Policy Incentives as Behavioural Drivers of Beef Enterprises in Ireland: Where are the Kinks?

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Abstract

The current structure of agricultural production is still influenced by historical coupled payments, even though it has been eight years since decoupled payments were introduced. Much of the expansion in the Irish cattle herd that occurred during the era of the MacSharry reforms is still visible. In this paper we consider the incentives associated with the Common Agricultural Policy (CAP) over time in relation to production. Our primary focus is on subsidies that were available to the beef sector, and we investigate the behavioural pressures associated with these incentives. We have developed a Hypothetical microsimulation model using a typical farm, based on plausible values taken from the Teagasc National Farm Survey (NFS) 1995. We are investigating if subsidies available to the beef sector in Ireland through the CAP since 1984 resulted in non-linearity in the Direct Payment Schedule faced by cattle farmers, and if so where were these kinks and what were the behavioural pressures associated with these incentives? Identifying non-linearity in the Direct Payment Schedule indicates where incentives occurred. Large kinks are associated with large incentives at that point. We calculated a total payment for each subsidy from 1984 to 2014, and constructed a Direct Payment Schedule that varies by stocking rate. We find that subsidies, and in particular the CAP reform payments of the MacSharry era introduced large discontinuities or kink points in the Direct Payment Schedule of beef farmers, indicating that there were large incentives for farmers to produce at or just before these points.

JEL Classification:

Key Words: Direct Payments, Incentives, Subsidy, CAP

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1. Introduction

The Common Agricultural Policy (CAP) of the European Union (EU) enjoys a reputation not only as the oldest Community policy (Piccinini and Loseby, 2001) but also as a highly complex, evolving and expensive policy for European taxpayers. (Zhu and Lansink, 2010).

In this paper we investigate the behavioural pressures associated with historical direct payments to beef farmers. Our research covers the period 1984 -2014, which can be divided into three distinct policy regimes. The first period (1982-1992) which we call the Pre MacSharry period, was a time when Market Policy instruments were in place. These instruments included intervention pricing, export subsidies and import levies. These policies boosted farm incomes by enabling farmers to sell their produce at prices above world prices.(Ewing, 1985; Daugbjerg, 2007; Swinbank, 1980)

The second period (1993-2004) which we call the MacSharry Era was a period in which farmers received direct payments coupled to production. This was the first major shift in policy. A number of different production based subsidies (premium payments) were introduced as outlined in Table 1. Eligibility criteria varied for each different payment, but a maximum stocking rate limit, measured as livestock unit per hectare, was applicable to all. (Hill, 1992; Fennell, 1992; Cardwell, 2002)

The third period under consideration (2004-2014) is a period of decoupled direct payments, The Single Farm Payment Scheme (SFP). These payments were based on a historical reference period and the number of coupled direct payments drawn during that time. When the SFP was introduced many predicted the abandonment of land and the emergence of entitlement farmers. This did not happen, and the question remains as to why farmers in receipt of SFP continued to produce beef when it seemed unprofitable to do so. (Daugbjerg, 2006; Swinnen, 2010; Hennessy and Thorne, 2005)

There is a vast literature exploring the economic performance of an agricultural sector in which support policies are in place. Agricultural support policies impact in a number of ways on farm production: changes in relative output / input prices (Lansink and Peerlings, 1996) changes in input use (Serra et al., 2005b), changes in investment (Hennessy, 1998) and labour supply decisions (Woldehanna et al., 2000, Hennessy and Rehman, 2008, Serra et al., 2005a) and changes in farm exit and entry decisions. (Pietola et al., 2003).

Subsidies may result in allocative inefficiencies or investment-induced productivity gains (Rizov et al., 2013). Allocative inefficiencies arise if farmers modify their behaviour in order to avail of subsidies. This is referred to as subsidy-seeking behaviour and can lead to inefficiencies in relation to input choices and uses, where farms overinvest in subsidised inputs. Subsidies may also give rise to technical inefficiencies whereby higher profits may lead to a lack of effort in seeking cost cutting methods. By increasing wealth, subsidies may also introduce soft budget constraints and farms may be slower to adjust production systems. If producers face hard budget constraints then they will adjust to external influences much quicker. (Rizov et al., 2013).

Coupled payments, directly linked to production, may distort decisions towards subsidised activities which may be less profitable from a market perspective. In contrast decoupled payments break the link between production and payments.(Rizov *et al.*, 2013)

Hennessy (1998) decompose the impacts of decoupled income support policies into wealth, insurance and coupling effects. A wealth effect arising from direct payments which increase income, an insurance effect in which the risk associated with agricultural production is lessened and a coupled effect if the support policy is explicitly linked to production.

However, there has not been a forensic examination of policy instruments as drivers of farmer behaviour. In this paper we investigate the incentives associated with direct payments to beef farmers in Ireland.

2. Structural Trends In Irish Agriculture

In this section we outline the importance of the beef sector to Irish agriculture and take a look at the trends in breeding stock over time.

The beef sector is the largest sector in Irish agriculture both in terms of the number of farmers and the area of land dedicated to beef production. Teagasc NFS has collected data on Irish farms for 40 years and in 2013 over 50% of Irish farms are categorised as cattle rearing (suckler) farms or cattle other (finishing) farms. (NFS, 2013) However, farms categorised as Dairy or Tillage also engage in some cattle farming and so 79% of all Irish farms in 2013 had some cattle enterprise on their farm. (NFS, 2013). .Over 90% of Irish Beef is exported which makes Ireland the largest exporter of beef in Europe and the fifth largest exporter in the world.(ref) The sector has also been plagued by low profitability with low viability issues, raising questions as to why, in the presence of decoupled direct payments, beef farmers continue to do what they do. Are Irish beef producers using decoupled direct payments to subsidise non-profitable enterprises?

In 1984 a milk quota was introduced to curtail overproduction in the dairy sector. In conjunction a payment for suckler cows incentivised beef farmers to increase production. Figure1 illustrates the structural changes that occurred in cow numbers in Ireland from 1975 - 2011.

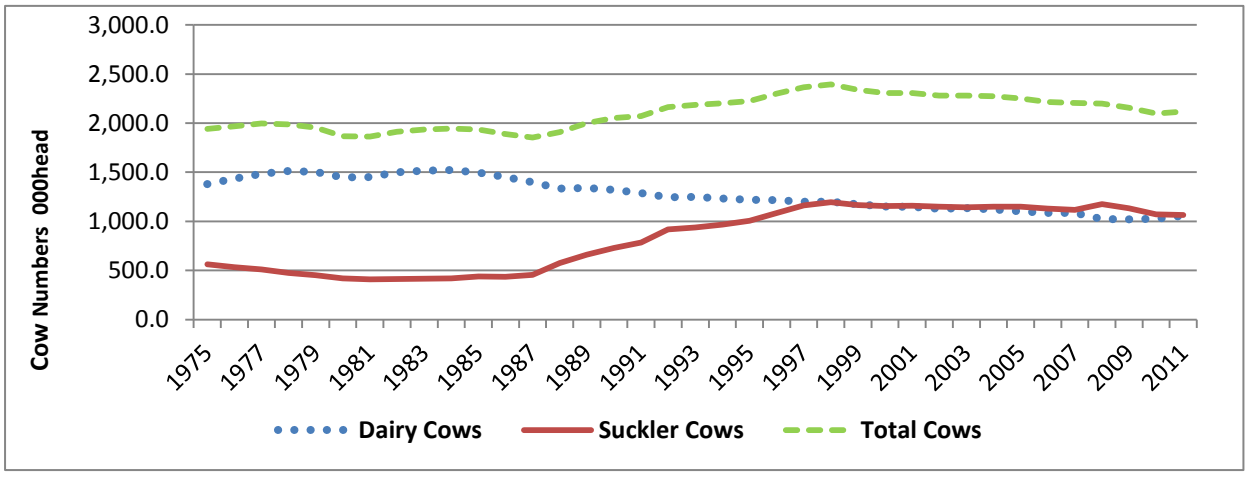

Figure 1. Changes in cow numbers
Source: CSO Various Years

With the introduction of the Dairy quota in 1984 dairy cow numbers began to decrease from just over 1.5 million cows in 1983 to 1 million in 2009. In 1983 a suckler cow payment was introduced but the payment was relatively low at £25 per cow. In 1987 this payment increased three fold to £75 and suckler cow numbers began to increase dramatically. In 1993, as part of the MacSharry reform payments a suckler cow quota was introduced based on the number of suckler cows in the herd in 1992. The introduction of this quota and conditions for eligibility were announced well in advance, and suckler cow numbers increased further in anticipation of this measure. This quota was not a production quota, it did not limit the number of suckler cows in the herd, it was a quota on the number of entitlements to payments on the farm. For example if a farmer had ten cows in 1992 then he was only eligible to draw payments on ten cows from 1993 onwards, the farm may keep more than ten cows but was only paid for ten. It would seem strange for farmers to increase the number of suckler cow in the herd if they were not receiving premium payments on them, yet from 1993-1999 suckler cow numbers continued to rise.(Matthews, 2000). This may be due to the other premium payments on ten month and twenty-two month steers available at the time.

From the late nineties on we can see a levelling out of suckler cow numbers with a slight increase in 2008 when a Suckler Welfare scheme was reintroduced. Dairy cow numbers have begun to increase slightly in recent years in anticipation of the removal of Dairy quota in 2015.

Between 1987 and 1998, the total number of cows increased by approx. 29%. However suckler cow numbers increased by 162% during the same period, a quite dramatic shift towards a more inefficient system of beef production.

Today we have a beef sector characterised by low profit enterprises, situated in disadvantaged areas, where farms are smaller than average, and beef farmers have a higher age profile than farmers in the more profitable dairy and tillage sectors. Increasing profitability on suckler farms remains an issue, and the sustainability of many of these farms is a concern for farmers and policy makers alike.

Many commentators predict that market conditions alone will not be enough to increase the profitability of beef farming, structural changes are necessary. In order to understand the nature of these structural changes it is first necessary to understand the behavioural pressures associated with historical direct payments that helped to create the present situation.

3. Theoretical Section

In this section, we outline the theoretical framework on which our research is based. Utility maximizing techniques are based on maximising a utility function subject to some constraint. If these constraints are non-linear the process becomes more difficult from an econometric point of view, but from a policy design perspective identifying these kink points can be useful as indicators of where the incentives occur.

Theory of Kinked Budget Sets

The analysis of labour supply responses to changes in the tax system has resulted in a large body of research on the subject.(Saez, 2010; Burtless and Hausman, 1978; Hausman, 1980; Hausman, 1979; Moffitt, 1990). Studies have shown that progressive income tax or benefit transfer systems introduce piece wise linear budget sets which create difficulties in deriving labour supply responses based on utility maximizing techniques. Our research has shown that

historical payments to farmers introduced similar non-linarites and while labour responses are not the focus of this paper similar techniques can be applied to uncover underlying farmer preferences. Theory predicts that agents will choose to supply labour until the marginal disutility of labour becomes equal to the marginal benefits. In 1978 Burtless and Hausman developed a method known as *the non-linear budget set estimation method* which states that if agents are utility maximising then they must be on the linear part of the budget set or at a convex kink point. This method examines the behavioural response to a policy change. (Burtless and Hausman, 1978; Moffitt, 1990; Saez, 2010).

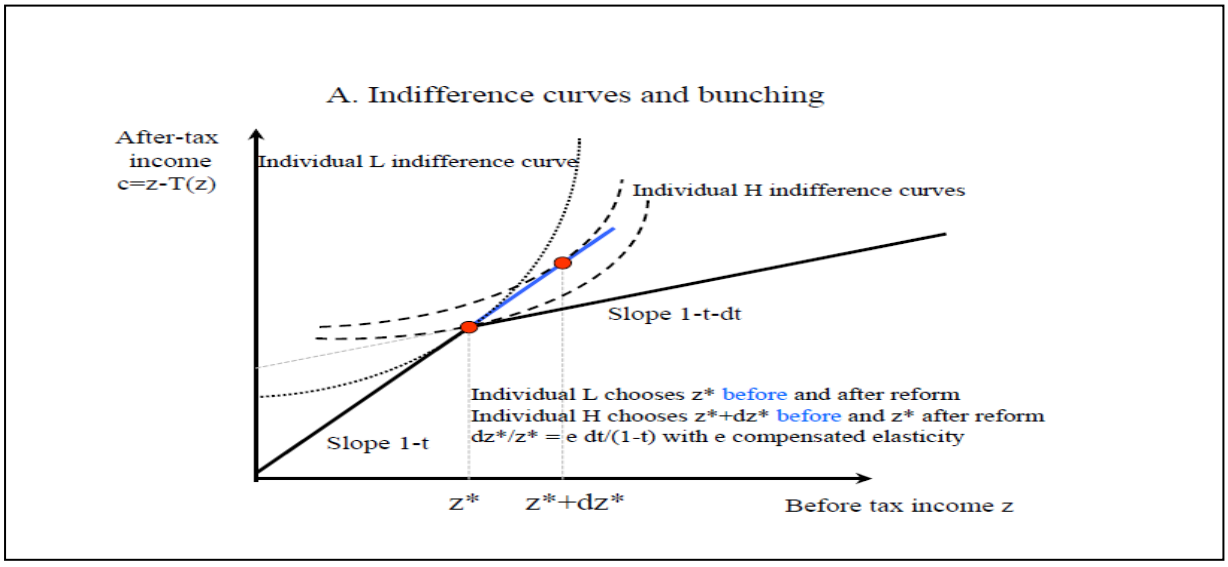

Figure 2. Indifference curves and bunching
Source: Saez; 2010

Figure 2 displays the effect on earnings choices of introducing a (small) kink at the budget set by increasing the tax rate t by dt above income level z*. Individual L chooses z* before the reform, and stays at z* after the reform. Individual H chooses z*+dz before the reform, but moves to z* after the reform. (Saez, 2010)

This illustrates how a change in policy affects individuals in different ways depending on their initial position along the constraint. If preferences are "well behaved" and evenly distributed then after a policy change theory predicts the individual at the higher level on the constraint will adjust their behaviour. By plotting the distribution of earnings we should observe bunching of individuals at or just before the kink point.

In the context of this paper we are focused on identifying where the non-linearity's occurred in the Direct Payments Schedule of beef farmers. This is a first but crucial step in our research

4. Methodology – Hypothetical Farm Level Modelling

This section describes the methodology used in this paper. We have adopted a hypothetical microsimulation approach based on a typical farm model from which we uncover a Direct Payments Schedule for each year from 1984-2014 across a range of stocking rates

The model used in this research is based on the *Typical Farm* methodology developed by The International Farm Comparison Network (IFCN). The IFCN typical farm model is a unique

methodology that provides a realistic and up-to-date data-base of different farm types in several different regions. A typical beef farm is representative of the beef farms within the region in terms of size, crops grown, livestock systems, labour organisation and production technology used. The technical and economic data used to describe the typical farm is neither individual farm data nor statistical averages, but is based on a consensus achieved in a panel meeting consisting of farmers an advisor and a scientist.(Deblitz, 2005) There are a number of advantages to using this approach. Firstly, the cost of collecting farm level data on a regular basis is hugely expensive and therefore the typical farm concept offers a realistic alternative. Secondly, understanding agricultural production systems and farmer's decision making requires an accurate picture of the real farm situation, but the use of individual case studies will invariably contain some particularities.

We extend the scope of the IFCN approach which looks at a typical/representative farm at a single point in time in that we look at changes in the Direct Payments Schedule across time. Therefore our approach incorporates an inter temporal dimension

Structure of Teagasc Typical Farm Model

The Teagasc Typical Farm Model is a Hypothetical microsimulation model, constructed using actual NFS data from 1995, from which a stylised but plausible farm scenario is developed. "As a modelling framework, microsimulation modelling is a mechanism of abstracting from reality to help us understand complexity better".(O'Donoghue, 2014) The unit of measurement is the farm, and at the farm level there a number of issues that add to this complexity. In particular the complexity of modeling at farm level stems from the fact that there exists a large degree of population and behaviour heterogeneity.

By using a microsimulation approach it allows us to focus on a single dimension of complexity, the policy. This is a novel approach to abstracting from the level of heterogeneity at farm level and the subsequent issues of aggregation bias associated with such heterogeneity. Individual farmers, producing at different stocking rates, create a different direct payments schedule for each farm. By adopting a static typical farm methodology we abstract from the complexity and create an optimal direct payments schedule which identifies the optimal stocking rate to maximise direct payments. All farmers faced the same rules so all farmers could in theory adopt their behaviour to maximise their direct payments.

The parameter used is Stocking Rate which is a measure of the intensive/extensive nature of the farm and is calculated as Livestock Unit per Hectare (Lu/Ha). All subsidies are applied to the static farm over the period 1984-2012. Stocking rates are allowed to vary across a range from 0.1 Lu/Ha to 3.1 Lu/Ha. Total payments from all subsidies are then used to create a Direct Payments Schedule which represents the marginal rate of return to the farm from all subsidies. Where rules in the conditions of a subsidy change, an increase/decrease in payment, a stocking rate limit is reached or a maximum payment per farm/Hectare is reached, the marginal return to the farm changes thus creating a change in the slope of the Direct Payments Schedule. This change creates what is referred to in the literature as a kink point.

The Model in Excel

We began developing the model in excel, where each subsidy is defined by a set of parameters which are outlined in the conditions for eligibility as laid down by the Department of Agriculture under EU guidelines and Directives. For each individual subsidy, if the farmer is eligible, a total payment is then calculated which is allocated to the farm according to the

livestock unit share. For example the Suckler Cow Premium total payment is calculated based on a maximum stocking rate eligibility of 2 Lu/Ha and this payment is then allocated on a range of stocking rates from 0.1 Lu/Ha up to 3.1 Lu/Ha. When the stocking rate reaches 2 Lu/Ha payment ceases, thus creating a change in the total payment graph where up to that point the graph is increasing, at 2 Lu/Ha the graph becomes horizontal.

In calculating the payment for Single Farm Payments an average of 2000 2001 and 2002 was applied to total subsidies drawn during this reference period. These included Suckler Cow Premium, Special Beef Premiums (10 and 22 month) Special Bull Beef Premium, Ewe Premium, Rural World Premium, Extensification Premium, Slaughter Premium, National Top Ups and additional payments for heifers which did not qualify for payments during the reference period.

Having calculated all payments for all individual subsidies, total payments for each year and associated graphs which illustrate the return to farming from all subsidies were calculated

5. Results

This section presents the results from the model for a hypothetical farm where livestock numbers remain constant over the entire period. In the confines of this paper we present results from direct payments which were available to all farmers. We do not include Less Favoured Area Payments or Environmental Payments, but form our research we have found that these payments increased the overall level of payments linearly, that is they increased the level of payments but did not create any additional kink points in the schedule.

Marginal Changes 1984-2014

Figure 3 represents the marginal changes year on year in total payments at 101 different livestock units per ha that range from 0.1 Lu/Ha to 3.1 Lu/Ha in increments of 0.03. Each line represents a different stocking rate. In the Pre MacSharry period (1984-1992) we see a marginal increase in payments in 1987 and again in 1989. The payments available at this time are illustrated in Table3. These marginal increases were due to changes in the eligibility criteria for male animals where the maximum number of animals eligible for a beef derogation payment increased from 50 to 90 animals. There was also an increase in the amount paid for suckler cows but the overall level of payments during this time was relatively low compared to those in the next period of coupled payments.

During the MacSharry Era (1993-2004) we see substantial marginal increases in payments when the schemes in Table 1 were first introduced in 1993. These increases were graduated with those at lower stocking rates (up to 1.4 Lu/Ha) receiving the largest marginal increase in payments year on year with an increase of over 200%. Farmers producing at stocking rates above 2 Lu/Ha received the lowest marginal increase (50%). Farmers producing between 1.4 Lu/Ha and 2Lu/Ha saw an increase of 150% in their payments between 1992 and 1993. Between 1993 -1996 those at very high stocking rates experienced negative marginal changes as the upper stocking rate limit reduced from an initial high of 3.5 Lu/Ha to 2Lu/Ha over a period of four years. However there were little if any cattle farmers producing at these very high stocking densities. From 1997 onwards the marginal changes across all stocking rates are relatively stable with some variation in the years preceding the introduction of decoupled payments in 2005, and again in 2008 when the Suckler Welfare Scheme was introduced. Payments at all stocking rates up to 1.9 Lu/Ha decreased slightly with the introduction of decoupled payments

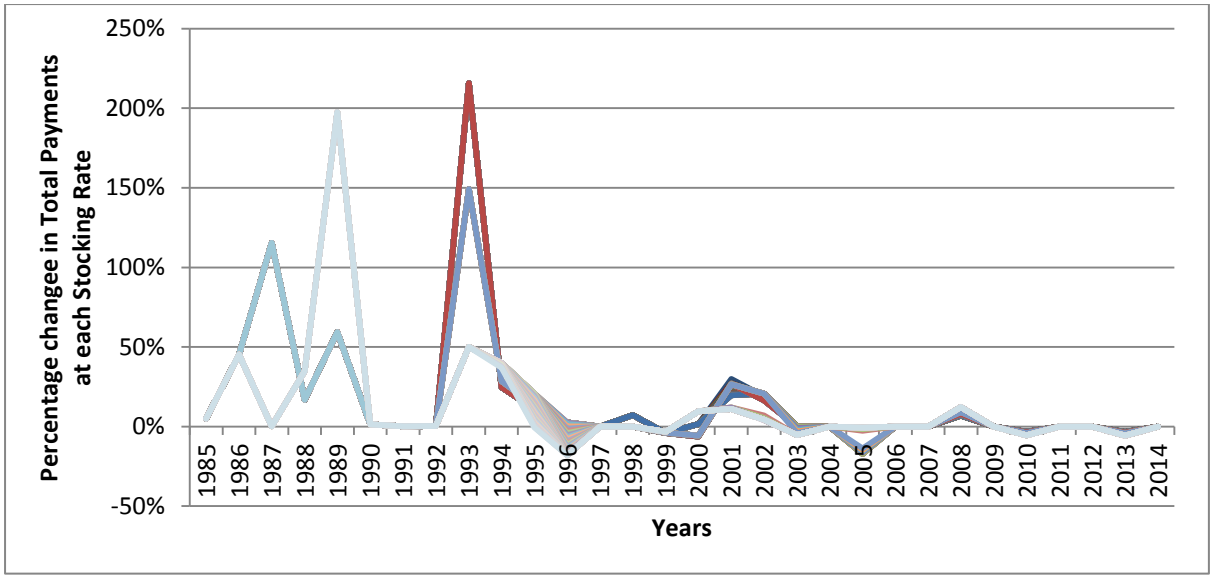

Figure 3. Marginal changes in total payments year on year

Pre MacSharry Era 1984-1992

During the Pre MacSharry period a policy of market support existed, but there were also a number of direct payments available as outlined in Table 3. Figure 4.shows how total payments increased as animal numbers increased For the most part these payments were linear in nature so as animal numbers increases total payments increased. Exceptions to this existed in 1987 and 1988 when the maximum number of animals on which Beef Derogation Premiums could be drawn was 50 male animals, thus creating a kink point at 2.35 Lu/Ha This limit increased to 90 male animals in 1989 and the Direct Payments Schedule reverts to the linear nature indicating that the more you produced the higher direct payments you received. The overall level of payments in this period was relatively low, for example the highest level of payment in 1988 was at a stocking rate of 2.35 Lu/Ha of €2,000,[1] However, the majority of Irish farms were producing at stocking rates much lower than this.

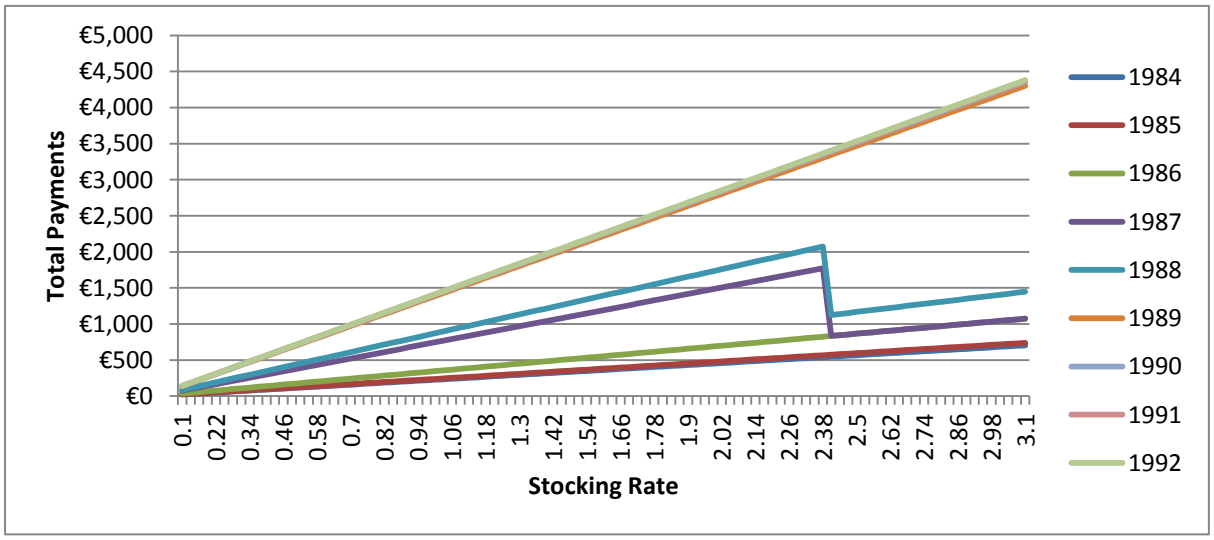

Figure 4. Figure Total payments Pre MacSharry Era

[1] All historical payments have been converted to Euro and Hectares but have not been indexed to 2014

The MacSharry Era 1993-2004

Figure 5 shows the level of increase in total payments from 1993-2004. The complexity and hectic nature of this period are evident, both in terms of the number of new payments and the eligibility rules for different subsidy payments. These conditions introduced a number of kink points in the Direct Payments Schedule where stocking rate limits were reached. Payments available at this time are illustrated in Table 1.

In 1993 there are two kinks in the schedule, at 1.4 Lu/Ha where the Extensification Premium limit is reached and again at 1.9Lu/Ha where the Slaughter Premium limit is reached. Farmers still received payments on Special Beef Premiums and Suckler Cow Premiums up to 3.5 Lu/Ha at this time. There is also very little advantage to increasing from 1.4 Lu/Ha as the maximum payment at 1.9 Lu/Ha is only €500 greater but the loss of increasing above 1.9 Lu/Ha is over €1,500 at that time.

By 2004 on the eve of the introduction of decoupled payments there are three distinct kinks in the Direct Payments Schedule. The first two kinks are at two different levels of Extensification. The first kink is at 1 Lu/Ha where farmers received a higher payment if their stocking rate was less than 1 Lu/Ha and the second Extensification premium at 1.4 Lu/Ha. Slaughter Premiums had reduced to 1.8Lu/Ha creating a minor kink and the final kink and both the Suckler Cow Premium and the Special Beef Premia had an upper limit of 1.9 Lu/Ha. By Increasing stocking rates above this upper limit farmers were receiving less direct payments per hectare than if they were producing at 1 Lu/Ha

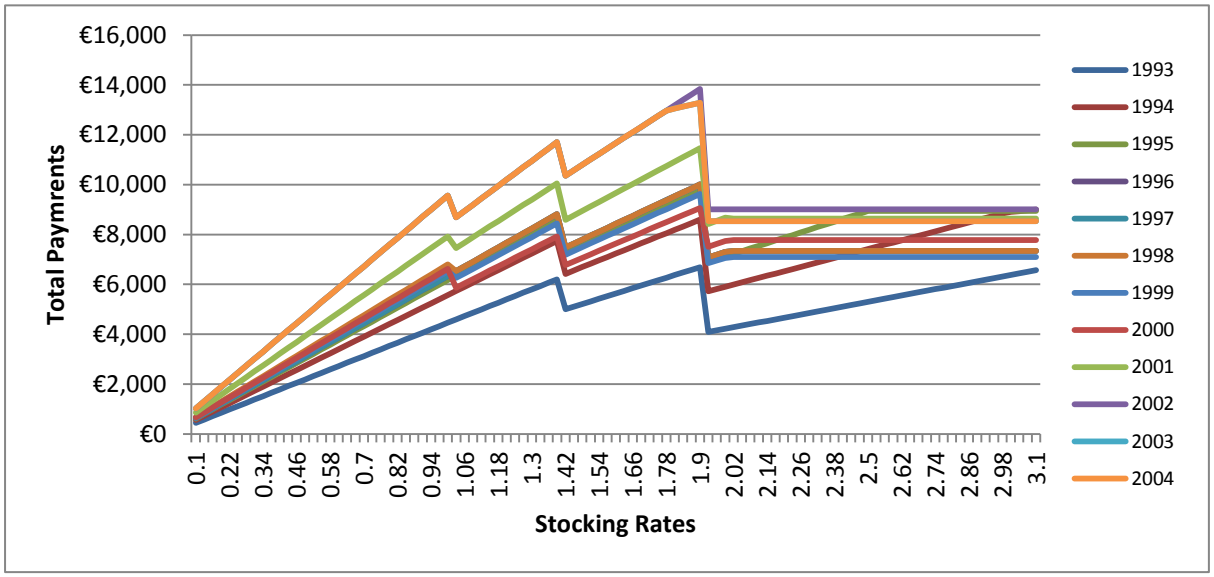

Figure 5. Total payments MacSharry Era

Figure 6 relates the marginal changes as stocking rate increases in both 1993 when coupled direct payments were first introduced and 2004 the last year of coupled payments. In both years the highest marginal changes were at very low stocking rates. So for example increasing the stocking rate from 0.1 Lu/Ha to 0.13 Lu/Ha resulted in an increase in total payments of 20%. This marginal rate of change remains positive but decreasing up to 1.4 Lu/Ha in 1993 corresponding to the first kink point in Figure 5, which implies that increasing stocking rate from 1.4 Lu/Ha to 1.41 Lu/Ha but by 2004 the first negative marginal change is

at to 1 Lu/Ha, also corresponding to the first kink in the Direct Payments Schedule in Figure 5

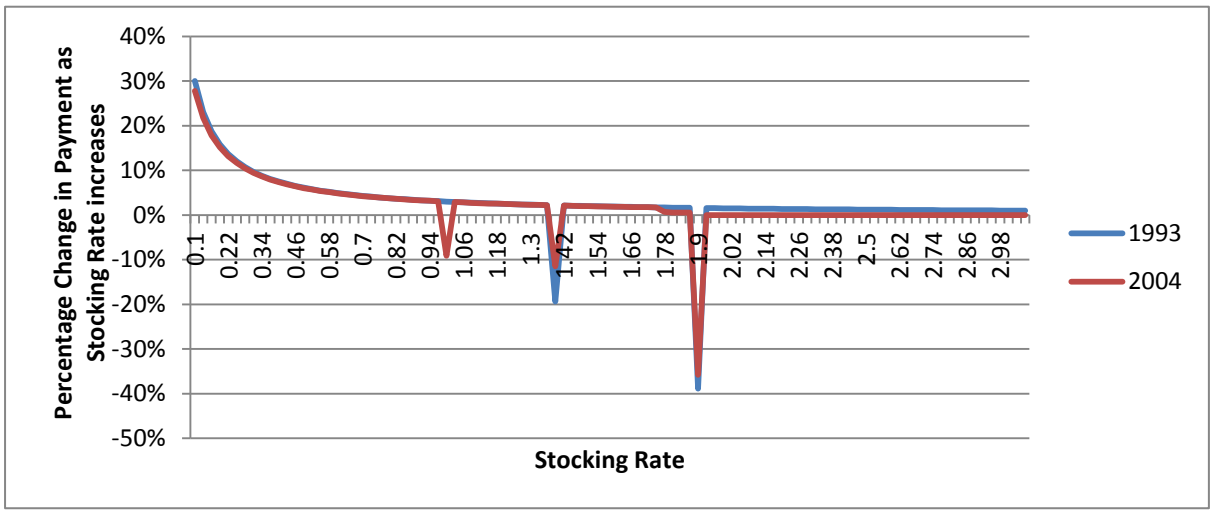

Figure 6. Marginal changes per livestock unit MacSharry Era

Single Farm Payments 2005-2014

Figure 7 shows the level of increase in total payments from 2005-2014. Although these payments were decoupled from production, payments were based on production levels during a historical reference period (200-2002) hence payments maintain the same shape.as during MacSharry era. This highlights the distortionary nature of these payments whereby those who produced most during the reference period also received higher decoupled payments.

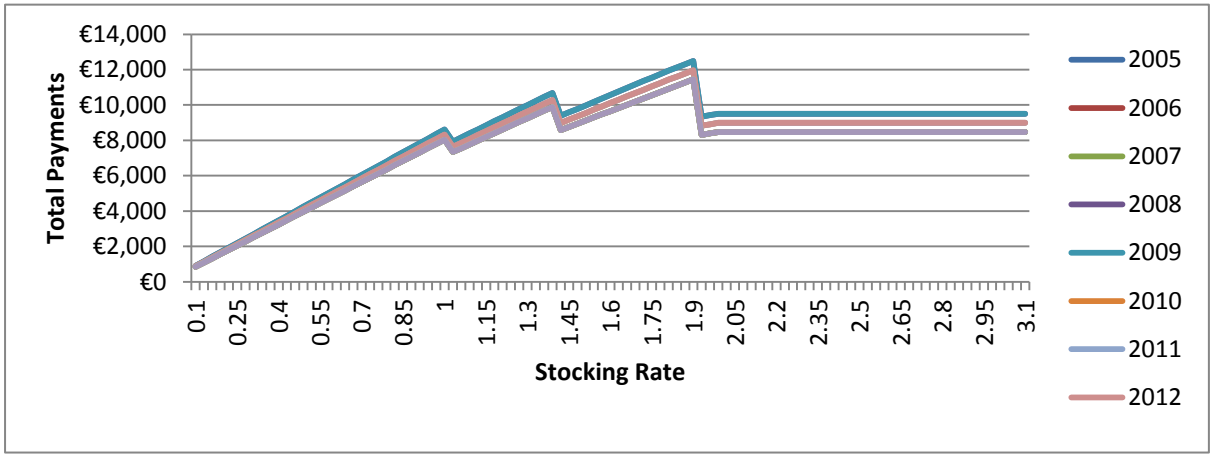

Figure 7. Total payments per livestock unit Single Farm Payments

Figure 8 shows the marginal changes year on year from 2003 -2014. Producers at all stocking rates up to 1.9 Lu/Ha saw a 20% drop in payments when the Single Farm Payment Scheme was first introduced in 2005. There was a 10% drop in payments at stocking rates between 1.9 and 1.96 Lu/Ha and above this stocking rate there were no changes in payments year on year. In 2008 there was an increase in payments at all stocking rates following the introduction of the Suckler Welfare Scheme which was a coupled payment specifically designed to assist farmers with suckler cows. This followed a period from 2005 where there

were no coupled payments available to suckler farmers and farmers only received a single farm payment.

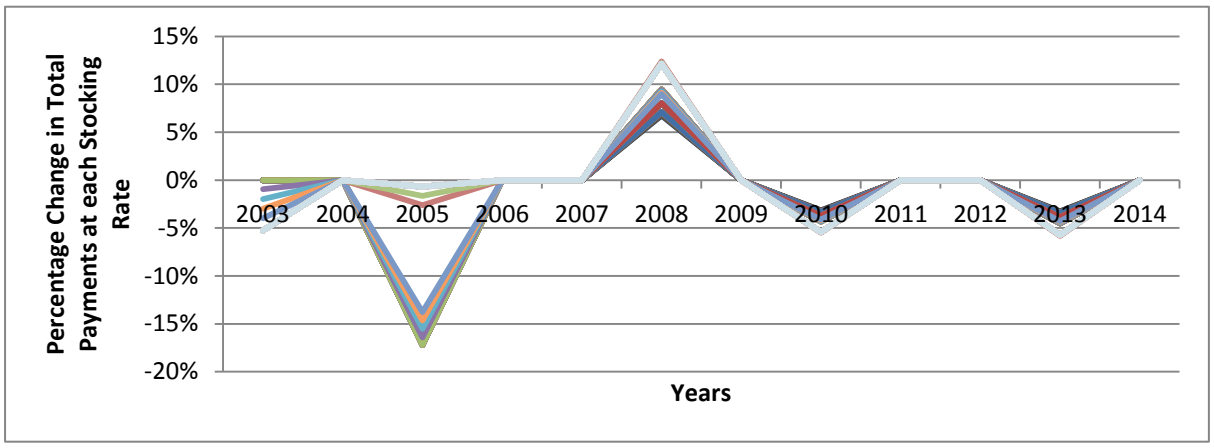

Figure 8. Marginal changes per livestock unit Single Farm Payment

6. Conclusions

In this paper we investigate the behavioural pressures associated with historical direct payments to beef farmers in Ireland. Our primary focus is on subsidies that were available to the beef sector, and we investigate the behavioural pressures associated with these incentives. We have developed a Hypothetical microsimulation model using a typical farm, based on plausible values taken from the Teagasc National Farm Survey (NFS) 1995.

We have found that subsidies paid to farmers created substantial kinks in the Direct Payments schedule of beef farmers in Ireland. Large kinks are associated with large behavioural pressures at that point. These behavioural pressures are particularly evident in the MacSharry Era 1993-2004, when coupled direct payments were first introduced. The complexity of this era both in terms of the number of new subsidies and the constant changing of conditions for eligibility increased the difficulty for farmers in making decisions.

Identifying the points where subsidies created non-linarites in the historical budget constraints of beef farmers helps us to understand where the behavioural incentives occurred. This is a first but important stage in developing a Utility Maximising framework for beef farmers in Ireland. It is clear from the trends in cattle numbers that Irish farmers reacted to these incentives. What is not so clear is why we have not seen any dramatic changes in the structure since the introduction of decoupled payments. Clearly there is a level of utility associated with cattle farming that goes beyond a purely monetary gain.

A better understanding of past behaviour is essential to understanding how policy instruments in the future might be used to bring about changes in agricultural production systems.

The next stage in this process is to investigate, using NFS data on actual farmer decisions, whether beef farmers in Ireland bunched at these kink points as theory would suggest they should. According to Moffitt (1990) it is important in policy design to know the distribution of individuals over the constraint, as different people on different parts on the constraint react to changes in different ways. “The net effect of a policy change may well depend critically upon the relative numbers of individuals located at different points” (Moffitt, 1990)

Appendix

Table 1. MacSharry Cap Reform Payments 1993

Suckler Cow Premium	Individual farm quota based on the number of suckler cows held in 1992. Payment per head. Upper stocking rate limit per farm of 3.5Lu/Ha in 1993 which reduced to 2Lu/Ha by 1996	£79 (€100)
Special Beef Premium	Paid in two instalments on steer cattle at 10 months and 22 months. Payment per head. Upper limit of 90 animals increasing to 180 animals in 2000. Upper stocking rate limit similar to suckler cow premium.	£52.73 (€67)
Slaughter Premium	Paid automatically on the number of animals slaughtered. Payment per head. No limit on the number of animals eligible. Stocking rate limit per farm 1.8 Lu/Ha	£52.73 (€67)
Extensification Premium	Paid automatically on suckler cows or male animals if a stocking rate per farm of 1.4 Lu/Ha or lower is achieved	£26.36 (€33)
Ewe Premium	Individual farm quota based on the number of Ewes held in 1992. Payment per head. Minimum stocking rate of 10 ewes Upper limit of 1000 in Less Favoured Areas and 500 in Non Less Favoured Areas	£17 (€21)
Rural World Premium	Extra payment to farmers in less favoured areas. Payment per head. No limit.	£5.25(€6.60)

Source: Teagasc Management Data for Farming, Teagasc, various years

Table 2. Payments available in Less Favoured Area (1992)

Animal Category	LFA Subsidy
Cattle Headage (MSH)	£40 on first 8 LUs. £33 for each LU from 9-30 LU's
Beef-cow headage (MSH)	£84 per cow. Maximum number of cows: 40
Beef Cow Scheme (LSH)	£75 per cow. Maximum number of cows: 30
Sheep headage (MSH) and (LSH)	£10/ewe for first 200 ewes. Max payment £2,000/farm

Source: Teagasc, various years. Teagasc Management Data for Farm Planning

Table 3. Direct payments available to all farmers prior to 1993 (payments in 1992)

Suckler Cow Premium	No limit	£52.73 per head
Beef Premium Derogation	Male cattle over 9 months. Max 90 head	£35.15 per head
Ewe Premium	Min number 10 ewes	£19 per head

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