



Tokaj on the grape and the wine markets

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1. Introduction and literature review

Tokaj is among the oldest geographical indications benefiting from legal protection (Meloni and Swinnen, 2018). This paper summarises the results of the author's and colleagues¹ latest research on the economic value of geographical indications (or GIs, for short), focusing on the PDO Tokaj. The investigation goes beyond the wine market with reflections on the effect of the Tokaj PDO on grape prices, too. Moreover, how producers use the Tokaj name on their labels is also examined.

In order to present a wider context, this paper starts with an outlook on the history, the regulation and the economic nature of GIs.



1.1 Historical and legal outlook

Government measures in wine-producing countries regulating the practice of labelling the origin have been introduced since the beginning of the 20th century – yet regional regulations on the delimitation of the area were applied much earlier, for example, in Tokaj, but also Burgundy, Champagne, Chianti or Porto. Meloni and Swinnen (2018) identified two common elements in the protection and geographical delimitation of the first GIs: changes in the wine trade causing conflicts between historical and potential new producers and the good relationship between the producers and the political regime.

Geographical indications play an important role in European Union agriculture and

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are key in the wine sector. Despite the uniformity of the EU regulatory framework, we can distinguish two essential approaches to geographical indications: the Germanic system and the Latin system. In short, the Germanic system focuses on the ripeness (and thus the quality level, or the technological quality according to Botos and Szabó, 2002) of the grapes, while the Latin system on the typical products of their origin (or on the classification quality according to Botos and Szabó, 2002 – the French concept, underlying the Latin system, is perfectly summarised in Braham, 2003).

Intellectual property rights measures cover the legal protection of geographical indications, and there are currently four different regimes under European Union law (wine products, agricultural products, foodstuffs, and spirits). For wine products, EU law distinguishes between two types of geographical indication: protected designations of origin and protected geographical indications. The difference between the two is not the degree of legal protection but the nature of the relationship between the product and the place of production: the former is close, and the latter is loose². The most important element of the regulation is that the competent producer communities determine the exact conditions for the use of the geographical indication in a so-called product specification. This document shall contain the requirements for the delimitation of the place of production of the grapes, the quality parameters of the raw material of the grapes, the oenological practices, the chemical composition and the organoleptic characteristics and the proof of the link between the product and the place of production.

1.2 The economic nature of geographical indications

Wine economics literature (for a detailed summary, see Gál, 2020.) shows that GIs generally have a predominant role in wine pricing. Moreover, most of these papers highlight significant, statistically significant differences between the effects of specific geographical indications on wine prices. In other words, it is not the mere fact that a product bears a geographical indication that has value but the specific geographical indication.

Geographical indications are of a dual nature: they can be interpreted as factors decreasing information asymmetry, hence increasing efficiency, or seen as rents

² Regulation (EU) No 1308/2013 of the European Parliament and of the Council of 17 December 2013 establishing a common organization of agricultural markets and amending Directives 922/72 / EEC, 234/79 / EC, 1037/2001 and 1234 Article 93 (a) and (b) of Council Regulation (EC).

for those who own the production factors (Meloni and Swinnen, 2018). For a better understanding, we need to review primarily their qualities that stem from their collective nature. GIs embody a collective reputation, which in Tirole's (1996) approach can be understood as the totality of the individual reputation of the individuals who make up the group. Individual and group reputations are interdependent and depend on past performance (product quality) in this approach. Thus, the stronger the incentives are to maintain (improve) individual reputation, the better the group reputation will be. In this area, due to the collective nature of GIs, incentives in the opposite direction emerge within the group. On the one hand, with the increase in the size of the producer community, the likelihood of free-riding increases (Winfree and McCluskey, 2005), and on the other hand, joint branding allows for quality improvement and investment in quality where it would not otherwise occur (Fishman et al., 2018). As a consequence of their collective nature, wineries using a geographical indication are, on the one hand, interdependent and, on the other hand, competitors of each other, seeking to differentiate themselves from other members of the group by using their own individual brands (Patchell, 2008). Therefore, given the limited demand for products bearing a given geographical indication, the group's reputation is also exploited to the detriment of each other (Castriota and Delmastro, 2012).

The reputation of geographical indications can thus be interpreted as a common pool resource in the crossfire of conflicts between short-term individual and long-term group interests, like the commons in the famous example that illustrates this situation (Hardin, 1968) as they fulfil the criteria in terms of both impossibility of exclusion and competing consumption (congestion – Mike and Medgyesi, 2016). Ostrom (2003) proposes common governance as a solution to these problems. In this case, the group members determine the conditions of access and use of the common pool resource. The European Union's regulatory framework (Reg. No. (EU) 1308/2013) on geographical indications applies the same approach.

Using a GI imposes additional costs due to the additional regulations. Therefore, producer communities need to find the ideal balance when designing regulation; they must avoid both excessive rigours with high costs and the loss of meaningful differentiation due to excessive leniency (Tregear and Gorton, 2005). Maintaining the credibility of a GI representing collective reputation can pragmatically be assured by the sensory and analytical testing of the end product (Winfree and McCluskey, 2005; Tregear et al., 2007).

Nevertheless, the collective reputation in a competitive environment is not a perfect quality guarantee. Moreover, reputation building is mainly a cost-effective solution in cases where the product in question is produced at a high cost, or the member-

ship of the producer community is relatively homogeneous, and the marginal cost is decreasing (Shapiro, 1982). The distinctiveness and identifiability that come with the use of geographical indications are particularly falling in those medium and lower price categories, where consumers find it easier to understand the New Wine World's grape variety-based labelling practices (Tregear and Gorton, 2005). However, as indicators of unique quality, geographical indications may allow a higher price to be achieved, which may prove essential in competing with more efficient New Wine World countries (Tóth and Gál, 2014). It is perhaps not by coincidence that France and Italy are able to achieve price discrimination in certain non-European wine export markets (Balogh, 2017). These two countries possess 60% of European wine GIs (European Commission, 2019).

Even partial consumer information and the setting of quality standards (both in terms of character and quality level) can lead to welfare gains – the optimal level (i.e. extra costs) of investing in quality shall be determined accordingly in local rules. The real value of specific geographical indications is also influenced by the socio-economic characteristics of the producer community. Well-organized and managed producer communities can act more effectively for the collective benefit of their membership (Carter, 2015).

It follows directly from the above that each geographical indication (as the presenter of the place of origin on the label) has a unique relationship with wine prices. Therefore, on the one hand, their impact must be assessed individually, and on the other hand, it is worth exploring the factors behind the very different effects.

2. Data and method

Due to the complex subject of the study, three different approaches are applied.

2.1 Market value of PDO Tokaj on wines

A database of the off-trade sector in Hungary from 2016 is used to assess PDO Tokaj's market value. The sample was taken from nine retail stores in the Budapest metropolitan area. Following clearing the sample, 2,672 wines remained, produced by 392 wineries. The sample represents about 20% of wines marketed in one year both in terms of the quantity of wines (536,669 hl) and the number of lots.

Table 1 presents the descriptive statistics of the sample (excluding dummy variables).

The value of PDO Tokaj in the wine market is estimated by a series of hedonic price

Variable	Observations	Mean	Std. deviation	Min	Max	Unit of measurement
Price	2672	2693.23	5856.22	194.85	194330	HUF/0.75 litre
Lot size	2672	20084.92	39199.50	120	607568	litre
Sugar	2672	13.22216	37.67	0	578	gram/litre
Sugar free extract	2672	25.58	6.89	15.6	124.6	gram/litre
Age	2672	2.54	1.92	1	17	year

Table 1: descriptive statistics for models regarding wine prices.
Source: own calculations

indices (as it is applied in the literature presented), described as follows:

$$\ln P = \beta_0 + \beta_i * GI_i + \beta_1 * SV + \beta_j * IB_j + \beta_2 * SFE + \beta_3 * SUGAR * WHITE + \beta_4 * SUGAR * NONWHITE + \beta_5 * AGE + \beta_6 * \ln Q + \beta_k * CV_k + \varepsilon$$

where:

- P: price
- GI_i : GI dummies,
- SV: dummy for single-vineyard wines,
- IB_j : individual brand dummies,
- SFE: concentration of sugar-free extract,
- SUGAR: sugar content,
- WHITE: white wine dummy,
- NONWHITE: dummy for rosé or red wines,
- AGE: age of the wine,
- Q: lot size,
- CV_k : colour and varietal dummies.

As certain geographical indications are segmented into two or three quality levels using additional terms to the name itself (e.g. Eger Superior or Villány Prémium), two different approaches were applied: (A) these geographical indications were treated as one single name or (B) two or three separate names (depending on the actual number of quality levels). This distinction includes Tokaj, too, as we can differentiate Tokaj wine specialities (e.g. Aszú, Szamorodni) from other Tokaj wines (e.g. dry whites). Moreover, as heteroskedasticity occurred, robust standard error models were used instead of ordinary least squares models. In both cases, restricted (containing only the GI dummies) and extended (containing all variables listed) models were run.

2.2 How PDO Tokaj appears on wines

The way wineries use PDO Tokaj on their labels is also analysed using a sample taken from the Budapest off-trade sector. In this case, the sampling occurred in September-October of 2023, and the data and the photos of 1,372 wine products³ were collected.

The labels were analysed using content analysis to reveal the main messages communicated and determine how much emphasis they receive. The labelling particulars included geographical indications, village or cru names, individual brands, grape varieties, harvest year, colour, traditional terms and the shape of the label.

To measure the amount of emphasis, we coded all particulars appearing on the label from 1 to 5 as follows:

- 1 if the GI appeared only on the back label (or the back part of the label) without any highlighting,
- 2 if the GI appeared only on the back label but was highlighted in some way,
- 3 if the GI appeared on the front label (or the front part of the label) but with very small characters, clearly as auxiliary information,
- 4 if the GI was an important element on the front label, albeit not the most emphasised (or in other words, more emphasised than at level 3, but not the most emphasised element on the front label)
- 5 if the GI was the most emphasised element of the front label.

2.3 How PDO Tokaj affects grape prices and producer's income

The relationship between the potential use of the PDO Tokaj and the grape prices or the producers' revenue is estimated on a dataset containing all grape purchases in Hungary between 2019 and 2022 (including more than 50,000 observations per year).

³ Wine products are wines in a broad sense, including proper wines, sparkling wines, aerated semi-sparkling wines etc.

Table 2 presents the descriptive statistics of the sample (excluding dummy variables).

Variable	Mean	Std. deviation	Min	Max	Measure
Grape price	115.39	53.68	52.30	750.00	HUF/kg
Producers' income	1,018,200	597,133	38,340	7,999,266	HUF/ha
Vine density	3.83	1.09	1.02	18.18	1000 vineyards/ha
Age of the vineyard	23.13	15.50	0.00	120.00	year
Quality of the plot	287.87	58.36	190.00	393.00	cadastral points
Grape maturity	11.67	1.54	6.69	36.99	%vol
Yield	92.79	48.84	6.30	225.80	q/ha

Table 2: descriptive statistics for models regarding grape prices and producers' income
Source: own calculations

Two models are estimated here, too. In the first case, the dependent variable is the log of the grapes' unit price (HUF/kg).

$$\begin{aligned} \ln PRICE = & \beta_0 + \sum \beta_i GI_i + \sum \beta_j VARIETY_j + \beta_1 * VYAGE + \beta_2 * VYDENSITY + \beta_3 \\ & * VYCP + \beta_4 * VYOWN + \sum \beta_k * VYTRSYS_k + \beta_6 * GRAPEMAT + \beta_7 \\ & * YIELD + \sum \beta_l * YEAR_l + \varepsilon \end{aligned}$$

In the second case, the dependent variable is the log of the grape producers' average income (HUF/ha), which is calculated as a multiplication of the unit price (HUF/kg) and the yield (kg/ha).

Where:

- GI_i : GI dummies (reference category: without GI)
- $VARIETY_j$: varietal dummies (reference category: white grapes without registered variety)
- $VYAGE$: Age of the vineyard (years)
- $VYDENSITY$: Vine density, expressed in 1000 plant/ha
- $VYCP$: Quality of the plot, expressed in cadastral points
- $VYOWN$: ownership of the plot (dummy, 1 if the producer is the owner)
- $VYTRSYS_k$: Training system (dummies, reference category: mid-cordon)
- $GRAPEMAT$: Grape maturity, expressed in natural alcohol content (%vol)
- $YIELD$: Yield (t/ha; only used as an estimator in the case of the grape price),
- $YEAR_m$: year dummies (reference category: 2019)

The unit of observation is the purchase in this case. To avoid the complications⁴ arising from this fact, pooled OLS models using time dummies were estimated instead of building a panel. Being outliers, purchases of Aszú grapes were excluded from the sample.

3. Results

The results are presented here.

3.1 Market value

When analysing the results of models described in section 2.1, one must not forget that hedonic price analyses are not intended to measure consumer behaviour. Moreover, they are essentially supply-oriented; they examine the relationship between specific characteristics of the supply side and prices. Thus, the results of these models answer questions such as “How much does the consumer have to pay extra or less for a wine from district X as opposed to a wine from district Y or the average wine?” (2004, p.133).

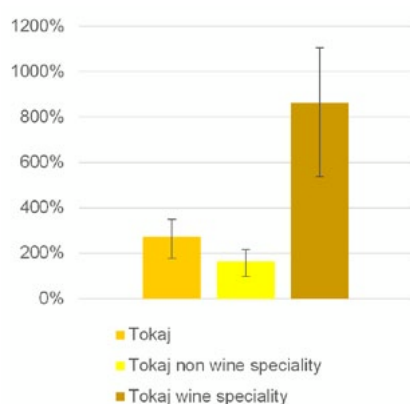


Figure 1: estimated price premia of the PDO Tokaj (restricted models).

Source: own calculation.

All coefficients were significant at 1% level

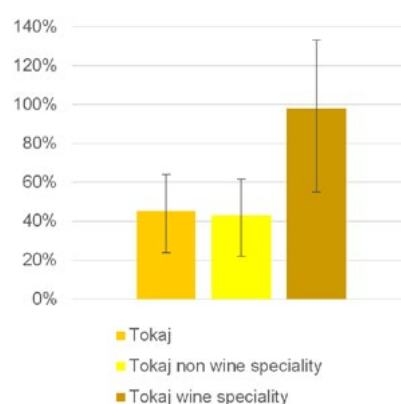


Figure 2: estimated price premia of the PDO Tokaj (extended models).

Source: own calculation.

All coefficients were significant at 1% level

⁴ These complications arise from the fact that parcels are not constant over time. They can be divided each year upon the actual contracts agreed on. E.g. in year 1, a producer may decide to sell the whole production of the parcel to one buyer, while in the next year, they can opt to divide the parcel into two and sell the grapes to two different buyers (potentially with different attributes regarding potential GI use or grape maturity), or to keep a part of the harvest for themselves to make their own wine. Thus, it would be hard to avoid arbitrary choices when building a panel.

Tokaj is the most famous Hungarian GI and one of those that can be split into several quality tiers. Here, the tradition serves as the basis of the division. Tokaj wine specialities constitute one tier, and Tokaj non-wine specialities form the other. Figures 1 and 2 show the estimated price premia of the PDO Tokaj in different models.

The price premia of Tokaj are positive and statistically significant in all models (in both approaches and in the case of both restricted and extended models).

When treated as a sole PDO, the price premium for Tokaj starts at 245%⁵ and gradually decreases to 45%.

When applying the second approach, we can take note of the extremely high level of the value added of Tokaj wine specialities. The study of the restricted and extended models shows that the price premium starts at a very high level (+863%) and gradually decreases as more and more factors are added to the model. The largest drop in the estimated coefficient occurs with the inclusion of variables describing chemical composition (as these wines are very rich in compounds). Still, the premium for Tokaj wine specialities

The price premia of Tokaj non-wine specialities is significantly lower than that of wine specialities but is still positive and statistically significant.

Albeit lower than the estimated premium for Tokaj wine specialities, both estimated premia for Tokaj (as a sole GI) and Tokaj non wine specialities exceed the national average (24% and 31% for approach A and B, respectively) and median (31% for both approaches) of GI price premium.

3.2 Appearance on the label

The results of the content analysis described in section 2.2 are detailed in Table 1. The results show that the PDO Tokaj is the most emphasised GI in Hungary by far.

⁵ Being dummy variables in a log-linear specification, the estimated coefficients shall be calculated to percents using the formula:

Geographical indication	Mode	Median	Ratio of GI on the main label	Ratio of GI <i>emphasised</i> on the main label
1. Tokaj	4;5	4	96%	68%
2. Eger	4	4	86%	64%
3. Villány	3	4	92%	52%
4. Szekszárd	3	3	90%	45%
5. Mátra	3	3	76%	14%
6. Etyek-Buda	2	3	53%	26%
7. Pannon	3	2	50%	0%
8. Sopron	2	2	47%	5%
9. Nagy-Somló	2	2	43%	36%
10. Pannonhalma	2	2	40%	40%
11. Badacsony	2	2	40%	10%
12. Duna-Tisza köz	2	2	36%	12%
13. Balaton	2	2	33%	14%
14. Balatonboglár	2	2	32%	6%
15. Kunság	2	2	31%	13%
16. Dunántúl	2	2	27%	6%
17. Neszmély	2	2	18%	12%
18. Balatonfüred-Csopak	2	2	15%	10%
19. Felső-Magyarország	2	2	12%	5%
20. Balatonmelléki	2	2	8%	4%
NATIONWIDE	2	3	62%	34%

Table 1: The top list of Hungarian GIs based on their emphasis on the label
Source: own calculation¹

The results show an overwhelming emphasis on the use of PDO Tokaj on labels, which gets only stronger if we put them in the context of GI use patterns in the Hungarian off-trade market. Contingency-table analyses show that geographical indications are more emphasised on non-Hungarian wines (Pearson $\chi^2(4) = 63.6679$; $Pr = 0.000$) and that among Hungarian wines, the geographical indications are more emphasised on reds (Pearson $\chi^2(8) = 34.3696$; $Pr = 0.000$).

96 out of 100 Tokaj wines label the PDO on their main label, while in more than 2/3 of the cases, the word Tokaj is among the most important and emphasised elements.

¹ The list contains only Hungarian GIs with a frequency over 5 in the sample.

On the other hand, such an emphasised presentation of the PDO Tokaj is not surprising given its fame and recognition even at international level.

3.3 Effect on grape prices and producers' revenue

As the dataset consists of real purchases, the results of these models can be interpreted both on the supply and the demand side.

The estimated effect on grape prices and producers' income of the potential use of PDO Tokaj is presented in Table 2. Due to space limitations, a handful of dummy variables are excluded from the table. The whole output is presented in the Annex.

Variable	Dependent variable: lnPRICE	Dependent variable: lnINCOME
PGI FELSZŐ-MAGYARORSZÁG	-0.0749***	0.0202*
PGI ZEMPLÉN	0.0447***	0.2047***
PDO TOKAJ	0.1970***	0.1436***
PGI DUNA-TISZA KÖZI	-0.0570***	0.3798***
PGI DUNÁNTÚL	0.0192***	0.3891***
FURMINT (FROM TOKAJ R.)	0.0138	0.1891***
FURMINT (OUTSIDE TOKAJ R.)	0.2696***	0.5022***
HÁRSLEVELŰ (FROM TOKAJ R.)	-0.011	0.1900***
HÁRSLEVELŰ (OUTSIDE TOKAJ R.)	0.1173***	0.4440***
SÁRGAMUSKOTÁLY (FROM TOKAJ R.)	0.0579***	0.3013***
SÁRGAMUSKOTÁLY (OUTSIDE TOKAJ R.)	0.1736***	0.5878***
KÉKFRANKOS	0.2052***	0.6642***
BIANCA	-0.0596***	0.0728***
OLASZ RIZLING	0.1375***	0.4813***
IRSAI OLIVÉR	0.5476***	0.7399***
PINOT GRIGIO	0.3675***	0.9283***
VYAGE	-0.0007***	-0.0013***
VYDENS	0.0091***	0.0116***
VYCP	0.0006***	0.0003***
VYOWN	-0.0169***	0.0151***
YIELD	-0.0003***	
GRAPEMAT	0.0551***	-0.0283***
YEAR 2020	0.2142***	0.2422***
YEAR 2021	0.1905***	0.2219***
YEAR 2022	0.1242***	0.1116***
CONSTANT	3.5996***	13.2788***
adj.-R2	0.5481	0.1766
N	204,128	204,128
AIC	-18,608.61	388,418.9
BIC	-17,667.77	389,349.5

Table 2: Results of the pooled OLS estimations for grape price and producers' income
Source: own calculation. *: 10%; **: 5%; ***: 1% level of significance

As some GIs may overlap both in the territory and other rules (e.g. wines that qualify for the use of the PDO Tokaj also qualify for the use of PGI Zemplén), the majority of GI coefficients do not directly refer to the value-added of the potential use of the given GI. Thus, overall effects on the prices shall be calculated as follows (in the case of Tokaj):

Figures 3 and 4 present the detailed calculations of the price premia for geographical indications available in the Tokaj region.

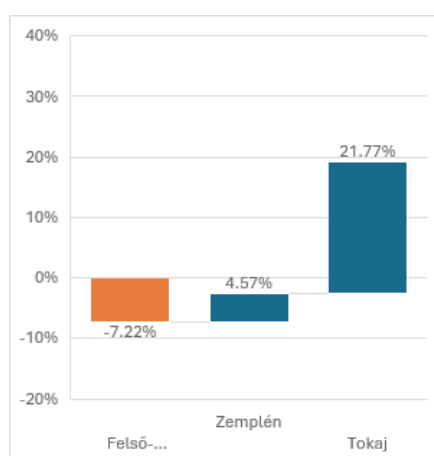


Figure 3: estimated price premia of the geographical indications available in Tokaj region – grape prices.
Source: own calculation

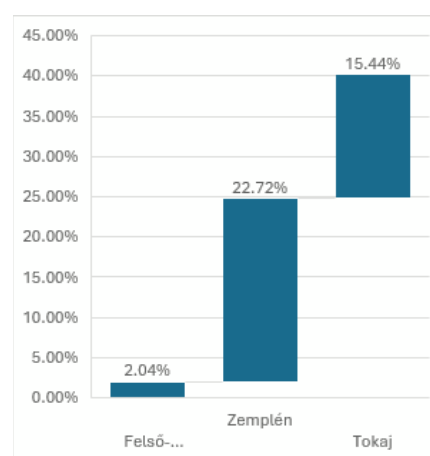


Figure 4: estimated price premia of the geographical indications available in Tokaj region – producers' income.
Source: own calculation

As Figures 3 and 4 show, PDO Tokaj has positive price premia in case of grape prices and income, well (the overall premia are +18% and +45%, respectively). The estimated premium for the PDO Tokaj exceeds the national average both in the case of grape prices and producers' income (the national average of premia are 15% and -10%, respectively). However, Tokaj's income premium lags behind by far the two big PGIs, Dunántúl and Duna-Tisza közse.

However, we shall not ignore the coefficients of the traditional Tokaj varieties. For a more detailed examination, the varietal dummies for Furmint, Hárslevelű and Sárgamuskotály were divided into two groups: vineyards situated in the Tokaj region and outside of it. The results suggest that the coefficient of the PDO Tokaj dummy would contain elements of these varieties' effects on prices (as these varieties are more or less considered and cultivated typically in Tokaj). In all three occasions, the coefficient is significantly higher for the non-Tokaj cases, with Furmint from Tokaj and Hárslevelű from Tokaj having even an insignificant price premium. This difference

occurs in the case of the producers' income, however in this case, all coefficients are significant and positive.

4. Conclusion

In this paper, I analysed the value added of the PDO Tokaj in the case of wines and grapes, too. Moreover, I revealed the patterns of how wineries use this GI on their wine labels – identified as an outlier, resembling more to the case of Champagne than the majority of Hungarian wine GIs.

The analyses showed that the premia for PDO Tokaj are relatively high (among the highest in the country) both in the wine supply and the grape market.

However, in the case of grape growers' income, some low-tier PGIs have higher income effects. These results show that the average Hungarian grape grower is better off by producing low/average quality raw material for very basic wines, while price premia obtainable by using higher-positioned PDOs seem not to pay off at the level of the grape growers.

To assess the profitability of the GIs in question further studies shall include the costs of grape-growing, winemaking and wine sales.

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