

## Extended Abstract

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<b>Paper/Poster Title</b>	<b>Regional technical efficiency rankings and their determinants in the Irish dairy industry: a stochastic metafrontier analysis</b>
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<b>Abstract</b>	<b>200 words max</b>
<p>The paper aims to evaluate regional farm efficiency rankings for Ireland which seeks to be a leader in the global dairy industry. It conducts a within-country analysis based on technical and scale efficiency of dairy farms to explore how regional constraints imposed during the milk quota era may have affected Ireland's regional efficiency levels. The stochastic meta-frontier approach is adopted because of its usefulness in comparing regional technical efficiencies. The findings suggest that policies aiming to promote labor and soil quality improvement in the East region, and that relate to discussion groups in the South region, in addition to management of herd size, would be useful for improving efficiency post-quota. Moreover, some farms expanded beyond their optimal scale leading to a reduction in efficiency levels and this points to the need to tailor farm advice and promote caution and prudence in farm expansion decisions, especially in a region like South West.</p>	
<b>Keywords</b>	Farm efficiency rankings; Technical efficiency; Scale efficiency; Stochastic metafrontier;
<b>JEL Code</b>	e.g. Energy: Demand and Supply Q41 see: <a href="http://www.aeaweb.org/jel/quide/jel.php?class=Q">www.aeaweb.org/jel/quide/jel.php?class=Q</a> )
<b>Introduction</b>	<b>100 – 250 words</b>
<p>The Irish dairy industry seeks to be a strong competitor in the global market with sustainable and efficient farming practices in line with the Common Agricultural Policy. Farms in poor-performing regions may struggle to be viable in the long run which can threaten the value chain and stakeholders in those regions (Shrestha and Hennessy, 2008). Even though Ireland is a small country, regional disparities may still apply. Therefore, comparing regional performance may provide insights for the regions that need more support, labour and capital investment to ensure sustainable growth and enhanced efficiency levels, thus improving the average farming profits and the living standards of farmers. Ireland makes an interesting case study within the EU and some questions remain in the Irish dairy industry which other countries can learn from, especially those with regional technology differences. For example, did production expansion result in efficiency improvements and/or unit costs saving through economies of scale? Which region(s) performed the best and what were the factors that influenced the adjustments? Did the government programs and policies, i.e. discussion groups and quota abolition, have an impact on efficiency? These questions have not yet been addressed in the literature using long-term data that includes both the pre and post-quota periods and using a meta-frontier approach to compare regions</p>	

in the Irish dairy sector. This is a unique feature of this study, especially within the EU context.

**Methodology**

*100 – 250 words*

The unbalanced panel data was collected from the Irish Teagasc, National Farm Survey (NFS) for the years 2010–2018, i.e. pre (2010-14) and post (2015-18) quota. The study focuses on farms classified as specialist dairy farms with dairy products as the main output. There were, on average, 280 observations per annum which represents, on average, a weighted national population of 14,919 farms per annum, with 207 farms in 2010 and 298 farms in 2018. This study uses the stochastic meta-frontier (SMF) production function which envelops the stochastic production functions for different groups employing different technologies (Battese et al., 2004). The translog and Cobb-Douglas functions are adapted. In the dairy industry, recent studies have used the SMF model to study the differences in technical efficiency and technological gaps between regions, and to compare regional performance, e.g. in New Zealand (Jiang and Sharp, 2015) and Norway (Alem et al., 2019). So far, the SMF model has not been applied to any EU country, including Ireland, and this study seeks to close that gap. MTE can be defined as the firm’s technical efficiency concerning the meta-frontier production technology or the total distance of each farm to the meta-frontier. The distance of the region’s production frontier to the meta-frontier is defined as the meta-technology ratio, MTR. It shows the difference (or gap) in the technology available to a given region relative to the technology available to the industry or country.

**Results**

*100 – 250 words*

It was noted that the inefficiencies that existed in East and South regions were managerial-related rather than technological, in a context of a restrictive policy. An interesting difference between East and South regions from a managerial perspective was that labor was statistically significant only in the East region post-quota which potentially relates to the growth in scale efficiency. The East region had the highest performing farm technology in the country based on MTR but the South region had the best performing farms in the country based on the overall MTE measure, along with the South West region. In other words, farms in the East region were less efficient compared to farms in the South region.

The South West region was the only region that had a decline in both technical and scale efficiency post-quota, farms were more efficient pre-quota than post-quota. The findings indicated that inefficiencies in the South West and Rest regions were technological (i.e.  $TE > MTR$ ) rather than managerial, suggesting that investments in research and technology for the adoption of new production practices would be useful in the South West and Rest regions. It was also observed that land or farm size and technology adoption were not statistically significant post-quota in the South West region which potentially explains the decline in efficiency.

**Discussion and Conclusion**

*100 – 250 words*

Policies aiming to promote labor efficiency and investment in soil quality improvement would be important for farms in the East region, and policies that relate to discussion groups in the South region, in addition to other inputs like management of herd size, could improve the overall efficiency rankings for the regions and ensure the sustainable expansion of farms post-quota. Policies that can support the ability of farms to invest and procure new resources to expand their size and minimize their unit costs



associated with their growth are essential. The results from the South West region suggest that the national policy approach to support dairy expansion was not a “good fit” for all farms and all regions which can be expected given the technology differences. The evidence presented here suggests that some farms expanded beyond their optimal scale leading to a reduction in efficiency levels and this points to the need to tailor farm advice and promote caution and prudence in farm expansion decisions, especially in a region like South West.

The findings are important for informing future regional policy, farm advice and promotion, and industry development. It is important that farm advisors understand the needs of the regions post-quota and provide specialised services to the different regions. Understanding what has driven past performance is critical for policy makers and industry leaders to avoid setting challenging or under ambitious targets, especially in the context of new sustainable intensification targets that have been set for the Irish dairy industry.