateral patterns of global wine trade over a historical period, shedding light on the evolving nature of international wine trade relationships.

Additional studies have focused on country-specific contexts. Lessoua et al. (2020) investigated the Romanian wine industry, revealing that firms' financial performance is positively linked to export activities. Landazuri-Tveteraas et al. (2021) examined the dynamics of buyer–seller relationships in Norwegian wine imports, highlighting the importance of these relationships in shaping trade flows. Depetris Chauvin and Villanueva (2024) provided a detailed analysis of exporting wineries in Argentina, offering insights into the characteristics and strategies of these firms. Dearden et al. (2021) examined how offering wine by the glass influences bottle markups in New York City restaurants, finding that glass offerings are associated with higher retail and wholesale markups, particularly for lower-priced wines.

Our study explores the relationship between markups and the export activities of Hungarian wine exporting firms, providing new insights in the process. Hungary's wine industry differs significantly from Western European markets due to its structural heterogeneity, varying scales of production, and distinct policy environment. These characteristics offer a compelling context to examine how markups influence firms' decisions to engage in export markets and the extent of their export activities. By focusing on this sector, the study provides insights into how economic liberalization

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and EU integration have influenced firm performance in a traditionally fragmented market.

We will discuss the following research questions: What is the impact of markups on a firm's decision to export and, further, the export intensity in the wine industry? Does participating and sustaining presence in the export market have an impact on the markups of firms? Do exporters and non-exporters have different markups?

We contribute to the literature in several ways. First, to our knowledge, this is the most comprehensive study examining the relationship between export behavior and markups in the wine industry. Second, the Hungarian wine industry offers a unique post-EU accession context, providing insights distinct from markets with longer export traditions. Third, we employ a robust methodological approach, following Jafari et al. (2023), utilizing a double hurdle model with instrumental variables to address endogeneity concerns and distinguish between export participation and intensity. Additionally, we control for productivity differences that may influence the relationship between markups and export behavior (De Loecker and Goldberg, 2014).

This article is structured as follows: we first present the background to the research, the literature, and our hypotheses. Second, we outline our empirical approach for examining markups and export connections, then provide details about our data, and ultimately, present and analyze our findings and conclusions.

II. Background, literature, and hypotheses

The relationship between trade, firm markups, and export behavior has been a significant topic of research, particularly since the emergence of trade models with monopolistic competition assumption (Behrens and Murata, 2007). There has been an increase in this interest in parallel with the development of intra-industry trade models with a distinction between domestic and export markets (Jafari et al., 2023). Rich micro-level datasets since the mid-1990s have revealed that markups affect firms' export behavior, that entering or remaining in export markets can alter firm markups, and that notable differences exist between exporters and non-exporters (De Loecker and Warzynski, 2012). Significant attention has been directed toward understanding how markups—defined as the ratio of a product's price to its marginal cost—affect both the decision to export and the degree of export engagement. Since a firm's productivity shapes its marginal cost, it serves as a key factor in determining whether the firm opts to enter export markets and thrive within them (Koppenberg, 2023). Melitz (2003) illustrates that firms with higher productivity are more likely to engage in multiple foreign markets due to their ability to cover fixed export entry costs. Models by Chaney (2008) and Helpman et al. (2008) suggest that lower bilateral trade frictions result in a higher expected export share for firms. Despite extensive exploration of the relationship between individual markup components and export decisions, empirical studies directly linking firm markups to export participation and intensity are lacking except Jafari et al. (2023). Based on the theory, the first two hypotheses are:

Hypothesis 1: Higher markups increase the probability of exporting.

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Hypothesis 2: Higher markups result in greater export intensity.

Theoretical models propose that engaging into exporting and retaining export markets have an impact on a firm's pricing, marginal costs, and consequently its markups. Exporters can modify their prices to align with the prices in the export market, which is influenced by the marginal costs of their competitors (Melitz and Ottaviano, 2008). The market size and level of competition in the export destination are important factors that have a significant impact. Firms may strategically lower their markups to enter new markets or take advantage of economies of scale and enhanced product quality, which can have a positive effect on their markups (De Loecker et al., 2016). Thus, we postulate:

Hypothesis 3a: Markups of firms increase once they start exporting.

Hypothesis 3b: Markups of firms increase once they start exporting even when we control for productivity.

Moreover, firms that continue to operate in foreign markets often gain advantages from the process of learning through exporting, resulting in enhanced effectiveness, technological progress, and overall enhancements in productivity. As a result, firms that continue to export usually have decreasing additional costs and increasing profit margins over time. We test the following:

Hypothesis 4a: Markups increase with continued involvement in exporting.

Hypothesis 4b: Markups increase with continued involvement in exporting even when we control for productivity.

Exporters tend to have higher markups than non-exporters, partly due to the learning effects and productivity improvements gained through export participation. Bellone et al. (2016) found that exporters in the French manufacturing industry had higher markups compared to non-exporters, attributing this to the quality-enhancing impact of productivity outweighing the competitive price pressures in export markets. However, this study did not control for the simultaneity of markups and export participation, potentially biasing the estimates (Koppenberg, 2023). Jaumandreu and Lopez (2024) extend this discussion by examining markups in U.S. food manufacturing accounting for non-neutral productivity. They find that exporters generally exhibit higher markups than non-exporters. Therefore, the final group of hypotheses is:

Hypothesis 5a: Exporters have higher markups than non-exporters.

Hypothesis 5b: Exporters have higher markups than non-exporters, even when we control for productivity.

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III. Methodology

We employ a two-stage approach. First, we estimate markups by adopting the approach of De Loecker and Warzynski (2012) and augment it to account for input market power in order to recover markups of price over marginal cost. Production functions are estimated using Cobb–Douglas specifications (Ackerberg et al., 2015). To estimate markups, we use firms' net turnovers as output, fixed assets as capital, the number of employees as labor, and intermediate inputs as inventories. As in earlier studies, we do not estimate a separate markup for domestic and export turnover, rather we differentiate firms based on export activity. In second stage, to address the three research questions posed by our study, we have constructed three models in accordance with the methodology proposed by Koppenberg (2023) and Jafari et al. (2023).

We begin with the estimation of the regressions meant to test Hypotheses 1 and 2, that is, the effect of markups on firms' decision to export and the extent of their export activities. Because only a relatively small fraction of firms participates in export activities, the dataset contains many zero trade values. Nevertheless, these zeros must be treated as meaningful observations as they represent the optimal choice for these firms. Therefore, we employ the Cragg hurdle regression as estimator. The hurdle model is based on $EI = s + EI$ where EI is the export intensity and s is a latent variable capturing the participation in exports, defined as Equation (1), as follows:

$$s = \left\{ \begin{array}{c} 1 \text{ if } \alpha_0 + \alpha_1 ln\mu + X\gamma + \in > 0 \\ 0 \text{ otherwise} \end{array} \right\} \tag{1}$$

where μ are the markups previously estimated by Cobb–Douglas production function, X is the vector of control variables, α_1 and γ are their associated coefficients, respectively. The controls are labor, capital, and material (all in logarithmic form) and lagged export intensity. Furthermore, year dummies are included to account for the trend. $\in$ is a standard normally distributed error. EI is a continuous latent variable that is observed only when $s = 1$; in exponential form it is the following (Equation (2)):

$$EI = \exp\left(\beta_0 + \beta_1 \in \mu + [X, EI_{-1}] + \nu\right) \tag{2}$$

where EI_{-1} is the lag of export intensity, employed to control for potential dynamic effects of export intensity. Because the hurdle model makes it possible to explore a firm's two-step decision process—whether to export and how intensively—we rely on the same explanatory variables for both stages, except for EI_{-1}. As Jafari et al. (2023) noted, the markups are potentially endogenous to export behavior due to simultaneity in Equations (1) and (2). In addressing endogeneity, several instrumental variables are employed. This involves the utilization of instruments such as the lagged values of labor and capital, and years. It has been observed that the former are significantly correlated with productivity, i.e. markup (De Loecker, 2007), and markup exhibits variability across firms of varying ages (Peters, 2020).

Equation (3) is estimated next, to test Hypotheses 3 and 4 on learning by exporting:

$$ln\mu = \lambda_0 + \lambda_1 Entry + \lambda_2 Continue + [X, ln\mu_{-1}]\gamma + \nu \tag{3}$$

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where *Entry* is a dummy variable that equals one if the firm is an exporter in time t, and *Continue*is a dummy variable that equals one if the firm exports in time t and $t-1$. To capture the genuine markup gap between newly entering firms and those already active in the export market, we also incorporate the lagged dependent variable ($ln\mu_{-1}$) on the right-hand side. We use the lags of capital and labor as instrumental variables for export status, both of which are highly correlated with the productivity, and hence with markups. The coefficients of our interest are $\lambda_0$and λ_1, which measure the differences in markups between starters and those firms that continue exporting, in comparison to the firms without export activity.

Finally, for Hypothesis 5, stating that exporters will have higher profit markups than non-exporters we estimate Equation (4):

$$ln\mu = \delta_0 + \delta_1 Export + [X, ln\mu_{-1}]\gamma + \nu \tag{4}$$

where the *Export* variable is a binary indicator, taking the value of one if firm i is an exporter in period t and zero otherwise. The same instrumental variables are used. The associated coefficient δ_1 indicates the percentage markup advantage enjoyed by exporting firms.

For regressions (2) and (3), we also assess the robustness of our results by controlling for firms' productivity. This procedure entails regressing markups on productivity estimates, so that the residuals capture the component of markups not explained by productivity. These adjusted markups are then substituted into Equations (2) and (3) in place of the original markups, while the estimation methods remain unchanged.

IV. Data

We use a detailed Hungarian firm-level database. Our unit of analysis is the Hungarian wine exporting firms with more than five employees between 2004 and 2019. We merged data from the firms' balance sheets and earnings statements with detailed export and import data from the Hungarian Customs Statistics (HCS). The corporate financial statements hosted by the National Tax and Customs Administration for the primary purpose of tax collection. The data cover enterprises using the double-entry bookkeeping system as defined by Act LXXXI of 1996 on corporate and dividend taxes. All such enterprises contribute data, resulting in a sample size ranging from 150,000 to 400,000 firms each year between 2000 and 2022. The main topics include the region, headcount, and sector of the enterprises, along with selected financial statement information.

We have observations for roughly 200 companies each year. The number of new exporters varies between 17 and 40 per year, while about the same number of firms exits the export market. Considering that more than 10% of all firms start exporting each year (with even higher numbers exporting) this represents a notable proportion.

From the balance sheet and earnings statements, we use sales, employment, fixed assets, and various cost measures including expenditures on labor and materials, as well as ownership structure (foreign-owned, domestic state-owned, domestic privately owned). HCS reports data on essentially all export and import flows, both as value and

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Table 1. Summary statistics

	Variable	Obs	Mean	Std. dev.	Min	Max
Non-exporters (85.11%)						
	Year	9834			2004	2019
	Output (1000 EUR)	9834	0.120	0.450	0	12.447
	Capital (1000 EUR)	8766	0.203	0.634	0	14.318
	Intermediate (1000 EUR)	6579	0.109	0.282	0	5.249
	Labor (person)	8348	2.803	6.247	0	257
	Intensity (%)	7319	0.027	0.119	−0.065	1
	Intensity_{t-1} (%)	6388	0.030	0.126	0	1
	Markup	2612	0.010	0.011	0.000	0.404
	Exit	9834	0.032	0.176	0	1
Exporters (14.89%)						
	Year	1721			2004	2019
	Export	1721	1	0	1	1
	Output (1000 EUR)	1721	2.328	5.931	0	61.554
	Capital (1000 EUR)	1679	1.949	3.082	0	26.132
	Intermediate (1000 EUR)	1680	1.569	3.313	0	28.785
	Labor (person)	1682	24.485	43.584	0	408
	Intensity (%)	1698	0.227	0.261	0	1
	Intensity_{t-1} (%)	1547	0.215	0.261	0	1
	Markup	970	0.018	0.018	0.000	0.309
	Entry	1721	0.211	0.408	0	1
	Continue	1721	0.700	0.459	0	1

quantity, for each firm by six-digit HS (harmonized system) product category, partner country, and year.

Table 1 presents the descriptive statistics of firms in the Hungarian wine industry that either do not export or do export, covering the period from 2004 to 2019. The summary includes key variables such as output (Output), capital (Capital), intermediate inputs (Intermediate), and labor (Labor). Furthermore, it demonstrates export intensity (Intensity and Intensity_{t-1}), markup (Markup), and indicators for market entry, continuation, and exit. It is evident that non-exporters exhibit markedly low average export intensity, while exporters demonstrate higher average intensity values. Additionally, exporters tend to have higher labor inputs (Labor) but slightly lower markups (Markup) relative to non-exporters. These observations underscore the potential link between exporting behavior and firm performance. In the estimations, we used the logarithmic specification of these variables.

Results are presented in the following structure. First, we present the number of firms entering and exiting the export markets, followed by estimation of the impact

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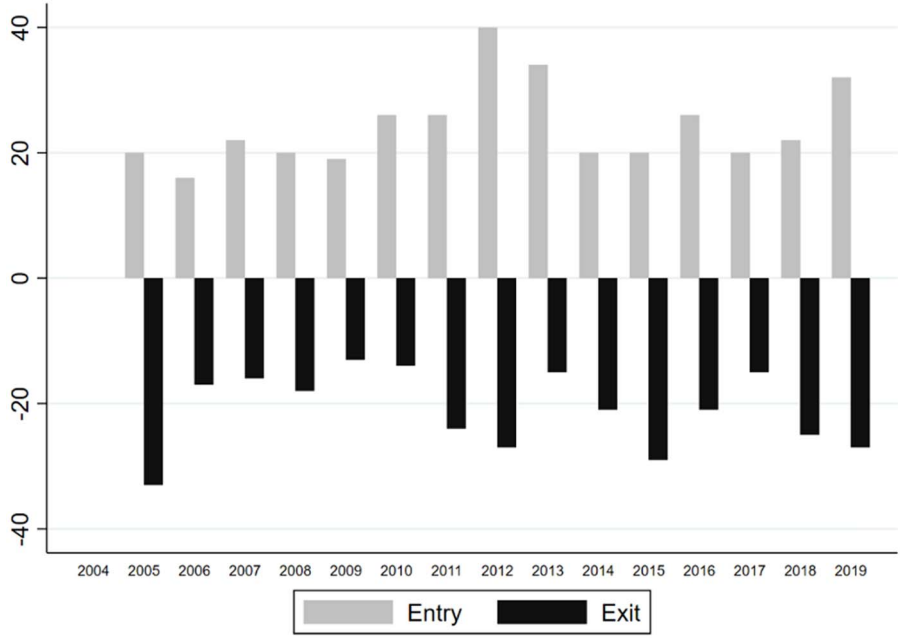


Figure 1. Firms entering and exiting the export market—Hungarian wine industry.

Table 2. Impact of markups on export intensity

	(1)	(2)
Export intensity		
$Intensity_{t-1}$	1.365***	1.368***
lnMarkup	0.020*	0.021*
lnLabor	0.010	0.017
lnCapital	−0.014**	−0.018***
lnIntermediate	0.001	−0.002
Year FE	-	+
Constant	−0.239***	−0.232***
Export status		
lnMarkup	0.083***	0.083***
lnLabor	0.101***	0.101***
lnCapital	0.063***	0.063***
lnIntermediate	0.380***	0.380***
Constant	1.018***	1.018***
Log likelihood	−106.995	−93.917
LR Chi^2	2446.75***	2472.91***
N	3131	3131

Note: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

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Table 3. Learning by exporting

	(1)	(2)
lnMarkup		
$lnMarkup_{t-1}$	0.607***	0.147***
lnLabor	0.0151	−0.149***
lnCapital	0.049***	−0.004
lnIntermediate	−0.013	0.020***
Entry	0.199*	0.164***
Continue	0.192**	0.190***
Residuals from reduced form equation		0.985***
Year fixed effects	+	+
Constant	−1.821***	−3.700***
Export		
$lnCapital_{t-1}$	0.179***	0.208***
$lnLabor_{t-1}$	0.508***	0.494***
Year fixed effect	+	+
Constant	−1.502***	−1.349***
Log pseudolikelihood	−3584.856	−648.441
Wald Chi^2	1803.61***	19,495.63***
N	2561	1992

Note: *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

of markup upon the export entry and the resulting export intensity. Next, we assess whether firms that enter (or continue in) the export markets have higher markups (learning by exporting). We use two dummy variables, *Entry* (takes the value 1 if the firm was not exporting in the previous period but it is exporting in the current year) and *Continue* (takes the value 1 if the firm was exporting in the previous year and continues to do so in the current year). Lastly, we compare the markups of exporting firms to those that are not exporting using a dummy variable *Export* (takes the value of 1 if the firm is exporting and 0 otherwise).

Figure 1 shows the number of firms starting and ending export activity. The number of exporting firms fluctuated widely during the period under investigation. During the analyzed period, new firms entered the export market, while many firms exited.

V. Results

The results emphasizing the impact of markups on wine export intensity (Equations (1) and (2)) are presented in Table 2. For all models, markups were derived using the Cobb–Douglas production function. Year fixed effects were incorporated into model (2) to account for heterogeneity between years.

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Table 4. Markup differences between exporters and non-exporters

	(1)	(2)
lnMarkup		
lnLabor	0.015	−0.149***
lnCapital	0.049***	−0.004
lnIntermediate	−0.013	0.020***
$lnmarkup_{t-1}$	0.607***	0.147***
Residuals from reduced form equation		0.985***
Export	0.192**	0.188***
Year FE	+	+
Constant	−1.821***	−3.700***
Export		
$lnCapital_{t-1}$	0.179***	0.208***
$lnLabor_{t-1}$	0.508***	0.494***
Year fixed effect	+	+
Constant	−1.502***	−1.350***
Log pseudolikelihood	−3584.862	−649.089
Wald Chi^2	1802.78***	19477.54***
N	2561	1992

Note: **$p < 0.05$, ***$p < 0.01$.

Markups have a significant impact on both export participation and export intensity in the structural model. The consistency of these results across all model specifications highlights the reliability of the findings. Albeit only significant at 10%, firms with higher markups demonstrate an increased propensity toward engaging in export activities. This empirical evidence confirms the validity of Hypotheses 1 and 2 being consistent with existing research (Jafari et al., 2023; Melitz and Ottaviano, 2008).

Table 3 presents the results on learning by exporting within the Hungarian wine industry. However, for model (2), the results are adjusted using residuals from the reduced form equation, and year fixed effects are incorporated across all models.

The results imply that entering export markets does result in higher markups and does favor continued export activity. Adjusting the results by residuals confirms that the impact of beginning and continuing export activities on markups is detectable across all cases. The coefficient of the *Entry* variable for models implies that entry into export markets is associated with a 16.4–19.9% increase in markups. Similarly, according to the models where the coefficients of the *Continue* variable are obtained, firms that export for at least two consecutive years apply markups that are approximately 19–19.2% higher than those charged by firms that have exited the export market or have never exported. The coefficients for *Entry* and *Continue* variables are much higher comparing results by Jafari et al. (2023) suggesting a higher role of export on the markup in Hungarian wine sectors. Overall, these findings confirm Hypotheses 3a and 3b, which propose that firm markups increase after beginning to export, and

this effect remains significant when considering productivity. Additionally, Hypotheses 4a and 4b are supported, indicating that sustained export activity increases firm markups.

The final question to addresses whether there is a difference in markups between exporters and non-exporters, attributable to learning effects and productivity gains from export participation (Equation (4)). The results are presented in Table 4, following the same formatting as Table 2. There is a correlation between export activity and higher markups. The results support Hypotheses 5, which propose a difference in markups between firms that export and firms that do not export. The observed difference remains statistically significant even when taking into consideration the productivity of the firm. The coefficient of the binary *Export* variable suggests the markup premium ranges between 18.8% and 19.2% for exporters compared to non-exporters. These numbers are significantly higher comparing the results by Jafari et al. (2023) suggesting the export status has remarkable higher importance in the Hungarian wine sector.

VI. Conclusion

This study examines the relationship between markups and export activity in the Hungarian wine sector. The results provide valuable knowledge for managers of the industry and add to the current body of research on the export decisions made by individual firms.

The results of our study show a strong and positive impact of markups on both the likelihood of engaging in exports and increasing export intensity. This is consistent with the results of Jafari et al. (2023) in the French food processing sector. This result emphasizes that firms with greater profitability (as indicated by markups) have a higher probability of engaging in export activities.

The examination of the learning-by-exporting hypothesis uncovers important findings. The estimations show significant and positive influence of exporting on markups. Accounting for productivity enhances the correlation, providing further evidence that exporting results in higher markups (Hypotheses 3a, 3b, 4a, and 4b). This is consistent with the idea of learning through exporting, possibly because it leads to improved efficiency or the acquisition of knowledge in foreign markets.

The final stage of the investigation analyses the difference in markup between firms that export and those that do not export (Table 3). We find that exporters consistently have higher markups than non-exporters, even when productivity is considered (Hypotheses 5a and 5b). The markup premium in the Hungarian wine industry is higher compared to French food processing sector, see Jafari et al. (2023), suggesting a significant impact specific to this industry.

To summarize, this research presents strong evidence that markups have a substantial impact on export decisions and performance within the Hungarian wine industry. Firms with higher profit margins are more willing to engage in international trade and achieve higher levels of export activity. The practice of exporting appears to result in higher markups, possibly because of learning-by-exporting. The utilization of a double hurdle control function methodology helps to separate the valuable insights into these relationships.

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These findings have substantial implications. Policymakers can establish conditions that promote higher prices (e.g. tax breaks) for firms, which in turn stimulates the exportation of goods and contributes to economic expansion within the wine industry. Firms should prioritize enhancing productivity and implementing strategic pricing strategies to attain higher profit margins and achieve success in exporting. Further research could investigate similar dynamics in different nations and sectors to gain a deeper understanding of the intricate relationship between price markups and export patterns in the worldwide wine industry.

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