Land Use Policy 66 (2017) 172–182

Contents lists available at ScienceDirect

Land Use Policy

journal homepage: www.elsevier.com/locate/landusepol

Productivity effects of CAP investment support: Evidence from Sweden using matched panel data

Pia Nilsson

Department of Economics, Finance and Statistics, Jönköping International Business School, Jönköping University, Gjuterigatan 5, 551 11, Jönköping, Sweden

ARTICLE INFO

Keywords:
CAP
Investment support
Productivity
CEM

ABSTRACT

This paper studies the effects of investment support from the common agricultural policy on labour and total factor productivity of agricultural firms in Sweden. Detailed firm-level data on 34 300 firms are used to estimate a matched panel model that relates firm productivity to a series of factors reflecting internal and external characteristics. The recently developed Coarsened Exact Matching method is used to estimate matched control groups and handle selection bias. Findings show a positive and significant treatment effect of investment support on firm productivity, but only for small firms. The analysis also reveals that an increase in the size of the support in relation to firm income has a negative and significant impact on productivity for all firms. Differentiating between various types of investment supports indicates heterogeneous treatment effects. The policy instrument can improve its efficiency if targeted to small firms and investments that have a link to public good provision.

1. Introduction

The Common Agricultural Policy (CAP) outlines the framework for agricultural policies implemented across European Union member states. A specific type of policy instrument included in the Swedish Rural Development Programme (RDP), as well as in other member states, is the investment subsidy. This is included in the first thematic axis of the second pillar and is targeted to agricultural firms that realize investments in primary production. The objective is to modernize agricultural holdings, improve the competitiveness of the agricultural sector, and accelerate the pace of adjustment to new market conditions and changes in demand to promote rural development. A substantial share of the Swedish RDP budget for 2007–2013 was allocated to such subsidies, about SEK 2.7 billion to 7400 firms. The large amount of funding to agricultural firms naturally gives rise to several questions concerning the effects, particularly on the overall goal, which is to improve the competitiveness of the beneficiaries.

The purpose of this paper is to address the effects of investment support dispersed during the RDP period 2007–2013 on firm labour and total factor productivity, which are common indicators of competitiveness in the literature (Latruffe, 2010; Rizov et al., 2013). Policy-oriented questions addressed in this study concern whether there is heterogeneity in the outcome with respect to firm characteristics and the type of investment granted by the support.

The role played by various types of CAP subsidies has received a great deal of attention in the literature, with mixed results (Kumbhakar and Bokusheva, 2009; Sckokai and Moro, 2009; Weber and Key, 2012; Viaggi et al., 2013; Mary, 2013). Studies that use firm-level data and consider CAP subsidies have found that these impacts both negatively and positively on productivity (McCloud and Kumbhakar, 2008, Zhu et al., 2012; Rizov et al., 2013). Considering the strong focus on the transition from coupled to decoupled subsidies, less focus has been devoted to the productivity effects of investment support of the second pillar. Mary (2013) found that investment subsidies had no significant effect on the productivity of French crop farms, while Ratinger et al. (2013) found a positive effect on labour productivity for medium-sized farms in the Czech Republic. Hence, despite the vast number of studies on different CAP subsidies, it is still difficult to draw major conclusions. As discussed in Michalek et al. (2014), a possible explanation is differences in methodological approaches, particularly the methods used to handle selection bias. Like Mary (2013) and Rizov et al. (2013), many studies treat the assignment of support as random. Most types of capital subsidies included in the CAP are not assigned randomly since they have eligibility conditions and selection criteria that can only be met by certain types of firms. In Sweden, firms granted investment support during the RDP period 2007–2013 are shown to be more productive and capital-intensive, implying that an econometric approach that accounts for selection bias is necessary to avoid biased estimates (Rosenbaum and Rubin, 1983). Firms can also receive different levels of subsidies depending on the nature of the investment project and the characteristics and choice of the firm, which may affect the outcome. This reasoning is in line with Michalek et al. (2014), showing that there is strong heterogeneity in the treatment outcome with respect to different levels of capital subsidies.

E-mail address: pia.nilsson@ju.se.

http://dx.doi.org/10.1016/j.landusepol.2017.04.043
Received 13 July 2016; Received in revised form 6 April 2017; Accepted 28 April 2017

This study contributes to the literature on the productivity effects of CAP subsidies and builds on prior research. In contrast to prior studies that tend to treat the assignment of support as random, this study applies the recently developed Coarsened Exact Matching method, derived from the exact matching theory, to model selection bias and to estimate the causal effect (Blackwell et al., 2009; Iacus et al., 2009, 2011). Moreover, while prior studies tend to rely on geographically delimited subsamples or subsets of the agricultural sector using data from the European Farm Accounting Data Network (FADN), this study uses detailed firm-level employer–employee-linked data that comprise all active agricultural firms in Sweden for the period 2007–2012.[1] Having access to detailed micro data enables the study to address intra-industry heterogeneity and examine whether differences on the level of subsidization, firm characteristics, and investment type affect the outcome. A fixed-effects panel model with matched control groups is used to relate firm productivity to factors that reflect internal and external characteristics, which are hypothesized to improve the possibilities for firms to absorb internal and external knowledge. Despite the increased focus on access to external knowledge as a key determinant of firm productivity and sustained economic activities in rural areas (Gruber and Soci, 2010; Artz et al., 2016), this perspective has been mostly left out in prior studies with this focus.

2. Background and theoretical framework

The question whether subsidies to the agricultural sector give rise to improved productivity and the underlying arguments in support of such policy have received growing attention in the literature (McCloud and Kumbhakar, 2008; Sckokai and Moro, 2009; Kline and Moretti, 2014). Arguments in support of such policy often emphasize that the agricultural sector gives rise to positive externalities through its multifunctionality and that there are market failures that validate government interventions to firms in lagging regions (European Commission, 2010). The issue of food security is also highlighted as countries that cannot domestically produce enough to meet the demand might be vulnerable to trade pressure (Candel et al., 2014). These types of arguments form the basis of the CAP, but different support payments also have their specific targets and objectives.

Support to investment and modernization of agricultural holdings is a capital subsidy that aims to encourage agricultural firms to undertake more gross investment in plant, machinery, and new production equipment on the assumption that this results in increased productivity and output. This can be realized in the form of net investment, which can bring additional productive capacity to the firm, and in the form of replacement investment, which can modernize the firm's stock of production equipment (Harris and Trainor, 2005). Hence, the subsidy can give rise to investment-induced productivity gains because of improved access to capital and possibilities to adopt new production equipment (Serra et al., 2008). The investment subsidy may thus stimulate technological development and market adjustment as it can lower the investment cost and assist firms to better use economies of scale (Blancard et al., 2006). The effect on labour is ambiguous as subsidies can be used to increase the labour stock but may also result in lower labour demand if the subsidy increases labour productivity (McCloud and Kumbhakar, 2008).

The main argument is that an investment subsidy can form an incentive for firms to invest while the support is in effect. The q-theory of capital investment provides a framework for modelling the investment behaviour of firms and can be used to investigate this argument. This framework assumes that there are capital installation costs associated with investment in capital goods that are strictly convex, e.g., costs related to installation and reorganization in addition to the direct cost of buying the capital goods.[2] For simplicity's sake, the subsidy can be assumed temporary and take the form of a direct rebate to the firm of fraction θ of the price of capital and apply to the price but not to the adjustment costs. In the presence of a subsidy of this form and under the assumption that the purchase price of capital is fixed at 1, the firm invests as long as the value of the capital plus the subsidy exceeds the capital costs. This condition can be written as[3]:

$$q(t) + \theta(t) = 1 + C(I(t)) \quad (1)$$

where $\theta(t)$ denotes the subsidy at time t, $q(t)$ denotes the value to the firm of an additional unit of capital at time t, e.g., the market value of a unit of capital (Tobin's q (Tobin, 1969), and $C(I(t))$ shows the cost of firms' investment I at time t. The theory predicts that a capital subsidy will cause an increase in investment when it is in place, but when it expires, investment will return to the old equilibrium steady state. It also predicts that a temporary investment subsidy will cause a larger effect on investment, compared with a permanent, as firms adjust their intertemporal investment plans to take advantage of the subsidy (Abel, 1983). Sckokai and Moro (2009) address firms' investment behaviour in the context of the CAP and show that among the effects of CAP payments on farmers' decisions, the impact on farm investment is the most relevant.

Given that firms adjust their investment behaviour in the presence of a subsidy, a policy-oriented question that arises is whether the subsidy leads to improvements in productivity. Specifically, following the view that it is the "residual" (total factor productivity, TFP) that drives long-run growth (Solow, 1956), a relevant approach is to examine if investment subsidies affect this measure of firm productivity (Easterly and Levine, 2001). Increases in TFP reflect a rise in productivity that is not attributable to any of the production inputs of labour and capital but to improvements in the combination of inputs used in production, e.g., to technological development or improvement (Romer, 1990). Therefore, an investment-induced subsidy should result in a positive effect on firm TFP, given that the investment spurs technological development. Sauer and Latacz-Lohmann (2015) investigate the link between subsidy-induced investments and TFP using panel data of German dairy farms (1996–2010). They find that investments in new technology increase TFP of dairy production by shifting out the production frontier.

The literature on the productivity effects of subsidies highlight that capital subsidies may also lead to a negative effect on productivity because of allocative inefficiencies. Baumol (1996) addresses this and argues that a negative productivity effect may result if subsidies make firms adjust their behaviour and realize investments that grant subsidies in favour of more productive investments. This follows the view of Tullock (1980), emphasizing that rent-seeking behaviour may induce firms to re-allocate productive resources to the process of seeking support, which may result in a negative effect on productivity. Similar arguments are put forward by Bergström (2000), in that subsidies may result in a lack or slack of effort to seek cost-improving methods, which may negatively affect firm productivity. The rationale is that the motivation to work efficiently and increase productivity falls as the firm increases its dependence on subsidies as a source of income.

Zhu et al. (2012) focus on dairy farms in Germany, the Netherlands, and Sweden and find a significant negative marginal effect of the share of total subsidies in total farm income. They find that an increase of one percentage point in the share of total subsidies in total farm income leads to a 0.89 decrease in technical efficiency among Swedish dairy farms. The studies by Brummer and Loy (2000) on dairy farmers in northern Germany and Zhu et al. (2010) on German, Dutch, and Swedish crop farms lend support to a negative or insignificant impact

[1] The FADN data comprise around 10 per cent of agricultural firms in Sweden and have missing values for several key variables.

[2] Firms face costs of adjusting their capital stocks and the adjustment costs, $C(\dot{\kappa})$, satisfy $C(0) = 0$, $C'(0) = 0$, and $C''(\cdot) > 0$.

[3] Eq. (1) shows the first-order condition for current investment obtained from the maximization of the current-value Hamiltonian (Romer, 2006; p. 413).