Extended Abstract
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Paper/Poster Title	**Weather conditions and the effects of CAP subsidies on the technical efficiency of French dairy farms**

Abstract prepared for presentation at the 98th Annual Conference of The Agricultural Economics Society will be held at The University of Edinburgh, UK, 18th - 20th March 2024.

Abstract	***200 words max***

Several studies have concluded that CAP subsidies have a negative impact on the technical efficiency of farms. However, in the context of climate change, none of these studies considered weather variations. Therefore, our work aims to study the effect of these subsidies on French dairy 'farms' technical efficiency between 2002 and 2017 when weather conditions are taken into account. To do this, we used different models of stochastic frontier analysis in which the weather conditions are modeled differently. Our results show that, as in the literature, CAP subsidies negatively impact our sample of farms, but this effect is significantly reduced when weather conditions are considered.

Keywords	Dairy farms, technical efficiency, Common Agricultural Policy, Weather conditions, Subsidies, Stochastic frontier
JEL Code	C46, D24, Q10 see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	***100 – 250 words***

The Common Agricultural Policy (CAP) is an essential toolthe European Union uses to support agricultural production. The CAP is the EU's largest contribution, accounting for around 30% of the total budget, and on average, representing 84% of French farmers' income. But over the last few decades, the CAP has been criticized for leading to overproduction, contributing to environmental deterioration, and generating economic inefficiencies. In theory, decoupled subsidies can modify producers' behavior by reducing their effort or changing their risk management, leading to poor management decisions and reduced technical efficiency (producer's ability to produce a maximum output level with a given level of inputs). Stochastic

production frontier analysis (SFA) is used to evaluate this technical efficiency. However, to the best of our knowledge, no study on the link between subsidies and technical efficiency takes into account the weather risks associated with recent climatic variations. Yet weather's direct and indirect effects on agricultural production are important for assessing technical efficiency. Agricultural production is the most climate-dependent human activity, and recent climatic changes are the most significant risk factors facing by farmers. Our contribution in this article is to determine whether the negative impact of agricultural subsidies on technical-economic performance, widely revealed in the literature, is verified when weather variations are taken into account.

Methodology ***100 – 250 words***

We use the SFA method developed by Aigner et al., (1977), which estimates technical efficiency using a production frontier with a double error term, one representing the technical inefficiency (u) and the other the random noise (v).

$$y = f(\mathbf{x}; \boldsymbol{\beta}) + v - u(s)$$

To carry out this work, we used the French FADN data to obtain structural and accounting data on a representative panel of 3,197 dairy farms observed between 2002 and 2017. This base provide us inputs (x) (land, work, intrants, livestock and capital), ouput (y) (dairy) and inneffiency determinants (s) (subsidies). As this work aims to integrate meteorological variables into the production frontier, we use meteorological data provided by Météo France. This includes data such as rainfall, sunshine, temperature, and relative humidity, all at a daily frequency across the 96 départements of mainland France. These data are used to construct growing degree days (DD) for pastures, and temperature humidity index (THI) for dairy cows.

Results ***100 – 250 words***

The average inefficiency scores obtained in each model are similar, at around 86%. This means that, on average, producers can increase their overall production by around 16% while maintaining the same level of inputs. As for the determinants of this inefficiency, we find a significantly negative effect of subsidies on technical efficiency, as in most of the literature. Models that take weather conditions into account also confirm the previous results. The negative impact of subsidies per

hectare also remains significant, but the level is halved in these models that take weather data into account, compared with models without weather conditions. As for the weather conditions themselves, they significantly impact production, mainly in the hot season. During this period, DD and rainfall have a slightly negative effect on production, while THI has a positive effect.

Discussion and Conclusion	***100 – 250 words***

This work represents a first step towards understanding the role played by climate in the link between subsidies and technical efficiency. We propose here some avenues for future research to improve the methodology. First,decomposing intermediate consumption. In concrete terms, all our estimates confirm the strong impact of intermediate consumption on milk production, but it is impossible for us to know to what extent this impact is linked to the use of concentrates, fertilizers, pesticides, or antibiotics. Yet, these inputs are essential adjustment variables for farmers in the face of weather variations. Second, the reallocation of inputs in response to a subsidy differs depending on whether the input increases production risk (like fertilizers) or decreases it (like crop protection products). Our SFA model did not account for the production risk.