Vienna 2019 Abstract Submission

Title
Technical efficiency, water use efficiency and unobserved heterogeneity: Evidence from small and medium size vineyards in Central Chile

I want to submit an abstract for:
Conference Presentation

Corresponding Author
Roberto Jara-Rojas

E-Mail
rjara@utalca.cl

Affiliation
Department of Agricultural Economics, Universidad de Talca

Co-Author/s

Name	E-Mail	Affiliation
Alejandra Engler	mengler@utalca.cl	Department of Agricultural Economics, Universidad de Talca
Boris Bravo-Ureta	boris.bravoureta@uconn.edu	Department of Agricultural and Resource Economics, University of Connecticut, Department of Agricultural Economics, Universidad de Talca
Carlos Bopp	cboppm@gmail.com	Department of Agricultural Economics, Universidad de Talca

Keywords
Stochastic Frontiers, Cross Sectional Data, Technical Efficiency, Unobserved Heterogeneity, Wine Grapes, Chile

Research Question
to determine technical efficiency in vineyards, including water used as an input.

Methods
We used a stochastic production frontier and assess irrigation efficiency and the marginal value of water. We apply panel data models to a cross-sectional dataset that contains multiple plot level.

Results
The results reveal the importance of accounting for unobserved heterogeneity when repeated observations are available in a cross-section of farms. Results show and average technical efficiency of 69.5%.

Abstract
Increasing water scarcity and variability exacerbated by climate change are challenging agricultural production. Agriculture is the major water consuming sector in the world and thus represents an important source of potential water savings. Hydrological sustainability requires a more efficient use of water resources, and improved irrigation technologies have a critical role in dealing with water scarcity and promoting conservation. In Chile, over the last three decades, agriculture has become a major contributor to export earnings and wine has played an essential and rising role. This evolution in Chilean agriculture has been attributed to significant structural reforms, particularly land reform, initiated in the early 1960s, along with macroeconomic policies introduced over the past

several decades. It has been widely argued that free market policies have allowed Chilean entrepreneurs to take advantage of the natural resources available for high quality fruit production. The fast growth in demand for horticultural products and wine in the developed world has also been a major contributor to the Chilean success story. However, wine grape production faces significant challenges including price fluctuations, rising quality requirements and agronomic risks.

Another important challenge for Chilean producers derives from projections that the Central-South region over the next 40 years will experience a decrease in precipitation of up to 40% and a rise in temperatures between 2 ◦C and 4 ◦C. As a point of reference, the average rainfall in the city of Talca, the capital of the Maule region, which is the most important grape and wine producing area in the country, is 700 mm per year. We note that this region has experienced a reduction in annual rainfall of 147.7 mm from 1870 to 2014. In addition, the intensity of droughts has increased in the last 10 years reaching severe levels where some villages have even lacked sufficient drinking water for the population. A recent study completed in Maule covering a variety of irrigated and dryland agro-ecological areas shows decreasing rainfall and increasing variability during the last three decades, a trend that has had adverse effects on farming.

Wine grapes is one of the most important crops in the Chilean agricultural sector generally and in the regions covered in this study in particular. This crop accounts for 128,638 ha or 73% of the national total. Increasing Chilean wine production and exports have pushed this sector to make significant changes in productive strategies including the production of high quality grapes, which are very sensitive to water stress. The study area covers the O'Higgins and Maule regions in Central-South Chile (33◦ 50' and 36◦ 33'S). Both regions belong to the central valley of the country, in the heart of fruit and vineyard production. This area has a temperate Mediterranean climate, with a six-month dry season (September through February) and a rainy winter, with precipitation around 700 mm annually. The data used in this study was generated from a sample of 452 farmers across 16 municipalities in the Maule and O´Higgins regions. The sample was stratified by municipality, and the observations were grouped into three valleys that represent different climatic and soil conditions, namely, Colchagua, Curicó, and Maule. The questionnaire was composed of six different sections. The first focused on farm structure and general demographic information (e.g., age, experience and educational level). The second part contained questions concerning irrigation issues, including knowledge of irrigation scheduling, instruments and information used, and the use of advisers among others. The third section focused on specific variables needed to calculate the profitability of the vineyard. The last two sections aimed at evaluating trust of and individual's respect for farming regulations, plan to adopt different technologies, as well as the extension network.

We used a stochastic production frontier to determine technical efficiency in vineyards, including water used as an input. We also assess irrigation efficiency and the marginal value of water. We apply panel data models to a cross-sectional dataset that contains multiple plot level observations for each farm. Specifically, the data has 1181 plots grown by 452 farmers. The data contains large, medium, and smallholders, with an average area planted equal to 37 hectares, ranging from 0.5 to 810 hectares. The adoption rate of improved irrigation technologies is 43% while the remaining 57% of the sample uses gravity methods. An important feature of the paper is the application of various methods in order to calculate the volume of water applied in gravity irrigated plots.

The results reveal the importance of accounting for unobserved heterogeneity when repeated observations are available in a cross-section of farms. Results show and average technical efficiency of 69.5% whereas while the shadow price per cubic meter of water is US $0.032 for drip irrigation and US $ 0.012 for gravity irrigation. In addition, the findings indicate that there is no discernable difference in technical efficiency across the different types of irrigation systems. Finally, technical inefficiency is explained by winegrowers' human and social capital, where education and bridging networks tend to reduce inefficiency.

Privacy

- Technical efficiency, water use efficiency and unobserved heterogeneity: Evidence from small and medium size vineyards in Central Chile
- By using this form you agree with the storage and handling of your data by this website.