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**ASSESSING THE IMPACT OF FINANCIAL INCENTIVES FOR PARTICIPATION IN EXTENSION
PROGRAMMES: EVIDENCE FROM IRELAND**

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ASSESSING THE IMPACT OF FINANCIAL INCENTIVES FOR PARTICIPATION IN EXTENSION PROGRAMMES: EVIDENCE FROM IRELAND

Abstract

This article evaluates the impact of an extension programme that financially rewards farmers for participation. The evaluation focuses on programme participants who joined after a financial reward was introduced and compares their farm performance to farmers who chose not to join the programme. Farmers are assessed in relation to improvements in financial, grassland and breeding management over an observation period from 2008 and 2012. The results, based on a modified difference-in-difference estimator, reveal no significant impact of the programme, albeit programme participants seem to have improved their farm performance. Reasons for this finding are discussed and, given this rather unique policy move, the study offers policy recommendations of broad relevance.

Keywords Extension programme, difference-in-difference estimator, farm performance.

JEL code Q160, C10.

1. INTRODUCTION

Agricultural innovation is seen as an important part in achieving growth targets in agricultural production. Within this context, effective agricultural advisory and extension methods are perceived to play an important role in enhancing the uptake of innovations in the farming sector. This is why many governments spend a considerable amount of money on agricultural extension programmes. For example the EU Commission has used programmes under the Pillar II of the Common Agricultural Policy (CAP) for many years to fund public extension programmes. Within the EU there is now a renewed interest in the importance of knowledge transfer as is evident by the proposal in the 2013 CAP reform to create European Innovation Partnerships (EIPs) to promote “faster and wider transposition of innovative solutions into practice by better linking research and practical farming” (EU SCAR, 2012). Apart from co-financing, public bodies have also sought to increase the numbers using extension by making services more effective in transferring knowledge to farmers. For example, there is a growing recognition that the top-down knowledge transfer model is not as effective as more participatory or farmer-led approaches (Feder *et al.*, 2004a). To date efforts by government or government agencies to increase participation in extension services have largely been confined to funding or co-funding of such services, and thereby improving provision. In contrast, direct financial rewards to farmers for participating in extension programmes are a relatively new policy move and consequently very little knowledge exists about the effectiveness of such a government intervention.

This study aims to fill this gap in the literature by assessing whether extension programmes that are directly incentivised by payments to farmers have a positive impact on farm performance. Given this rather unique policy move, this study provides policy insights of broad relevance to the literature, but also makes an important contribution to the wider literature on agricultural extension. That is, our study conducts a complete assessment of the programme as the evaluation includes all key objectives of the scheme. In addition, our study is based on a panel data set, therefore we are able to observe the

same farmers before and after the introduction of the programme. This allows controlling for important methodological issues that arise with programme evaluation.

In line with the considerable amount of money expended on extension programmes and the fact that agricultural extension exists in almost every country worldwide, there is a vast number of studies focusing on impact assessment of agricultural extension programmes. In summary, evidence regarding a positive impact of extension programmes on farm profitability or efficiency is mixed (Birkhauser *et al.*, 1991; Dercon *et al.*, 2009; Feder *et al.*, 2004a; Feder *et al.*, 2004b; Goodhue *et al.*, 2010). Feder *et al.*, (2004a), for example, look at the impact of farmer field schools in Indonesia using a modified difference in difference approach. They distinguish between graduate, exposed and control farmers and also account for differences in length of exposure between villages. Results indicate that the programme does not have significant effects which were measured in yields and pesticide usage. In contrast, Davis *et al.*, 2011 report positive effects of farmer field schools in East Africa using a longitudinal study combining matching with a difference in difference estimator. Utilising a panel data set, Dercon *et al.*, (2009) employ an instrumental variables model in order to assess the impact of agricultural extension on poverty and consumption growth in Ethiopia. Their results indicate that receiving at least one extension visit significantly reduces poverty and increases consumption. Part of this inconclusiveness in extension outcomes documented in the literature can be attributed to the fact that measuring extension impact is a complicated task. This is exacerbated by the fact that reliable data before and after the start of the extension programme are often not available and a comparable control group is difficult to locate. This is reflected by the number of different methodological approaches used to assess the impact of extension programmes.

Methodological issues aside, the majority of studies focusing on agricultural extension are conducted in a developing country context. In contrast, this study focuses on agricultural extension in an EU country, which given the recent policy focus on EIPs as well as the increasing recognition of intensifying agricultural systems in a sustainable manner, is a pertinent issue. Furthermore, previous studies exclusively focus on government or government agency funded programmes, while this study aims to investigate the impact of a financially incentivised programme, where farmers receive direct financial compensation

for participation. It is argued that this significantly alters farmers' incentives to participate and therefore may have an impact on the effectiveness of the extension programme. We focus on the Dairy Efficiency Programme (DEP) in Ireland as a case study which aims to encourage efficiency gains on dairy farms through the adoption of best practice in relation to grassland, breeding and financial management through participation in discussion groups. To this end, farmers who participated in the extension programme after the scheme was launched are compared to farmers who decided not to join at all.

The extension programme is described in more detail in the following section, while the theoretical and empirical model is specified next. Section 4 offers a description of the data, while the results are presented and discussed in section 5, followed by some concluding remarks.

2. BACKGROUND

In 2010 the Irish government launched the DEP in order to encourage efficiency gains in the dairy sector through the adoption of best practice in relation to grassland, breeding and financial management. The scheme is operated through providing a financial reward to farmers for participation in discussion groups. Discussion groups are a form of participatory extension, and have actively been used in Ireland as a form of extension for many years before the programme was launched. However, in line with the scheme, provision of discussion groups has been increased in order to accommodate a greater demand for discussion groups. Under the auspices of this programme, farmers participating in the discussion groups will receive a payment of up to €1,000 in each of 2010, 2011 and 2012, amounting to an investment of €18 million over three years. Nevertheless, farmers are still liable for fees for participation and therefore the net financial gain from participation is generally in the order of €600 to €700 per annum. This payment applies to both new members and those that were voluntarily participating in discussion groups before the programme was launched. The programme is funded from the CAP's Single Payment Scheme fund, as unspent Single Payment Scheme funds can be used to address specific disadvantages affecting farmers in the dairy sector.

In terms of operational details of the programme, discussion groups are held on a monthly basis addressing a specific issue each month focusing on the adoption of best practice in breeding, grassland or financial management. Under the terms of the scheme and in order to receive the financial reward, farmers must be officially registered as group members and are required to attend at least eight meetings in 2010 and nine in subsequent years. However, farmers need to attend at least one meeting dealing with each of the three key areas and also host one meeting at their own farm within the scheme period. In addition, farmers are expected to complete specific projects in relation to managing their finances, breeding and grass utilisation, as well as to attend other extension events, such as research visits or open days.

Overall, the financial incentive in combination with an increased number of discussion groups offered makes participation in discussion groups attractive to a larger number of farmers, however this comes with relatively strict rules and administrative costs. While it is clear that incentives to participate in the extension programme have changed with the introduction of the scheme, it is unclear how this affects the success of the scheme.

3. THEORETICAL AND EMPIRICAL FRAMEWORK

Theoretical Model

In general, discussion groups aim to improve farmers' problem solving ability, critical thinking and knowledge in relation to agricultural practices which is thought to translate into improved farm performance. In fact, it has been shown that participation in discussion groups before the DEP was launched provides an economic return of about 12% increase in gross margins (Läpple *et al.*, 2013). However, the financial incentive offered for participation as well as an increasing number of discussion groups associated with the scheme, have considerably altered farmers' incentives to join discussion groups. More generally, assuming a utility maximizing farmer, the farmer will participate in a discussion group if private benefits exceed private costs of participation or stated differently if the utility of participation U_{DG} is greater than the utility of not-participating U_N , i.e. $U_{DG} > U_N$.

However, through the implementation of the DEP, costs and benefits of farmers associated with participation have changed.

To illustrate this case, consider the following: pre-DEP, a farmer joined if private benefits (B_{DG}) exceed private costs (C_{DG}), such as:

$$B_{DG} > C_{DG} \quad [1]$$

In contrast, post-DEP private benefits have increased by the financial incentive (P) associated with participation and private costs have change by T , such as:

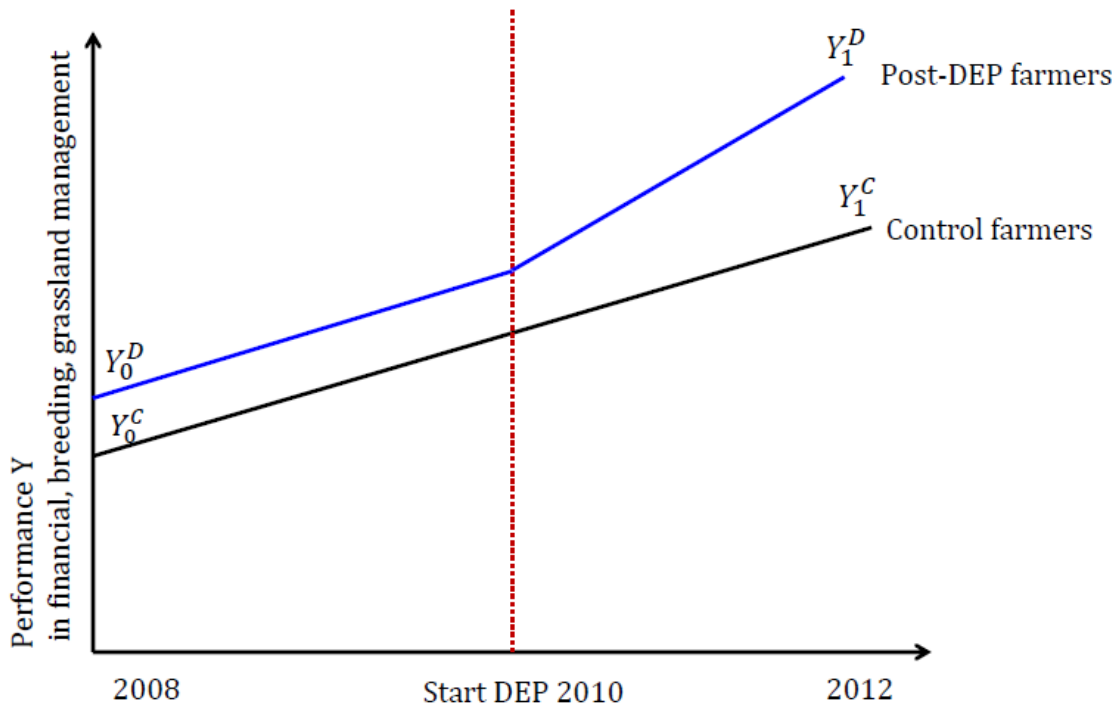
$$B_{DG} + P > (C_{DG} \pm T) \quad [2]$$

T represents a change in private costs resulting through an increased provision of discussion groups which improve accessibility and thereby reduce travel costs. Included in T are also administrative costs, such as compulsory attendance at a certain number of meetings. Whether or not private costs increase or decrease depends on the individual farmer's preferences which are unobserved to the researcher. Either way, it can be seen from equation [2], that private costs and benefits of farmers to join discussion groups have changed with the introduction of the programme. Given the increased participation post-DEP (participation rate increased from 24.3% in 2008 to 41.1% in 2010) it is assumed that the gain in private benefits outweigh a potential increase in private costs. Hence, the utility threshold of joining is lower, which on the one hand makes participation in discussion groups attractive to a larger number of farmers, but on the other hand may have an adverse impact on programme outcome. To illustrate this point, it is possible that farmers merely join for the financial reward and less for the knowledge gain. In fact, there is evidence that some post-DEP farmers participate due to monetary compensation and less due to knowledge gain (Bogue, 2013).

Nevertheless, based on the targets of the programme, discussion group members are expected to improve their farm performance. However, irrespective of discussion group participation, farm performance can increase over time and therefore performance is modelled as a growth process (Dercon *et al.*, 2009; Feder *et al.*, 2004a). Figure 1 illustrates the growth in farm performance for farmers who joined after the scheme was launched (post-DEP farmers) and control farmers over the observation period from 2008 (pre-DEP)

to 2012 (post-DEP). There are a number of important things to note: first, there are expected initial differences between post-DEP and control farmers, which is indicated by the difference in the blue and black line in performance in 2008, i.e. $Y_0^D - Y_0^C$. Second, these initial differences are assumed to be time-constant, which by definition excludes the possibility that post-DEP members might be, for example, faster learners. Third, it is assumed the all farmers are exposed to the same time trends, which is a reasonable assumption given that the main influences for dairy farmers are milk price, input prices as well as policy changes such as the impending removal of the milk quota. However, a more detailed discussion of modelling assumptions are outlined in the following section.

Figure 1: Growth Process of Post-DEP and Control Farmers



Empirical Model

Measuring the impact of extension programmes is a complicated task as any impact assessment is generally hampered by selection and placement bias that come with participation in extension programmes (Birkhaeuser *et al.*, 1991). Underlying motivation and ability of farmers as well as location of the extension programme play an important role. For example, often better farmers with more efficiently managed farms chose to

participate in extension programmes or alternatively governments decide to provide extension in areas with high agricultural growth potential (Dercon *et al.*, 2009). Evidently, there are unobserved factors at play that impact on farm performance, which however, cannot be attributed to the programme. Furthermore, farmers either enrol into the programme or they do not, but for obvious reasons they cannot do both. Unfortunately, interest lies in comparing the outcome of the programme for the same farmer, which complicates the analysis. Hence, any empirical methodology that aims to evaluate the impact of extension methods has to consider these potential biases as simply comparing programme participants to a control group will lead to biased results, i.e. comparing $Y_1^D - Y_1^C$ (see Figure 1) would falsely attribute unobserved differences to the programme impact.

If farmers are observed before and after the introduction of the programme, the difference in difference (DiD) estimator offers a straightforward analysis of the treatment effect, as the unobserved time-constant effects are simply differenced away. That is, the estimator compares the change in performance before and after the programme for participants in the programme (i.e. post-DEP farmers) to the change in performance to farmers who chose not to participate in the programme (i.e. control farmers). It follows that the DiD estimator is: $(Y_1^D - Y_0^D) - (Y_1^C - Y_0^C)$ (Wooldridge, 2010). By definition this double differencing over time removes biases in comparisons between members and control farmers that could be a result from initial differences between the groups, i.e. ability, as well as biases in comparisons that result from time trends unrelated to programme but affect outcomes, i.e. change in input and output prices (Imbens and Wooldridge, 2009). Given the fact that our data set is based on panel data, i.e., we observe the same farmers over time, we use a modified DiD estimator, as specified below.¹

The empirical model is as follows:

¹ Many recent studies combine propensity score matching with DiD (Pufahl and Weiss, 2009, Davis *et al.*, 2011). However, as our data is based on panel data set and we observe the same farmers over time, it is possible to eliminate time-constant unobserved effects and test for the parallel trend assumption. Based on a small number of observations as well as poor explanatory power of a propensity score measures, we decided to apply the modified DiD estimator. However, we also tested a PSM DiD estimator, and our results do not change significantly.

$$Y_{it} = \alpha + \theta t_2 + \delta DG_{it} + c_i + u_{it} \quad [3]$$

With $E(u_{it}|DG_{it}, c_i) = 0$.

Where Y_{it} is the outcome of farmer i at year t , t_2 is a dummy variable equal to one if $t = 2$ and zero otherwise. DG_{it} indicates if farmer i is a member in a discussion group at year t . Importantly DG_{i1} equals zero for all i farmers. c_i is an unobserved effect, such as farmer ability, that is assumed to be time constant and allowed to be correlated with discussion group membership. α, θ and δ are coefficients to be estimated, while u_{it} is the idiosyncratic error, assumed to be normally distributed.

First differencing the equation eliminates the unobserved effect c_i , yielding to the following equation:

$$\Delta Y = \theta + \delta DG_{i2} + \Delta u \quad [4]$$

Interest lies in the magnitude and significance of δ , which provides insight into the impact of the programme, i.e. if post-DEP farmers perform significantly better on a number of breeding, grassland and financial management indicators than control farmers. In fact $\hat{\delta}$ is similar to the standard DiD, except that the same farmers are observed over time (Wooldridge, 2010).

The estimator is based on the assumption that the unobserved differences between discussion group members and control farmers are constant over time. While some might argue that this is an unreasonable assumption, for example programme participants may be faster learners, this assumption has often been used by others in order to evaluate extension impact, see for example Dercon *et al.*, 2009. In addition, the validity of the estimator relies on the parallel trend assumption, meaning that underlying trends in the outcome variable are the same for pre-DEP and control farmers. We test for this assumption by comparing outcomes of both groups for a number of pre-DEP years.

4. DATA

The main data source is Irish Farm Accountancy Data Network (FADN) data for 2008 and 2012 (Hennessy *et al.*, 2013). Irish FADN data are collected through the Irish National

Farm Survey (NFS). The NFS was established in 1972 and has been published on an annual basis since. Overall, a statistically representative random sample of 1,100 farms, representing a farming population of approximately 110,000 farms, is surveyed each year through a series of face to face interviews with a professional data collection team. Farms are classified into farming systems based on the dominant enterprise which is calculated on a standard gross margin basis. The NFS distinguishes between six farming systems: specialised dairying, dairying other, cattle rearing, cattle other, mainly sheep and tillage. Here, a sub-sample of specialised dairy farms is used. While these farms are specialised in dairy production, there is typically a significant alternative enterprise also operated on the farm. In addition to data on the farm business, the farm operator and household, data on discussion group membership, including date of initial membership, is also recorded.

Our sample is selected based on information on discussion group membership and date of initial participation. As this analysis specifically focuses on assessing the outcome of the DEP, only farmers who joined discussion groups after the introduction of the DEP (post-DEP farmers) as well as farmers who did not join at all are included (control farmers). A post-DEP member is a farmer who joined discussion groups in or after 2010. Farmers who were members in discussion group before the scheme was launched are excluded from the analysis as it is expected that outcomes differ between pre- and post-DEP members.²

As previously outlined, the focus of the evaluation is on the three key areas of the DEP, namely financial, grassland and breeding management. To this end, the following indicators are selected: in relation to financial management, change in profits expressed in gross margins per hectare and direct costs per litre are selected. These are commonly used financial performance indicators, and the former has previously been used to assess the impact of pre-DEP discussion groups in Ireland (Läpple *et al.*, 2013). In the case of farm profits, post-DEP members are expected to have higher growth rates than control farmers, while the reverse holds for direct costs per litre.

²Of course, it would be very interesting to compare outcomes between pre- and post-DEP members, but we do not have before and after observations for pre-DEP members and we also observe very little variation over time within the pre-DEP group which makes this analysis very difficult to conduct.

In relation to grassland management, the use of grass which is expressed in days on grass is selected as a proxy to measure improvement in grassland management. Hence, participation in the DEP is thought to have a positive impact on use of grass. In general, Irish dairy production systems are predominantly based on a combination of grazed grass, grass silage, and concentrate but grazed grass is the cheapest feed available on most Irish dairy farms (O'Donovan *et al.*, 2010). There has been a recent movement toward increasing grazed grass by simultaneously decreasing the proportion of grass silage and concentrate offered to the lactating animal. However, despite this effort, the efficiency of grass utilization on average Irish dairy farms, at approximately 60%, is still relatively low and requires significant improvement. In recent years, grazing management strategies have been identified to increase the proportion of grazed grass and to decrease the dependency on indoor feeding in Irish dairy systems, which are actively supported by the DEP.

Finally, breeding management is measured by the change in percentage of calves born in January and February, providing a proxy for compact calving which is generally measured as the percentage of cows calved in six weeks. Here, it is expected that through better breeding management post-DEP members are able to tighten their calving interval.³

5. RESULTS

Before embarking on an analysis of farm performance indicators, it is useful to compare post-DEP and control farmers in relation to their farm and household characteristics. Table 1 presents summary statistics of important characteristics, classified by membership status in 2008. Results of tests of significant difference (t-test and Chi²) between the groups are reported in the last column of the table. As is evident in Table 1, post-DEP and control farmers are quite similar in many characteristics. For example, there is no difference in farm size and livestock units per hectare between the groups, however post-DEP members have significantly larger herd sizes. While pre-DEP members are also significantly younger,

³ The selection of indicators is constrained by data availability, which is particularly apparent in grassland and breeding management indicators, as for example information on specific grassland management techniques used by the farmer or EBI are not available.

the groups are the same in relation to any other farmer or household characteristics. Importantly, the two groups do not differ in relation to agricultural education. Overall, we find that both groups are quite similar which is in contrast to the general findings in the literature, that there are initial differences between participants and non-participants (Imbens and Wooldridge, 2009). This could be an indication that financial incentives attract farmers similar to those who chose not to participate in extension programmes, which has also been found by Hennessy and Läpple (2014).

Table 1: Descriptive Statistics for the Sample

Variable	Description	Farmer Category		t-value
		Post-DEP Members (n=40)	Control farmer (n=117)	
UAA	Farm size in hectares	61.51 (31.57)	56.77 (27.64)	-1.28
Herd	Size of dairy herd	63.27 (28.83)	53.16 (23.37)	-2.23**
LU/ha	Livestock units per forage area	1.88 (0.41)	1.90 (0.46)	0.29
Family labour	Number of household members in working age	2.70 (1.39)	2.62 (1.42)	-0.29
Age	Age of the farmer	48.45 (10.38)	52.20 (9.02)	2.18**
Job	= 1 if farmer has an off-farm job	0.225 (0.42)	0.137 (0.34)	1.73
Education	= 1 if farmer has agricultural education	0.80 (0.41)	0.71 (0.45)	1.24

Means and standard deviation in parenthesis. The last column reports t-values for continuous variable and chi² values for binary variables. ** P<0.05.

Table 2 reports the means of the financial management indicators before and after the introduction of the scheme for both farmer groups, as well as the estimated DiD coefficient and its associated t-value.

Before moving on the analysis of programme effects, a number of observations are worth remarking on. First, farm profits have decreased considerably for all groups between 2008 and 2012, while consistent with this, direct costs per litre have increased over the observation period. This is partially due to the fact that in 2008, dairy farmers achieved relatively high returns from farming, while milk price declined by 9% from 2011 to 2012. In addition, inclement weather conditions coupled with high feed prices caused rising feed expenditure and direct costs increased by 21% between 2011 and 2012 (Hennessy *et al.*, 2013). However, post-DEP members were better able to offset these adverse conditions and their farm profits decreased less than the control group's farm profits, with a reduction of 10.5% and 18%, respectively. Second, we do not observe significant differences in the financial management indicators before the introduction of the scheme between the groups. This is in contrast to Pufahl and Weiss (2009), who observe significant differences in almost all outcome indicators in the pre-treatment year when evaluating the effects of agri-environment programmes.

Overall, as is evident from Table 2, post-DEP members have higher farm profits than control farmers, and the difference between the two groups over the observation period increased from €52 per hectare to €191 per hectare. The estimated DiD effect of the DEP on farm profit is €134 per hectare, though the effect is not statistically significant.

Differences between groups in relation to direct costs per litre are less obvious (see lower part of Table 2). Interestingly, post-DEP members had higher direct costs than the control farmers in 2008, but were able to revert this over the study period. However, neither of these differences were found to be statistically significant. When comparing the percentage change in costs between 2008 and 2012, post-DEP members' costs increased on average by 13.7%, while direct costs of control farmers increased by 17%. The estimated DiD effect of the DEP on direct costs is 0.002 cent per litre, however the coefficient is not statistically significant.

Table 2: Financial Management Indicators

Variable	Change between 2008 and 2012			
	2008	2012	Difference over years	% Change
<i>Farm profit (GM/ha)</i>				
Post-DEP farmers	1,940.05 (854.49)	1,740.10 (842.39)	-205.76 (665.34)	-10.5
Control farmers	1,887.51 (743.62)	1,548.57 (700.85)	-340.44 (489.54)	-18.0
Difference between groups	52.54 (141.58)	191.53 (133.99)	134.67 (100.72)	DiD
t-value	0.37	-1.43*	1.34	
<i>Direct cost/ litre</i>				
Post-DEP farmers	0.131 (0.029)	0.149 (0.037)	0.021 (0.027)	13.7
Control farmers	0.129 (0.032)	0.151 (0.040)	0.019 (0.027)	17.0
Difference between groups	0.002 (0.006)	-0.002 (0.003)	0.002 (0.005)	DiD
t-value	0.31	-0.17	(0.34)	

Means and standard deviation in parenthesis are reported for post-DEP and control farmers. For the row differences between groups means are reported with the associated standard error in parenthesis and t-value underneath. * P<0.10.

While post-DEP members appear to have improved in relation to their financial management, the effects fail to show a significant impact that could be attributed to the programme. It is interesting therefore to consider if post-DEP members have made significant improvements in their farm performance in relation to grassland and breeding management. Table 3 reports the use of grass and the percentage of cows calved in January and February for the two groups over the observation period. Again, before focusing on the analysis, it is worth noting that no initial difference between the groups is observed for the use of grass, while the proxy for compact calving shows significant initial differences.

In relation to use of grass, the difference between the groups is just over one day in 2008 and increases to almost four days in 2012, however neither of those differences are statistically significant. Overall, post-DEP members increase days on grass by almost 3%,

while control farmers lengthen their grazing season by almost 2%. However, it is important to consider that in Ireland the national research target for grazing season length is 300 days (O'Donovan *et al.*, 2010), and research has proven that it is possible to consistently achieve a 270 day grazing season length even in less-advantaged areas (Patton *et al.*, 2011). It is clear from the data in Table 3, that both groups have considerable room to improve their use of grass. However despite a strong focus on increasing grazed grass in a dairy cow's diet of the DEP, the DiD estimator, with an estimated differences of 1.9 days, does not show a significant effect of participation in the extension programme.

Table 3: Grassland and Breeding Management Indicators

Variable	Change between 2008 and 2012			
	2008	2012	Difference over years	% Change
<i>Use of Grass</i>				
Post-DEP members	233.60 (36.77)	240.59 (36.80)	4.2 (25.71)	2.9
Control farmers	232.24 (27.96)	236.88 (31.31)	6.09 (26.49)	1.9
Difference between groups	1.36 (5.57)	3.72 (5.94)	-1.89 (4.88)	DiD
	0.24	0.62	(-0.39)	
<i>% calves born in Jan/Feb</i>				
	2008	2012	Difference over years	% Change
Post-DEP members	0.414 (0.202)	0.472 (0.206)	0.049 (0.192)	14.2
Control farmers	0.345 (0.189)	0.347 (0.187)	0.009 (0.198)	0.5
Difference between groups	0.069 (0.034)	0.125 (0.035)	0.039 (0.036)	DiD
	2.03**	3.61***	1.08	

Means and standard deviation in parenthesis are reported for post-DEP and control farmers. For the row differences between groups means are reported with the associated standard error in parenthesis and t-value underneath. ** P<0.05.

Finally, in relation to breeding management, post-DEP members have a higher proportion of calves born in January and February than control farmers, which is observed pre- and post-DEP, with 6.8% and 12.5% difference, respectively. In addition, these differences are statistically significant at the 5% level. Moreover, post-DEP farmers were able to increase

compact calving by 14% over the study period, while the control group only has a minimal increase in this indicator. The DiD estimator indicates a difference of almost 4% increase in compact calving for post-DEP members, which, however, is not statistically significant.

The robustness of the results is checked by testing the parallel trend assumption that underlines our model estimates. Here, we focus on the development of farm profits before the introduction of the programme and compare gross margins per hectare from 2007 to 2009 for both groups. The results in Table 4 clearly indicate that both groups follow the same trends, and no significant difference of farm profits between the groups is evident. In general, gross margins have decreased in the observation period, and the significant decline in 2009 is due entirely to a 30% drop in milk prices (Connolly *et al.*, 2010). Given the equal exposure of dairy farmers to milk prices and cost changes, it appears reasonable to assume that both groups are exposed to a common trend.

Table 4: Pre-DEP Development of Farm Profits

Year	Gross Margins/ hectare		t-test
	Pre-DEP farmers	Control farmers	
2007	2196.05 (678.93)	2202.32 (707.30)	0.049
2008	1940.05 (854.49)	1887.51 (743.62)	0.38
2009	1060.51 (458.56)	969.61 (462.93)	-1.075

Means and standard deviation in parenthesis as well as t-values for differences in the means are reported

6. CONCLUSION

This article assesses whether an extension programme that is directly incentivised by payments to farmers has a positive impact on farm performance. The analysis focuses on the Dairy Efficiency Programme (DEP) in Ireland as a case study. The DEP is an extension programme that is operated through a series of discussion groups, which have been in place for a number of years before the programme was introduced. The analysis focuses on farmers who participated in discussion groups after the incentive was introduced (post-DEP farmers) and compares their outcomes to farmers who chose not to participate (control farmers). In line with the key objectives of the extension programme, the

evaluation focuses on financial, grassland and breeding management. A modified difference in difference (DiD) estimator is used as the same farmers are observed before and after the introduction of the scheme. The estimation methods controls for time-constant unobserved differences between the groups as well as time trends that affect all farmers. The results provide important policy recommendations, especially as financially rewarding farmers for participation in extension programmes is a rather unique policy move and consequently little is known about its impact.

The findings of this analysis indicate that post-DEP farmers have improved their farm performance in all key areas of the programme (financial, grassland and breeding management), however neither of the changes show a significant effect that could be attributed to participation in discussion groups. However, before the introduction of the DEP, discussion groups have been found to provide economic gains in the order of 12% increase of gross margins (Läpple *et al.*, 2013). Hence, discussion groups per se are a successful extension method, but it appears that changed incentives for farmers to participate in the extension programme had an effect on its outcome. In fact, there is evidence that farmers join for the financial reward but less for the knowledge gain (Bogue, 2013), which seems to have an impact on the effectiveness of the programme.

However, it is also important to bear in mind, that the analysis is conducted two years after the programme was introduced and it might be possible that a farmer would need to be a group member for a longer period for full benefit. This might be plausible especially as our findings do show improvement in all indicators for programme participants, albeit no significant impact that can be attributed to the scheme.

The insignificant programme impact suggests the need to exercise more caution in the design of extension methods. This is particularly important as the DEP was targeted to increase overall efficiency in the dairy sector. However, in the long term, an efficient dairy sector may require less efficient farmer to exit from the industry. To the extent that the scheme allows inefficient farmers to remain in the industry, it may reduce the efficiency of the industry in the long run. It may be sensible to focus on other options to increase participation of farmers rather than resorting to payments. For example, if farmers lack

information about the existence of the programme, increasing means to disseminate information about the programme is a much cheaper option. Alternatively, providing free advice to farmers might be an option to make extension services accessible to a larger group of farmers and thereby improve aggregate farm performance.

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