Tbilisi 2022 Abstract Submission

Title
Projecting the demand for logistical services for South African wine exports

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Conference Presentation

Corresponding Author
Nick Vink

E-Mail Corresponding Author
nv@sun.ac.za

Affiliation
Stellenbosch University

Co-Author/s

Name	Affiliation
Kandas Cloete	Bureau for Food and Agricultural Policy
Tracy Davids	Bureau for Food and Agricultural Policy
Marion Delport	Bureau for Food and Agricultural Policy

E-Mail/s Co-Author/s

E-Mail
kandas@bfap.co.za; tracy@bfap.co.za; marion@bfap.co.za

Keywords
South Africa; wine exports; infrastructure; logistics; demand

Research Question
How do the projected trends in South African wine exports affect the demand for logistical services?

Methods
The BFAP partial equilibrium model is used to model expected trends in wine production and exports, and from this the demand for logistical services is modeled.

Results
The theoretical demand for twenty-foot equivalent containers is calculated and this provides the basis for estimates of the logistical requirements.

Abstract
1. Introduction

Global port congestion and container shortages have affected most, if not all, international trade. South African

wine were affected more than many other domestic agricultural industries, and perhaps more than other global wine traders. This is due to the inefficiencies of domestic container ports in South Africa (World Bank, 2021), stringent measures during Covid-19 lockdown restriction the transportation of alcohol (Vinpro, 2020), the hacking of the port authority's electronic system (Transnet, 2021) and substantial growth in fruit export volumes (BFAP, 2021). Exports is an important marketing channel for the South African wine industry, with, on average, 46% of total wine production over the last decade being exported (SAWIS, 2021). The lowest export share was recorded for 2020, with only 35,4% of produced wine exported in that year. In evaluating the impact of COVID-19 on the South African wine industry, Davids et al (2022) note that wine exports were banned in the early stages of the pandemic, when the first lockdown regulations were promulgated towards the end of the 2020 wine grape harvest. Market demand also decreased, as many countries closed restaurants and bars during strict lockdown periods, effectively ending on-premises sales and consumption of alcoholic beverages for a prolonged period.

One of the most prominent results of this black swan event was a sudden and dramatic increase in wine stock levels in South Africa. In turn, this affects prices, marketing decisions and ultimately also production decisions.

To this end, the purpose of this paper is threefold, first to determine the drivers of variation in packaged and bulk exports by cultivar, and secondly to forecast changes in production volumes by cultivar over a ten-year outlook period. Lastly, this paper aims to illustrate how this information can be incorporated to project the demand for and timing of the demand for logistical services for the export of wine from South Africa.

The paper provides a brief descriptive review of the data, followed by a regression analysis to determine which wine cultivars have historically been responsible for the variance in bulk and packaged export volumes and why. Section 3 describes the simulation model, model, as developed by the Bureau for Food and Agricultural Policy (BFAP) to project export volumes, This is followed by a short analytical description of the details of the production outlook, followed by a discussion on how this information contributes to projecting demand for logistical service for wine exports in section five. Section six will conclude.

2. Cultivars driving variance in total packaged and bulk exports

Monthly export volumes by cultivar for 2017-2021 were considered to determine which cultivars drive variability in the dataset. The complete dataset consists of total monthly volumes for packaged and bulk exports by major cultivar group. Considering the impact of Covid-19 related regulations intermittently restricting the transportation of alcohol in South Africa, 2020 was deemed an outlier and excluded from the dataset. The remaining data was compartmentalised into four subsets: red packaged exports, white packaged exports, red bulk exports, white bulk exports.

The volatility was quantified for each subset, as well as each cultivar in the different subsets. Ordinary least squares regressions were performed on each subset to determine which cultivar drove variability, where cultivars were considered as the independent variables and the total variance in each subset were the dependent variables.

In terms of packaged exports, Cabernet Sauvignon, Merlot and Shiraz were deemed significant ($p < 0,05$) in driving variance in monthly red packaged exports for the period 2017-2021 (excluding 2020). Similarly, Dry White (primarily Colombar) and Sauvignon Blanc for monthly white packaged exports. No significant explanatory power was found for a red cultivar in bulk exports, with only Dry White proving to be significant in driving volatility in the total white bulk exports for the mentioned period.

3. BFAP production projection model

The latest structure of the BFAP wine model projects cultivar area and production by region, which is consequently aggregated to compute an equilibrium wine prices by equating total supply to total demand, as described by Davids et al (2022).

The estimation of area under Pinotage grapes in the Robertson district below represents a practical demonstration and provides evidence of the role that wine grape profitability has played in the region's dynamics.

Y_(Pinotage (PIN)area Robertson(RO))= α+β_1 X_(lagged PIN area RO)+ β_2 X_(Revenue PIN RO/Production Costs)+β_3 X_(Revenue Table Grapes /Production Costs)

Table 1: Statistical values for the function estimating area of Pinotage in the Robertson region

Coefficients	Estimate	St. Error	t-value	p-value
α	62.16	122.65	0.51	0.62
β_1	0.95	0.10	9.76	<0.01 ***
β_2	0.03	0.01	1.91	0.08 *
β_3	-81.77	61.16	-1.34	0.20

*** significance level 0.01
* significance level 0.1

From the results of the estimation it is clear that the real (inflation adjusted) revenue generated from wine grape production has contributed significantly to explaining the variation in Pinotage area harvested in the Robertson region.

4. Output of the BFAP production projection model

The projection of wine area and wine grape production is projected individually for each cultivar in each production region and then aggregated to the total national volume. Total wine volumes are consequently derived from the aggregated wine grape production. This is allocated to different marketing channels, such as domestic sales or exports, based on relative prices and core demand drivers in different markets. Exports are in turn allocated to packaged and bulk volumes based on historic information on the split and the stock levels in any given year.

5. Projecting the logistical services demand for South African wine exports

Considering the historic split between packaged and bulk exports, together with the impact of stock levels on higher bulk exports, and the projected wine volumes derived from the wine grape production volumes, the theoretical demand for twenty-foot equivalent containers (TEU) can be calculated. Container demand is calculated by assuming a TEU can carry 24 000 litres of bulk wine or 9 900 litres of packaged wine. Such a demand forecast informs role-players in the supply chain of the expected volumes, enabling them to plan for and manage logistical bottlenecks optimally.

6. Conclusions

The bottom-up approach presented in this analysis enables projections on the expected demand for TEUs by month for wine exports from South Africa. Whilst certain cultivars were historically more significant than other in driving variation in monthly volumes, the ability to project by cultivar should reduce the variance from projected volumes.

In a time of global port congestion and container shortages, together with the inefficiencies of domestic ports in South Africa, such an output is critical to inform role-players in the value chain (freight forwarders, port authorities, shipping lines, etc.), enabling them to plan and manage volatile volumes and congestions.

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Projecting the demand for logistical services for South African wine exports

Kandas Cloete[1], Tracy Davids[1], Marion Delport[1] and Nick Vink[2*]
[1]Bureau for Food and Agricultural Policy (BFAP)
[2]Emeritus Professor, Stellenbosch University
*Corresponding author

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From the results of the estimation, and Figure 1 below, which compares the estimated area to the actual area historically, it is clear that the real (inflation adjusted) revenue generated from wine grape production has contributed significantly to explaining the variation in Pinotage area harvested in the Robertson region.

[1] A partial equilibrium model of the South African wine industry, detailed in Davids, Vink & Cloete (2022)

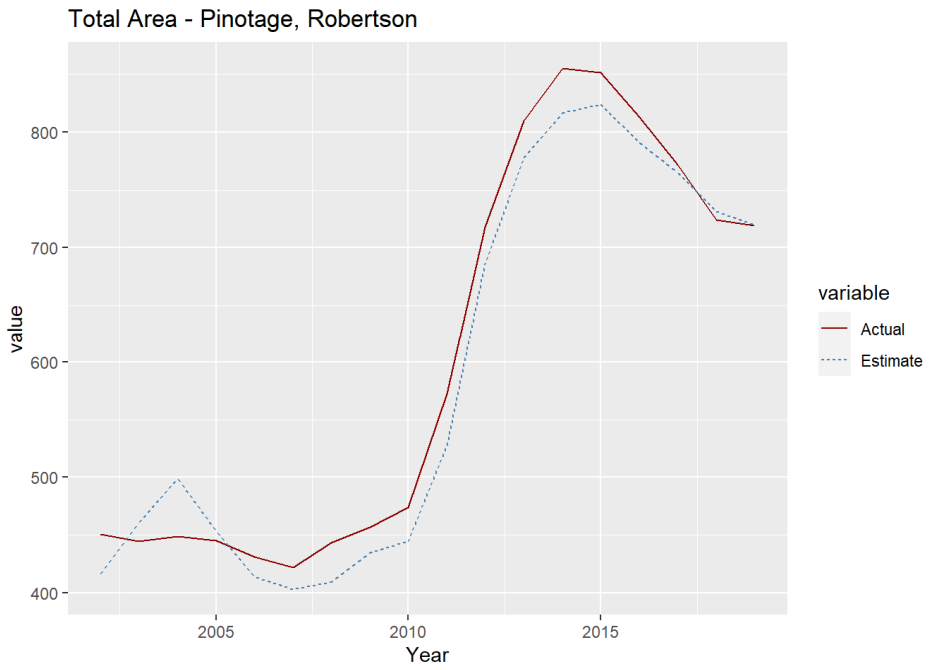

Figure 1: Total area of Pinotage in the Robertson region as an illustration of decline in area

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