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Keywords
Wine economics; Difference-in-Differences; Retail sector; Climatic shock

Research Question
How could we measure the impact of a hail weather shock in a specific Swiss wine region on the outcomes of the retail market?

Methods
Difference-in-Differences model, Panel data analysis, Fixed effect (FE) regression

Results
Depending on the econometric specification, statistical significant and negative effects of the volume of wine consumed, vary between -24.5% and -15.9%. These effects can be interpreted as Average Treatment Effect.

Abstract
This paper examines the treatment effect of a hail weather shock in a specific Swiss wine region using a Difference-in-Differences approach. We exploit a natural experiment from the Swiss wine region “Three Lakes” in 2013 on the outcomes of the Swiss retail market. Depending on the econometric specification, we find statistical significant effects of the volume of wine consumed, which vary between -24.5% and -15.9%. These effects can be interpreted as Average Treatment Effect, which is the difference in outcomes between treated and control groups in a before-post shock set-up. Several robustness checks are provided confirming the statistical significance of the estimated effects as well as the initial assumptions.

The goal of this project is to study the effect of hail damages to the grape harvest on the wine sales in the retail sector in Switzerland. We exploit a natural experiment from the year 2013 in a specific Swiss wine region. In fact, the 20th of June 2013 a violent hail storm hit very hard the region of Neuchâtel, causing significant damage and very important losses for the entire vineyard sector (République et Canton de Neuchâtel, 2013). The wine and crops have suffered losses of up to 100% in certain places. This storm had also some consequences on the Geneva region and the Jura side of region Vaud. This weather supply shock should be totally exogenous as this kind of hail storm appears suddenly and is very difficult to forecast in advance. Measures in order to limit the damage in the wine growing sector are also not really feasible.

According to the Federal Office for Agriculture (FOAG), the situation on the Swiss harvest grape in 2013 varies considerably from one region to another. For example, the wine region Ticino experienced an abundant grape harvest, in contrast to the hardest hit region by the hail storm, Canton Neuchâtel, whose wine production fell by 54% in 2013 compared to 2012 (FOAG, 2014). The Canton Neuchâtel is part of the “Three Lakes” wine region along with Lake Bienne and the region Vully (around the Morat Lake and shared between the Canton Fribourg and Vaud), whose wine harvests fell by respectively 34.2% and 17.5% in the same period mentioned above.

In order to estimate this effect, we set a difference-in-differences (DID) approach, following Ashenfelter (1978), with a specific treated group (“Neuchâtel-Three Lakes”) and a before-post period. The choice of the cut-off date, which defines the limit between the before and post period is settled in April 2014, because this is the date when

officially the firsts wines vintages of 2013 arrive in the Swiss supermarkets. In the wine data we do not have the vintage date information, so we have therefore to assume that the harvest in year “t” enters in the retail market as wine in April of the year “t + 1”. We fix subsequently the date of March 2015 as the last period used in our analysis, because the vintage 2014 should be not touched any more by the 2013 hail storm effect. It will be therefore important to analyse an eventual anticipation effect (in the period just after the weather shock information and before April 2014) of the retail market in term of supply assortment and pricing.

For this paper, we gained access to a unique data set from the Nielsen (2016) Company which the Swiss Wine Market Observatory (OSMV) made available to us as a part of the collaboration with the Swiss Federal Institute of Technology in Zurich (ETHZ). The panel scanner data set used in this paper allows us to identify the purchase of the consumers and interpret it as an equilibrium between the demand and the supply of wine. In this data set, we have all the types of wines sold (quantity) and prices per litre in the major supermarkets brand in Switzerland (which include Coop, Denner, Manor, Globus and Volg, with the exception of Landi, Lidl and Aldi (OSMV, 2015)) as scanned at the cashier.

The main motivation of this paper is to contribute to the understanding of the wine consumer’s behaviour to a weather shock, through the Swiss retail market reaction, exploiting a unique and completely exogenous hail storm in a specific wine region at a specific time. This study can make an important contribution to forecast future weather shocks, in support to the OSMV, helping cantonal and federal agricultural departments, professional associations of Swiss wine as well as wine producers in taking appropriate economic policy decisions.

The impact of the hail weather shock on the retail sector can be decomposed into a direct and a compensation effect. The direct effect corresponds to the sales loss due to the sharp reduction in the supply of wine from the Three Lakes region. The retail sector could compensate this loss mainly in two ways: by drawing from the wine stocks of the Three Lakes region or by selling more wines from other control regions. We find that the direct effect is larger than the compensation one. Hence, depending on the econometric specifications, the net effect is negative, statistically significant at the 1-5%-levels and vary between -24.5% and -15.9%. Taking into account the more convincing econometric specification, the weather hail shock has a significant effect in lowering by -15.9% the treated wines compared to the control wines, in the “post” period.

The Hausman Test, which rejects the hypothesis H0 that the difference in coefficients between the fixed effect (FE) and the random effect (RE) models are not systematic, support the inclusion of individual FE (through the within transformation of the data) as well as time FE in our different specifications (Hausman, 1978). Controlling for anticipation effect, we still find similar and statistically significant effect by moving backward the cut-off point in January 2014. This would suggest that the Swiss supermarkets started to remove Three Lakes wines (prior to vintage 2013) from their shelves before the introduction of the affected vintage 2013 or that consumers already included the information of the weather shock in their demand functions.

We observe a strong visual evidence of the parallel trend assumption before the weather shock between the treated group and the control group which allows us to use the DID framework. This identification strategy was the more appropriate in our specific situation, taking into account the longitudinal structure of our data. Several robustness checks, as placebo pre-post treatments, creating fake treated region, dropping out some control regions or wine colours, have confirmed the validity and stability of the results. These results are therefore important as they can give a contribution to forecast future weather shocks. In particular, this study can help the OSMV, cantonal and federal agricultural departments, professional associations as well as Swiss wine producers in taking appropriate economic policy decisions when a supply shock occurs in this specific market.

Concerning the internal validity of the DID framework, we are quite confident that this exogenous weather shock, after controlling for several confounding covariates, is quite close to the true causal effect. Regarding the external validity, the DID model could be applied and used if a similar weather shock occurred in a specific wine region. This would also be the case for other agricultural commodities if we take different econometric specifications depending on the distribution policies of the market.