The Economics of Decoupled Payments in the Presence of Cheating

Konstantinos Giannakas

Murray Fulton

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Konstantinos Giannakas is a Ph.D. candidate in the Department of Agricultural Economics, University of Saskatchewan. Murray Fulton is Director, Centre for the Study of Co-operatives and Professor, Agricultural Economics, University of Saskatchewan.

Please direct correspondence to: Konstantinos Giannakas, Dept. of Agricultural Economics, University of Saskatchewan, 51 Campus Dr., Saskatoon SK S7N 5A8.

Phone: (306) 966-4277; Fax: (306) 966-8413; E-mail: Dinos.Giannakas@usask.ca

The latest Common Agricultural Policy (CAP) reform and the 1996 Farm Bill are both characterized by the use of decoupled payments as the main means of transferring income to agricultural producers. Because of their neutrality in terms of market effects, decoupled income transfers are viewed as the appropriate policy mechanism in terms of efficiency in redistributing income to the farmers.

Implicit in the traditional analysis of decoupled income transfers to producers is the assumption that: (i) either farmers do not cheat; or (ii) enforcement is perfect and costless. However, policy enforcement requires resources. Even though the actions of the farmers are potentially perfectly observable to agricultural policy enforcers, monitoring every farmer is costly. Because of these monitoring costs agricultural policy makers find it economically optimal to under investigate.

Under investigation of farmers' actions results in imperfect enforcement, which in turn creates economic incentives for cheating. Under an area payment scheme with payments linked to past acreage, farmers may report and collect on a greater area than they actually cultivated. A recent report on the extent of cheating on subsidies in the European Union estimates the losses through fraud and lax controls in the payment of subsidies and subsidy overpayments to $4 billion per year (EU Fraud and Waste on Farm Subsidies, *117 Journal of Commerce*, 12/22/97). The extent of detected misrepresentation varies among the countries/members of the EU as well as between different areas in these countries. For the 1993 crop year, the total claims exceeded the base area in parts of Spain, Scotland and former East Germany by up to 15 per cent (Swinbank and Tanner).

The current study introduces farmer misrepresentation and cheating into the economic analysis of decoupled area payments. Policy design and implementation is modeled as a sequential (dynamic) game among a regulator who selects an area payment, an enforcement agency that enforces policy, and a representative farmer who chooses the area to cultivate and the area on which claims for subsidy payments are made. This sequential game is solved using backward induction (Kreps; Gibbons). The problem of the farmer is considered first, the payoff function of the enforcement agency is derived next, and the solution to the regulator’s problem is determined last. Different scenarios concerning the political preferences of the enforcement agency are examined within this framework.

The institutional arrangement examined in this paper involves a separation of powers between the regulator and the enforcement agency. This arrangement reflects agricultural policy making in most developed countries and certainly the EU and the US. In the EU, the Council of Agricultural Ministers decides on the transfer, and the countries/members of the EU are assigned the implementation and enforcement of the policy (Swinbank; Andersen and Eliassen). In the US, the Congress decides on agricultural policy, while the USDA implements it (Gardner 1987; Moyer and Josling).

Optimal Misrepresentation by the Representative Farmer

When an area payment is in effect, farmers may decide to misrepresent the area on which they claim payments. To model this possibility, consider a risk neutral representative farmer who is deciding whether he will cheat, and if so, by how much. Assuming the farmer knows the area payment, the penalty if he is caught cheating, and the probability of his being investigated, expected profits can be written as the sum of the profits from farming and the expected benefits from cheating. Formally, the farmer's problem can be written as:

(1) $\max_{\alpha, \alpha_m} E[\Pi] = pq(\alpha) - c(q(\alpha)) + r\alpha_h + [(1-\delta)r - \delta\rho]\alpha_m$

where p is the market price for the commodity in question; q (α) is the quantity produced as a function of the land used, α; c(•) is the cost function; α_h is the historical acreage cultivated; r is the area payment; α_m is the misrepresented area (i.e., the area reported as eligible for the payments over and above α_h); ρ is the penalty paid per unit of misrepresented and detected area; and δ is the probability that the farmer will be detected and prosecuted if he is caught cheating. The variable δ is assumed to be a linear function of the area misrepresented, i.e., $\delta = \delta_0 + \delta_1\alpha_m$. The base detection probability, δ_0, is function of the resources spend by the program enforcement agency in auditing farmers. The parameter δ_1 is assumed to be strictly positive and exogenous to agricultural policy makers.

The first order conditions (F.O.C.) for the problem outlined above are:

(2) $\dfrac{\partial E[\Pi]}{\partial \alpha} = 0 \Rightarrow p\dfrac{\partial q(\alpha)}{\partial \alpha} = c'(\alpha)$

(3) $\dfrac{\partial E[\Pi]}{\partial \alpha_m} = 0 \Rightarrow \dfrac{r}{r+\rho} = \delta_0 + 2\delta_1\alpha_m$

Equation (2) shows that optimal land use involves equating the marginal value product of land with its marginal cost. The decoupled nature of the program means that the area payment, r, does not affect land use.

Equation (3) shows the determination of the quantity of land to report as eligible for payment over and above the historical acreage cultivated. The optimal α_m is determined by equating $\dfrac{r}{r+\rho}$ with $\delta_0 + 2\delta_1\alpha_m$. The ratio $\dfrac{r}{r+\rho}$ is the ratio of the marginal benefits in case cheating goes undetected over the opportunity cost in case the farmer is caught cheating, while $\delta_0 + 2\delta_1\alpha_m$ is the marginal penalized area (mpa). The mpa shows the change in the area that is expected to be penalized for a change in the area misrepresented.

Solving equation (3) for α_m gives the representative farmer's best response to the policy variable and enforcement parameters, i.e.,

$$(4) \qquad \alpha_m = \frac{r - \delta_0(r+\rho)}{2\delta_1(r+\rho)}$$

The variable α_m will be positive whenever δ_0 is less than a critical value $\delta_0^{nc} = \frac{r}{r+\rho}$, where nc stands for no cheating. The aggregate area misrepresented by N representative farmers, A_m, is:

$$(5) \qquad A_m = N\alpha_m = \frac{r - \delta_0(r+\rho)}{2\delta_1'(r+\rho)} \qquad \text{where } \delta_1' = \frac{\delta_1}{N}.$$

Under an area payment scheme, farmers receive a payment r on historical acreage A_h. In addition, they receive an expected benefit from misrepresenting their eligible area, $E[B_c] = [r - \delta(r+\rho)]A_m$. Expected producer transfer, PT, is thus $rA_h + E[B_c]$. These benefits to producers come at the expense of taxpayers. Taxpayer costs equal $(1+d)\{rA_h + [r - \delta(r+\rho)]A_m + \Phi(\delta_0)\}$ where d is the marginal welfare loss from taxation (Ballard and Fullerton), and $\Phi(\delta_0)$ are the resource costs of monitoring. Note that taxpayer costs can be written as $(1+d)[PT + \Phi(\delta_0)]$. The cost $\Phi(\delta_0)$ is assumed to be an increasing function of δ_0 (i.e., $\Phi'(\delta_0) \geq 0$, $\Phi''(\delta_0) \geq 0$). The net social costs of the program equal $d\{rA_h + [r - \delta(r+\rho)]A_m\} + (1+d)\Phi(\delta_0)$.

Optimal Enforcement by the Enforcement Agency

Equation (5) indicates that farmer misrepresentation depends on the choices made by the agencies responsible for policy design and implementation. This section examines the problem of program enforcers in a decentralized policy setting. The problem of the enforcement agency is to determine the degree to which the area payment scheme designed by the policy regulator is enforced, knowing exactly how its decisions will affect the behavior and welfare of farmers.

The degree to which the area payment scheme is enforced is determined by the variables δ_0 and ρ. Penalties on detected misrepresentation (ρ) are generally exogenous to agricultural policy makers, since they are determined elsewhere in the legal system. As a consequence, the enforcement agency is assumed to take ρ as given when choosing δ_0 to achieve a desired level of enforcement. Specifically, the enforcement agency's problem is:

$$
\begin{aligned}
&\max_{\delta_0} W = \theta PS + TS = \\
(6) \qquad &= \theta\left\{pQ(A) - c(A) + rA_h + \left[(1-\delta)r - \delta\rho\right]A_m\right\} - \\
&- (1+d)\left\{rA_h + \left[(1-\delta)r - \delta\rho\right]A_m + \Phi\left(\delta_0\right)\right\}
\end{aligned}
$$

where PS and TS stand for producer surplus and taxpayer surplus, respectively, and θ is the weight attached to producer surplus.[1] All other variables are as previously defined.

Assuming $\Phi(\delta_0) = \frac{1}{2}\psi\delta_0^2$ (where ψ is a strictly positive scalar depending on things like the agrarian structure and the number of representative farmers), the F.O.C. for the problem is:

$$
(7) \qquad \frac{\partial W}{\partial \delta_0} = 0 \Rightarrow (1+d)\Phi'(\delta_0) = \left[(1+d) - \theta\right]\left[\frac{r}{2\delta_1'} - \frac{r+\rho}{2\delta_1'}\delta_0\right]
$$

[1]Due to the decoupled nature of the transfer through cheating, the well-being of consumers is not affected by farmer misrepresentation.

Equation (7) indicates that the optimal δ_0 is determined by equating the marginal monitoring costs (MCe) with the marginal benefits from enforcement (MBe), where MCe $= (1+d)\psi\delta_0$ and MBe $= \left[(1+d)-\theta\right]\dfrac{r-\delta_0(r+\rho)}{2\delta_1'}$. The term MBe includes the penalties collected on detected cheating and the benefits from induced honesty.

For a variety of reasons, different policy enforcers may place different weights on producer welfare and program costs when enforcing policies. In the model that follows, three different weights on producer welfare are examined – a high weight ($\theta=\theta^H$, where $\theta^H \geq 1+d$), a low weight ($\theta=\theta^L$, where $\theta^L \in (0, 1+d)$) , and no weight ($\theta=\theta^0=0$). Substituting these values into the F.O.C. and solving for δ_0 gives the policy enforcer's optimal δ_0 as a function of the area payment chosen by the regulator for the three values of θ, i.e.,

$$(8) \qquad \delta_0^{\theta^0} = \frac{r}{r+\rho+2\delta_1'\psi}; \qquad \delta_0^{\theta^L} = \frac{\left[(1+d)-\theta\right]r}{\left[(1+d)-\theta\right](r+\rho)+(1+d)\,2\delta_1'\psi}; \qquad \delta_0^{\theta^H} = 0$$

where the superscript denotes the weight placed by the enforcement agency on producer welfare. Equation (8) indicates that, whenever there are positive resource costs of monitoring (i.e., $\psi>0$), enforcement will be incomplete, i.e., δ_0 will always be smaller than the detection probability that completely deters cheating, δ_0^{nc}.

The optimal choices of δ_0 for the different values of θ can be determined graphically by the intersection of the MCe curve and the MBe curve when these are graphed as a function of δ_0. The MCe is given by the solid upward sloping curve in Figure 1. When $\theta=0$, the MBe curve is the solid downward sloping curve. Increases in θ cause a leftward rotation of the MBe curve through δ_0^{nc}, where δ_0^{nc} is given by the intersection of the MBe curve and the horizontal axis.

For $\theta \in (0, 1+d)$, the MBe curve always falls between the solid MBe curve and the horizontal axis (when θ=1+d, the MBe curve lies on the horizontal axis). Therefore, whenever θ is less than the marginal cost of public funds, the variable δ_0 will always be positive and policy makers will actively spend resources in investigating farmer misrepresentation. When θ >1+d, the MBe curve has a positive slope and lies below the horizontal axis. Thus, δ_0 is zero.

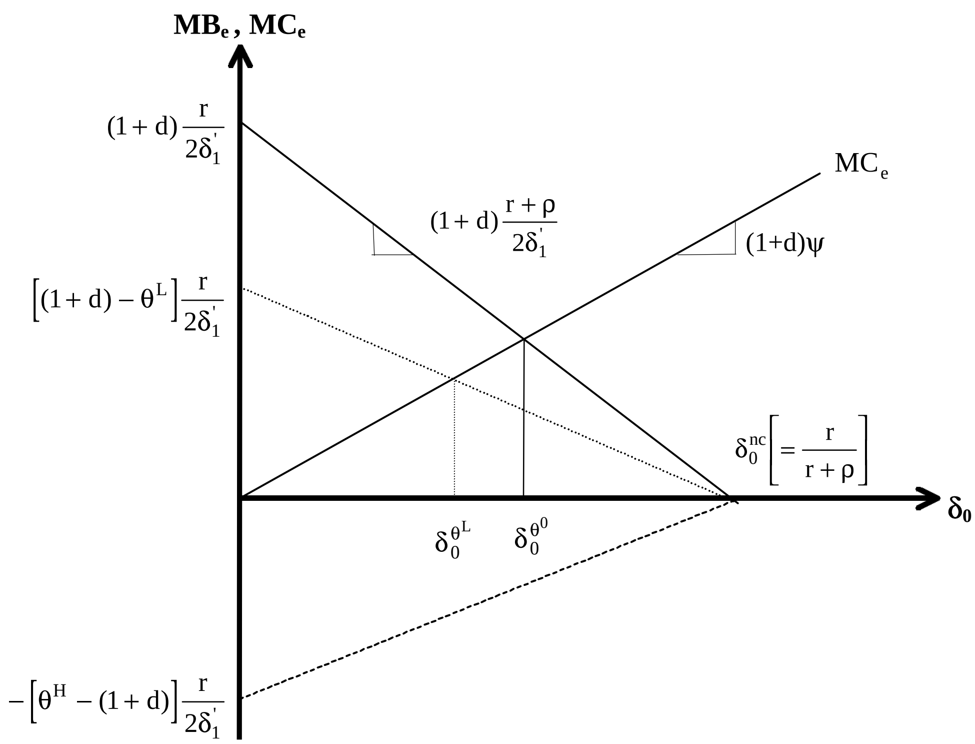

Figure 1. Optimal Enforcement of Decoupled Area Payments

Since program enforcement falls with an increase in the weight placed by policy enforcers on producer welfare, optimal area misrepresentation increases with θ. Mathematically, A_m is derived by substituting the appropriate δ_0 into the farmers' reaction function in equation (5), i.e.,

$$(9)\quad A_m^{\theta^0} = \frac{\psi r}{(r+\rho)(r+\rho+2\delta_1^{'}\psi)}\,;\; A_m^{\theta^L} = \frac{(1+d)\psi r}{(r+\rho)\left[(1+d)\,(r+\rho+2\delta_1^{'}\psi)-\theta\,(r+\rho)\right]}\,;\, A_m^{\theta^H} = \frac{r}{2\delta_1^{'}(r+\rho)}$$

Regulator and Optimal Intervention

Now consider the case of a regulatory agency that desires to make a given expected transfer, PT, from taxpayers to producers of a commodity. Considering that total producer benefits from a decoupled area payment equal $PT = rA_h + \left[r - \left(\delta_0 + \delta_1^{'}A_m\right)(r+\rho)\right]A_m$, the problem of the regulator is to determine the area payment that achieves the desired income redistribution. When enforcement is perfect and costless, the determination of the optimal r calls for a simple division of the desired transfer PT over the base area A_h. However, when monitoring farmers is costly, enforcement is imperfect and area misrepresentation occurs. To make an expected transfer of PT, the regulator must decide on r knowing exactly how her choice affects the equilibrium amount of enforcement and cheating. Mathematically, the regulator chooses r knowing the reaction of farmers and enforcers as given in equations (8) and (9).

For any given area payment, r, enforcement decreases and area misrepresentation increases with an increase in the weight placed by the enforcement agency on producer welfare (i.e., $\delta_0^{\theta^0} > \delta_0^{\theta^L} > \delta_0^{\theta^H}$ and $A_m^{\theta^0} < A_m^{\theta^L} < A_m^{\theta^H}$). The result is that the expected transfer to producers increases with θ. Therefore, the area payment required to make an expected transfer of PT to producers falls as θ increases. Therefore, it always holds that $r^{\theta^0} > r^{\theta^L} > r^{\theta^H}$, where r^{θ^0}, r^{θ^L}, and r^{θ^H} are the area payments required to make an expected transfer of PT to producers under values of θ equal to θ^0, θ^L, and θ^H, respectively.

Efficiency in Redistribution and Total Transfer

When enforcement is perfect and costless, decoupled payments are completely efficient in transferring income to producers if d equals zero. Put in the context of the standard policy analysis framework, the slope of the surplus transformation curve (STC), s, equals $\frac{\partial PS/\partial r}{\partial TS/\partial r} = \frac{\partial PS}{\partial TS} = -1$ when d = 0 (Gardner 1983). When d is positive, decoupled payments are never fully efficient; the slope of the STC equals $s_1 = -\frac{1}{1+d}$ (Alston and Hurd). The STC for the case of decoupled payments when enforcement is perfect and costless is shown as STC_1 in Figure 2.

Consider now the case where enforcement is costly and therefore, imperfect. For a given surplus transfer from taxpayers to producers, the resource costs associated with any positive δ_0 have to be added to the taxpayers' costs. The slopes of the STCs for $\theta=\theta^0$, $\theta=\theta^L$ and $\theta=\theta^H$ are given as:

$$(10)\quad s^{\theta^0} = -\frac{\partial PS}{(1+d)\left[\partial PS + \partial\Phi(\delta_0^{\theta^0})\right]};\ \ s^{\theta^L} = -\frac{\partial PS}{(1+d)\left[\partial PS + \partial\Phi(\delta_0^{\theta^L})\right]};\ \ s^{\theta^H} = -\frac{\partial PS}{(1+d)\partial PS}$$

respectively, where ∂PS represents the desired increase in producer welfare and $(1+d)[\partial PS+\partial\Phi(\delta_0)]$ the reduction in taxpayer surplus due to income redistribution. Since $\Phi(\delta_0)$ is an increasing function of δ_0, taxpayer costs decrease and the transfer efficiency of the policy instrument increases with an increase in θ. Thus, $|s^{\theta^0}| < |s^{\theta^L}| < |s^{\theta^H}| = |s_1|$. Graphically, STC^{θ^0} lies under STC^{θ^L} which, in turn, lies under STC^{θ^H} everywhere to the left of E in Figure 2. Curve STC^{θ^H} coincides with STC_1. For any given transfer to producers, the horizontal distance between the STCs reflects the difference in monitoring and enforcement costs under the different scenarios. Since the optimal δ_0 under θ^0 and θ^L increases with an increase in r, the greater is the transfer to producers (i.e., the further left from E we move), the greater is the horizontal distance between the STCs.

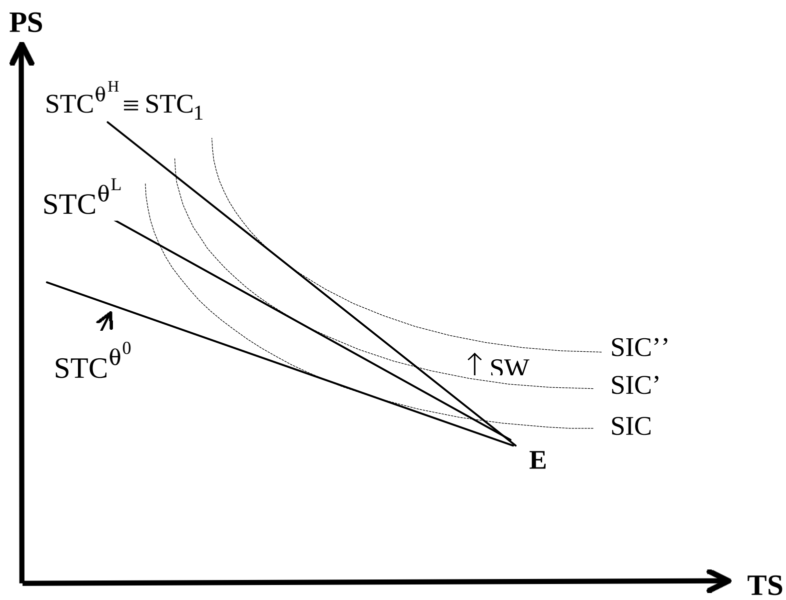

Figure 2. STCs for Decoupled Area Payments under Costly Enforcement

The value of s is crucial in determining the socially optimal total transfer to producers. For instance, suppose the problem of the regulator is the determination of the income redistribution that maximizes some social welfare function (SWF) and that the political preferences of the regulator result in social indifference curves (SIC) similar to those presented in Figure 2. The value of SWF increases with a northeast shift of the SIC. In such a case, the greater is the weight placed by the enforcement agency on producer welfare, the greater is the transfer efficiency of the program. The greater is the marginal efficiency of decoupled area payments in redistributing income, the greater are the total transfers to producers and the social welfare from intervention.

Concluding Remarks

Cheating on farm programs has been traditionally assumed away from agricultural policy analysis. The assumption of perfect and costless enforcement of farm programs is implicit in the traditional analysis and, to the extent that it is realistic, justifies the negligence of cheating. Investigating farmers to detect cheating is, however, costly. The resource costs of monitoring result in enforcement that is always incomplete, which in turn generates economic incentives for farmers to cheat.

The analysis in this paper shows that the weight placed by policy enforcers on farmers' welfare is crucial in determining the enforcement that is carried out, which in turn affects the misrepresentation that occurs and the subsidy payments that are made. Since area misrepresentation results in gains for producers and losses for taxpayers, the more important are producers in the objective function of the enforcement agency, the lower is the equilibrium amount of enforcement and the greater is the area that is over-reported. Reduced enforcement and increased misrepresentation result in increased benefits from cheating. The greater are the benefits from cheating, the lower is the area payment that achieves a given surplus transfer to producers.

The transfer efficiency of decoupled area payments is maximized when policy enforcers place a relatively high weight on producers. In such a case, the efficiency of the policy instrument is equal to that derived in the traditional analysis under perfect and costless program enforcement. One important implication of this result is that the efficiency of decoupled payments in transferring income to agricultural producers might be less than is traditionally believed; the marginal cost to consumers/taxpayers of transferring another dollar to producers can exceed (1+d). This will occur if the enforcement agency attaches a relatively low weight to the welfare of producers and/or when the enforcement agency is concerned solely with minimizing taxpayer cost.

The results of this paper can assist in explaining the different levels of compliance observed in different areas/countries. Differences in the structure of the agricultural sector and the efficiency of institutions could account for differences in enforcement costs. Obviously, the greater is the number of farmers and the more dispersed are the farms, the greater are the monitoring costs (the parameter ψ in this model). Increased enforcement costs mean less detection and more cheating. Moreover, the greater is the proportion of farm population, and/or the greater is the (perceived) difference between farm and non-farm incomes, and/or the greater is the contribution of agriculture to the GDP of an area/country, the more important the sector is expected to be. Increased weight on producers (i.e., a larger θ) is translated into less enforcement and more cheating. An empirical examination of the relationship between observed program cheating in EU countries, for instance, and the structural characteristics identified above would shed light on the factors determining cheating.

The objective of this paper has been to introduce costly enforcement and cheating into the economic analysis of decoupled area payments. Morality and culture, though significant determinants of individual farmer’s behavior, are not incorporated into this analysis. Extensions of the model to account for producer heterogeneity and culture could provide valuable insights for further explaining discrepancies in terms of policy compliance observed between different areas/countries. Finally, empirical analysis of cheating, though demanding in terms of quality data, could make the analysis of the policy instrument under costly enforcement more useful in practical policy settings.

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