

Extended abstract for Contributed Paper session

Paper Title	The Role of Innovation in Farm Economic Performance: Generalised Propensity Score Evidence from Irish Dairy Farms
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Abstract	<i>200 words max</i>
<p>Recent developments in EU dairy sector policy underline the importance of competitiveness and productivity of farms. In this context, continuous innovation is seen as an important factor in sustaining an economically viable enterprise. This article explores the impact of innovation on economic performance of dairy farms by applying a generalised propensity score method to Irish FADN data. Empirical results indicate that economic performance increases with higher levels of innovation, where higher innovation is associated with larger economic gains. The article concludes by discussing the implication that a certain level of innovation is required to realise economic gains.</p>	
Keywords	Innovation, Economic Performance, Generalised Propensity Score
JEL Code	Q12; Q16
Introduction	<i>100 – 250 words</i>
<p>Given recent policy changes in the dairy sector, enhancing competitiveness and productivity are important for successful dairy farming. Specifically, in April 2015, the EU eliminated milk quotas after three decades during which milk production was subject to quantity constraints. Milk output constraints were initially motivated by reducing market uncertainty and milk price fluctuations in order to ensure a constant income for farmers. Moving from highly protected and regulated markets towards more open markets will exacerbate existing differences in dairy sector performance across countries, but also among individual farms. In order to ensure competitiveness of the dairy sector, innovation is considered to play a crucial role. For example, taking a farm-level perspective, farmers need to continuously innovate in order to increase efficiency. But, how do different levels of innovation affect economic performance?</p> <p>To date, there is very little evidence about how innovation affects economic performance at the individual farm level, as the vast majority of existing studies focuses on the macro level.</p>	

The aim of this article is to contribute to the empirical evidence on the impact of innovation on economic performance at the micro level. By utilizing data from Irish dairy farms, we assess whether innovation efforts by farmers translate into better economic performance.

Methodology

100 – 250 words

We assess the impact of innovation on (i) *productivity of land*, which is measured as gross output per hectare and is seen as a measure of efficiency; (ii) *profitability* which is market based gross margin per hectare and (iii) *market orientation* which is the output derived from the market in percentage terms. Innovation is measured as a composite index that consists of three components of innovation relating to *innovation adoption*, *acquisition of knowledge* and *continuous innovation*, resulting in a continuous measure between 0 and 1.

Innovation efforts depend on the farmer's ability and motivation. Therefore it is likely that more innovative farmers are different from their less innovative counterparts. Individual ability and motivation of a farmer also lead to different farm performance, regardless of innovation efforts. This suggests that isolating the impact of innovation is complicated, as farmers choose (i.e. self-select) to innovate.

In the absence of a suitable instrument and given that our innovation measure is a continuous score, using a binary estimation technique would be inefficient. Hence, in order to overcome self-selection and endogeneity issues, we use a generalized propensity score (GPS) method. The GPS is an extension of the binary treatment propensity score method. However, in contrast to the binary propensity score, the GPS method allows estimation of average and marginal outcomes that correspond to different innovation levels. That is, the GPS does not only give us the average innovation effect on economic performance, it allows us to estimate economic effects for different innovation levels.

Results

100 – 250 words

Our findings indicate that economic performance increases with higher innovation, but not in a linear way. For example, we observe that profitability increases from no innovation (0) to low innovation levels of 0.2. Profitability then decreases slightly for innovation levels between 0.2 and 0.5, while profitability then increases rapidly for higher innovation levels, before slightly levelling off at high innovation efforts of approximately 0.9. Our second indicator, productivity of land, shows a very similar pattern to profitability. However, only higher innovation efforts bring significant effects for productivity increases, for example raising innovation effort from 0.7 to 0.8 increases productivity by €217 per hectare. Our last indicator, market orientation, provides insight into dependence on subsidies. The model reveals that low levels of innovation (between 0 and 0.4) result in quite similar market orientation scores. However, once innovation scores move above 0.4, market orientation improves

rapidly as a result of innovation effort, but levelling off once high levels are achieved.

As a final step of our analysis, we explore how much farmers with different levels of innovativeness would gain from enhancing their innovativeness. The results from our simulation exercise show that improving relatively high levels of innovativeness even further (i.e. from 0.7 to 0.9) brings significant economic gains.

Discussion and Conclusion

100 – 250 words

In this study we analysed the effect of farm-level innovativeness on economic performance using a generalised propensity score method. Our results provide strong evidence that innovation enhances economic performance, but not in a linear way. Specifically, we find that mostly higher levels of innovativeness have a significant effect on economic performance. In other words, farmers who are not very innovative must enhance their innovative efforts considerably, in order to see economic rewards.

The findings provide evidence of the importance of innovation in economic performance and suggest that supporting farm-level innovation is crucial for the success of dairy farms in an increasingly competitive environment. Advisory services should ensure that farmers achieve sufficient levels of innovation in order to achieve economic benefits from innovation.