

THE EFFECT OF AGRICULTURAL SUBSIDIES ON EFFICIENCY AND PRODUCTIVITY OF FARMS: A LITERATURE REVIEW

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This paper investigates the relationship between agricultural subsidies and efficiency/productivity of farms. Traditional economic theory states that agricultural subsidies distort incentives and reduce productivity. However, some recent theoretical studies have challenged these arguments and say that subsidies may enhance agricultural productivity. Empirical evidences are also mixed, some authors find positive, while others find negative effect. In this paper, we review the empirical literature and summarize the results of recent empirical studies that investigated the subsidies-efficiency/productivity link.

Keyword: agricultural, subsidies, efficiency, productivity

ABSTRACT

A cikk célja a mezőgazdasági támogatások és a mezőgazdasági üzemek hatékonysága és termelékenysége közötti kapcsolat vizsgálata. A tradicionális közgazdasági elméletek szerint a támogatások torzítják a piaci ösztönzőket, és ezáltal csökkentik a termelékenységet. Újabb elméleti tanulmányok azonban megkérdőjelezik a tradicionális elméleteket és azt állítják, hogy a támogatások növelhetik a mezőgazdasági üzemek termelékenységét. A témában végzett empirikus kutatások eredményei is vegyesek, egyes szerzők a támogatások negatív, míg mások pozitív hatását mutatták ki. A cikkben áttekintjük az utóbbi években e témában megjelent empirikus vizsgálatokat végző főbb elemzéseket, és összefoglaljuk azok eredményeit.

Kulcsszavak: mezőgazdaság, támogatás, hatékonyság, termelékenység

INTRODUCTION

Agriculture is subsidised in one form or the other in most of the countries. Subsidies can be coupled to inputs and/or outputs. Since coupling subsidies distorts prices and makes the relevant market non-competitive, the recent tendency is to decouple subsidies. Decoupled subsidies should, by definition, not affect farmers' short-term marginal production decisions if the markets are perfectly competitive, there are no economies of scale and producers are risk neutral. However, in practice, these conditions do not hold, and thus even decoupled

subsidies may affect production decisions (Kumbhakar–Lien 2010).

Theoretically, there are four mechanisms by which coupled and decoupled subsidies can have impacts on production: (i) by changing relative prices of inputs and outputs (ii) through an income effect changing on- and off-farm, (iii) through an income effect on investment decisions, and (iv) through farm growth and exit (Zhu and Oude Lansink 2008).

All these effects may change the technical and economic performance on the farms. In this context, one of the most important questions

is whether these effects are positive or negative on farm performance.

Traditional economic theory and policy analysis state that agricultural subsidies distort incentives and reduce productivity (Johnson 1973; OECD 2008; Garrone et al. 2018). As Garrone et al. (2018) report subsidies may reduce agricultural productivity, because

- farmer investment decisions may be distorted towards relatively less productive activities that are supported by subsidies (Alston and James 2002);
- farmers may over-invest in subsidised inputs (Rizov et al. 2013);
- subsidies may reduce a farmer’s incentive to adopt cost optimising strategies (Leibenstein 1966; Minviel and Latruffe 2017);
- subsidies may lead to soft budget constraints, causing inefficient use of resources (Kornai 1986).

However, some recent studies posit that these arguments are not always necessarily true. As Garrone et al. (2018) report subsidies may enhance agricultural productivity, through the impact of subsidies on farm constraints due to rural market imperfections:

If rural capital market imperfections exist, subsidies may help overcome financial constraints of farmers (either directly by boosting a farmer’s financial resources or indirectly by improving access to credit) (Blancard et al. 2006; Ciaian and Swinnen 2009).

In case of imperfect insurance markets, subsidies may mitigate risk and trigger investment in certain types of activity, which the farmer may otherwise consider too risky (Hennessy 1998; Roche and McQuinn 2004).

Empirical studies find also mixed evidences. In the next section of this paper, we review the results of some recent empirical papers con-

cerning the effect of subsidies on agricultural efficiency/productivity.

THE EFFECT OF AGRICULTURAL SUBSIDIES ON EFFICIENCY/PRODUCTIVITY

Numerous studies can be found in the literature about the subsidy efficiency/productivity link, e.g. Zhengfei and Oude Lansink 2006; Zhu and Oude Lansink 2010; Zhu et al. 2012; Latruffe et al. 2009; Bojnec and Latruffe 2013; Mary 2013; Rizov et al. 2013; Sipiläinen et al. 2014; Latruffe et al. 2017; Minviel and Latruffe 2017.

In this section, we review the methods commonly used by authors and the main findings of selected studies.

The next paragraphs give some more details concerning the studies summarised in table 1.

Table 1. Methods and results of selected empirical studies examining the effect of agricultural subsidies on farm performance

Author(s)	Method	Results
Zhengfei – Oude Lansink, 2006	two-step approach; first step: Malmquist productivity growth index based on DEA second step: regression model	• subsidies have a significant negative impact on productivity growth.
Hadley, 2006	stochastic frontier and inefficiency effects model of Battese and Coelli (1995)	• Results are mixed; • Negative effects are found for cereal, sheep, general cropping and mixed farms; • Positive effects are found for dairy and beef farms.
Kleinhass et al., 2007	Data Envelopment Analysis with a counterfactual index	• on average direct payments generally tend to increase efficiency; • However, the mean efficiency decreases as the percentage of direct payments rises.
Fogarasi and Latruffe, 2009	DEA + second stage regression	• subsidies have positive effect on TFP growth.
Bakucs et al., 2010	stochastic frontier and inefficiency effects model of Battese and Coelli (1995)	• subsidies have a negative influence on technical efficiency.

Author(s)	Method	Results
Zhu and Oude Lansink, 2010	output distance function with inefficiency effects model based on SFA	<ul style="list-style-type: none"> coupled subsidies increase technical efficiency; decoupled subsidies decrease technical efficiency.
Zhu et al., 2012	output distance function with inefficiency effects model based on SFA	<ul style="list-style-type: none"> subsidies have negative impacts on TE in Germany and the Netherlands, but no significant impacts in Sweden; a higher degree of coupling in farm support negatively affects farm efficiency.
Rizov et al., 2013	semi-parametric estimation algorithm, directly incorporating the effect of subsidies into a model of unobserved productivity	<ul style="list-style-type: none"> subsidies had a negative impact on farm productivity in the period before the decoupling reform; after decoupling the effect of subsidies on productivity was more nuanced, in several countries it turned positive.
Sipiläinen et al., 2014	decomposition of profitability change into various sources	<ul style="list-style-type: none"> A significant negative association between technical efficiency and; investment subsidies encouraged more rapid technological change.
Minvel and Latruffe, 2017	meta-analysis	<ul style="list-style-type: none"> Subsidies are commonly negatively associated with farm technical efficiency; The direction of the observed effects is sensitive to the way subsidies are modelled.
Latruffe et al., 2017	an original method-of-moments estimator which account for endogeneity	<ul style="list-style-type: none"> mixed evidence; negative association between subsidies and technical efficiency in Belgium and the United Kingdom; no significant relationship for Denmark, Germany, France, and Ireland; a positive relationship for Spain and Portugal.

*Notes: DEA – Data Envelopment Analysis (Charnes et al. 1978; Coelli et al. 2005); SFA – Stochastic Frontier Analysis (Kumbhakar and Knox-Lovell 2000; Coelli et al. 2005; Greene 2008)

Source: own compilation

Zhengfei and Oude Lansink (2006) used the Malmquist productivity growth index as a proxy for performance to study the impact of capital structure (debt) on farm performance using data from Dutch arable farms over the period 1990–1999. Using a regression model, they also examined the effect of different factors, e.g. subsidies on farm performance and found that subsidies have a significant negative impact on productivity. growth.

Hadley, (2006) English and Welsh employed farm-level survey data to estimate stochastic frontier production functions for eight different farm types (cereal, dairy, sheep, beef, poultry, pigs, general cropping and mixed) for the period 1982 to 2002. The author applied the well-known and widely used Battese and Coelli Modell (Battese and Coelli 1995). The ratio of the sum of all subsidies received by the farm to total farm gross margin was examined. Negative effects were found for cereal, sheep, general cropping and mixed farms. Positive effects were found for dairy and beef farms.

Kleinhanss et al. (2007) modelled the interaction between the targets of the CAP: environmental adaptation, subsidies, and efficiency of animal farming. They used Data Envelopment Analysis (DEA) to estimate farms technical for each animal-oriented farm in the sample. Then, the efficiency scores of the farms including direct subsidies are compared with the counterfactual exercise in the case in which direct subsidies are not considered. Their results showed a positive correlation between subsidies and efficiency looking at the absolute amounts. However, the mean efficiency decreases or stagnates as the percentage of direct payments rises.

Fogarasi and Latruffe (2009) investigated the difference in technical efficiency and in productivity change, and the technology gaps, between French and Hungarian farms in the dairy, cereal, oilseeds and protein seeds (COP) sectors during the period 2001–2004. The

analyses are performed with national FADN data and the Data Envelopment Analysis (DEA) approach under each country's respective frontier and under a metafrontier. In the second step, they applied regression analysis to examine the role of subsidies on farms' performance in both countries. They found that subsidies received by farms during the period 2001–2004 decreased technical efficiency.

Bakucs et al. (2010) examine the technical efficiency of Hungarian farms before and after accession to the European Union and investigated the efficiency determinants. The authors used the BC95 Model (Battese–Coelli 1995). The period studied was from 2001 to 2005. They found that subsidies received by farmers under the CAP have a negative influence on their technical efficiency.

Zhu and Oude Lansink (2010) analysed the impacts of the CAP-reforms on the technical efficiency of the crop farms. The authors used an output distance function and an inefficiency effects model, which incorporates the influences of exogenous variables on farm efficiency. They formulated policy variables (e.g. the CAP subsidies) and producer characteristics as explanatory variables in the inefficiency model. They used FADN¹ data over the period 1995–2004 to estimate the production frontiers of the crop farms in Germany, Netherlands and Sweden, to derive their technical efficiency, and to determine the effects of the explanatory variables. Results showed that subsidies have positive impacts on the technical efficiency of crop farms in the Netherlands and Sweden, but not significant in Germany, and the ratio of the total subsidies received to the total revenue has negative impacts on the technical efficiency in three countries. Their findings revealed that coupled subsidies increase technical efficiency whereas decoupled subsidies decrease technical efficiency.

Zhu et al. (2012) investigated technical efficiency and technical efficiency change of specialized German, Dutch and Swedish dairy farms and to compare their relative productivity. Data for specialized dairy farms over the period 1995–2004 were used. The authors applied the Battese and Coelli model (Battese–Coelli 1995.) Three subsidy-related variables were introduced to the model to reflect the wealth and insurance effect and the coupling effect of Common Agricultural Policy (CAP) subsidies. The results implied that a higher degree of coupling in farm support negatively affects farm efficiency, and the motivation of farmers to work efficiently is lower when they depend to a higher degree on subsidies as a source of income.

Rizov et al. (2013) investigated the impact of subsidies from the CAP on the total factor productivity of farms in the EU. They employed a structural, semi-parametric model, directly incorporating the effect of subsidies into a model of unobserved productivity. The authors empirically studied the effects using samples from the Farm Accountancy Data Network for EU-15 countries over the period 1990–1998. The main findings of the paper were that subsidies had a negative impact on farm productivity in the period before the decoupling reform was implemented; after decoupling the effect of subsidies on productivity was more nuanced and, in several countries, it turned positive.

Sipiläinen et al. (2014) examined profitability and productivity dynamics in Finnish and Norwegian farms during the period 1991 to 2008. The analysis draws on a decomposition of profitability change into various sources. A significant negative association between technical efficiency and subsidies were found in both countries. Another finding is that in Finland, agricultural policy and extensive investment subsidies have probably encouraged more rapid growth and Technological change during the EU membership. They also

¹ FADN: Farm accountancy Data Network. Further information about the FADN system can be found at <http://ec.europa.eu/agriculture/rica/>.

found some evidence that increasing share of subsidies in total return is linked to increasing inefficiency. This may indicate some adverse effects of the increasing share of direct payments with respect to productivity of inputs. However, the authors call attention to the fact that they have not identified a clear causal effect in this paper, and further study is, therefore, required to focus more particularly on the dynamics underlying the trends.

Minviel and Latruffe (2016) conducted a meta-analysis of empirical results on the issue of subsidies and efficiency link, based on data gathered from a systematic literature review. They find that, in the empirical literature, subsidies are commonly negatively associated with farm technical efficiency. Meta-regression estimation results show that the direction of the observed effects is sensitive to the way subsidies are modelled in the empirical studies. Hence, their recommendation that investigating the effect of subsidies on farms' technical efficiency should rely on a careful modelling of subsidies, and that, when possible, sensitivity analyses based on several modelling strategies should be carried out.

Latruffe et al. (2017) examined the association between agricultural subsidies and dairy farm technical efficiency in the European Union and made a novel contribution to the literature. The authors included in the analysis nine western European Union countries over an 18-year period (1990–2007) encompassing the various Common Agricultural Policy reforms enacted since the inception of the EU. The countries included were Belgium, Denmark, France, Germany, Ireland, Italy, Portugal, Spain, and the United Kingdom. The authors also accounted for input endogeneity using an original method of moment's estimator. The model was specified as a Cobb-Douglas stochastic production frontier and

allows for the endogeneity of one input. The subsidies considered were as follows: direct payments for areas planted with specific crops and for heads of specific livestock; decoupled subsidies introduced in 2005; and subsidies provided to farms located in less favoured areas.

The results showed a negative association between subsidies and technical efficiency in Belgium and the United Kingdom, no significant relationship for Denmark, Germany, France, and Ireland, and a positive relationship for Spain and Portugal. The analysis also revealed that the introduction of decoupling with the 2003 CAP-reform weakens the effect that subsidies have on technical efficiency.

CONCLUSION

The aim of this paper was to conduct a literature review about empirical papers, which examined the effect of subsidies on economic performance of farms. This literature review showed that results of empirical papers are mixed, there is no clear evidence concerning the effect of subsidies on efficiency/productivity. However, some pattern can be found. Earlier papers usually found negative effect. One reason for this, as Minviel and Latruffe (2017) highlight that earlier studies have focussed on coupled subsidies.

However, several studies showed that the introduction of decoupling with the 2003 CAP-reform changed the effect that subsidies have on technical efficiency (Rizov et al. 2013, Latruffe et al. 2017). Another reason may be scientific progress in terms of methodologies (Minviel and Latruffe 2017). Therefore, further research is needed to understand better the effect of subsidies on efficiency/productivity.

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