The quality of vineyard sites in the Mosel valley of Germany

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1. Introduction

In this paper we report the results of a hedonic study of the determinants of the quality of the wines from different vineyards in the Mosel Valley. This beautiful area has been the source of wine production for hundreds of years and has been, at one time or another, a part of several different countries. The wines are denoted by the vineyard from which they come, and sell for different prices accordingly. Wines from famous vineyards like the Berncasteler Doctor sell for far more than wines from Hatzenporter Kirchberg. As a result, the price of a vineyard represents the capitalized value of the vineyard's wine quality. We make use of the fact that for taxation purposes there have been several different rankings of the quality of the vineyards of the Mosel and use these as the measure of vineyard (and wine) quality in our analyses.

We also have remarkably detailed data on the characteristics of the vineyard sites in the Mosel Valley. The Mosel represents one of the coolest regions in which fine wine grapes are grown, and the character of the vineyard site is critical in determining the ripeness and character of the grapes produced and also of the resulting wines. The best vineyards would logically have the character of a solar panel, facing toward the South with a steep slope, and with soil that holds the warmth and provides fine drainage. Our goal is to determine the precise magnitudes of the effects of each component of the vineyard site on its quality, and also to determine how much of the variability in the quality of the sites can be explained by this hedonic model.

2. Vineyard classification in the Mosel

The first distinction of vineyard sites in the Mosel valley is recorded in 1680. According to a decree of the Elector of Trier, the vineyards of the Mosel valley were simply divided into two

regional classes in order to tax the wines regarding to their respective quality. This first classification distinguished between the upper and the lower Mosel. The wines from the upper Mosel, from Trier down to Puenderich, were deemed much better than those from the lower Mosel, between Zell and Koblenz. According to this ranking, the prices of the 1st class wines were estimated at 30 Thaler per Fuder (960 liter), and those of the 2nd class at 15 Thaler. (Heger, 1905). One-third of this estimated value was to be paid as a compulsory levy to the knights and feudal lords in the valley. This distinction between good and less good vineyard sites is especially astounding since the producers had no possibilities and incentives to produce the high quality wine of today. Most of the land was feoff, all harvest dates were strictly regulated, they worked mainly with low quality varieties such as Elbling (the Riesling had its breakthrough not earlier than the 1830s), and the vintners were not allowed to sell their wine on their own. In short, since the producer could not be responsible for different qualities, the wine assessment must have been based upon differences among the vineyard sites.

A far more distinguished approach to Mosel vineyard site classifications was introduced in 1804 during the Napoleonic era. The Mosel valley became a part of the French "Saare-Departement" and a part of France in 1801. Therefore the French Revolution also had a huge impact on wine production in the Mosel valley. Ecclesiastical properties were confiscated and put up for auction, feudal levies were abolished, the fixing of harvest dates became the responsibility of municipal authorities and - most important – every wine producer was allowed to commercialize his own wine. To support the marketing the wine producer could choose to pay his rent and taxes either in wine or in cash. This can virtually be seen as repurchase. The prices of this repurchase were fixed by law, which distinguished between 10 quality classes. Geographical unit was the village level, the price ranged from 64 Franc/1000 liter to 172 Franc/1000 liter. The most remarked villages were Dusemund (Brauneberg), Piesport, Wehlen, Machern, Graach, Zeltingen, Erden and Lösenich. Although this ranking was not based on market prices of the wines, it could refer to the first auction results of the confiscated vineyards as well as to the preparative work. These auctions were held from 1803 to 1813 during which time approximately 11% of all vineyards in the Mosel valley changed their proprietor (Müller, 1980). In preparation for these auctions, every single item was registered and its value was estimated. These estimates should reflect the potential profit of the land and were based on the annual rents. The French government not only allowed, but supported self-marketing, the development of a lively wine market, and the introduction of

wine auctions in the Mosel valley. Accordingly, the long tradition of Mosel wine auctions was founded in the 1820s, which was also the basis for the following Prussian ranking.

With the peace treaty of Vienna in 1815, the entire Mosel-Saar-Ruwer area became a part of Prussia. The Prussian tax administration resumed the work of the French and presented a complete land register in the 1830s in order to tax the land according to its yield. Since the land tax was the most productive kind of tax, an assessment of yield and cost of land was considered fairly important and it was an important goal to achieve a geographical disaggregation level which was as low as possible. The yield of particular wines was determined by referring to the market process and observing market and auction prices over a 24 year period from 1837 to 1860, then taking the average (Beck, 1869)[1]. In a second step, estimated labor costs were subtracted and the remaining net yield was taken as the tax base. The Prussian tax administration distinguished 8 different net yield grades. The area within each of these grades, as well as the net yield result by village, was published by the government of the King of Prussia in 1869 (Beck, 1869, pp. 26-33). This allows a distinction between different vineyards within one village as well as a distinction between different villages. For instance, the net yield range among the vineyard sites in Berncastel lay between 106 Thaler per hectare in the best and less than 6 Thaler per hectare in the worst site. To locate the vineyard site the government also published a map for the administrative district Trier, *i.e.*, the upper Mosel, in 1868 (Clotten, 1868); the respective map for the lower Mosel, *i.e.*, for the district Koblenz, was published in 1897 (Lintz, 1897). The most important trait of the Prussian ranking was certainly that it relied on the assessment of the market instead of predetermining the quality of single vineyard sites. That leads to variations of the ranking over time due to changing market preferences.

Compared to the classification from 1804, the 1869 ranking shows a lot of new assessments. The vineyards of Lösenich so highly esteemed in 1804 were downgraded, while vineyards in villages such as Berncastel (from 3 to 1), Trittenheim (from 5 to 2) or Longuich (from 7 to 2) were substantially upgraded. This variation may partly be caused by different approaches of the ranking. But there are also strong indications for a variation over time even when the same ranking method is applied. Wine auction statistics by the publisher *Lintz Verlag Trier* (Heger 1905) showed that, even resuming the Prussian method, a variation in the ranking is

[1] Since one wanted to avoid distortions caused by the vast volatility among the vintages the optimal estimation period and the appropriate proxy was discussed a long time (e.g., Lindauer, 1815; Flotow, 1820; Gebhard 1824, Schimmelfennig, 1831),

inevitable. According to Heger there are a lot of vineyards, which could increase their ranking significantly between 1869 and 1902. Mentioned especially are Ayl, Erden, Trittenheim and Uerzig. Heger attributes that to efforts of the winemaker, which result in substantial enhancements in quality and price. Accordingly, the vineyard site map was revised several times. The 5th and latest edition dates back to 1925 (Lintz, 1925).

With increasing importance of income taxes, land taxes fell more into the background. That also led to less attention from public authorities regarding quality assessments of land in general and vineyard sites especially. This development led to a new ranking in 1936 (Goldschmidt, 1937) by the then "Reichsernährungsministerium" (ministry of nutrition). Compared to the Prussian ranking from 1869, which took the assessment of the market to judge the quality, this ranking went the opposite way: It aimed to fix minimum prices by a 3-stage quality ranking.[2] Accordingly, wine auctions were prohibited during the following years until the auction tradition could be resumed in 1948. This ranking procedure does not include an "automatic adjustment tool" such as market prices but assumed that the ranking of vineyard sites, once qualified, does not change anymore. That led us to the questions: (1) how much is the quality of vineyard sites determined by physical attributes, and (2) are there other important factors aside from the physical traits which could influence the ranking of a vineyard site? This paper attempts to shed light especially on the first question, whereas the second part will be considered only in a speculative way.

3. Data

The definition of distinct vineyard sites has changed many times during the last two centuries. The definition of vineyard sites was much more disaggregated in the past than it is nowadays. For instance in 1910 there were about 2000 defined vineyard sites within a covered area of 6,800 ha (Goldschmidt, 1925) Hence, the average size of a vineyard was about 3.4 ha. According to the German wine law of 1971 the Mosel-Saar-Ruwer region now contains 523 vineyard sites within an area of almost 11,985 ha (1997) (Stöhr et al., 1981; Statistisches Bundesamt, 1998)). Therefore, the average vineyard size jumped to almost 23 ha. This tendency to higher aggregation levels leads to a strong leveling out effect, *i.e.*, the vast vineyards of today often contain both very highly ranked parts and less highly ranked parts,

[2] This ranking is to be seen in Diemer (1937).

whereas the character of the smaller defined lots of the last century was much more homogeneous.

The aim of this study is to explain the relationship between vineyard site rankings, *i.e.*, wine price, and their physical attributes. Stöhr et al. (1981) presented a comprehensive description of all Mosel-Saar-Ruwer vineyards sites as they were defined in 1971. These data were taken as the base of all following calculations. More difficult was the ranking evaluation of the respective vineyards. Certainly the most comprehensive and complete ranking is taken from the Prussia tax administration from 1869. Unfortunately its vineyard site´s definition is not identical with the one of 1971, which is currently valid. Accordingly, the maps of 1868 and 1897, respectively, as well as the maps provided by Stöhr et al., were taken in order to apply this ranking on contemporary vineyard sites. This rough estimation method certainly contains a lot of mistakes and is not a perfect solution. In order to minimize these faults we also excluded all the "new vineyards" which did not exist during the 1869 ranking. Therefore, from the 523 current vineyards, only a total of 344 vineyard sites were considered. The remaining sites were founded after the Prussian ranking and are located mainly in the bottom of the valley. The ranking distinguishes 8 grades where 1 is the highest and 8 is the worst quality.

It is obvious that the larger average vineyard site size of nowadays leads to leveling out effects. While the Prussian ranking mentioned more than 60 vineyards ranked on place one, the application of the Prussian ranking shows that only 9 vineyards could be ranked first (e.g., *Erdener Prälat, Uerziger Goldwingert, Bernkasteler Doctor, Brauneberger Juffer-Sonnenuhr*). The average size of these vineyards is 2.0 hectare and therefore much smaller than the average of 21.2 hectare.

The independent variables taken were: vineyard's size, slope, altitude, exposure, depth of soil, as well as soil type. Any of these variables refer to Stöhr et. al. (1981). The vineyard's size is measured in hectare and refers to 1975. However, the area of a vineyard site includes not only the planted part, but also unexploited parts. Stöhr et al. guess the error to be about 20-30 percent. This is the reason why the sum of all vineyards sites exceeds the official total area of all vineyards.

The slope is given by Stoehr et al. as a fraction of *steep*, *middle* or *flat*. The *Uerziger Wuerzgarten* for example is characterized as 80% steep, 20% middle and 0% flat. This was transformed into a weighted average measure where 1 means steep, 0.5 middle and 0 flat. The respective value in our example, the *Uerziger Wuerzgarten* is 0.9. Problematic is that within one category -- for instance *steep* -- there is no further distinction by degree. Hence, it does not matter if the slope of a vineyard is 40^0 or $57^{0,}$ as it is in Europe´s steepest vineyard, the *Bremmer Calmont*. The steepness of both is measured as 1.

The altitude of a vineyard is given in meters in its lowest and its highest point. In addition to these measures we constructed an average measure. However, these data were not weighted, *i.e.*, it is not known which fraction of the vineyard is in the lower or the upper area, respectively. For the sake of simplicity we assumed a normal distribution. Since the close distance to the water and its climatic leveling out effect is considered fairly important we also introduced the altitude of the Mosel as an additional variable. On its way from the border to Luxembourg to its mouth into the Rhine at Koblenz, it falls from 135 to 60 meter. Hence, while a vineyard with its lowest point at 135 meter near Trier would be on the bank of the Mosel, in Koblenz it would appear high up in the hills.

The Mosel-Saar-Ruwer region belongs to the northernmost wine regions of the world. Hence optimal usage of the sun is far more essential than elsewhere and the vineyard's exposure is assumed to be one of the most important variables. Stöhr et al. provide the "prevailing exposure" as, for example, south or southwest. We assigned a value to the variable of exposure: 1 equals 100% southern exposure and 0 equals no southern exposure. In our example, *south* would be 1 and *southwest* 0.5. More complex exposures such as *south-southwest* were weighted equally and would get a 0.75. Since there are also vineyards with exposures to northern directions, the same method was applied to calculate the northern fraction. While there are many vineyards with a southern fraction of 1, the highest northern fraction is 0.5.

The depth of the soil of a vineyard site was measured similarly to the exposure. Stöhr et al. give the measures *deep*, m*oderate* and *flat* without any weight. We calculated the depth as a variable ranging from 0 to 1 where 1 means deep and 0 means flat. For instance a vineyard like the *Erdener Praelat*, which is deep to moderately deep, got the measure 0.75.

Besides the depth of the soil we also refer to the kind of soil. A first glance shows, that the entire Mosel-Saar-Ruwer region is characterized by different forms of slate. Other soils prevail only in the valley around Trier (sandstone) and between Trier and the border to Luxembourg (limestone). However, considering the micro-geological features of a single vineyard, the results are fairly different. We distinguish slate, slate quartzite, clay slate, sandstone, limestone, gravel, alluvial land, sand, clay, graywacke and quartzite. The existence of one of these kinds of soils is indicated by a dummy variable taking only the value 1 for yes and 0 for no.

Finally, a dummy variable was introduced in order to indicate a vineyard's distance from the Mosel, Saar or Ruwer, respectively. The dummy variable takes the value 1 for remote vineyards, and 0 for the vineyards located within the river system. In general remote vineyards are very rare -- they are either domestic vineyards of castles or cloisters, such as the *Alfer Schlossberg,* or they are concentrated in villages, such as Maring, Veldenz and Oberremmel.

4. Results

In general the vineyard sites of the wine region Mosel-Saar-Ruwer are divided into two parts: Mosel and Saar-Ruwer (e.g., Goldschmidt, 1937). Since a first overall estimation for the entire sample did not lead to convincing results, we followed this distinction and estimated separate equations for 278 Mosel vineyard sites as well as for the remaining 66 Saar-Ruwer sites. A simple OLS estimation for the Mosel shows the following results:

OLS equation Mosel

Dependent Variable: RANK
Method: Least Squares
Date: 05/05/00 Time: 11:13
Sample: 1 278
Included observations: 278

	Coefficient	Std. Error	t-Statistic	Prob.
SOUTH	-2.224378	0.317529	-7.005278	0.0000
$SLOPE^{27}$	-1.230665	0.167919	-7.328907	0.0000
AWAY	2.107013	0.328216	6.419589	0.0000
SAND	0.494930	0.332750	1.487392	0.1381
SLATE	-1.129511	0.217968	-5.182010	0.0000
DEPTH	0.761664	0.278105	2.738765	0.0066
CLAY	0.627383	0.204081	3.074187	0.0023
SLATE	-1.886344	0.224663	-8.396326	0.0000
SLATEQ	-0.503636	0.287105	-1.754188	0.0805
ALTMAX-ALTMOS	0.008019	0.001647	4.869056	0.0000

$NORTH^{0.5}$	0.842270	0.543316	1.550239	0.1223
C	6.824154	0.371202	18.38394	0.0000

R-squared	0.630267	Mean dependent var	5.712230
Adjusted R-squared	0.614978	S.D. dependent var	1.887617
S.E. of regression	1.171270	Akaike info criterion	3.196260
Sum squared resid	364.9182	Schwarz criterion	3.352848
Log likelihood	-432.2801	F-statistic	41.22170
Durbin-Watson stat	1.516136	Prob(F-statistic)	0.000000

where: RANK: ranking with 1=best and 8=worst vineyard site
SOUTH: fraction of southern exposure (see text)
SLOPE: slope (see text)
AWAY: dummy variable 1 for remote vineyards, 0 otherwise
SAND: dummy variable for sand
SLATE: dummy variable for weathered slate
DEPTH: depth of soil (see text)
CLAY: dummy variable for clay
SLATEC: dummy variable for clay slate
SLATEQ: dummy variable for slate quartzite
ALTMAX: maximum altitude of the vineyard in meter
ALTMOS: altitude of the Mosel river next to the vineyard in meter
NORTH: fraction of northern exposure (see text)

The equation explains the ranking of the Mosel vineyards with an R^2=0.63, *i.e.*, almost 2/3 of the qualification can be explained by physical traits. Since the vineyard ranking is defined as 1 = best and 8 = worst, a positive influence of independent variables is indicated by a negative sign. Accordingly, slope, southern exposure and a slaty soil are important factors to get a good ranking. All of these factors support the vineyard's ability to take advantage of the sun and to store the heat during the night. The steeper the vineyard and the more it is exposed to the south (and the less it is exposed to the north), the more solar radiation can be caught. Additional slate holds the warmth during the night and sees that the temperature range between day and night does not get too high. The equation indicates that among the slate family especially weathered slate and clay slate provide these attributes.

Since water also stores warmth well**,** this leveling-out effect is also caused by rivers or lakes near the vineyard. This is certainly one more reason why the Mosel valley has been a wine producing region for more than 2,000 years. However, several vineyards which are remote from the river cannot profit from this effect. The positive sign as well as the high t-value of the dummy variable AWAY indicates this importance. The same relationship is indicated by the term (ALTMAX-ALTMOS) since the higher and the further away from the Mosel river, the higher the difference between day and night temperature and the worse the ripening conditions for the grapes. Hence, it would be the best for a vineyard to be located at the bank of the Mosel river.

One of the worst conditions for a vineyard is a deep underground, which cannot provide a fine drainage and is often too humid or even wet. Deep soils can consist of clay, sand **or** slate. They all tend to have a bad influence on the quality of a vineyard. However, if the prevailing soil of the vineyard consists of sand or even clay, the bad conditions would be enforced. These kinds of soil can neither store the warmth nor provide a fine drainage.

Ultimately we can conclude that the ideal Mosel vineyard is exposed to the south, very steep, consists of a flat soil of (clay-)slate without sand or clay parts, and is located near or at the bank of the Mosel river. Example conditions for a perfect vineyard are met only by the very small sites *Erdener Praelat* (2.2 ha), *Uerziger Goldwingert* (0.3 ha) and, with a few restrictions, the *Bernkasteler Doctor* (1.0 ha).

The equation for the remaining Saar-Ruwer vineyard sites is not that significant due to the character of this region – Saar and Ruwer are far more homogeneous than is the Mosel valley. Without exception, weathered slate is the prevailing soil in every vineyard site, and there are virtually no slate sorts such as slate quartzite or clay slate. Since Ruwer or the Saar river, respectively, are much smaller than the Mosel river, the importance of being near to the water is not as pronounced as it is within the Mosel valley. Also, the Saar and Ruwer rivers fall not more than 15 meters from Saarburg and Kasel, respectively, to the mouth of these rivers in the Mosel in Trier. (The Mosel river falls from almost 160 meter near the border to Luxembourg to 60 meter in Koblenz.) As a result no soils other than sand and clay are inserted into the equation. Since no significant results were derived by including the AWAY dummy variable, we also forego inserting it.

OLS Equation Saar-Ruwer

Dependent Variable: RANK
Method: Least Squares
Date: 05/08/00 Time: 07:17
Sample: 279 344
Included observations: 66

	Coefficient	Std. Error	t-Statistic	Prob.
SOUTH	-3.001785	0.644182	-4.659841	0.0000
Log(SLOPE)	-1.176092	0.852861	-1.378997	0.1731
SAND	1.134337	0.850596	1.333578	0.1875
CLAY	0.715866	0.468276	1.528725	0.1317
ALTAVG	0.005334	0.006343	0.840845	0.4038
DEPTH	0.545130	1.080140	0.504684	0.6157
C	5.084578	1.399122	3.634121	0.0006
R-squared	0.370081	Mean dependent var		5.333333

Adjusted R-squared	0.306022	S.D. dependent var	1.748259
S.E. of regression	1.456394	Akaike info criterion	3.689807
Sum squared resid	125.1439	Schwarz criterion	3.922044
Log likelihood	-114.7636	F-statistic	5.777145
Durbin-Watson stat	1.326327	Prob(F-statistic)	0.000088

where: ALTAVG: average altitude of the vineyard in meter

In general the conditions found in the Mosel valley are important also for the vineyards within the valleys of Saar and Ruwer. The steeper the vineyard and the more it is exposed to the south the better. On the other hand, the more it is exposed to the north, the deeper the soil and the higher the altitude, the worse the conditions. As in the Mosel valley, soils like sand and clay indicate bad drainage and a diminished ability to store the warmth of the day. However, variables such as ALTAVG and DEPTH are not very significant and the R^2=0.37 indicates a lower explanatory power than it was in the Mosel-equation.

Although these OLS estimations show a clear relation between the physical traits of a vineyard and its economic profitability, the estimation method should reflect the character of the ranking as **a** discrete choice. Hence, this can be appropriately addressed by an ordered probit approach (e.g., Greene 1997, pp. 926). The estimated ordered probit equations show a result, which is virtually the same as the OLS results.

Ordered Probit equation Mosel

Dependent Variable: RANK
Method: ML - Ordered Probit
Date: 05/02/00 Time: 20:03
Sample: 1 278
Included observations: 278
Number of ordered indicator values: 8
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

	Coefficient	Std. Error	z-Statistic	Prob.
SOUTH-NORTH	-2.416285	0.268397	-9.002666	0.0000
SLOPE^8	-1.297006	0.189910	-6.829576	0.0000
AWAY	2.529206	0.397448	6.363610	0.0000
DEPTH	0.816013	0.263828	3.092979	0.0020
SLATE	-1.325055	0.224714	-5.896637	0.0000
SLATEC	-2.033407	0.242761	-8.376168	0.0000
SLATEQ	-0.658606	0.278617	-2.363838	0.0181
CLAY	0.755181	0.206872	3.650470	0.0003
SAND	0.714686	0.370596	1.928480	0.0538
ALTMAX	0.006469	0.001538	4.206356	0.0000
Limit Points				
LIMIT_2:C(11)	-4.361002	0.469862	-9.281449	0.0000

LIMIT_3:C(12)	-3.745265	0.449558	-8.330993	0.0000
LIMIT_4:C(13)	-3.056044	0.438881	-6.963257	0.0000
LIMIT_5:C(14)	-2.318005	0.427502	-5.422209	0.0000
LIMIT_6:C(15)	-1.745313	0.421691	-4.138843	0.0000
LIMIT_7:C(16)	-0.672955	0.411039	-1.637204	0.1016
LIMIT_8:C(17)	0.616585	0.411960	1.496709	0.1345

Akaike info criterion	2.801644	Schwarz criterion	3.023477
Log likelihood	-372.4285	Hannan-Quinn criter.	2.890641
Restr. log likelihood	-530.0595	Avg. log likelihood	-1.339671
LR statistic (10 df)	315.2621	LR index (Pseudo-R2)	0.297384
Probability(LR stat)	0.000000		

Ordered Probit equation Saar-Ruwer

Dependent Variable: RANKORD
Method: ML - Ordered Probit
Date: 05/08/00 Time: 08:18
Sample: 279 344
Included observations: 63
Excluded observations: 3
Number of ordered indicator values: 8
Convergence achieved after 6 iterations
Covariance matrix computed using second derivatives

	Coefficient	Std. Error	z-Statistic	Prob.
SOUTH-NORTH	-2.602111	0.539032	-4.827375	0.0000
SLOPE	-1.883583	0.923642	-2.039300	0.0414
LOG(DEPTH)	0.221161	0.355068	0.622869	0.5334
CLAY	0.685419	0.344472	1.989768	0.0466
SAND	0.871265	0.614949	1.416808	0.1565
ALTAVG	0.004525	0.004834	0.936069	0.3492
Limit Points				
LIMIT_2:C(7)	-4.694682	1.420003	-3.306106	0.0009
LIMIT_3:C(8)	-3.557223	1.379736	-2.578191	0.0099
LIMIT_4:C(9)	-3.367665	1.375370	-2.448552	0.0143
LIMIT_5:C(10)	-2.784499	1.368591	-2.034574	0.0419
LIMIT_6:C(11)	-2.215441	1.363679	-1.624607	0.1042
LIMIT_7:C(12)	-1.275254	1.345164	-0.948029	0.3431
LIMIT_8:C(13)	-0.063944	1.336515	-0.047843	0.9618

Akaike info criterion	3.568793	Schwarz criterion	4.011027
Log likelihood	-99.41698	Hannan-Quinn criter.	3.742726
Restr. log likelihood	-117.7979	Avg. log likelihood	-1.578047
LR statistic (6 df)	36.76187	LR index (Pseudo-R2)	0.156038
Probability(LR stat)	1.96E-06		

5. Summary

This study seeks to find a relationship between physiological traits of vineyard sites in the Mosel valley of Germany and the economic value of the land. We assumed that the profitability is expressed the best by the price of the wine. This was already recognized by the

French authorities 200 years ago and further developed by the Prussian government in the 1850s. In order to tax the vineyards sites according to their profitability, Prussian tax authorities distinguished 8 quality classes of vineyards based on wine market prices of the respective vineyard sites. It is questionable how far this ranking corresponds to features of the vineyards such as slope, exposure or kind and consistency of the soil. On one hand, an econometric analysis showed that about two third of the ranking is explainable by vineyard traits as mentioned above. A southern exposure and a steep slope are especially positive. On the other hand, one third of this ranking, *i.e.*, of the wine prices, seems to be dependent on other variables. We suspect that this is due to factors, which are not constant in time, factors such as the efforts of winemakers to enhance the quality of their wines. This would allow even a site with sub-optimal conditions to achieve a top price, whereas a physically ideal vineyard tilled by a less ambitious vintner will not guarantee a top price. Hence, a vineyard site ranking should not be fixed forever but revised from time to time. This conclusion was already reached by the Prussian tax authorities, which closely observed the wine auction market for almost an entire century. Accordingly, the ranking was revised more than once.

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