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Review

# The impact of decoupled payments on farm choices: Conceptual and methodological challenges

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ABSTRACT

In this paper we review the methodological framework for analysing decoupled payments in models of agricultural production. Market and technological uncertainty, farm efficiency, credit constraints, farm household choices involving extra-agricultural decisions, policy uncertainty and long-run impact of decoupling on investment and land values are the relevant issues that should be pursued by methodological and empirical analysis. Future research should refine the analysis of decoupled payments, mainly trying to provide results that can be useful for policy simulation, to bridge the gap between analysis at the individual level and sector policy models.



## Introduction and motivation

In recent years, the most relevant innovation in terms of farm income support tools has been the introduction of decoupled payments by both the US, with the 1996 Federal Agriculture Improvement and Reform (FAIR) Act, and the European Union (EU), with the 2003 Fischler reform of the Common Agricultural Policy (CAP). This has led to a radical change in the composition of the OECD Producer Support Equivalent (PSE) measure. For example, in the case of EU farmers, while in the 1980s market support measures accounted for around 90% of the PSE, in 2008–2010 their share has decreased to around 24%. The remaining 76% is made of other payments, in which the decoupled Single Farm Payment (SFP) takes the largest share (more than 41% of the total PSE). A similar pattern can be seen for the US : the support based on commodity output have dropped from about 45% in the 1980s to the current 10% (2008–2010 average), while payments not linked to production or commodity criteria account for more than 41% of the total PSE. In October 2011 the European Commission has presented a set of legislative proposals for the future of the CAP after 2013 (European Commission, 2011): although the political negotiation may lead to rather different outcomes, it is reasonably certain that, in the near future, decoupled direct payments will still play a central role, although likely redesigned (through, for example, their redistribution among beneficiaries and the linkage to stronger environmental constraints).

Since their introduction, the central research issue concerning decoupled payments has always been whether or not they have an impact on farm choices, and eventually the size of this impact, since the underlying idea of decoupling is the use of support tools having no market distorting effects. This has important political consequences, since both the EU and the US policy makers tend to consider their payments as "green-box" tools, which in the current World Trade Organization (WTO) discipline imply an exemption from any domestic support reduction commitment.

The difficulties in empirically addressing this fundamental issue are clearly shown by the first wave of studies on decoupling. Since the announcement of the introduction of the SFP (which became operational in 2005), all large partial and general equilibrium models routinely used for policy analysis have been adapted for simulating the impact of the "decoupling" scenario in EU agriculture, as opposed to a counterfactual scenario of continuation of the previous "partially coupled" policies. A review of these studies is available in Balkhausen et al. (2008) and Gohin (2006), where it is clear that simulation results are rather sensitive to the hypotheses made by modellers on the "degree of decoupling" of the new SFP, and also that these hypotheses are essentially represented by an arbitrary (implicit or explicit) "coupling factor" attached to the SFP.

The fact that most simulation models are forced to use an arbitrary coupling factor is clearly a signal of the complexities involved in modelling explicitly the potential output effect of decoupled payments. The conceptual paper written by the OECD (2001) already analysed some of the possible mechanisms that may generate output and trade effects of decoupled payments. Two of these mechanisms are analysed in detail in that paper: the risk related effects and the dynamic effects involving investment decisions

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and expectations on future policies. However, decoupled payments may affect other key variables concerning the farm decision-making behaviour (i.e. labour/leisure choices, on-farm and off-farm labour allocation, financial constraints, land values, entry–exit decisions, technical efficiency).

In recent years, all these possible linkages have been addressed by the empirical literature. The purpose of this paper is to review these studies, discussing the features of the conceptual models that are behind the analysis of decoupled payments, their empirical implementation and their results. The objective of this review is to draw some implications for future research on this key policy modelling problem.

A common element to most of these studies is that they rely almost exclusively on case studies analysed with farm level data; certainly, the use of individual data poses the problem of aggregating individual responses, so to provide usable information for policy simulation models. Another common element of the studies is that they often analyse specific details of how such payments are designed. This is another key issue: the same decoupled tool may have a totally different impact on farm choices depending on details like eligibility criteria, timing, transferability and so on. Finally, another common feature is that most of these studies (at least those referring to the EU policy) are based on data preceding the introduction of the SFP. Thus, they typically run simulations using data/parameters referring to a totally different policy environment, requiring at least some caution in interpreting the results.

The paper is organised as follows. The next section analyses the studies on decoupled payments based on the fundamental assumptions of their reference model: we start with a simple static model of profit maximisation with no uncertainty and then we introduce further elements of complexity, such as risk, credit constraints, farm efficiency, entry/exit decisions, land and labour allocation choices. This section concludes with the analysis of dynamic models, focusing on long term investment decisions and expectations on future policies. The following section addresses the empirical issues, focusing both on the data problems as well as on their econometric treatment. The final section concludes, drawing the major implications for the future research agenda.

## A stylised model of decoupling

### *The static model with no uncertainty and/or risk neutrality*

We start from the simple short-run analysis of agricultural production decisions in a static environment by price-taking farmers. Profit maximisation has been taken for a long time as the reference framework for analysing farmer's behaviour and the impact of policy instruments. The farmer's problem may be written as:

$$\max_x \quad \pi = pq - wx + G \qquad \text{s.t.} \quad (q, x, z, l) \in T \tag{1}$$

where farm's profits $\pi$ are maximised given technology $(q, x, z, l) \in T$, $q$ are outputs, $x$ are variable inputs, $p$ and $w$ are output and input prices, respectively, $z$ are fixed and/or quasi-fixed inputs, $T$ is technology and $G$ stands for a generic form of government support. Under this formulation, a standard result is that agricultural policy instruments may affect farm's output only if their amount is coupled to production choices, that is if $G \equiv G(x)$, so that government support may influence production decisions at the margin (i.e. through the First Order Conditions (FOCs)); in this framework, decoupled instruments cannot display any impact on farmer's choices as long as $\partial G/\partial x_i = 0$.

The above framework is very simplified, since agricultural production is largely characterised as being a risky business, with market risk (i.e. price risk) and technological risk (i.e. output risk) as distinctive features. Nonetheless, in many modelling efforts uncertainty has often been treated in a simplified way, if at all. Under risk neutrality, farmers maximise expected profits, while riskiness (i.e. profit variability) does not matter. Given a single output technology, with production function $q = q(x, z, l)$, and output price risk only, with distribution $p \sim (\bar{p}, \sigma_p^2)$, the risk-neutral farmer's maximisation problem is:

$$\max_x \quad E(\pi) = E(pq - wx + G) = \bar{p}q - wx + G \tag{2}$$

and the only additional issue is that of modelling price expectations $\bar{p}$ (which may be based on naive and adaptive expectations, rational expectations, futures contracts). Even by adding output risk, with $q \sim (\bar{q}, \sigma_q^2)$, and assuming that $\text{cov}(p, q) = 0$,[1] the producer's problem is:

$$\max_x E(\pi) = E(pq - wx + G) = \bar{p}\bar{q} - wx + E(G) \tag{3}$$

thus maintaining the implications for government support of the certainty model.

Empirically, a tractable specification of this model can be retrieved by resorting to either the primal approach or the dual approach, leading to a system of equations producing information on (variable) input demands and output supplies. Estimating the model with available data (time-series data, cross-section data, panel data, unbalanced panel data, pseudo-panel data) at different levels of aggregation (aggregate or individual data, different levels of output and/or input aggregation), will then provide valuable information (i.e. input demand and output supply elasticities) that can be employed in policy simulation models (either partial or general equilibrium models).

The primal approach requires to specify a functional form for the production function and then to estimate it jointly with the FOCs; a possible endogeneity issue for inputs arises in estimation, but methods are available to circumvent the problem.[2] Attention must be paid to the specification of the production function, where flexible specifications (such as the translog) can be employed.[3]

Under the dual approach, we first derive a dual representation of the technology. For example, we may start by specifying the profit function:

$$\pi(p, w, z, l, G) \equiv \max_x \{pq - wx + G\} \tag{4}$$

where the maximised value of the objective function (i.e. profits) does not depend directly on choice variables (i.e. variable inputs), but only on (exogenous) prices, fixed and/or quasi-fixed inputs, and policy instruments. However, if government support is fully decoupled (i.e. it does not enter the FOCs) then also the dual profit function will not depend on $G$, i.e. $\pi(p, w, z, l)$. Empirically, a (flexible) functional form is assumed to represent the profit function and then an explicit specification of the output supply and input demand functions is derived, using derivative properties.

An alternative dual representation of technology is the cost function:

$$C(q, w, z) \equiv \min_x \{wx : (q, x, z, l) \in T\} \tag{5}$$

[1] Market equilibrium should imply that market risk and technological risk are not independent. However, with farm data, this assumption can be considered acceptable (Serra et al., 2006) and is actually commonly employed in many empirical studies.

[2] Instrumental variable methods, such as 3SLS, or GMM (see Ooms and Peerlings, 2005).

[3] For example, to represent a stochastic technology a commonly used specification is that proposed by Just and Pope (1978): output $q$ is modelled as $q = q(x, z, l) + h(x, z, l)\varepsilon$, where $\varepsilon$ is a stochastic term. This specification is largely employed in empirical studies, and usually parameterized by resorting to quadratic functional forms. The stochastic part allows inputs to be risk-increasing or risk decreasing, according to the sign of $\partial h^2/\partial x_i$.