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GERMAN WINE: MEASUREMENT AND EVALUATION OF PRODUCT QUALITY

Günter Schamel[*]

1 Introduction

German wine is classified according to legally binding standards that are measurable and verifiable, because any appraisal of sensory wine quality is based on subjective impressions. This notion of "quality" is outlined in wine laws and regulations. The EU wine law assigns general conditions that apply to all wine-producing member states, but takes common interests as well as national differences into account. For example, the vineyard areas in the EU are divided into climatic zones to help compensate for the climatic variations that influence wine production. Similarly, the EU wine law defines quality categories that enable legally equivalent comparisons among member states. However, each member state is permitted to determine the criteria and method of assessment necessary to meet local (and EU) quality standards.

In other countries, wine quality is closely tied to origin; i.e. the system is based on given conditions. Quality standards vary considerably, depending on appellation of origin, and the qualitative assessment is usually determined by regional wine trade organizations. However, in Germany quality is confirmed or denied by official testing. The quality in the glass rather than the origin counts. The standards are largely uniform and the assessment is determined through quality control testing. Regulations governing quality categories and testing are important components of the German wine law.

Table 1: Grape must yields in hl/ha (Regional and vintage overview)

	Vintage				
Region	2002	2001	2000	1999	1998
Ahr	92.9	80.9	89.0	104.9	97.8
Baden	89.3	76.1	79.7	102.7	96.0
Franken	76.4	84.6	80.9	123.5	99.8
Hess. Bergstrasse	82.8	71.8	94.6	103.8	71.9
Mittelrhein	82.8	65.5	83.9	97.2	86.2
Mosel-Saar-Ruwer	106.8	89.6	102.1	135.6	121.0
Nahe	100.1	73.8	81.6	105.0	89.4
Pfalz	108.9	102.1	115.5	119.9	115.7
Rheingau	97.9	66.9	87.5	106.7	69.4
Rheinhessen	108.2	95.4	101.8	124.0	101.4
Saale-Unstrut	60.7	49.1	67.9	77.2	53.3
Sachsen	44.5	35.2	56.0	61.4	67.3
Württemberg	118.7	105.1	109.8	145.3	127.4
Overall	103.0	91.1	99.3	121.2	106.6

Source: DWI (2003)

Germany is the world's sixth largest wine producer with a total production of about ten million hectolitres. German wine is grown in 13 classified regions and renowned for its white varieties such as Riesling and Müller-Thurgau. Table 1 provides an overview of recent yields of production by growing region. Vineyard area and production quantities remained relatively steady over the last decade. However, significant structural changes have occurred (DWI, 2003). In particular, the proportion of red variety vineyards has grown to over 31 %. Mass producing white varieties are on the decline and the production increasingly focuses on premium quality wine (STORCHMANN and SCHAMEL, 2004).

[*] Dr. Günter Schamel, Institut für Wirtschafts- und Sozialwissenschaften des Landbaus, Humboldt-Universität zu Berlin, Luisenstr. 56, D-10099 Berlin, g.schamel@rz.hu-berlin.de.

We analyze an extensive data set of 10,485 wines evaluated at three annual national competitions administered by the German Agricultural Society (DLG) between 2000 and 2002. We develop a hedonic model which includes award level (bronze, silver, gold, gold extra), wine style (dry, off-dry, mild), barrique aging, color (red, white, rosé), special quality attributes (e.g. Spätlese, Auslese), and regional origin (e.g. Baden, Pfalz) as independent variables to explain variations in price. We show that the estimated implicit prices for these quality characteristics are highly significant (except for one regional indicator and rosés) and that they exhibit expected signs and relative magnitudes. The price premiums for special quality attributes are significantly larger than the premiums for competition awards. Moreover, the smaller wine growing regions (e.g. Ahr, Saxony) receive high price premiums relative to the larger bulk producing regions. There are significant year to year variations that are largely determined by vintage conditions.

Wine producers are required by law to declare specific quality categories on their labels. The EU wine law mandates two broad quality categories: Table Wine and Quality Wine. Within these quality categories, the German wine law specifies more sub-categories than other EU countries. For a detailed exposition of wine regulations see SCHAMEL (2003).

The DLG administers a system of wine quality control where each German wine labeled "quality wine" first undergoes a critical, blind, sensory testing procedure based on a uniform 5-point scale. For each wine to be tested, producers have to submit an application for an official quality control test number (A.P.Nr.).[1] The actual examination procedure is divided into two rounds: (a) checking specific prerequisites and (b) examining a wine's sensory characteristics. In the first round, the examination panel verifies whether the wine is typical for the region of origin, grape variety and quality category stated on the application. Just one negative score on any of these questions disqualifies a wine from further assessment. Subsequently, the second round is a sensory evaluation of three important characteristics: *bouquet*, *taste* and *harmony*. "Harmony" embraces all sensory impressions, including color. The overall balance between sweetness and acidity as well as alcohol and body are also considered. Up to five points or fractions thereof are awarded for each of the three characteristics. A minimum of 1.5 points (per characteristic) is necessary to avoid rejection. The total sum of this characteristic score yields an overall evaluation that is divided by three to determine the wine's quality rating number - the wine must achieve at least 1.5 points in order to receive a quality control test number (A.P.Nr.).

The DLG and its regional associations use the same testing procedure and "five-point system" to determine wines of superior quality, which are worthy of seals, award medals and prizes. In order to qualify, a wine must achieve at least 2.5 points, i.e. achieve a significantly higher quality rating than required to simply receive a quality control test number (A.P.Nr.). The German Wine Seal indicates wine styles using a color-coded system. Dry wines bear a bright yellow seal; lime green seals identify off-dry wines; and red seals denote sweet wines. State Chambers of Agriculture (Landwirtschaftskammern) award bronze, silver and gold *medals* that require a minimum of 3.5, 4, and 4.5 points, respectively. These medal-winning wines are then eligible to enter the annual national wine competition (Bundesweinprämierung) administered by the DLG at which they can win bronze, silver and gold awards (DLG-Prizes). In a special competition, the Gold Extra Prize (Goldener Preis Extra) may be awarded to wines that achieve a perfect 5-point score. For consumers, wine seals, medals and DLG awards are valuable guides to assess the quality of German wine. In the next section, we briefly review the literature on hedonic price analysis specifically as related to wine quality indicators.

[1] A.P.Nr. = Amtliche Prüfnummer.

2 Literature Review

Economists often use hedonic models based on ROSEN (1974) to empirically study price-quality relationships. In his seminal paper, Rosen posits that goods are valued for their utility-generating attributes. Consumers evaluate such attributes (e.g. car features, wine quality ratings) when making a purchasing decision. Competitive markets define implicit prices for these utility-generating attributes and the product price is the sum of all implicit prices. Rosen recognizes an identification problem in estimating hedonic price functions, as implicit prices are equilibrium prices jointly determined by supply and demand conditions. Thus, implicit prices may not only reflect consumer preferences but also supply factors. In order to solve the identification problem it is necessary to separate supply and demand conditions. ARGUEA and HSIAO (1993) argue that the identification problem is essentially a data issue that can be avoided by pooling cross-section and time-series data specific to a particular side of the market. In this paper, we chose not to model the supply side, because we assume a market equilibrium. That is, consumers have made their utility-maximizing choices, given their knowledge of prices, characteristics of alternative wines and other goods. In their purchase decision, they use available information on how experts evaluate a particular wine and how the growing region succeeds as a supplier of quality wine. Moreover, all firms have made their profit-maximizing decisions given production technologies and the costs of alternative wine qualities producible, and that the resulting prices and quantities clear the market. According to FREEMAN (1992), the equilibrium assumption implies that implicit prices may be specified without separately modelling supply conditions.

SCHAMEL et al. (1997) analyze U.S. wine prices and quality ratings for two varieties (Chardonnay, Cabernet Sauvignon) from seven growing regions. The estimated price elasticity for quality ratings is lower for red wine and consumers are willing to pay a higher quality premium for white wine. However, regional origin carries a higher premium for red varieties. In other words, the public-good value is higher for regions primarily growing red wine and that producers in those regions may benefit more from collective marketing efforts. In another paper, SCHAMEL (2002) argues that as quality indicators improve over time, pullovers will affect other producers within a region. Quality indicators for premium California wine are medals awarded during nine annual wine competitions, variety, regional origin, judging age as well as derived producer (brand) and regional reputation indicators. Estimating a hedonic model, the data confirms that a wine's price is significantly related to its own quality as well as to historically accumulated producer and regional reputation indicators for quality.

SCHAMEL and ANDERSON (2003) examine wine prices and quality ratings from two separate data sets in Australia and New Zealand. They show that consumers increasingly differentiate wine origin with cool-climate regions becoming their preferred choice. In a recent working paper, SCHAMEL (2003) analyzes quality premiums vs. brand values at producer and regional levels. Strong positive producer quality signals receive larger premium than comparable negative signals. In a first application to German wine data, SCHAMEL (2003) estimates hedonic prices for wine quality attributes confirming significant price impacts for competition awards and categories, regional origin, style, and age.

LANDON and SMITH (1997) analyze wines from the Bordeaux region, studying the impact of current quality as well as reputation indicators on consumer behavior. Lagged quality ratings define product reputation while government/industry classifications denote regional reputation. They conclude that an established reputation has a big impact on prices and is considerably more important than a short-term quality improvement. Ignoring reputation indicators will overstate the impact of current quality on consumer behavior. COMBRIS et al. (1997) estimate a hedonic price equation and what is referred to as a jury grade equation for Bordeaux wine to explain the variations in price and quality, respectively. OCZKOWSKI (2001) estimates a hedonic price function for Australian wine arguing that single indicators of wine quality are

imperfect measures because tasters' evaluations differ and contain measurement errors. He finds significant reputation effects but insignificant quality effects.

BROOKS (2001) argues that traditional models of international competitiveness emphasize product quality and production cost and neglect the potential impact of marketing and brand development on exports. After controlling for vintage, blind-tasted quality, variety and cost differences, cross-country comparisons suggest that neither cost nor quality differences, but country "brands" may affect wine prices up to fifty percent. Crucial for her result is to interpret regional dummy coefficients as a marketing premium and not as a quality premium. ROBERTS and REAGANS (2001) examine market experience, consumer attention, and price-quality relationships for New World wines in the U.S. They argue that producer or regional quality signals improve with the duration of market exposure and evaluation.

SHAPIRO (1983) presents a theoretical framework to examine the effects of producer reputation on prices, assuming competitive markets and imperfect information. For consumers, it is costly to improve their knowledge about quality. He demonstrates that reputation allows high-quality producers to sell their items at a premium which may be interpreted as return on investments in reputation building. In an imperfect information environment, learning about reputation indicators may be an effective way for consumers to reduce their decision-making costs. Since the quality of a bottle of wine is unknown until it is de-corked, reputation indicators associated with it will affect consumer willingness to pay. TIROLE (1996) presents a model of collective reputation as an aggregate of individual reputations where current producer incentives are affected by their own actions as well as collective actions of the past. He derives the existence of stereotype producers from history dependence, shows that new producers may suffer from past mistakes of older producers for a long time after the latter disappear, and derives conditions under which the collective reputation can be regained.

3 Data and Analysis

We analyze quality indicators for German wine admitted to the annual national wine competitions (Bundesweinprämierung) in 2000, 2001, and 2002. Competition results are published in print and on the Internet (www.wein.de). The original data sets were extracted from the Internet and had about 400 additional observations. The usable sample size was reduced to 10,485 because some wines listed without price information. The price information used in the estimation is *pre*-competition and does not reflect any direct effects from awarded medals. Producers are asked to state a retail price per bottle on the submission form *before* entering the competition. The model employs dummy variables for the medals as an indicator of sensory quality in addition to the quality attributes (e.g. Spätlese, Auslese) ensuing from the wine law. The data set also denotes wine style, color, regional origin, age at the time of judging, and whether or not the wine was aged in barrique (oak barrels).

Table 2 lists the independent variables used in the model. All independent variables are categorical dummies, except for judging age and Barrique (regular dummy). The dependent variable in the model is the logarithm of the retail price [log(Price)].

Table 2: Description of independent variables

Variable	Parameters
Award	Gold Extra, **GOLD***, Silver, Bronze
Quality	Qualitätswein (QbA), Kabinett, **SPÄTLESE***, Auslese, Beerenauslese (BA), Trockenbeerenauslese (TBA), Eiswein
Wine Style	lieblich/mild, halbtrocken, **TROCKEN***, Barrique
Color	Weißwein, Rosé, **ROTWEIN***
Regions	Ahr, Baden, Franken, Hessische Bergstrasse, Mittelrhein, Mosel-Saar-Ruwer, Nahe, **PFALZ***, Rheingau, Rheinhessen, Saale-Unstrut, Sachsen, Württemberg
Age	1 – 5 Years

* Parameters in BOLD are chosen as base category.

Source: Own description based on DLG.

Table 3 lists the number of awards with corresponding average prices for the three competition years. For the 2000 competition, over 42 % of wines were awarded a DLG Gold prize, 47 % in 2001, but less than 30 % in 2002. The average nominal price is 8.96€ for the 2000 competition (9.99€ for 2001, 8.33€ for 2002). The smaller regions receive a more than proportional share of prizes awarded. Both the cheapest and the most expensive wine in 2000 competition received a Gold prize. The sample contains about 68 % white wine for the 2000 competition (59 % for 2001, 67 % in 2002). The share of red wines was 29.5 % in 2000, 38 % in 2001 and just under 31 % in 2002. The share of rosés is relatively constant at about 2.5 %.

Table 3: Distribution of competition awards and average prices

Prize	2000		2001		2002	
Bronze	809	6.49€	441	7.02€	766	6.54€
Silver	1511	7.42€	1117	8.28€	1531	7.54€
Gold	1743	11.07€	1436	11.98€	980	10.34€
Gold Extra	78	17.36€	37	19.41€	36	24.92€
All Wines	4141	8.96€	3031	9.99€	3313	8.33€

Source: DLG, own calculations.

The theory of hedonic pricing models is well documented in the literature (e.g. NERLOVE, 1995). Therefore, we neglect a detailed exposition. We hypothesize that consumers are uncertain about wine quality and their willingness to pay depends on quality evaluations from DLG awards received. Control variables include a set of indicators for quality attribute, wine style and color, growing region as well as the age of the wine at the time of judging as we can expect that older wines should achieve higher prices. Building on the seminal work by ROSEN (1974), we assume that the price of a particular wine i (P_i) as a function of its characteristics z_j:

$$P_i = P_i(z_{i1}, ..., z_{ij}, ..., z_{in}) \quad (1)$$

We employ a log-linear function for the estimation. Following OCZKOWSKI (1994), we used a RESET test which rejected other functional forms (i.e. inverse, linear). Thus, we estimate the following multivariate regression model:

$$log(P_i) = \alpha + \beta_1 D_{i\,Award} + \beta_2 D_{i\,Quality} + \beta_3 D_{i\,Style} + \beta_4 D_{i\,Color} + \beta_5 D_{i\,Region} + \gamma Age_i + \delta Bar_i + \varepsilon_i \quad (2)$$

where $\log(P_i)$ is the logarithm of the retail price P_i and the error term ε_i is distributed identically and independently with a zero mean and uniform variance. Given the functional form and the nature of the categorical dummies for award, quality level, style, color and region (D_i), the estimation of equation (2) yields price premiums and discounts β_i (i =1, ..., 5) relative to the contribution of the base category (Gold, dry, white Spätlese from the Pfalz region). Note that for the estimation, we select "Gold" as the base award, "Pfalz" as the base region,

"Spätlese" as the base quality attribute, and Trocken/Weißwein as the base wine style/color categories. Specifically, β_1 is the coefficient for the medal received, β_2 for the quality attribute, β_3 for wine style, β_4 for color, and β_5 for regional origin. The coefficients γ and δ measure the price premiums paid for older wines and barrique-aged wine, respectively. According to HALVORSEN and PALMQUIST (1980), appropriate adjustments are to be made to interpret the estimated dummy coefficients as percentage premiums or discounts.

4 Estimation Results

Table 4 lists the regression results for the model defined in equation (2). The last column for each competition year translates the estimated coefficients into money equivalents relative to the base category (a dry-white Gold award winning Spätlese from Pfalz) at the average price, respectively. As expected, prices are positively related to sensory evaluations (DLG prize) and wines receiving higher ranking awards command significantly higher prices. Comparing the competition years, it is apparent that the results for the year 2001 are somewhat different.

Ceteris paribus, the discount in the 2000 competition for a Silver (Bronze) award relative to a Gold is 3.4 % (7.5 %) and the premium for a Gold Extra prize is 11.2 %. In monetary terms, the discount for a Silver (Bronze) award relative to a base category wine is equal to 31¢ (67¢) while the premium for a Gold Extra is roughly 1€. For the 2001 competition, the discount for a Silver (Bronze) award relative to a Gold is 2.9 (6.0 %) and the premium for a Gold Extra is 5.5 %. In monetary terms, the discount is equal to 26¢ (54¢) for a Silver (Bronze) award relative to a base category wine while the premium for a Gold Extra is roughly 50¢. In 2002, the bronze discount is about 40¢, the discount for a silver is 29¢, and the premium for a Gold Extra is over 2.50€. These numbers are in contrast to much larger price differentials for the quality attributes, which are all highly significant. For example, "Auslese" commands more than a 50 % premium in 2000 relative to a Spätlese, other things equal. As expected, specialty wines such as TBA or Eiswein receive premiums well above 100 %. Barrique-aged wine carries a relatively constant premium over 7 €. With respect to style and color, dry reds carry a premium relative to non-dry whites. However, there is hardly a price differential between mild and off-dry styles (11.6 % vs. 10.9 %). The price premium for red wine is almost 20 % in 2000 but declines in subsequently, a proof of the increasing depth in high quality production of red wine.

Price differentials for the various wine regions are almost all significant and positive relative to the base region Pfalz (other things equal). Rheinhessen being the largest growing region is an exception in 2000 and 2002. Pfalz and Rheinhessen have large vineyard areas producing the bulk of German quality wine and are thus less suited to market regional quality premiums. On the other hand, many of the smaller regions (e.g. Ahr and Saxony) carry very large price premiums, which would indicate that they have been quite successful in niche marketing their premium wines. Significant year to year variations in regional price differentials are determined by specific vintage conditions.

Overall, the results indicate that although the sensory quality indicator is significant, special quality attribute and regional effects dominate. The explanatory power of the models is good and the data set confirms strong positive price effects for quality indicators such as competition prizes awarded and quality attribute.

Table 4: Results [Dependent variable: Log (Price)]

Parameter	2000	€ [a]	2001	€ [a]	2002	€ [a]
Constant	1.579 (68.1) [†]	---	1.846 (62.1)	---	1.683 (71.8)	---
Bronze	-0.078 (-5.6) [†]	-0.67	-0.062 (-2.9) [†]	-0.54	-0.047 (-3.1) [†]	-0.41
Silver	-0.035 (-3.1) [†]	-0.31	-0.030 (-2.0)*	-0.26	-0.032 (-2.6) [†]	-0.29
Gold Extra	0.106 (3.0) [†]	1.01	0.053 (0.9)	0.49	0.251 (4.9) [†]	2.56
Qualitätswein (QbA)	-0.348 (-23.9) [†]	-2.63	-0.304 (-16.1) [†]	-2.35	-0.265 (-17.9) [†]	-2.09
Kabinett	-0.286 (-20.2) [†]	-2.23	-0.230 (-10.9) [†]	-1.84	-0.277 (-16.8) [†]	-2.17
Auslese	0.417 (27.3) [†]	4.64	0.359 (14.3) [†]	3.87	0.383 (20.6) [†]	4.18
Beerenauslese	1.087 (43.4) [†]	17.61	1.185 (30.0) [†]	20.36	1.064 (28.4) [†]	17.02
TBA	1.512 (36.0) [†]	31.68	1.477 (28.4) [†]	30.30	1.572 (32.0) [†]	34.19
Eiswein	1.590 (69.5) [†]	34.99	1.480 (38.9) [†]	30.39	1.445 (54.5) [†]	29.05
lieblich (mild)	-0.123 (-9.8) [†]	-1.04	-0.134 (-7.5) [†]	-1.12	-0.143 (-10.4) [†]	-1.20
halbtrocken (off-dry)	-0.116 (-7.8) [†]	-0.98	-0.132 (-6.4) [†]	-1.11	-0.122 (-8.0) [†]	-1.03
Barrique	0.580 (24.3)	7.05	0.628 (23.5) [†]	7.83	0.600 (25.3) [†]	7.37
Rosé	0.060 (1.89) [‡]	0.55	0.008 (0.2)	0.07	-0.008 (-0.2)	-0.07
Red Wine	0.180 (12.2) [†]	1.77	0.165 (8.1) [†]	1.61	0.127 (8.0) [†]	1.21
Ahr	0.542 (11.4) [†]	6.45	0.715 (8.9) [†]	9.36	0.800 (13.3) [†]	10.99
Baden	0.284 (16.6) [†]	2.94	0.252 (10.4) [†]	2.57	0.279 (15.4) [†]	2.89
Franken	0.471 (25.6) [†]	5.39	0.273 (10.6) [†]	2.81	0.362 (18.2) [†]	3.91
Hess. Bergstraße	0.350 (9.5) [†]	3.75	0.419 (7.7) [†]	4.66	0.372 (9.6) [†]	4.04
Mittelrhein	0.123 (3.6) [†]	1.17	0.228 (4.5) [†]	2.30	0.211 (5.6) [†]	2.11
Mosel-Saar-Ruwer	0.334 (17.6) [†]	3.56	0.234 (7.7) [†]	2.37	0.279 (13.7) [†]	2.88
Nahe	0.223 (8.0) [†]	2.24	-0.032 (-0.6)	-0.28	0.193 (5.7) [†]	1.90
Rheingau	0.384 (14.6) [†]	4.20	0.234 (5.6) [†]	2.37	0.283 (8.2) [†]	2.94
Rheinhessen	0.002 (0.2) [†]	0.02	-0.170 (-7.0) [†]	-1.40	0.003 (0.2)	0.03
Saale-Unstrut	0.509 (9.0) [†]	5.95	0.374 (6.4) [†]	4.07	0.409 (5.4) [†]	4.53
Sachsen	0.734 (15.2) [†]	9.71	0.765 (13.2) [†]	10.29	0.685 (13.1) [†]	8.82
Württemberg	0.185 (11.0) [†]	1.82	0.134 (5.7) [†]	1.28	0.168 (9.3) [†]	1.64
Age	0.064 (4.0) [†]	0.57	0.014 (0.9)	0.14	0.032 (2.0)*	0.27
adj. R^2	76.9%		67.5%		74.1%	
F	512.7		233.52		352.5	

[†], *, and [‡] indicate significance at the 1%, 5%, and 10% level, respectively.

[a] relative to base category (Gold, Spätlese, dry, white, Pfalz) at average prices, with adjustments made according to HALVORSEN and PALMQUIST (1980).

Source: Own calculations.

5 Summary and Conclusion

In Germany, wine quality is confirmed or denied by official testing. The German wine law categorizes wines by their degree of ripeness at harvest. It also defines four basic wine styles in terms of residual sugar content and total acidity. Producers are required to declare specific quality categories on their labels. The quality wine category has six higher-rated subcategories identified by special quality attributes (QmP). The German wine law, which is quite different from regulations in other EU countries, has been subject to much criticism especially because sugar content at harvest is the sole criterion for inclusion into a special quality attribute category.

In addition to the quality categorization by law, the DLG administers a critical and blind, sensory testing procedure based on a uniform five-point scale for every German "quality wine". In annual wine competitions (Bundesweinprämierung) bronze, silver and gold as well as special Gold Extra Prizes are awarded. DLG awards provide a valuable guide for consumers to assess the quality of German wine. In our analysis, we confirm a highly significant and positive impact on the prices for premium wines, even after correcting for legal quality categorization and regional origin. This is consistent with various other studies based on quality ratings. However, the estimated premiums for individual wine quality appear to be small in the context of quality assessments at wine competitions as well as relative to estimated premiums based on the quality categories. This result is in line with a study of premium California wine tasted and evaluated at multiple wine competitions (SCHAMEL, 2002). Moreover, the results indicate that although the sensory quality indicators are significant, special quality category and regional effects dominate.

We estimate significant relative differences between quality categories and between growing regions, which warrant important marketing implications for quality categories as well as individual producers and their regional and sub-regional associations. From the estimation, it follows that for specialty wines (esp. BA, TBA, Eiswein) quality categorization seems to work quite well. However, in the lower categories, the estimated differences are smaller. For 2000 and 2002, Silver vs. Bronze (36¢ and 12¢) yields about the same premium as Kabinett vs. QbA (40¢ and 8¢). Thus, the strategy of some producers to declassify their wines (e.g. reasoning that it is better to offer an excellent QbA rather than a mediocre Kabinett) is reconfirmed through the data. Critics of the German wine law argue that the reputation of the quality categories has degraded. However, the reputation of a quality category has public good properties and it is crucial to promote its value. Here, TIROLE'S (1996) model of collective reputation applies to quality categories. The collective reputation for a specific wine quality attribute is an aggregate indicator. When producers declassify their wine their incentives seem to be affected by collective actions of the past. Following TIROLE, regaining collective reputation depends on producer eagerness, the trust level required by consumers, and on free riders.

Our results point towards the need for greater regional differentiation. In searching for information about wine quality, discerning consumers value more specific information. The degree of regional differentiation in Germany is mainly a result of the wine law. We confirm positive price effects for sensory quality indicators such as competition prizes awarded. However, price-quality relationships depend on the performance of producers over time and of other producers in the same region. As consumers become aware of producers (brands) or sub-regional quality and reputation indicators, they will pay more attention to producer and site-specific quality signals. At the same time, they become less reliant on more diffuse signals, such as special quality attributes specified by the wine law which may blur the supremacy of distinct vineyard sites in larger regions. Efforts by leading German wine estates to change the current regulatory system and to demand stricter quality controls point in this direction. They strive for stronger property rights and value in sub-regional or site names, thereby raising the rates of return on individual promotion efforts. Then, the French tradition of emphasizing regional origin would take hold in Germany.

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