Farmland Use Transitions After the CAP Greening: a Preliminary Analysis Using Markov Chains Approach

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Abstract

This paper represents a preliminary attempt to evaluate ex-post impact of the CAP greening payment on farmland use changes. Unlike previous contributions, relying on ex-ante simulations, our analysis is based on the actual behaviour of farmers over the period immediately after the last CAP reform. Such ex-post assessment was based on real georeferenced data on farmland allocation, collected in the Lombardy Region, in Northern Italy, over the period 2010-2016.On this ground, we pointed our attention on analysing at a very detailed (parcel) level the temporal and spatial dynamics of farmland use transitions before and after the introduction of greening commitments. Our contribution aims to highlight whether discontinuities in agricultural land use emerged after the last CAP Reform. To do that we developed a spatial statistical model based on the use of Markov Chains to analyse land use change in the Lombardy Region in the last years.

Our statistical model exploits parcel-level georeferenced data of Lombardy region over the period 2010- 2016. We based our analysis on a dataset of about 2 millions of land parcels in Lombardy, of which we registered the barycentre of the parcel shape, in GIS coordinates, its extension in hectares and the (main) type of crops over the period 2010-2016. Crop typologies have been aggregated into 23 different categories, in order to reduce the complexity of the analysis.

The system has been modelled as a Markov chain, where each land unit (hectare, group of hectares, or parcel, depending on the spatial scale at which we work) evolves, from one year to the other, into one of the 23 cultivation classes. Our aim was to check if any statistically significant change in the transition probabilities and/or in the spatial distribution of the 23 cultivation categories, took place after the introduction of greening (that is between 2014 and 2015).

As a final output, we computed the Gini index to measure the heterogeneity of cultivations and the transition probabilities for the cultivation classes, which resulted significant to applied statistical tests. Each quantity was computed in a rectangular grid overlapped to our geographical region of interest, In this way we can visualise the zones of Lombardy which have mainly been affected by the greening policy.

Preliminary results shows that for certain crops the spatial heterogeneity and probability of transition increased after the introduction of greening. Such evidence is particularly relevant for maize (all the uses), other cereals and soybean. Pointing our attention to maize, we can observe that after the introduction of greening the red zone (the core of maize monoculture in Lombardy) has been partly "eroded", introducing more variability in the crop rotation. Furthermore these preliminary results seem to be consistent with those of previous ex-ante evaluations on the same area, conducted by a PMP methodology (Cortignani et al., 2017; Solazzo and Pierangeli, 2016; Solazzo et al., 2016).

Keywords: Common Agricultural Policy, Greening, Crop diversification, Markov chains, Spatial analysis

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