A micro level analysis of the Irish agri-food sector: lessons and recommendations from Denmark and the Netherlands

DAFM Project Ref No: RSF 07 505
Start date: 01/12/11
End date: 31/05/12 (Extension – original end date 30/11/10)

Principle Coordinator: Prof Carol Newman, Trinity College Dublin
Email: cnewman@tcd.ie

Other Principle Collaborating Researchers: Dr Fiona Thorne, Teagasc.

Please tick below the appropriate area on the research continuum where you feel this project fits

BASIC/FUNDMENTAL  

APPLIED/PRE COMMERCIAL  

X

Key words: (max 4)

CAP Reform, Structural Change, EU Agricultural Sector
1. **Rationale for Undertaking the Research**

Recent reform of the Common Agricultural Policy has led to the decoupling of direct payments to farmers from production. This policy change is expected to make production decisions more market-oriented and farmers more productive. However, little empirical evidence exists as to whether ex-post these policy changes have had the expected impact on farmers. This research fills this gap in knowledge by providing evidence on the impact of EU policy changes on various aspects relating to the agricultural sectors in Ireland and other EU countries. Evidence on the production response of farmers to CAP reform is needed to inform policymakers on the future of the agricultural sector in Ireland in terms of its nature, structure, and performance.

Using farm-level survey data this research takes a micro approach that allows a number of research questions to be addressed. Specifically, the project explores the impact of CAP reform on: 1) productivity and competitiveness; 2) the changing structure of production systems in terms of farm numbers, the role of economies of scale, specialisation and system switching; 3) the wider rural community; and 4) alternative uses for land focusing in particular on organic farming and the use of land for alternative energy sources. The availability of comparable micro-data across a number of European countries presents a unique opportunity for rigorous econometric analysis to be conducted that allows many of the standard identification problems in establishing a causal relationship between policy changes and outcomes to be overcome. Moreover, using these data and approaches allows the Irish experience to be compared to that of similar countries in Europe facing the same set of constraints but with significantly different sectors in terms of structure, organisation and the role of government supports.

The results of this project provide valuable lessons for policy by deepening our understanding of the important issues facing the agricultural sector in Ireland at the micro level and observing how the Irish experience compares to that of our competitors.

2. **Research Approach**

This research exploits extensive farm level micro-datasets for Ireland and other EU countries to address the core research questions of interest. We use a combination of descriptive and econometric approaches. The project has resulted in four core scientific papers which employ new and novel techniques to develop convincing strategies for identifying causal relationships between policy changes and the outcomes of interest.

In the first scientific paper ‘Analysing the effect of Decoupling on Agricultural Production: Evidence from Irish Dairy Farms using Olley and Pakes Approach’ we estimate agricultural sector production functions using a modified Olley and Pakes (OP) methodology. We compare productivity trends estimated using more traditional approaches such as Stochastic Frontier Analysis (SFA) with those obtained from our modified OP techniques, and discuss possible reasons for differences in these trends. We introduce SFA efficiency estimates as a proxy for the probability of survival in the OP estimation procedure and evaluate the influence of possible selection bias. Finally, we investigate the effect of decoupling on Irish dairy farmers’ productivity using the modified OP productivity estimation results. One of the goals of this paper is to disentangle the effect of the various exogenous and endogenous changes that have occurred simultaneous to the introduction of the Single Farm Payment. In doing so we control for other policy changes that have occurred alongside decoupling (relating to intervention prices and milk quotas) and explore the effect that uncertainties associated with increased price volatility may have had on farmers’ decisions. We also pay particular attention to farmer’s decisions in relation to capital investments in the post-decoupling period.

In the second scientific paper entitled ‘The impact of decoupled subsidies on productivity in agriculture: a cross-country analysis using micro-data’ we use Irish, Danish and Dutch farm level data to investigate whether the decoupling policy has contributed to productivity growth in agriculture through the
mechanism of farm product switching and specialization. We estimate agricultural production functions for each country that control for the endogeneity of input choices and aggregate demand shocks that may affect different sectors across countries in different ways. We use these production functions to examine the impact of decoupling on productivity. We also examine the impact of decoupling on changes in the output mix of farms and sector switching in an attempt to uncover the mechanism through which the policy change induces changes in farmer behaviour.

In the third scientific paper entitled ‘Disinvestment, farm size and gradual farm exit: the impact of subsidy decoupling in a European context’ we use an extensive farm level panel dataset for the EU15 countries for the period 2001-2007 and exploit the variation in the timing of the implementation of the decoupling policy to identify its effect on farm production decisions. Using quasi-experimental methods allows us to control for the factors that may confound the impact of the shift to decoupled support payments that are not typically observed in the data. Our measure of farm contraction takes into account disinvestment by farmers, reductions in land use and profitability, which we link to the probability of farmers exiting production. We extend the model to take account of the fact that the extent to which farms depend on farm direct payments may also have an impact on how they are affected by the policy change. In addition, we include a new innovative control for unobserved farm heterogeneity which allows us to control for productivity changes in identifying the policy effect.

In the fourth scientific paper entitled ‘The effect of mandatory agro-environmental policy on farm fertilizer and pesticide expenditure’ the effect of the cross-compliance policy on farm environmental performance is identified using a differences-in-differences method, where we investigate the differential response of farms subject to mandatory cross-compliance from 2005 relative to the environmental performance of farms that were subject to cross-compliance measures earlier than 2005. Our main hypothesis is that newly introduced compulsory cross-compliance measures should improve environmental performance in the form of fertiliser and pesticide reduction. To sharpen the identification, we take into account farmers’ dependency on overall subsidies and also participation in other agro-environmental schemes. We account for observed and unobserved farm-level heterogeneity by controlling for farm productivity changes and other farm and/or time specific characteristics.

3. Research Achievements

This research consisted of five distinct tasks and in what follows we summarize the research results from each task.


The aim of this task was to provide an overview of the literature to date concerned with measuring the efficiency and productivity performance of the Irish agricultural sector, focusing specifically on studies that have attempted to compare this performance to our nearest competitors. Of particular interest is the performance relative to Denmark and the Netherlands, two countries that are very similar to Ireland in terms of size, climate and role of agriculture, but are very different in terms of recent productivity performance. It is apparent from this review that while there are a wide range of studies concerned with these issues, there are few that focus in a comprehensive way of determining the differential effects of changing policies at EU level on agricultural enterprises across countries. Analysing the impact of the introduction of the Single Farm Payment (SFP) on productivity, given its aim of reducing production distortions that create non-market based incentives for farmers, is particularly important. The main result of this task was to identify significant gaps in the literature to help inform and structure the other core tasks of this project.

Task 2: ‘An investigation of the impact of policy reform on the structure of the agri-food sector in Ireland, Denmark and the Netherlands’
The aim of this task was to conduct a detailed micro-focused investigation of the implications of recent agricultural policy changes and growth in the wider economy on the structure of production systems in Ireland, Denmark and the Netherlands in terms of farm numbers, system switching, specialisation, the role of economies of scale, and on-farm investments. The Descriptive Report produced for this task found that the recent CAP reform has had little effect on structural change on Irish, Danish and Dutch specialist dairy and cereal farms. Long run trends related to the changing structure of these systems have continued following decoupling with little evidence of a change in the nature or pace of these changes.

The academic paper entitled ‘The impact of decoupled subsidies on productivity in agriculture: a cross-country analysis’ produces evidence to support the fact that the decoupling policy has had positive and significant effects on productivity, particularly in Ireland. In an attempt to uncover the source of productivity improvements we consider both product switching and changing patterns of specialization. We do not find that product switching behaviour is significantly related with decoupling. We do find evidence, however, that increased specialization in more productive farming activities is affected by decoupling. A possible explanation for the inertia of farmers in product switching behaviour is that farmers may have started their behavioural adjustment to the introduction of the decoupling policy in less significant and less expensive ways, such as, simply increasing their production in more profitable and productive products, before implementing more drastic measures such as changing production system or the farm’s product mix.

Task 3: The changing structure of the agri-food sector in Ireland, Denmark and the Netherlands: Implications for employment, demographics and Ireland’s rural community

The first research output from this task is a detailed, micro-focused investigation of the implications of issues such as recent agricultural policy changes and growth in the wider economy on the structure of production systems in Ireland, Denmark and the Netherlands in terms of farm numbers, system switching, specialisation, the role of economies of scale and on-farm investment. The ability of each member state to choose the degree to which agricultural payments can be decoupled from production allows for comparisons of agricultural structural change under alternative decoupling strategies. The Netherlands and Denmark are ideal case studies for this purpose given their similarities to Ireland in terms of their size, climate, recent economic performance, the relative importance of agriculture to their overall economy and their participation in the Farm Accountancy Data Network. The results indicate that a ‘safety first’ approach is being taken by farmers, with structural change continuing along historical levels.

As a consequence of the recent Common Agricultural Policy (CAP) reforms the agricultural sector throughout the EU is undergoing a process of major structural change. The removal of direct payments and price support policies are expected to change farmers’ behaviour and force them to reconsider their participation in agricultural production. For this task we produce a scientific paper entitled ‘Disinvestment, farm size and gradual farm exit: the impact of subsidy decoupling in a European context’ which is an ex-post cross-country farm level empirical analysis of farmers’ market exit behaviour post CAP reform. Using a panel dataset for the EU15 countries for the period 2001-2005, we apply quasi-experimental empirical methods (difference-in-differences) to identify the causal relationship between the decoupling policy and farm market exit. Our analysis shows strong evidence that the probability of farm exit decreased due to the policy change but that the reform facilitated exit for those farms who had already made the decision to leave the sector. Our findings may be of particular interest to policymakers concerned with addressing rural development issues arising from the decoupling of direct payments from production at the local level.

Task 4: An investigation into alternative land usage for Ireland: Lessons from Europe

For this task we perform an econometric analysis of the impact of policy changes on environmental outcomes in Europe in a paper entitled ‘The effect of mandatory agro-environmental policy on farm fertilizer and pesticide expenditure’. This analysis investigates the impact of mandatory cross-
compliance measures under the 2005 reform of the Common Agricultural Policy on farmers’ behaviour towards the environment. Using quasi-experimental methods (difference-in-difference) a causal relationship between mandatory cross-compliance and farm environmental performance is established. The results suggest that cross-compliance has a positive effect on EU farmers’ environmental outcomes in terms of fertiliser and pesticide reduction. This result also holds for farmers who participate in other voluntary agro-environmental schemes. The results, however, do not support the expectation that farmers who rely on larger shares of public payments have a stronger motivation to improve their environmental performance.

In addition three separate working papers were prepared: (i) examining the evolution of biofuels and organics in Ireland; (ii) exploring econometrically the effect of policy on the adoption of energy crops across the EU; and (ii) providing an overview of the European organics sector.

The first paper brings together the literature on organics and biofuels in Ireland. It highlights the small scale of both the organics and biofuels sectors in Ireland relative to the increasingly ambitious Irish and EU targets for the development of both sectors. It highlights the opportunities available for Irish farmers to engage in organic and biofuels production. These include high levels of profitability relative to other types of farming, Irish government supports for in the form of grants and EU support payments. In particular, it calls for more research into the effect that shifts in policy measures towards alternative land uses, such as organics and biofuels, will have on the agricultural sector more generally.

The second paper examines the descriptive statistics regarding the development of energy crops within the EU and also examines econometrically the effect of the policy on the adoption of energy crops. The descriptive statistics show that the production of energy crops has developed strongly in the period since the introduction of the energy crops premium in terms of both the land planted under energy crop contracts and the value of the crops planted. This rise coincided with a positive trend in the production of oilseed rape. To examine the effect of policy on the increase in oilseed rape area an econometric model was specified. We find that for farms that adopted oilseed rape the effect of policy is positive, large, and statistically significant for both the area of oilseed rape sown, and the proportion of total area dedicated to oilseed rape.

The third paper provides an overview of the European organics sector which reveals that the sector has expanded at a considerable rate over the past two decades. This growth has been lead by a strong and persistent demand for organic food products throughout Europe. However, the sector has developed unevenly as measured across space, and also as measured across the variety of food products which could be produced organically. The analysis of policy effects on adoption rates indicates that differences in policy have certainly contributed to the rise or fall of organics in the various Member States. A lack of proper support and subsequent removal in some member states such as Italy was likely responsible for the end of the growth of organics in that country. Meanwhile, strong policy support in Austria has continued to promote a very healthy sector there.

4. **Impact of the Research**

This research provides new evidence on the impact of CAP reform on various aspects of the agricultural sector in Ireland and across the EU. Our results are of particular interest to the agricultural sector, policymakers and the scientific community.

Understanding the competitive environment in which farmers will find themselves in the future is of vital importance to the sector and to policy makers concerned with supporting the rural communities and development initiatives. Reform of the CAP was expected to lead to a quickening of the pace of structural change in agriculture resulting in aggregate productivity improvements in the sector. We find evidence that the decoupling of direct payments has led to an increase in farm productivity, particularly in Ireland but aggregate productivity improvements do not appear to be as a result of structural change. We find that while a gradual decrease in farm numbers has been observed over the last decade, there is
no evidence that CAP reform has impacted on this trend. Moreover, we find strong evidence to support the fact that the decoupling of payments from production has reduced the probability of farm exit while facilitating exit by farmers that had already decided to do so. If reallocations from small to large farms is the mechanism through which productivity gains in the sector are to be realised then it is possible that the process of structural change will be much slower than originally anticipated. In contrast to expectations, our results suggest that the single farm payments appear to continue to artificially support production in the sector.

We also find evidence of behavioural responses to other policy changes within Europe. We find that cross-compliance has a positive effect on EU farmers’ environmental outcomes in terms of fertiliser and pesticide reduction. This result also holds for farmers who participate in other voluntary agro-environmental schemes. The results, however, do not support the expectation that farmers who rely on larger shares of public payments have a stronger motivation to improve their environmental performance. We also find that the introduction of the Energy Crops Scheme had a positive, large, and statistically significant effect on the production of oilseed rape. While for organics we find some evidence that the growth and expansion of the sector is linked with local policy measures. Evidence of such behavioural responses by farmers to policy changes will help inform policy makers in future devising policy measures aimed at incentivizing farmer’s behaviour.

Finally, this project uses extensive farm-level panel data and a combination of descriptive and innovative econometric approaches. This has added significant value to the scientific community from both a methodological point of view but also by providing a deeper understanding of the mechanisms through which policy measures can induce production changes.

5. **Exploitation of the Research**

The objective of this research project was to provide new evidence on the impact of CAP reform on various aspects of the agricultural sector in Ireland and across the EU. Our results are of particular interest to the agricultural sector, policymakers and the scientific community. The results of this research have been published in scientific journals and were presented at academic conferences and specialist workshops within Teagasc and contributed to the wider understanding of the effects of policy change.

6. **Summary of Research Outputs**

(a) Intellectual Property applications/licences/patents
Not applicable

(b) Innovations adopted by industry
Not applicable

(c) Number of companies in receipt of information
Not applicable

(d) Outcomes with economic potential
Not applicable

(e) Outcomes with national/ policy/social/environmental potential
Not applicable

(f) Peer-reviewed publications, International Journal/Book chapters.


4. Scientific abstracts or articles including those presented at conferences


(h) National Report


(i) Popular non-scientific publications

Not applicable

(j) Workshops/seminars/ open days at which results were presented (excluding those in (g))
1. Presentation of research by Andrius Kazukauskas to Graduate Student Seminar, November 3rd, 2008.
2. International Farm Comparisons Network – Dairy Conference, Kiel, Germany
## Permanent Researchers

<table>
<thead>
<tr>
<th>Institution Name</th>
<th>Number of Permanent staff contributing to project</th>
<th>Total Time contribution (months)</th>
<th>Average time contribution per permanent staff member</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trinity College Dublin</td>
<td>1</td>
<td>10.8</td>
<td>10.8</td>
</tr>
<tr>
<td>Teagasc</td>
<td>1</td>
<td>16.32</td>
<td>16.32</td>
</tr>
</tbody>
</table>

Total

## Researchers Funded by RSF

<table>
<thead>
<tr>
<th>Type of Researcher</th>
<th>Number</th>
<th>Total Time contribution (months)</th>
<th>Average time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Doctorates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract Researchers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PhD postgraduates</td>
<td>1</td>
<td>38.4</td>
<td>38.4</td>
</tr>
<tr>
<td>Masters postgraduates</td>
<td></td>
<td>30.42</td>
<td>15.21</td>
</tr>
<tr>
<td>Temporary researcher</td>
<td>2</td>
<td>30.42</td>
<td>15.21</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total

## Postgraduate Research

Total Number of PhD theses: 1


Total Number of Masters theses: 0

## Project Expenditure

Total expenditure of the project: € 390,993.56

Total Award by RSF: € 482,130.95

Other sources of funding (specify)

1. €
2. €
11. **Future Strategies**

   We plan to continue to publish the results from this research. Two working papers are currently under review at top international peer review journals. We will work on bringing these to final publication stage in the coming months.

   Coupled with our other publications, we hope that the publication of these articles and this final report will bring our results to the attention of policy makers, farmers and the academic community and help inform future debate, policy measures and research into farmer’s production responses to policy changes.

12. **Industry Collaboration**

   Not applicable