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Modeling Grape Price Dynamics in Mendoza: Lessons for Policymakers

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Abstract

Mendoza is the main wine-producing province of Argentina, and the government is currently implementing a range of policies that seek to improve grape grower profitability, including a vineyard replanting program. This study uses a dataset of all grape sales recorded in Mendoza from 2007 to 2018, totaling 90,910 observations, to investigate the determinants of grape prices. Key findings include: smaller volume transactions receive lower-average prices per kilogram sold; the discount for cash payments is higher in less-profitable regions; and the effect of wine stock levels on prices is substantial for all varieties. Long-run predicted prices are also estimated for each variety, and region; and these results suggest that policymakers should review some of the varieties currently used in the vineyard replanting program. (JEL Classifications: Q12, Q13, Q18)

Keywords: autoregressive distributed lag, grape price, hedonic price, Mendoza.

I. Introduction

Accounting for 71% of total Argentinean grape production, Mendoza is the main wine province of Argentina. Argentina is the fifth-largest wine producer in the world (Anderson, Nelgen, and Pinilla, 2017; OIV, 2018). Mendoza is a wine-producing region of international importance and in 2017 the estimated value of wine grape

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production in Mendoza was US$576 million (Argentinean Wine Corporation, 2018).

In Mendoza, there are two current government programs where a greater understanding of the determinants of wine grape prices would be valuable. The first is a vineyard replanting program that provides interest-free credits to growers with vineyards smaller than 20 hectares to help them pull out existing vines and replant with higher-quality varieties (Government of Mendoza, 2017). The program objective is to replant 10,000 hectares, which represents 6.5% of the current area planted with grapes in Mendoza (Argentinean Secretary of Agriculture, 2017). The second program, which started in 2019, is a market intervention program that will buy grapes (to make grape juice, wine, or industrial alcohol) and wine if wine stocks are deemed too high, and sell wine if wine stocks are deemed too low. The stated program objective is to stabilize grape (and wine) prices and avoid wine imports (Government of Mendoza, 2019).

In this research, we use a combined hedonic price autoregressive distributed lag (ARDL) model to estimate long-run relationships for grape prices in Mendoza. The regression model outputs are directly relevant to both the existing vineyard replanting program and the new wine and grape stock level management program.

II. Literature Review on Grape Prices

The factors that influence grape prices in Mendoza have not yet been studied in detail, and a search of the literature failed to identify any research on the determinants of grape prices in Mendoza, or any other Argentinean province. Relevant studies of wine grape prices outside Argentina include: Oczkowski (2006) for Australia; Costa-Font et al. (2009) for Catalonia; Fuller and Alston (2012) and Volpe et al. (2012) for California; and Tomsik et al. (2016) for the Czech Republic. Relevant related research on table grape prices identified included: Reynolds (2009) for South Africa; Weisong et al. (2010) for China; and Yilmaz and Abdikoglu (2017) for Turkey.

Based on our review of the Argentinean and international literature we determined that the variables we should consider in our model of grape price formations are: variety, region, financial characteristics of the transaction, harvest volume, and stock levels. Although the literature also suggests wine imports can be important, we do not consider wine imports an important factor for grape price determination in Argentina, because for the period between 2007 and 2018, imports represented less than 1% of wine production.

III. Literature Review on Grape Prices

The dataset used for this study includes all recorded grape sales from 2007 to 2018, for the 13 most planted varieties in Mendoza. There are a total of 90,910 observations in the data set (Table 1). The information recorded for each sale includes: price, variety, region, payment type (i.e., cash or financed) and quantity sold. The Mendoza Chamber of Commerce provided grape sale data. The Argentinean Wine Observatory and the Argentinean Wine Institute provided harvest and stock level data.

Official Argentinean inflation statistics for the period 2006 through 2015 are not reliable (Cavallo, Cruces, and Perez-Truglia, 2016; Daniel and Lanata Briones, 2019; Miranda-Zanetti, Delbianco, and Tohmé, 2019). As such, we use the independently compiled price index of the Santa Fe Chamber of Commerce to convert nominal prices to real prices. All prices are expressed in 2018 values.[1]

IV. Methods

We use an inverse demand ARDL/hedonic price model. Both hedonic models (Ashenfelter, 2017; Bekkerman and Brester, 2019; Cardebat et al., 2017; Cross, Plantinga, and Stavins, 2017) and distributed lag models (Cardebat and Figuet 2019; Gergaud, Livat, and Song, 2018; Niklas and Sadik-Zada 2019) have been widely used to investigate issues in the wine market. Following a process of backwards and forwards variable selection, the final model selected is:

$$\begin{aligned} P_{ijkt} = & \alpha + \sum_i \sum_j \beta_{ij} V_i R_j + \sum_l \sum_j \zeta_{il} R_j T_l + \sum_v \eta_v Q_v + \sum_i \sum_j \theta_{ij} \bar{P}_{ijt-1} \\ & + \sum_i \iota_i V_i H_t + \sum_i k_i V_i W_t + \sum_i \rho_i V_i G_t + \sum_i \sigma_i V_i Y_t + \sum_i \upsilon_i V_i Y_t^2 + e_{ijkt}, \end{aligned} \tag{1}$$

where P_{ijkt} denotes the log of the real per kilogram price of grape variety i sold in region j associated with transaction k, at time t; V_i and R_j denote variety and region dummies; T_l is a dummy variable for payment type (i.e., cash or installments); Q_v denote volume quartile dummies; $\bar{P}_{ijt-1}$ is the average real price per kilogram for variety i in region j at time $t-1$; H_t is the total quantity of grapes harvested in Mendoza in the year of the transaction; W_t is the total stock of wine in Argentina at the beginning of year t; G_t is the total stock of grape juice in Argentina at the beginning of the year of year t; Y_t denotes the year in which the transaction took place; Greek letters denote parameters to be estimated; and e_{ijkt} is a zero mean error term.

For clarity, note that in the dataset it is not possible to identify specific vineyards or growers through time. As such, $\bar{P}_{ijt-1}$ is the arithmetic mean real price for variety i in region j at time $t-1$, not the specific price received previously by the grower. Also,

[1] Additionally, for the regression model, we used the price index from the Province of San Luis to check our results. The results we obtain using this alternate price index series are qualitatively the same as the results based on the Santa Fe Chamber of Commerce price index.

Table 1
Number of Observations (i.e., Transactions) and Grape Prices (2018 US$/t) by Variety and Region

	Uco Valley			*Lujan-Maipu*			*South*			*Northeast*			
Variety (Color)	*Obs.*	*Price*	*SD*	*Obs.*	*Price*	*SD*	*Obs.*	*Price*	*SD*	*Obs.*	*Price*	*SD*	*Total Obs.*
Malbec (red)	8,582	474	179	8,592	398	159	1,287	286	132	4,177	294	142	22,638
Bonarda (red)	722	225	112	1,104	199	93	1,692	160	65	4,611	168	76	8,129
Cereza (rosé)	42	96	19	606	99	19	2,106	91	21	4,721	100	20	7,475
Criolla Grande (rosé)	57	102	21	631	98	18	2,164	92	20	10,075	99	19	12,927
Cabernet Sauv. (red)	3,035	411	168	2,890	339	146	1,049	241	114	1,784	247	126	8,758
Syrah (red)	873	328	126	826	253	110	1,125	173	68	2,482	182	79	5,306
Pedro G. (white)	210	120	35	845	110	29	722	100	24	3,113	109	26	4,890
Moscatel Ros. (rosé)	7	109	18	348	105	24	1,368	95	21	2,041	105	20	3,764
Tempranillo (red)	660	253	124	475	179	86	288	163	62	1,753	170	78	3,176
Chardonnay (white)	2,388	308	87	1,549	247	81	462	210	65	1,852	199	63	6,251
Merlot (red)	1,230	302	140	698	245	111	341	196	76	830	185	83	3,099
Torrontes R. (white)	358	157	61	235	131	47	203	123	27	1,442	125	37	2,238
Aspirant B. (blend)	203	472	227	450	474	245	60	419	276	1,546	447	239	2,259
Total obs.		18,367			19,249			12,867			40,427		90,910

in Argentina, during production, grape juice is sulfated to ensure fermentation does not take place, and it is illegal to de-sulfate grape juice. As such, grape juice cannot be used for making wine. For this reason we treat wine stocks and grape juice stocks separately, and grape juice stocks are defined as the sum of sulfated grape juice, and the grape juice equivalent volume of grape juice concentrate. For estimation, we drop a variety, region, quartile, and payment type category. For reporting we retrieve the relevant base information from the respective adding up constraints. For inference we use robust standard errors.

V. Results

Reported in the Appendix are complete regression results. The model R^2 = Adjusted-R^2 = 0.831, suggesting: (i) the model is a relatively good fit to the data; and (ii) that the model fit is not due to the inclusion of a large number of irrelevant variables. With log price as the dependent variable, and many interaction terms in the model, the raw regression coefficients are difficult to interpret directly. To aid with exposition, we present: (i) a table of long-run predicted prices by variety and region; (ii) a table documenting the price dynamics, by variety; and (iii) an in-text discussion of other key information derived from the regression results. To generate estimates of long-run predicted prices by variety and region, we assumed median levels for harvest, wine stocks, and grape juice stocks; payment by installments; quantity sold is in the first (smallest) quartile; and the year is 2018.

A. Long-Run Predicted Prices

Table 2 shows clear price differences between varieties and across regions. Within regions, in general, prices for red varieties are higher than for white varieties, which in turn are higher than for rosé varieties. The exception to this general result is for Chardonnay grapes, a high-quality white grape variety that sells at prices higher than some red varieties. Across regions, but within variety, the price premium achieved in Uco Valley and Lujan-Maipu, relative to the South and the Northeast, is most pronounced for premium varieties, and completely disappears for low-value varieties. Both Uco Valley and Lujan-Maipu are renowned for quality production, and although the price premium in these regions disappears for low-quality varieties, there are relative few transactions for low-quality varieties in these two regions (see Table 1).

For most varieties, prices are lower in the South region than in the Northeast region. These lower prices may reflect not just quality, but also logistics issues. The South region is relatively far from the other three regions. Selling grapes to a winery in another region may mean high transportation costs, which are usually paid by the grower. As such, growers in the South face a more restricted market than growers in the other three regions.

Table 2
Long-Run Predicted Prices for Mendoza, Current Area Planted, and Average Revenue (2018)

			Regional Prices (USD/t)				
Variety	*Color*	*Surface Area(ha)*	*Uco Valley*	*Lujan-Maipu*	*South*	*Northeast*	*Average Revenue (USD/ha)*
Cabernet Sauvignon	Red	11,133	419	347	249	262	3,114
Malbec	Red	35,983	406	342	243	257	4,501
Aspirant Bouchet	Blend	3,481	340	324	258	319	4,309
Chardonnay	White	5,099	321	255	223	211	2,962
Merlot	Red	4,205	288	243	200	197	2,497
Syrah	Red	8,666	235	181	132	144	2,832
Tempranillo	Red	5,678	193	150	141	150	2,615
Bonarda	Red	15,720	178	163	139	153	2,329
Torrontes Riojano	White	3,718	136	116	113	115	1,886
Pedro Gimenez	White	8,135	116	106	99	109	1,488
Moscatel Rosado	Rosé	5,908	106	98	90	102	891
Criolla Grande	Rosé	14,133	95	92	87	96	1,939
Cereza	Rosé	15,101	91	93	87	98	1,593

In the first phase of the government supported replanting program, Malbec was used for 40% of the area replanted; however, varieties associated with relatively low prices have also been widely used: Bonarda 20%; Tempranillo 6%; and Syrah 6% (Government of Mendoza 2017). Given the price observed for Cabernet Sauvignon grapes, it is notable that this variety, which tolerates a wide range of environmental conditions, has not been widely used for replanting.

Some varieties that have lower prices also have higher yields than premium varieties. For example, in Mendoza as a whole, for 2018, the average yield for Criolla Grande was 17 t/ha, while for Cabernet Sauvignon it was 7 t/ha. However, controlling for other relevant factors, the price differences observed are so large that some of the varieties currently used in the replanting program are unlikely to be the best option for growers seeking to maximize profit. To illustrate the issue, in the final column of Table 2, we show average revenue per ha by variety for Mendoza as a whole for 2018. Based on the detail in Table 2, it is difficult to understand the relative prominence of Bonarda in the replanting program: the relatively high yield does not compensate for the low price.

Looking forward, the high long-run equilibrium prices for Aspirant Bouchet are unlikely to be sustained. A unique feature of Aspirant Bouchet is that its color index is so high, that small quantities of the variety can be blended with generic white wine, and the resulting blend legally sold as red wine. During the study period there were no limitations on the percentage of white and rosé grapes that could be blended with a small amount of Aspirant Bouchet to create a wine that could be legally sold as red wine. However, since 2019, all red wine sold in Argentina must be made with at least 65% red grape varieties, and the red grape variety requirement will gradually increase to 80% in 2030 (Official Bulletin of Argentina, 2019). This structural change to the market is likely to impact Aspirant Bouchet prices, but as this policy change came after the study period, we have no direct evidence on the likely size of the impact.

B. Price Dynamics

Table 3 presents a summary of the price dynamics, by variety. Overall, the speed of adjustment coefficients (one minus lag of price coefficients) are slowest for red varieties. For rosé varieties and the lowest-quality white variety (Pedro Gimenez), the lag price coefficients are negative, which might be seen as implying a cobweb type dynamic for this segment of the market.

Alternatively, for low-quality varieties, it could be that the model fits this segment of the market poorly. To check model fit at the individual variety level, separate least squares regressions were estimated for each variety, and across these regressions (results available on request) the R^2 for the lowest-quality varieties are between two and three times lower than for the medium- and high-quality varieties. We interpret this result as suggesting that for low-price varieties there may be important elements of the market that we have not captured, and we qualify our remaining comments accordingly.

In Table 3, our primary focus is the long-run coefficients, and the values have an interpretation as elasticities. The first observation that can be made from a comparison of the long-run coefficients is that, in general, prices are most sensitive to changes in the size of the harvest, followed by changes in wine stocks, and then changes in grape juice stocks. This seems an intuitively reasonable result: harvest is the activity most directly related to the wine grape market, and grape juice production the most removed.

The wine stock elasticity information is of direct relevance to the government's proposed plan to influence grape prices through active wine stock level management. There is significant heterogeneity in the estimated variety level wine stock elasticity values, but: (i) the majority of values are above minus one; and (ii) premium varieties such as Malbec, Cabernet Sauvignon, and Chardonnay tend to have elasticity values closer to zero than other varieties. That grape prices for these premium varieties appear to be less influenced by stock levels is further evidence of the value of focusing on such varieties as part of the replanting program. Overall, the heterogeneity in elasticity values suggests that influencing grape prices through an active program of wine stock management will be difficult. However, to derive a reference point for how responsive wine grape prices will be to active wine stock level management, we combine the variety surface area information in Table 2, with the variety specific elasticity values in Table 3, and derive a share-weighted wine stock level elasticity estimate of –0.77. We suggest an elasticity of around this magnitude as an appropriate working assumption for how grape prices, on average, will respond to changes in overall wine stock levels.

Table 3
Price Dynamics Coefficients Summary (Elasticities)

			Short-Run Coefficients			*Long-Run Coefficients*		
Variety	*Color*	*Lag of Price*	*Harvest*	*Wine Stocks*	*Gr. Juice Stocks*	*Harvest*	*Wine Stocks*	*Gr. Juice Stocks*
Syrah	Red	0.36	−0.90	−0.80	−0.35	−1.40	−1.26	−0.55
Malbec	Red	0.30	−0.86	−0.45	−0.41	−1.23	−0.64	−0.58
Cabernet Sauvignon	Red	0.28	−0.96	−0.48	−0.38	−1.33	−0.67	−0.53
Bonarda	Red	0.28	−0.86	−0.92	−0.41	−1.19	−1.27	−0.57
Merlot	Red	0.26	−0.83	−0.63	−0.39	−1.12	−0.86	−0.53
Tempranillo	Red	0.23	−0.83	−0.88	−0.43	−1.07	−1.14	−0.56
Chardonnay	White	0.17	−0.45	−0.42	−0.23	−0.54	−0.50	−0.27
Aspirant Bouchet	Blend	0.14	−1.20	−0.83	−0.65	−1.40	−0.97	−0.76
Torrontes Riojano	White	0.03	−0.41	−0.58	−0.26	−0.42	−0.60	−0.27
Moscatel Rosado	Rosé	−0.11	−0.07	−0.52	−0.12	−0.06	−0.47	−0.11
Cereza	Rosé	−0.13	0.08	−0.73	−0.10	0.07	−0.64	−0.09
Pedro Gimenez	White	−0.14	−0.17	−0.71	−0.18	−0.14	−0.62	−0.16
Criolla Grande	Rosé	−0.14	0.07	−0.68	−0.10	0.06	−0.60	−0.09

For grape juice stocks, the overall pattern of effects is that the response is largest for Aspirant Bouchet, then red varieties, followed by white varieties, and finally rosé varieties. That the coefficients for rosé varieties are the lowest is surprising, as the main raw material for grape juice production is rosé grape varieties. However, for this market segment, the key grape attribute is sugar content. It may be the case that years with low harvests, and, hence, low grape juice stock levels, are correlated with factors that impact sugar content levels. As we have no information on the sugar content of the grapes sold, it is not possible to test this hypothesis, but thinking through how frosts and cold days may affect both harvest size and grape sugar content levels suggests a correlation of this type is one plausible explanation for the observed result.[2]

C. *Other Effects*

The payment type effect is both statistically and practically significant in all regions, with the price being higher for payments by installments. An immediate cash payment may be beneficial for growers that have debts to repay, and may also help finance pruning service costs in winter, and fertilizer and pesticide costs in early spring. Immediate cash payments are also valued in countries such as Argentina that have recent experience with high rates of price inflation.

The estimated immediate cash payment discount, relative to payment by installments, was 4.4% in Uco Valley and 5.2% in Lujan-Maipu. These two values are

[2] We note that there may be many plausible competing hypotheses for the observed result.

both statistically different from zero, but not statistically different to each other. The discount was 12.1% in the Northeast region and 12.4% in the South region, and these two values are not statistically different to each other, but are statistically different to the values for Uco Valley and Lujan-Maipu. On average, the Northeast and South regions are associated with lower grower profitability (Abihagle, Aciar, and Gonzalez Luque, 2015; Altschuler, 2012). We interpret the higher value of the discount for cash payments in the Northeast and South regions as consistent with growers in these regions facing relatively high levels of financial stress, and suggest that there could be value extending formal financial services to growers in these regions.

Transactions were grouped into volume quartiles, and the range for each quartile was: less than 11.3 tonnes; 11.3 to 26.4 tonnes; 26.4 to 56.1 tonnes; and greater than 56.1 tonnes. Relative to transactions in the first quartile, transactions in the second, third, and fourth quartile attracted price premiums of 2.6%, 3.5%, and 3.0%, respectively. These price premiums are not statistically different from each other, but are all statistically different from the first quartile. The government focus on policies that promote association schemes for the smallest growers therefore seem to be well founded. The average price gain from increasing transaction size is modest, but real; and as it is only necessary to move up to the second quartile to achieve this benefit, the required increase in volumes appears achievable.

There are plausible factors influencing prices that are not included in the model. For example, changes in export demand, exchange rate effects, tax changes, trends in domestic consumption, and changes in production costs. The variety level time trends, in part, capture the effect of factors not included in the model. In general, the variety level time trends describe the same basic pattern: falling real prices through to around 2013 or 2014, followed by a slow recovery. The time trend for rosé varieties, however, shows falling prices through to 2016, and then a much slower recovery. The overall effect is that the price gap between rosé varieties and other varieties has increased over the sample period.

V. Conclusion

This study has investigated wine grape price dynamics for Mendoza, the most important grape growing region of Argentina. The estimated model provides a good explanation of the price dynamics of medium- and high-quality grapes, and the model results have several practical policy implications. First, the long-run predicted prices suggest that some of the varieties used in the current government-sponsored replanting program may not be the varieties that will improve grower profitability the most. As such, a review of the replanting strategy seems appropriate. Second, there is a quantity discount effect that negatively impacts the smallest growers. Association schemes among the smallest growers to increase the average transaction size are therefore valuable. Third, there is evidence of greater financial stress in the

Northeast and South regions, relative to the Uco Valley and Lujan-Maipu regions; and so, the potential benefits from extending financial services to these two regions is likely to provide the greatest return. Finally, the estimated average long-run wine stock elasticity of –0.77 can be used by policymakers as a reference value as they start to implement a program of active wine stock level management.

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Appendix

Table A1 provides estimates where Malbec is the base variety, Northeast is the base region, payment is by cash, and quantity sold is the first quartile of the distribution (i.e., less than 11.3 tonnes). Table A2 provides information on the range of interaction terms. For each variety there is first a region specific term. Then for the lag of price, harvest in Mendoza, wine stocks, grape juice stocks, and the time trend, there is a variety specific term.

Table A1
Base Case Estimates

Variable	*Estimates*	*Variable*	*Estimates*
Intercept	5.479***	*Variety (See Table A2 for additional terms)*	
	(0.061)	Aspirant Bouchet (Blend)	2.939***
Region fixed effects (add to base)			(0.252)
Lujan-Maipu	0.263***	Bonarda (Red)	0.703***
	(0.009)		(0.121)
South	−0.043***	Cabernet Sauvignon (Red)	0.331***
	(0.012)		(0.113)
Uco Valley	0.390***	Cereza (Rosé)	−2.398***
Payment by installments	0.115***		(0.091)
	(0.003)	Chardonnay (White)	−1.048***
Payment by installments (add to base)			(0.103)
Uco Valley	−0.072***	Criolla Grande (Rosé)	−2.465***
	(0.007)		(0.079)
Lujan-Maipu	−0.063***	Merlot (Red)	0.115
	(0.006)		(0.184)
South region	0.002	Moscatel Rosado (Rosé)	−2.479***
	(0.006)		(0.121)
Quartiles (add to the base)		Pedro Gimenez (White)	−1.582***
Quartile 2 (11.3 to 26.4 tons)	0.026***		(0.111)
	(0.003)	Syrah (Red)	0.503***
Quartile 3 (26.4 to 56.1 tons)	0.035***		(0.137)
	(0.003)	Tempranillo (Red)	0.668***
Quartile 4 (over 56.1 tons)	0.029***		(0.180)
	(0.003)	Torrontes Riojano (White)	−1.286***
Dynamics (See Table A2 for additional terms)			(0.162)
Log of harvest in Mendoza	−0.862***	*Time trend (See Table A2 for additional terms)*	
	(0.014)	Year	−0.100***
Log of wine stocks	−0.447***		(0.004)
	(0.021)	Year^2	0.007***
Log of grape juice stocks	−0.407***		(.0003)
	(0.012)	*Goodness of fit*	
Log of lag of price	0.300***	R^2	*0.831*
	(0.013)	*Adjusted* R^2	*0.831*

Notes: *p < 0.1; **p < 0.05; ***p < 0.01. Heteroskedastic robust standard errors.

Table A2

Additional Effects for Interaction Terms

	Region								
Variety	*Lujan-Maipu*	*Uco Valley*	*South*	*Log of Lag of Price*	*Log of Harvest in Mendoza*	*Log of Wine Stocks*	*Log of Grape Juice Stocks*	*Year*	*Year²*
Aspirant Bouchet	−0.185***	−0.263***	−0.141**	−0.158***	−0.338***	−0.387***	−0.242***	−0.050***	0.002**
	(0.018)	(0.023)	(0.059)	(0.033)	(0.049)	(0.088)	(0.047)	(0.011)	(0.001)
Bonarda	−0.151***	−0.210***	−0.026*	−0.021	−0.001	−0.469***	−0.005	0.052***	−0.004***
	(0.013)	(0.015)	(0.014)	(0.023)	(0.028)	(0.041)	(0.023)	(0.006)	(0.0004)
Cabernet Sauvignon	−0.003	0.011	0.007	−0.015	−0.094***	−0.029	0.031	−0.043***	0.004***
	(0.013)	(0.015)	(0.017)	(0.023)	(0.026)	(0.035)	(0.02)	(0.007)	(0.001)
Cereza	−0.259***	−0.395***	−0.086***	−0.431***	0.938***	−0.282***	0.307***	0.081***	−0.006***
	(0.011)	(0.036)	(0.012)	(0.022)	(0.021)	(0.029)	(0.016)	(0.005)	(0.0004)
Chardonnay	−0.042***	0.031*	0.088***	−0.133***	0.408***	0.03	0.178***	−0.086***	0.006***
	(0.013)	(0.016)	(0.017)	(0.03)	(0.024)	(0.033)	(0.018)	(0.009)	(0.001)
Criolla Grande	−0.258***	−0.340***	−0.074***	−0.441***	0.927***	−0.234***	0.310***	0.078***	−0.006***
	(0.011)	(0.029)	(0.012)	(0.019)	(0.018)	(0.025)	(0.015)	(0.005)	(0.0003)
Merlot	−0.054**	−0.054**	0.050**	−0.036	0.034	−0.184***	0.02	0.001	0.0002
	(0.022)	(0.024)	(0.022)	(0.041)	(0.046)	(0.062)	(0.034)	(0.011)	(0.001)
Moscatel Rosado	−0.250***	−0.283***	−0.098***	−0.412***	0.794***	−0.072**	0.285***	0.089***	−0.007***
	(0.014)	(0.067)	(0.013)	(0.032)	(0.025)	(0.032)	(0.02)	(0.006)	(0.0004)
Pedro Gimenez	−0.236***	−0.251***	−0.066***	−0.440***	0.696***	−0.259***	0.223***	0.056***	−0.004***
	(0.012)	(0.019)	(0.014)	(0.025)	(0.025)	(0.031)	(0.018)	(0.006)	(0.0004)
Syrah	−0.054***	−0.005	−0.013	0.061**	−0.036	−0.355***	0.056**	0.020***	−0.002***
	(0.017)	(0.021)	(0.015)	(0.027)	(0.034)	(0.045)	(0.024)	(0.008)	(0.001)
Tempranillo	−0.198***	−0.124***	−0.004	−0.074**	0.035	−0.435***	−0.028	0.032***	−0.002***
	(0.02)	(0.021)	(0.02)	(0.033)	(0.042)	(0.06)	(0.032)	(0.008)	(0.001)
Torrontes Riojano	−0.195***	−0.157***	0.025	−0.266***	0.451***	−0.132***	0.146***	0.055***	−0.004***
	(0.02)	(0.021)	(0.017)	(0.042)	(0.039)	(0.048)	(0.024)	(0.008)	(0.001)

Notes: *p < 0.1; **p < 0.05; ***p < 0.01. Heteroskedastic robust standard errors.