

Studies investigating economic, agricultural-economic and demographic factors influencing land use dynamics

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ABSTRACT

In this paper, we review studies investigating economic, agricultural-economic and demographic factors influencing land use dynamics, making special emphasis on the policy framework in the European Union. We find several conclusions, among which the following should be emphasized. First, this review highlights the existence of different methodologies to build up models to identify the effects of policy reforms affecting land use and desertification. Second, use of micro data to set up an econometric-process simulation model of land use has already been used with success. Third, in the geographical distribution of land use, prices drive all short and long-run processes. Finally, logistic models have recently been used to study micro decisions at the agricultural sector to identify relative rents and land characteristics such as location and soil fertility as main determinants of land use patterns.

INTRODUCTION

Agricultural studies have traditionally been concerned with issues pivotal in order to identify the effects of policy reforms affecting land use and desertification. For this reason, any assessment of the different scenarios of desertification impact based on forecasts of demographic and economic growth and their associated land claims must look at the studies investigating economic, agricultural-economic and demographic factors influencing land use dynamics. In this paper, we review the more recent contributions to this literature, making special emphasis on the policy framework in the European Union. First, we evaluate the recent development of three main streams of research on supply responses in Agricultural Economics. In the first one, using the **conventional economic approach to agricultural supply**, estimates have been provided on the response, in the form of estimated elasticities of agricultural output at crop level, to relative changes in prices and other economic and demographic factors. The second line of research has focused on the **factors influencing land prices and the speed of transformation of agricultural land into other uses**. Finally, we comment on the **recent developments in the analysis of crop choice**.

ESTIMATED ELASTICITIES OF AGRICULTURAL OUTPUT AT CROP LEVEL

The literature on aggregate supply responses to prices has a long tradition in Agricultural Economics. Early empirical analysis using aggregate time series data report low values for the estimate of the short-run supply elasticity. In addition, the supply response appears to be dependent on lagged values for output and thus, the elasticity would depend on the length of

run. It has been argued that these findings reflect a constraint optimization and could be interpreted as evidence of adaptive expectations and partial adjustment.¹

More recently, several studies have provided estimates of aggregate supply functions which were embedded in a system of equations with explicit modeling of variables as endogenous and exogenous. These studies show that output responds following endogenous slow dynamics. Price response is not necessarily the main supply adaptor in agriculture. In this respect, there has been an increasing number of studies focusing on wealth effects in agricultural supply. A study of US acreage responses by Chavas and Holt (1990) incorporated wealth into their model and found that both wealth and risk perceptions were important determinants of acreage allocation decisions for corn and soybeans. Their estimated responses of plantings to changes in wealth were more than half those of the responses to direct price changes for each crop. For example, a one per cent increase in a farmer's wealth results in a 0.27 per cent increase in the area planted to soybeans. In their study of white beans, corn, soybeans and winter wheat in Canada, von Massow and Weersink (1993) found that wealth and risk variables were important in explaining variability in plantings, but the effects of both were relatively small. Hennessy (1998) concluded that the wealth and insurance effects of many support programs increased input levels 'even for supposedly decoupled programs'.

LAND PRICES AND THE SPEED OF TRANSFORMATION OF AGRICULTURAL LAND

A recent survey of the international literature on land prices modeling can be found in Le Mouel (2004). Most recent papers modeling prices distinguish between fundamental and non-fundamental variables influencing land prices.

The paper by Falk and Lee (1998) proposed an approach to decompose farmland price series into movements attributable to fundamental factors (i.e., factors that influence the time paths of rents and interest rates) and movements attributable to nonfundamental factors (e.g., speculative behavior)². Falk and Lee found that nonfundamental shocks appear to play an important role in explaining the short-run behavior of farmland prices. In the long-run however, farmland prices are mostly explained by permanent fundamental shocks. Thus, they concluded that deviations of farmland prices from predictions of the present value model are important in the short-run but not in the long-run. Furthermore, the short-run deviations appear to be a combination of overreactions to temporary fundamental shocks and reactions to nonfundamental factors.

In line with the underlying idea of Falk and Lee, a number of studies proposed to decompose farmland price movements into a market-driven fundamental price and a speculative nonfundamental price, with the latter allowed to exhibit differentiated dynamic behaviours. A general regime-switching model that may nest many types of speculative behaviours as special cases can thus be estimated in order to test which speculative behaviour prevailed according to the data used. Such an approach, together with a review of previous similar studies, was used by Roche and McQuinn (2001) in order to test for the presence of speculative behaviours in Irish agricultural land prices.

In the literature on agricultural productivity, applied work with US data by Moss et al. (2002) includes, among other factors influencing agricultural productivity, variables capturing the urban sprawl. That is an interesting perspective because it allows to model the interactions of the spatial variation in price land values and the urban pressures. More recently, a paper

¹ Diebold and Lamb (1997) argue that part of the large variation of the estimates of the response of agricultural supply to movements in expected price may be due to at least in part, to the statistical properties of the estimator of the Nerlove model of agricultural supply response.

² The approach is then applied to annual Iowa farmland prices (over the 1922-94 period)

studying the Spanish case, includes not only fundamental variables but also non-agricultural factor (including housing prices) affecting the agricultural land prices (Decimavilla, C., et al. 2005). Using a panel of micro data the paper describes the agricultural land price to identify the explanatory variables. The key variables in the panel data model to explain land price are location and expected farm rents as fundamentals and housing prices and increases in the irrigated area as non fundamentals dependent variables. Demographic growth is also a relevant explanatory variable in the regions.

In summary, two interesting conclusions can be driven: The non-fundamental dependant variables identified are not only related with population pressures but mainly with the housing rise of prices which generates revaluations expectative in the landlords selling parcels. Moreover, in the tourist developing areas the agricultural land prices overshoot during the recent expansive cycle (“the housing burble”) of the building side sector (e.g. the Canary Islands, the Mediterranean costal areas). Finally, different price slopes are also related with regional and county specialization. Export oriented counties tend to suffer larger price increases, specially after the EU single-market enforcement and the consequent boost in fruits and vegetables exports to North European markets. We find several **concluding remarks**, among which the following should be emphasized. **First**, this review highlights the existence of different methodologies to build up models to identify the effects of policy reforms affecting land use and desertification. **Second**, use of micro data to set up an econometric-process simulation model of land use has already been used with success. **Third**, in the geographical distribution of land use, prices drive all short and long-run processes. Presently we are developing a micro model, base on accounting farm data, to assess desertification in Italy, Spain and Portugal under the Desurvey integrated project (VI European Framework).

REFERENCES

- ❖ Chavas, J. and Holt, M.T. 1990, ‘Acreage decisions under risk: the case of corn and soybeans’, *American Journal of Agricultural Economics*,72: 529–38.
- ❖ Decimavilla, C., San Juan C., and Sperlich, S. 2005, ‘Precio de la Tierra con Presión Urbana: Un Modelo para España’. *Economía Agraria y Recursos Naturales*, (2008) 1 (8), pp. 3-20. ISSN 1578-0732
- ❖ Falk, B. y Lee, B.S. (1998), “Fads versus Fundamentals in Farmland Prices”, *American Journal of Agricultural Economics*, 80: 696-707.
- ❖ Diebold, F. X. and R. L. Lamb, 1997, ‘Why are estimates of agricultural supply response so variable?’ *Journal of Econometrics* 76:357-373.
- ❖ Hennessy, D.A. 1998, ‘The production effects of agricultural income support policies under uncertainty’, *American Journal of Agricultural Economics*,80: 46–57.
- ❖ Le Mouel, Ch. (2004): “Agricultural Land Markets: Main Issues in the Recent Literature”, *Working Paper Series n° 2 of the IDEMA Project*
- ❖ Roche, M.J. y McQuinn, K. (2001): “Testing for Speculation in Agricultural Land in Ireland”, *European Review of Agricultural Economics*, 85: 95-115.
- ❖ von Massow, M. and Weersink, A. 1993, ‘Acreage response to government stabilization programs in Ontario’, *Canadian Journal of Agricultural Economics*,41:13–26