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On why and how agriculture declines
Evidence from the Italian post-WWII experience

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ABSTRACT

This article proposes an empirical model to investigate the long-run decline of the agricultural sector during economic growth. Within a two-sector representation of open regional economies, agricultural decline eventually results from the interaction of few underlying driving forces acting on both the supply and demand sides of the economy. From this theoretical framework an estimable simultaneous equation model is specified as a panel SVAR model. Identification and estimation are performed according to the theoretical restrictions. The application concerns the Italian regions over the period 1952–2002. Estimation results highlight the relevance of the different driving forces as well as their interplay in shaping agricultural decline.

1. Introduction

This paper proposes an empirical approach to analyze the drivers of agricultural decline during economic growth. Eventually, all the causes of decline put forward by the literature converge in three fundamental driving forces: change in the terms of trade (or relative price) of agricultural products; differential sectoral technical change and factor productivity growth rates; change in factor endowment, i.e., of capital and land intensity (*per* unit of labour). In fact, these driving forces are the final outcome of complex adjustments to new equilibria. They always concur in determining agricultural decline and may either reinforce or offset according to the specific circumstances. In practice, the main difficulty in identifying and estimating these forces as separate effects consists in their simultaneity, or interdependence. While from a theoretical perspective, this simultaneity means to represent this long-term process within a General Equilibrium (GE) framework, empirically the main challenge is how to properly specify, identify and estimate a system of dynamic simultaneous equations.

The present paper aims at empirically disentangling the contribution of these driving forces to agricultural decline in the case of the post-WWII (1951–2002 period) heterogeneous experience of Italian regions. This specific historical experience is particularly suitable here because over these 50 years the whole process of agricultural decline can be observed across a range of diverse conditions: going from the stage of underdeveloped and subsistence agrarian economies (Italian Southern regions in early'50s) to post-industrial economies (Italian Northern regions in recent years). This wide range of development stages can be of major interest in understanding major forces driving

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agricultural decline also depending on region-specific initial conditions and features (Fuà, 1992; Paci and Saba, 1997; Lyon, 2005).

This specific case has been already investigated in previous empirical works. What is novel, here, is that the empirical model includes both supply and demand side equilibrium condition, and it does not only models the supply side of the economy as in Esposti (2012) and in other previous empirical works on this topic (Sun et al., 2007).

Therefore, the paper proposes an approach whose theoretical framework combines the supply and demand sides of the open regional economies and where the agricultural share is simultaneously determined together with the major drivers of its decline. The empirically tractable (i.e., estimable) specification of such theoretical model tries to mimic the real mechanisms through which these driving forces induce decline. Beside its theoretical foundation, however, another major contribution of the present study consists in properly investigating and tackling the whole set of econometric issues arisen within the modelling framework and to be addressed in order to achieve an appropriate model estimation.

2. The model

Let's assume a two-sector economy (A = agriculture; E = rest of the economy), producing two final goods, respectively, with quantities $\mathbf{Y} = \{Y_A, Y_E\}$ and prices $\mathbf{P} = \{P_A, P_E\}$ (Anderson, 1987; Mundlak, 2000; Esposti, 2012). Both products are obtained using three economy-wide (not sector-specific) inputs, capital (K), labour (L) and land (G) with different intensities and, thus, factor proportions across sectors. Given an initial aggregate factor endowment, K^*, L^* and G^*, the Production Possibility Frontier (PPF) defines the whole set of possible efficient combination of Y_A and Y_E. The shape of the PPF depends on the production technology underlying the two sectors. Among these combinations, the actual relative price P_A^*/P_E^* identifies the optimal production mix, Y_A^* and Y_E^*; consequently, the sectoral shares within the economy: $S_A^* = P_A^*Y_A^*/(P_A^*Y_A^* + P_E^*Y_E^*)$ and $S_E^* = 1 - S_A^*$.

In closed economies, however, the supply side forces (those affecting the PPF) are not enough to express the decline of agriculture. In fact, the relative price P_A^*/P_E^* is itself endogenous as it is identified by the tangent point between the PPF and the consumption Indifference Curve (IC), whose shape depends, in turn, on the underlying consumers' utility (U^*), that is, preferences (Fig. 1).

Economic growth generates a forward shift of the PPF either because of an increase in factor endowment (from L^* to L', due to population growth, and from K^* to K', due to capital accumulation) or because of technological progress. Moreover, a main result of growth is the forward shift of the IC (U'), due to higher income ($\Delta\mathbf{P}'\mathbf{Y}$). Capital accumulation and technological progress may themselves be endogenous whenever they depend on changing sectoral shares due to the different growth rates across sectors. Under non-homothetic preferences, we observe a non-linear Income Expansion Path (IEP), this being the curve of all optimal combinations of outputs as income grows. It follows that economic growth implies a new optimal mix, Y_A' and Y_E', a new relative price (in closed economies), P_A'/P_E', and, eventually, new sectoral shares, S_A' and S_E'. The shape of the IEP actually expresses the change in sectoral shares, that is, which sector is (relatively) declining during economic growth.

Fig. 1 shows how, in a closed economy, the making of agricultural decline can follow three different patterns. In case 1, growth is accompanied by a change in the IC shape which expresses the *Engel's Law*, that is, the less than proportional increase of agricultural goods' consumption as income grows. Therefore, the agricultural share declines due to the prevalence of this demand-side effect and is always accompanied by declining agricultural relative price as a consequence of the change in IC shape, that is, in preferences. In case 2, growth goes along with a change in PPF shape that reduces the agricultural share with the prevalence the supply-side effects. In case 3, finally, growth is accompanied with a change in both IC and PPF shape and this happens for the coexistence of demand and supply-side effects. In all cases, relative prices are fully endogenous (i.e., fully determined by internal demand and supply) and non-homothetic preferences (the Engel's Law) always induces agricultural decline. In cases 2 and 3, however, agricultural decline may be even associated with increasing agricultural relative price. Therefore, in a closed economy no univocal relationship occurs between the variation of relative price and agricultural decline.

As pointed out by Anderson (1987), however, the functioning of such process and its implications may substantially differ if we consider an open economy.[1] In such case, the representation in Fig. 1 is not valid since relative prices are, entirely or partially, driven by external demand. If we consider fully exogenous prices (i.e., independent of domestic demand, therefore domestic preferences), in particular, agricultural decline is always associated to declining relative prices. This may be one possible reason why many empirical studies on agricultural decline mostly concentrate on modelling the supply side of the economy and the respective equilibria and forces. If prices are assumed exogenous, the domestic demand-side forces are no relevant and modelling the domestic demand-side equilibrium is not needed.

Actually, we may argue that, in the real world, prices are neither fully exogenous nor fully endogenous and, therefore, that admitting open economies does not necessarily imply to assume that domestic demand has no effect on domestic price formation and all the drivers of decline come from the supply side. More generally, the interplay among the supply and demand side driving forces may differ across diverse circumstances (space and time) due

[1] It is worth noticing that, though openness may play a major role in determining the pattern of agricultural decline for the role of comparative advantages in generating specialization patterns, the historical experience of agricultural decline during economic growth is general: it is observed in either highly open or closed economies, in periods of globalization or relative protectionism, in countries (or regions) with or without relevant competitive advantages in agriculture. Openness and trade, therefore, do not seem crucial to generate agricultural decline. Nonetheless, disregarding them may lead to inappropriate conclusions on its major drivers.