On the use of targeting to reduce moral hazard in agri-environmental schemes

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ABSTRACT

This paper investigates the role of targeting in the context of agri-environmental schemes involving monitoring and penalties and well suited to a geographically-based distinction between participants. By separating participants into a target and a non-target group the aim of targeting is to reduce the moral hazard problem. The paper analyses three approaches to targeting and the focus is on reducing the extent of cheating by participants in the non-target group. By complementing the adoption of targeting with appropriate adjustments to the monitoring/penalty parameters it is shown how such an approach can exploit the risk aversion of participants to completely eliminate cheating by those participants in the non-target group.

INTRODUCTION

The issue of policy mechanism design has become popular in the recent literature relating to agri-environmental policy (Choe and Fraser, 1999; Hogan, Ozanne and Colman, 2000; Fraser, 2001; Latacz-Lohmann, 1998; Moxey, White and Ozanne, 1999). Both the incentive-compatible and the monitoring/penalties approaches have featured in this literature (see Moxey et al and Latacz-Lohmann respectively). However, in practical terms it is unlikely that the former approach will supplant the latter approach currently applied in agri-environmental policy contexts. Moreover, as is often the case is relation to existing policy, current practice has a tendency to move ahead of the literature.[1]

A relevant example of this in the monitoring/penalties area of regulatory policy is the use of "targeting" as a device for enhancing the efficiency of the resources applied to monitoring the implementation of a policy. In this situation the monitoring authority will announce in advance of the monitoring process commencing that a sub-group of participants will be "targeted" – implying that their probability of being monitored is higher than participants outside the sub-group.

In the literature research has been reported exploring the adjustment of monitoring/penalty parameters to improve policy effectiveness (see, for example, Polinsky and Shavell, 1979), however little research appears to have been done in the area of targeting . This may be because such targeting requires specific information about participants which in many situations is not available to the authorities, although it has been used in the context of income taxation by choosing the target group based on employment occupation (Australian Taxation Office, 2001).

From this perspective agri-environmental policy seems particularly well-suited to the application of targeting as agri-environmental schemes often have a well-defined geographical basis (Fraser and Rygnestad, 1999), and so it should be straight forward to target participants based on geographical location. Given this potential for applying the targeting approach to agri-environmental policy monitoring, the question arises as to the usefulness of this approach in alleviating the moral hazard problem in this context. The aim of this paper is to investigate this question, with a particular focus on the behaviour of those participants in the non-target group.

The structure of the paper is as follows. Section 1 develops a model of an agent participating in an "agri-environmental " policy which requires an action on the part of the agent subject to monitoring by the principal. The agent receives a payment for undertaking this action, which itself involves an income reduction. Consequently, the opportunity exists for the agent to "cheat" by claiming to undertake the action, but actually not do so, thereby receiving the payment, but not experiencing the income reduction associated with the action. Therefore, a monitoring/penalties system is used by the principal in an attempt to prevent the loss of effectiveness of the policy brought about by such "cheating". It is into this specification that the additional monitoring feature of targeting can be inserted, and its potential usefulness investigated. It should be emphasised at this point that an essential component of the targeting approach is repeated monitoring, whereby either the target group can be changed, or alternatively participants can be moved from the non-target group to the target group. Therefore, in Section 1 the decision framework of the agent is specified with an inter-temporal format so as to enable the targeting feature to be introduced. Within this framework three versions of the targeting approach will be considered. The first version is "resource-neutral" in that

overall monitoring resources are unchanged with the introduction of targeting, and so an increase in the probability of detection in the target group is achieved by a reduction in the resources applied to detection in the non-target group, thereby decreasing the probability of detection in this group. The second version is "non-resource-neutral" in that overall monitoring resources are increased in order both to maintain the probability of detection in the non-target group at the level applying prior to the introduction of targeting, and to increase the probability of detection for those in the target group. The third version restores "resource-neutrality", but draws on the concept of a "mean-penalty-preserving" adjustment of the monitoring/penalty parameters (i.e. probability of detection and size of penalty) developed in Fraser (2001b). These three versions are considered in order to more fully evaluate the potential for targeting to alleviate the moral hazard problem. In Section 2 this model is analysed numerically and it is shown that although "resource-neutral" targeting can reduce the extent of cheating by those participants in the non-target group previously cheating, it cannot eliminate this propensity, and it may also encourage cheating by those in the non-target group previously behaving truthfully. It is then shown that with "non-resource-neutral" targeting as specified, the problem of participants deciding to turn to cheating can be avoided. However, using this approach it continues not to be possible to fully eliminate cheating among those participants in the non-target group cheating prior to the introduction of targeting. Nevertheless, it shown that the introduction of the third version of targeting, "resource-neutral" with a "mean-penalty-preserving" adjustment of the monitoring/penalty parameters for those participants in the non-target group, is capable of eliminating all cheating. Therefore, as argued in the Conclusion, although targeting has the potential to alleviate the moral hazard problem in agri-environmental policy, it will operate most effectively if coupled with appropriate adjustments to the monitoring/penalty parameters for those participants in the non-target group.

SECTION 2: THE MODEL

As stated in the Introduction, this section develops a model of an agent participating in an "agri-environmental" policy which requires an income-foregoing action on the part of the agent in return for a payment. In addition, the principal used a monitoring/penalty scheme to discourage moral hazard: taking the payment but not undertaking the action. Finally, in order to analyse the targeting approach outlined in the Introduction it is necessary to specify an inter-temporal feature to the agent's decision framework.

In what follows the agent's income in each period if behaving truthfully (I_T) is known with certainty:

$$I_T \qquad = \qquad B - y + x \qquad\qquad (1)$$

where: $\quad x > y$

$\qquad\qquad B \qquad = \qquad$ income if not participating

$\qquad\qquad y \qquad = \qquad$ income forgone by participating

$\qquad\qquad x \qquad = \qquad$ payment for participating

Alternatively, if the agent chooses to cheat in each period then income (I_C) is uncertain:

$$I_c \qquad = \qquad B + x \text{ if not caught} \qquad\qquad (2)$$

$$= \qquad B + (1 - \partial)\, x \text{ if caught}$$

where: $\qquad \partial \qquad = \qquad$ penalty parameter ≥ 1

Specifying the probability of detection in the absence of targeting as p, means that the expected utility from cheating in a period $(EU(I_C))$ is given by:

$$EU(I_C) \qquad = \qquad (l - p)\, U(B + x) + p\, U(B + (1-\partial)\, x) \qquad (3)$$

where: $\qquad U(I) \qquad = \qquad$ utility of income $(U'(I) > 0,\ U''(I) < 0)$

compared with the utility from behaving truthfully $((U(I_T))$ in a period:

$$U(I_T) \qquad = \qquad U(B - y + x) \qquad\qquad (4)$$

Therefore, for a two-period decision problem, the present value of expected utility from cheating in both periods *(PVEU(I_{C12}))* is given by:

$$PVEU(I_{C12}) \quad = \quad EU(I_C) + EU(I_C) / (1 + r) \qquad (5)$$

where: $\quad r \quad = \quad$ discount rate,

while for behaving truthfully in both periods:

$$PVU(I_{T12}) \quad = \quad U(I_T) + U(I_T) / (1 + r) \qquad (6)$$

On this basis the agent will choose to behave truthfully or cheat in both periods depending on:

$$PVU(I_{T12}) \quad \overset{>}{<} \quad PVEU(I_{C12}) \qquad (7)$$

Note that in this situation the "mixed" strategy of cheating in one period and behaving truthfully in the other will always be dominated by a "pure" strategy of cheating or behaving truthfully in both periods. This follows from the observation that, for example, if:

$$EU(I_C) \quad > \quad U(I_T) \qquad (8)$$

then:

$$PVEU(I_{C12})) \; > EU(I_C) \; + U(I_T) / \; (1 + r)$$

$$> U(I_T) + EU(I_C) / (1 + r) > PVU(I_T) \qquad (9)$$

with the reverse applying if:

$$U(I_T) > EU(I_C) \qquad (10)$$

Next consider the introduction of targeting. For the first version of "resource-neutral" targeting outlined is the Introduction, the higher probability of detection of those in the target group *(p_H)* is achieved by shifting monitoring resources away from those in the non-target group, thus lowering this group's probability of detection *(p_L)*. It follows that:

$$p_H \quad > \quad p \quad > \quad p_L \qquad (11)$$

On the basis that the agent in question is not in the target group initially, but that if caught in the first period moves into the target group for the second period, the present value of expected utility from cheating in both periods is give by [2]

$$PVEU(I_{C12})) = (1 - p_L) \; U(B + x) + p_L \; U(B + (1 - \partial) \; x)$$

$$+ \; (p_L(p_H \; U(B + (1 - \partial) \; x) + (1 - p_H) \; U(B + x))$$

$$+ \; (1 - p_L) \; (p_L \; U(B + (1 - \partial) \; x) + (1 - p_L) \; U(B + x))) \; / \; (1 + r) \qquad (12)$$

In addition, the present value of expected utility from behaving truthfully in the first period and cheating in the second $(PVEU(I_{T1C2}))$ is given by[3]:

$$PVEU(I_{T1C2}) = U(I_T) +$$

$$(p_L \; U(B + (1 - \partial) \; x) + (1 - p_L) \; U(B + x)) \; / \; (1 + r) \qquad (13)$$

In this situation the impact of the targeting on the present value of expected utility from cheating in both periods may be positive or negative depending on the values of p_L and p_H. In particular, because $p_L < p$ the first term on the right-hand side of (12) is clearly higher that the first term on the right-hand-side of (5). However the impact on the second term on the right-hand-side of (12) may be positive or negative. Nevertheless, the aim of the principal will be for the overall impact of introducing targeting to be a decrease in (12) relative to (5), so that an agent who is the absence of targeting was cheating in both periods would with the introduction of targeting find that (12) was smaller than (6) (the present value of behaving truthfully in both periods). Note that the numerical analysis in the next section will illustrate how the principal's objective can be achieved. However, it can be seen from (13) that if in the absence of targeting cheating is preferred ((5) exceeds (6)), then with the introduction of targeting, because $p_L < p$, it follows that:

$$PVEU(I_{T1C2}) > PVU(I_{T12}) \qquad (14)$$

As a consequence, although as will be illustrated in the next section it is possible for the introduction of "resource-neutral" targeting to deter agents who were previously cheating

in both periods from doing so, it is unambiguously the case that these agents will still find that the mixed strategy of cheating in one period is preferred to behaving truthfully in both periods. Therefore, "resource-neutral" targeting can prevent "full-time" cheating, but not "part-time" cheating. Moreover, in this context, it should be recognised that for an agent who in the absence of targeting chooses to behave truthfully in both periods (i.e. (6)) exceeds (5)), because $p_L < p$, the potential arises for:

$$pU(B + (1-\partial) x) + (1 - p) \ U(B + x) < U(B - y + x) \tag{15}$$

but:

$$p_L U(B + (1-\partial) x) + (1 - p_L) \ U(B + x) > \ U(B - y + x) \tag{16}$$

in which case:

$$PVEU(I_{T1C2}) \ > \ PVU(I_{T12}) \tag{17}$$

In other words, the lower probability of detection associated with being in the non-target group may be sufficient to entice a previously truthful agent to adopt the mixed strategy of cheating in one period. In the numerical analysis of the next section, this potential for the introduction of "resource-neutral" targeting to induce "part-time" cheating among those previously behaving truthfully at all times is illustrated.

Therefore it would seem that the "resource-neutral" form of targeting features two major failings in its attempt to deter non-target group participants from cheating: it doesn't discourage cheating completely by those previously cheating all the time; and it may encourage those previously behaving truthfully all the time to begin cheating some of the time.

In an attempt to improve the performance of targeting, consider the second version, "non-resource-neutral" targeting, proposed in the Introduction. In this case the principal

devotes additional monitoring resources to the targeting activity in order to maintain the probability of detection in the non-target group at the level prevailing prior to the introduction of targeting:

$$p_L \quad = \quad p \tag{18}$$

It follows simply from (18) that if (15) holds, then the sign of (16) would be reversed, and so it is clearly the case that this form of targeting will not suffer from the failing of "resource-neutral" targeting of enticing those agents previously behaving truthfully to start cheating. However, for those previously cheating (i.e. (5) exceeds (6)), although the introduction of targeting may result in (12) being less than (6), so that behaving truthfully all the time is preferred to cheating all the time, it will still be the case that (14) holds, and the mixed strategy of cheating some of the time is preferred to behaving truthfully all the time. Note this follows from observing that for these agents:

$$EU(I_C) > U(I_T)$$

prior to targeting, so that with $p = p_L$ it will still hold subsequent to the introduction of targeting for those in the non-target group, and so (13) will exceed (6). As a consequence, even the more expensive ""non-resource-neutral" targeting will be unable to deter those agents previously cheating all the time from continuing to cheat some of the time.

Therefore, in a final attempt to improve the performance of targeting, consider the third version proposed in the Introduction: that of "resource-neutral" targeting accompanied by appropriate "mean-penalty-preserving" adjustments in the monitoring/penalty parameters of the non-target group (i.e. p_L and x) as outlined in Fraser (2001b). Note at the outset that the aim of this version of targeting is to eliminate cheating completely, without either expending more resources on monitoring, or increasing the perception among non-target

group participants of the expected penalty associated with cheating. In other words, this version of targeting features neither more expensive monitoring, nor an adjustment in the expected cost of cheating among participants in the non-target group. More specifically, it must hold that the increased probability of detection in the target group is resourced by a decreased probability of detection in the non-target group:

$$p_L \quad < \quad p \quad < \quad p_H \tag{19}$$

and that the expected cost of cheating among agents in the non-target group is unchanged:

$$p \, \partial \, x \; = \quad p_L \, \partial_T \, x \tag{20}$$

where ∂_T = new penalty parameter associated with targeting.

On this basis, the present value of expected utility from cheating all the time in the presence of targeting is given by:

$$PVEU(I_{C12}) =$$

$$p_L \, U(B + (1\text{-}\partial_T) \, x) + (1 - p_L) \; U(B + x)$$

$$+ \; (p_L \, (p_H \, U(B + (1\text{-}\partial_T) \, x) + (1 - p_H) \, U(B + x))$$

$$+ \; (1\text{-}p_L) \, (p_L \, U(B + (1\text{-}\partial_T) \, x) + (1 - p_L) \; U(B + x))) \, /(1+r) \tag{21}$$

while the present value of expected utility from behaving truthfully in the first period and cheating in the second is given by:

$$PVEU(I_{T1C2}) \quad > \quad U(I_T) +$$

$$(\rho_L \, U(B + (1\text{-}\partial_T) \, x) + (1 - \rho_L) \; U(B + x)) \, / \, (1+r) \tag{22}$$

It will be shown using the numerical analysis of the next section how the principal can select the parameters p_H, p_L and ∂_T so as to be consistent with the requirements of (19) and (20) regarding monitoring expense and the expected cost of cheating, and yet transform a situation prior to targeting of:

$$PVEU(I_{C12}) \quad > \quad PVEU(I_{T1C2}) \quad > \quad PVU(I_{T12}) \tag{23}$$

to one with the introduction of targeting of:

$$PVU(I_{T12}) \quad > \quad PVEU(I_{T1C2}) \quad > \quad PVEU(I_{C12})) \tag{24}$$

and in so doing eliminate cheating completely by those participants in the non-target group. Based on Fraser (2001b), it will also be shown how the key to this achievement is the adjustment of the monitoring/penalty parameters so as to increase the riskiness of cheating without affecting the expected penalty. In this way, the risk aversion of the agent is used to discourage cheating, rather that the size of expected penalty.

SECTION 3: NUMERICAL ANALYSIS

In order to undertake a numerical analysis of the model developed in the previous section

it is necessary to specify both a particular form for the agent's utility function, and a set

of parameter values to act as a Base Case. In what follows the utility function is specified

to take the constant relative risk aversion form[4]:

$$U(I) \qquad = \quad \frac{I^{1-R}}{1-R} \qquad\qquad (25)$$

$$\text{where R} \qquad = \quad \text{constant coefficient of relative risk aversion}$$

$$\qquad\qquad = \quad U''(I) . I / U'(I)$$

In addition, the following parameter values are chosen for a Base Case:

$$B \quad = \quad 20$$

$$y \quad = \quad 10$$

$$x \quad = \quad 18$$

$$\partial \quad = \quad 1$$

$$r \quad = \quad 0$$

$$p \quad = \quad 0.5$$

$$R \quad = \quad 0.5, 0.75$$

$$p_L \quad = \quad 0.4$$

$$p_H \quad = \quad 0.8$$

On this basis Table 1 contains details of the Base Case results before and after the

introduction of "resource-neutral" targeting for a participant in the non- target group.

Note in this context that it has been assumed that the target group comprises 25% of

participants so that an increase to 0.8 (i.e. $p_H = 0.8$) in the probability of detection for this

group can be achieved by a reduction in the probability of detection of the non-target

group to 0.4 (i.e $p_L = 0.4$).   Note also that the penalty is such that the payment received

by the agent   (x) is withdrawn if detected cheating ($\partial = 1$), and that the issue of

discounting has been overlooked for simplicity ($r=0$). The results in Table 1 have been presented for non-target group participants with two levels of risk aversion ($R=0.5, 0.75$) in order to create a Base Case situation where in the absence of targeting one type of agent ($R=0.5$) chooses to cheat all the time, while the other ($R=0.75$) chooses to behave truthfully all the time. In addition, as shown in Table 1, following the introduction of targeting the agent previously cheating all the time ($R=0.5$) now finds that the mixed strategy of cheating some of the time becomes the preferred choice. It should be noted at this point that in this example targeting also increases $PVEU(I_{C12})$, but not by as much as $PVEU(I_{T1C2})$ is increased. Unreported numerical results show that if the target group is smaller (less than 20%) of all participants), so that the probability of detection is greater for this group ($p_H > 0.9$) then the impact of targeting is to reduce $PVEU(I_{C12})$ below the level of $PVU(I_{T12})$ for non-target group participants. Nevertheless, even in this case the mixed strategy of cheating some of the time dominates all others. Therefore Table 1 clearly illustrates the finding of the previous section that resource-neutral targeting will deter non-target group agents previously cheating all the time from this behaviour, but it will not deter them from cheating some of the time. Moreover, as is shown in Table 1 for the more risk averse agent ($R=0.75$), targeting may encourage non-target group participants previously behaving truthfully all the time to commence cheating some of the time ($PVEU(I_{T1C2}) > PVU(I_{T12})$)[5].

Consequently, as suggested in Section 1, a modification to this targeting approach is required if these incentive failings are to be remedied. The first modification suggested in Section 1 was for extra monitoring resources to be spent with targeting to ensure that the increased probability of detection in the target group could be achieved without a

reduction in the probability of detection among the non-target group. In this numerical analysis this modification is equivalent to introducing targeting with $p_H = 0.8$ and $p_L = p = 0.5$. Table 2 contains details of the impact of this modification on the Base Case results. The results in Table 2 show that, as indicated in Section 1, such a modification would be able to prevent targeting enticing those non-target group agents previously behaving truthfully all the time $(R=0.75)$ to begin cheating some of the time. However, for those non-target group agents previously cheating all the time $(R=0.5)$, with targeting it remains the case that cheating some of the time is preferred.

On this basis, an alternative modification was proposed in the Introduction which remains resource-neutral, but which features a mean-penalty preserving adjustment of the monitoring/penalty parameters for the non-target group, and which aims to deter those in the non-target group who were previously cheating all the time from doing so at all in the presence of targeting. More specifically, consider an increase in ∂ from 1 to $(\partial_T = 1.25)$ which leaves the expected cost of cheating unchanged for those in the non-target group:

$$\partial p \, x \quad = \quad \partial_T \, p_L \, x \quad = \quad 9 \tag{26}$$

Table 3 contains details of the impact of this modification to resource-neutral targeting on the Base Case results. The results in this table illustrate the potential for the proposed modification to targeting to achieve a complete elimination of cheating among non-target group participants and in particular among those participants who prior to targeting were cheating all the time, and who with the previous two approaches to targeting still preferred to cheat some of the time $(R=0.5)$. Moreover, as indicated in Section 1, this elimination of the cheating incentive is not achieved by increasing either the resources expended on monitoring or the expected cost of cheating. Rather it is based on increasing

the riskiness of cheating combined with the aversion to this increase stemming from the agent's attitude to risk. More specifically, the increase in the riskiness of cheating associated with the increase in ∂ (and the decrease of p to p_L) reduces the expected utility from cheating not only all the time (see equation (12)) but even some of the time (see equation (13)), and so for a sufficient increase in this risk combined with the risk aversion of the agent, the choice of behaving truthfully all the time can be made the preferred option.

CONCLUSION

The concept of targeting in the context of monitoring/penalty systems involves separating the system's participants into a (larger) non-target and a (smaller) target group and increasing the probability of detection of those in the target group.   The aim of this paper has been to explore the potential for targeting to be used to alleviate the moral hazard problem in the context of agri-environmental schemes because it is relatively straightforward to separate participants in such schemes based on geographical location, and because of the perceived benefits of targeting specific sources of environmental damage.   The particular focus of the paper has been on the scope for using targeting to reduce the frequency of cheating among those participants in the non-target group, rather than the more straightforward case of those targeted participants.

In Section 1 of the paper an intertemporal model of an agent participating in an agri-environmental scheme was developed. Participation required the agent to take action to forego income in return for a payment, thereby creating the incentive to cheat by receiving the payment but not taking the action.   Hence, the principal uses a monitoring/penalty system to discourage cheating.   Within this model context three alternative approaches to targeting were analysed. First, a resource-neutral approach was considered whereby the extra monitoring resources needed to increase the probability of detection in the target group were taken from those used for monitoring the non-target group, thereby decreasing the probability of detection in the non-target group. It was shown in Section 1, and subsequently illustrated in the numerical analysis of Section 2, that this approach can reduce the frequency of but not eliminate cheating among those in the non-target group who cheated all the time in the absence of targeting.   Moreover,

because this approach reduces the probability of detection for those in the non-target group it was shown that those in this group, who in the absence of targeting did not cheat at all, may as a consequence of this form of targeting be enticed to cheat some of the time. Consequently, two alternative forms of targeting were considered in an attempt to eliminate these weaknesses in the first approach. The non-resource–neutral alternative involved increasing expenditure on monitoring resources in order to restore the probability of detection within the non-target group. It was shown in the numerical analysis of Section 2 how this approach could eliminate the propensity within the first approach to entice those previously not cheating at all to begin cheating some of the time in the presence of targeting. However, it was also demonstrated in Section 1 that this approach could not eliminate the preference of those previously cheating all the time to still cheat some of the time even in the presence of targeting. Therefore, the concept of a mean-penalty preserving increase in the riskiness of cheating developed in Fraser (2001b) was incorporated to create a third form of targeting. This form was specified neither to expend more monitoring resources (resource-neutral) , nor to increase the expected cost of cheating for those in the non-target group (mean-penalty preserving), but by appropriate adjustments in the monitoring/penalty parameters this approach was able to eliminate completely cheating by those participants in the non-target group. In particular, it was shown using the numerical analysis of Section 2 that by increasing the riskiness of cheating, the attraction of so doing to risk averse agents was able to be reduced to the point where behaving truthfully all the time was the preferred option.

On this basis it may be concluded that targeting has the potential to alleviate the moral hazard problem in agri-environmental schemes, but that in order to be most effective it

needs to be coupled with adjustments in the monitoring/penalty parameters which deter

risk aware agents in the non-target group from cheating.

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Table 1

Base Case Results Before and

After the Introduction of Resource-Neutral Targeting

	R	
	0.5	0.75
No Targeting		
$PVU(I_{T12})$	21.17	18.41
$PVEU(I_{C12})$	21.27	18.39
$PVEU(I_{T1C2})$	21.22	18.40
Targeting		
$PVU(I_{T12})$	21.17	18.41
$PVEU(I_{C12})$	21.41	18.45
$PVEU(I_{T1C2})$	21.56	18.54

Table 2

Comparison of Resource-Neutral and

Non-Resource-Neutral Targeting

	R	
	0.5	0.75
Resource-Neutral		
$p_L = 0.4; p_H = 0.8$		
$PVU(I_{T12})$	21.17	18.41
$PVEU(I_{C12})$	21.41	18.45
$PVEU(I_{T1C2})$	21.56	18.54
Non-Resource Neutral		
$p_L = 0.5; p_H = 0.8$		
$PVU(I_{T12})$	21.17	18.41
$PVEU(I_{C12})$	20.77	18.17
$PVEU(I_{T1C2})$	21.22	18.40

Table 3

Comparison of Resource-Neutral and

Penalty-adjusted Resource-Neutral Targeting

	R	
	0.5	0.75
<u>Resource-Neutral</u>		
$p_L = 0.4;\ \partial = 1$		
$PVU(I_{T12})$	21.17	18.41
$PVEU(I_{C12})$	21.41	18.45
$PVEU(I_{T1C2})$	21.56	18.54
<u>Penalty-Adjusted</u> <u>Non-Resource Neutral</u>		
$p_L = 0.4;\ \partial = 1.25$		
$PVU(I_{T12})$	21.17	18.41
$PVEU(I_{C12})$	20.38	17.95
$PVEU(I_{T1C2})$	21.13	18.34

ENDNOTES

[1]   For example, price-cap regulation – See Breautigam and Panzar, 1993.

[2]   Note that the analysis of targeting for agents who start in the target group is a straightforward problem to consider and is omitted in what follows. Note also that the target group will generally be a minority of participants.

[3]   Note that the alternative mixed strategy of cheating in the first period and behaving truthfully in the second yields similar findings and so for simplicity is ignored in what follows.

[4]   See Pope and Just (1991) for empirical evidence to support this assumption.

[5]   Once again, if the target group is smaller and p_H higher then this type of agent would still prefer behaving truthfully all the time to cheating all the time, but both are dominated by the mixed strategy.