Determinants of economic growth in organic farming: the case of Bavaria and Baden-Württemberg

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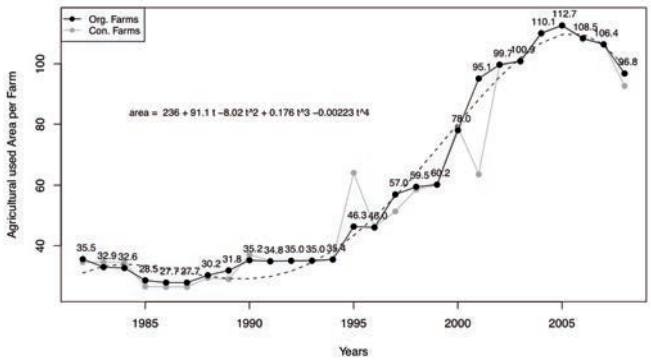
Abstract

Der vorliegende Beitrag untersucht Faktoren, die möglicherweise einen Einfluss auf das wirtschaftliche Wachstum von 332 ökologischen Betrieben in Bayern und Baden-Württemberg haben. Die Ergebnisse zeigen, dass Direktvermarktung und der Tierbesatz das einzelbetriebliche Wachstum positiv beeinflussen. Diese Effekte sind deutlicher ausgeprägt als andere Einflüsse. Daneben kann gezeigt werden, dass technisch ineffiziente Betriebe stärker wachsen als technisch effiziente Betriebe. Dies kann mit dem ökonomischen Druck auf ineffiziente Betriebe und mit Ineffizienz während eines Wachstumsprozesses erklärt werden.

Introduction

Organic agriculture in Germany is a very dynamic sector. In general terms, the numbers of organic farms, cultivated area and market size of organic products have substantially increased since the beginning of the 1990s until today.



Graph 1: Farm growth of organic and conventional farms in Germany 1982-2009
Source: Own Calculation, data from the federal Ministry of Agriculture, diff. Years

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During this process of expansion, most organic farms have also grown, while others have disappeared or reconverted to conventional agriculture. This raises the question which factors influence, positively or negatively, the growth of farms.

Figure 1 shows the average growth of organic and conventional farms since 1982[2]. There has been a substantial growth also in the organic sector on the farm-level. The present study aims to provide information regarding to the factors that have an impact on the economic growth of organic farms, based on a sample of organic farms from Bavaria and Baden-Württemberg.

Materials and methods

The sample is based on accounting data from organic farms in Bavaria and Baden-Württemberg from 1994/1995 to 2005/2006. The information was provided by Land Data GmbH and comprises an unbalanced panel data of 2.374 observations from i = 332 farms in t = 13 years. The characteristics of the dataset did not allow for treatment of farm survival.

The econometric model was developed based on Gibrat's Law, which states that the growth rates of firms are independent of their initial size. This implies growth is a random process. This Law also defines firm growth as a change in in relation to the initial firm size (Shapiro *et al.* 1987).

In this study, farm size was defined as total revenues from agricultural products, since this variable represents the process of economic growth within a farm better than potential alternatives, e.g., land size, or physical quantities produced. The model specification is a regression of farm growth (G) on farm size from the previous year (Y_{t-1}), its square and a set of additional explanatory variables (X):

$$G_t = \alpha_1 \ln Y_{t-1} + \alpha_2 (\ln Y_{t-1})^2 + X_{t-1}\beta + u_t \qquad (1)$$

Growth (G) was calculated as the first difference of log farm size (Y).

$$G_t = \ln Y_t - \ln Y_{t-1} \qquad (2)$$

The data were multiplied by 100 to obtain the annual percentage growth rate. Because of the potential endogeneity bias of initial farm size (Y_{t-1}), we used (Y_{t-2}) instrumental variables for farm size and farm size squared. Thus, the number of observations for the final econometric model was reduced to 1.760. The estimation of the econometric model uses the fixed effect method (FE) with cluster robust standard errors to control for heteroscedasticity and serial correlation of the sample.

Results

Table 1 presents the results of the econometric model and illustrates the significant factors for economic growth of the farms.

[2] The data are taken from the yearly report of the Federal Ministry of Agriculture in different years. The conventional farms in this dataset are *comparable* to the farm-structure of the organic farms.

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Table 1: Determinants of economic growth on organic farms in Bavaria and Baden-Württemberg (1993-2004)

Variables	Units	Coeff.		Std. err.
Ln Farm Size	Euros	-57,95		210,2
(Ln Farm Size)[2]	Euros	1,41		9,4
Share of grasslands areas	%	0,28		0,2
Livestock intensity	LU[1]/ha	11,63	***	3,1
Technical efficiency	Index	-116,02	***	29,49
Association costs	Euros	-0,003		0,003
Debt to assets ratio	%	-0,16		0,1
Invert current ratio	Index	0,01		0,01
Economic advisory	Euros	-0,01	***	0,002
Conversion Status	0/1	-2,66		5,1
Age	years	-0,06		0,2
Part-Time job	0/1	-7,80		11,5
Apprenticeship	0/1	-10,85		7,8
Master	0/1	-8,71		9,4
University	0/1	7,62		9,8
Subsidies	Euros	0,00004		0,0003
Farm shop	0/1	17,38	***	5,5
Observations	1.760			
F-statistic	21,41			
R-squared	41,06			

[1] LU: Livestock-Units (Großvieheinheiten)

[2] Standard deviation in parentheses, *** significant at P< 0,01

Source: owns calculations

Livestock intensity and presence of an on-farm shop are statistically significant and positively related with growth while technical efficiency and costs of economic advisory services have a negative effect. All the other variables in the model did not show a statistically significant impact on economic growth.

Livestock intensity has a positive impact on growth; an increase of one LU/ha raises the growth rate by 11,63 percentage points. However, the average of livestock intensity in the sample is 1,08 LU/ha and the stocking density for organic farming is limited at 2 LU/ha. Then, experiencing a substantially increase in growth based on the intensification of livestock production is unlikely, due to the restriction in the stocking densities.

Contrary to what we expected, the coefficient of technical efficiency is negative. The result implies that less efficient farms are adapting and growing faster than more efficient farms. According to the results, an increase on technical efficiency of 1 percentage point, holding all other factors fixed, decreases the growth rates by 1,16 percentage points. This result can be directly related the issue of optimal size of production, where small farms may adjust and grow up to reach the optimal size of production, while those farms above the optimal size grow at lower rates.

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The costs of economic advisory services exhibited a negative and highly significant coefficient. However, the result has little economic relevance since an increase of one Euro on economic advisory would decrease growth rates by 0,01 percentage points. The dummy variable for the presence of an on-farm shop has a positive and economically significant influence on growth. Holdings with an on-farm shop grew, on average, 17 percentage points more than those holdings without a shop. This outcome is in line with Nieberg & Offermann (2008), who found that more successful farms were more involved in direct marketing. A previous study of these Authors, Offermann & Nieberg (2000), pointed out that, within the organic sector, the product prices from direct marketing can double those prices received from the wholesalers.

On the other hand, the sample also shows a reduction over the years in the number of farms with on-farm shops (see also Rippin & Hamm 2007). This can be a consequence of the higher participation of conventional supermarkets and large retail outlets in the distribution of organic products in Germany, and due to a professionalisation trend on the farms, since a lot of farmers intensify or skip their direct-marketing over time.

Conclusions

Economic growth of organic farms in Bavaria and Baden-Württemberg is highly influenced by market involvement of the farms. Particularly, direct marketing through selling organic products in on-farm shops opened the opportunity for farms to increase the growth rates of total revenues, which is especially true for organic farms, since organic farms are highly involved in direct marketing. For future studies, it is important to consider other market-related variables such as product prices and other marketing channels.

Other factors such as livestock intensity and costs of economic advisory also showed statistical significance. However, the practical importance of these two factors is more limited since the economic impact on growth due to the model is rather small. Further research might take a more detailed look at the relation between growth and technical efficiency, e.g., by considering the relationship between farm growth and the ‘optimal size’ of farms, jointly with the effect of economies of scale on growth.

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