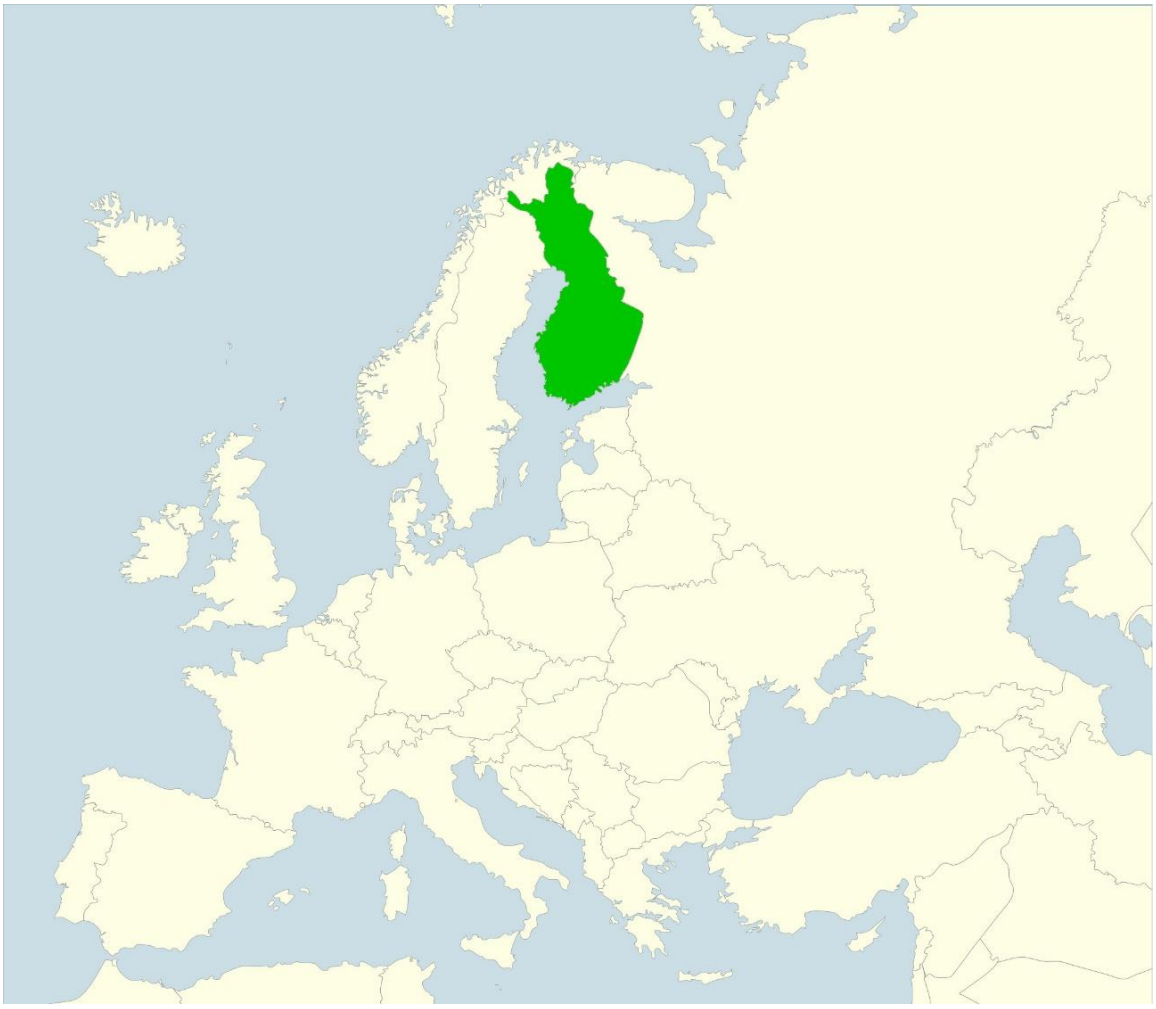
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DO THE SUBSIDIES OF THE RURAL DEVELOPMENT PROGRAMME INCREASE EMPLOYMENT IN RURAL FIRMS? A COUNTERFACTUAL IMPACT EVALUATION FROM MAINLAND FINLAND

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Abstract: This study examines the effect of the subsidies given to firms through the Rural Development Programme (RDP) for Mainland Finland in Finland during the 2007–2013 period. In order to understand the impacts that this programme had, the study uses counterfactual modelling to analyse what forms of subsidies impact job creation in supported firms. The results showed that subsidies from the RDP had a positive impact on the development of subsidized firms and thus, the RDP was a key instrument for the renewal of the countryside and the promotion of rural viability in Finland.

Keywords: Firm subsidies, RDP, counterfactual evaluation, Finland, jobs

Highlights

- In Finland, the subsidies had the positive impact on job creation.
- The success might be related to the small amount of the subsidies.
- The subsidies support diversification with off-farm enterprises

1. Introduction

Rural communities across the Northern peripheries of Europe are struggling with economic challenges and urgently need new activities to retain population and maintain basic services. For instance, in Finland, the number of jobs in rural areas decreased in 2007–2013 by 35 748 jobs, which corresponds to a 6.8 percent loss in the number of jobs in rural areas (Statistics Finland 2020). In many countries, rural areas have been supported through rural development programmes (RDPs) which aim to prevent social inequalities, maintain a high standard of living and provide security to citizens and society in general while also addressing a wide range of economic, environmental and social challenges (European Commission 2013; Andersson et al. 2017). In Finland, rural areas were developed in 2007–2013 by the RDP for Mainland Finland with a programme that aimed to promote the bioeconomy, diversify rural industries and create employment by improving the competitiveness of businesses, supporting new entrepreneurship and promoting the networking of companies (Ministry of Agriculture and Forestry 2007). One of the most important measures to implement development strategy is the fsubsidies which are aimed at training and the provision of information and advice, investments in physical property, development of economic activities and farms and various forms of start-up support (Ministry of Agriculture and Forestry 2007).

Research evaluating the efficacy of RDPs is limited (Andersson et al. 2017; Michalek et al. 2020) and the results obtained in the studies have been conflicting indicating that there is no consensus on how subsidies impact the development of supported firms (Petrick & Zier 2011). The earlier research findings on the impacts of subsidies on a firm's development have been conflicting. For example, Cerqua and Pellegrini (2014) analysed the effects of business support on firms' investments, turnovers, and employment impacts. Based on their results, subsidies seem to have a positive effect on the development of the supported firms, as business support increases turnover as well as new investments and does not seem to exclude and replace privately financed investments. In contrast, in the study from Lombardy, Italy, Porro and Salis (2018) reported opposing results that support for firms under the rural development programme does not have a positive effect on the development of the number of jobs in the subsidized firms.

The limited number of earlier studies demonstrate that there have been problems making evaluations of the RDP and subsidies. These difficulties are mainly due to two reasons, which explain why there are few research-based recommendations for improving the efficiency of the RDP: first, the lack of relevant databases severely impedes the possibilities of applying scientifically well-founded evaluation methods, and secondly, evaluation results have been uncertain and theoretically questionable, leading to few

recommendations and those that are given are seldom followed (Andersson et al. 2017). The assessment of the impact of the RDP is often driven by data availability, and therefore, studies usually have used survey data and descriptive statistics to analyse the effects of the RDP (Michalek et at. 2020; Lillemets et al. 2022). However, surveys are not always useful for impact evaluations because often they have problems with subjectivity as the subsidized firms themselves are being asked about the impact of public support. Research on the effects of the RDP has also been unevenly oriented, as almost all studies investigate the impact of the RDP on the performance of farms or the agricultural sector (Michalek et al. 2020).

This study examines the effect of the subsidies of the RDP for Mainland Finland implemented by local authorities in Finland during the 2007–2013 period. The study focuses on analysing what impact subsidies had on the performance of rural firms regarding the creation of jobs in 2007–2013. The question is important since there has been a lot of discussion in Finland about the general negative effects of subsidies and there is pressure to reduce the funding of such subsidies because only 10 percent of the total subsidies contribute to business reforms (Pietarinen 2012; TEM 2017). In addition to justifying (the need for) subsidies, there is also a need for information for planning future funding periods for 2021–2027. Therefore, there is a high demand for scientific evaluation of RDPs because impact evaluation can direct subsidies to more effective forms of support, and thus could potentially generate valuable information for future policy design and weighting (Andersson et al. 2017). Finland is also one of the most sparsely populated countries in Europe and there has not been such a counterfactual impact evaluation study in the Finland which makes it an interesting case for a study. Previous assessments of the RDP in Finland have been based on interviews and figures that authorities have collected, for instance, on job creation or turnover of the subsidized firms. The evaluation report 2007–2013 underlined that the subsidies had many positive effects on the development of firms. According to monitoring data, new full-time jobs have been created, 5 100 and about 18 000 jobs have been maintained with subsidies (Pyykkönen et al. 2016). However, previous evaluations in Finland have not answered the essential question what would have happened without subsidies

The study uses counterfactual modelling to analyse which forms of subsidies impact job creation in the supported firms. The analytical framework utilizes matching and considers selection bias in comparing job development in both subsidized and non-subsidized firms.

2. Rural enterprise support policy: literature review

In previous studies, the effect of subsidies is justified with the improved productivity or competitiveness of the subsidized firms leading to higher growth prospects and increasing the number of jobs in the supported firms (Lee 1996; Adda & Cooper 2000; Klette et al. 2000). Cerqua and Pellegrini (2014) analyses the impacts of the subsidies on company investment, turnover and employment. Based on their results, subsidies seem to have a positive impact on the subsidized firm and its employment. They recognized that the investment subsidies increased new private investments and support did not exclude other privately funded investments. The total capital of the recipient companies increased compared to those who did not receive public subsidies. However, the aid did not appear to have an impact on productivity growth.

Asvapp (2012) examined both the national-level effect of Italy's Law 488/1992 and the regional-level impact of 25 measures implemented in Piedmont – a region in Northern Italy – between 2005 and 2009. A counterfactual analysis found a positive effect on job creation but points out that interest-rate subsidies outperformed capital grants both in terms of investment incentive and job creation and that, more generally, large grants were ineffective. Similarly, the analysis by Adorno et al. (2007) found with a two-step matching procedure support for the evidence of previous studies about a global positive effect of the policy on employment but pointed out the significant variability of the outcome with respect to different treatment levels as they concluded that both too small and too high grants were less effective.

Another study assessing the effectiveness of the Italian subsidies system comes to an opposite conclusion. Bronzini and Blasio (2006) found in Italy that companies use public subsidies to promote already started

investment projects. In addition, subsidized firms seem to invest in the projects that seem to be realized even without subsidies as the non-subsidized firms invested on those kinds of projects. Based on the results, Bronzini and Blasio (2006) concluded that investment subsidies override investment self-financing and that the subsidies do not significantly increase new investment. Investment subsidies did not therefore seem very effective because firms use public support as a substitute for private investments. In Germany, Michalek et al. (2016) found that the crowding-out effect of the RDP on farm investment is nearly 100 percent, implying that firm investment would have been undertaken also without RDP support.

Similar findings are also reported from elsewhere. In Italy, Porro and Salis (2017) reported that the four local programmes, whose aim was to improve the competitiveness and survival capacity of subsidized firms, had no or negative net effects on employment growth, at least in the short run. However, they concluded that the absence of a clear positive impact on firms' earning profiles, on the other hand, induced one to suspect that the effect on employment cannot be relevant even in the medium-long run (Porro & Salis 2017). A parallel based on a difference-in-differences model implemented at the county (*Landkreis*) level, Petrick and Zier (2011) found that farm investment aids and transfers to LFA had no marginal employment effect at all. However, the authors argue that the support of production diversification is a reasonable way to develop additional jobs in agriculture. Similarly, the job creation effect of subsidies is often found to be insignificant (Gabe and Kraybill 2002), as the impact on productivity is found to be negligible or even negative (Bernini and Pellegrini 2011).

Jensen (2017) explored a state incentive programme implemented in Kansas in 2009 and applied coarsened exact matching technique to match subsidized firms with control firms that share similar characteristics but did not receive subsidies. The main finding was that there was no significant difference in job creation between recipient and non-recipient firms. The interpretation for the policy's ineffectiveness was that recipient firms obtained financial incentives for already planned employment expansions, that would have happened with or without public support (Jensen 2017).

3. Rural development and Rural Development Programme for Mainland Finland

3.1 Rural areas and development in Finland

Finland is one of the most sparsely populated countries in Europe. The total population of 2019 was 5.53 million and the land area was 303 933 km^2, and so the average population density was 18.2 inhabitants/km^2 (Statistics Finland 2020). According to the Finnish urban-rural classification (Figure 1), the degree of urbanization in Finland was more than 72 percent in 2018, but urban areas covered only five percent of land area (Helminen et al. 2020). The centres are small, and their internal distances are long, and so Finland is a very rural country by regional rural structure. The rural communities are often isolated, dependent from the success of local economy and they face social challenges due to an ageing population, unemployment and declining economies as a result of uneven regional development (Lehtonen 2015). Thus, their development requires place-based strategies that build on identified local assets and challenges and increase local economic activities (Partridge & Rickman 2008). Negative development trends in the past decades describe a lack of opportunities for economic diversification and a low resilience of the local economy, which underlines the importance of the new investments in industries from the RDP and economic activities increasing employment in rural areas.

To describe the dynamics of rural population development in Finland since 2005, we use the urban–rural typology, which divides Finnish territory into seven categories based on a complex classification procedure using data on population, labour, commuting, building and land use to measure the density, accessibility, versatility and orientation of the areas (Helminen et al. 2019; see Data and Methods for the description of the YKR georeferenced statistical database). From 2005 to 2019, urban areas have been characterized by a population increase (Table 1). In parallel to the population growth in urban areas, the four categories of rural areas in YKR typology have been characterized by a loss of population. The rural areas close to urban areas and local administrative and service centres in rural areas outside the reach of urban influence have had relatively stable population numbers. The remaining two rural

categories: core rural areas and sparsely populated rural areas, which together cover 84.2% of Finland's land area, have experienced a significant loss of population (Table 1).

The distribution of subsidies in urban and rural areas is also shown in Table 1. The largest share of funding has been allocated to core rural areas. A total of EUR 90.5 million in public support for core rural areas has been paid in the period 2007–2013, corresponding to about 38 percent of total public funding. The second largest share of public support has been allocated in sparsely populated rural areas, totalling around EUR 49.6 million, corresponding to around 20.8 percent of total public funding. Despite large differences in overall support, public support has been almost equal to that of core and sparsely populated rural areas in relation to population. In this respect, most of the public subsidies are allocated to the most economically stagnant areas.

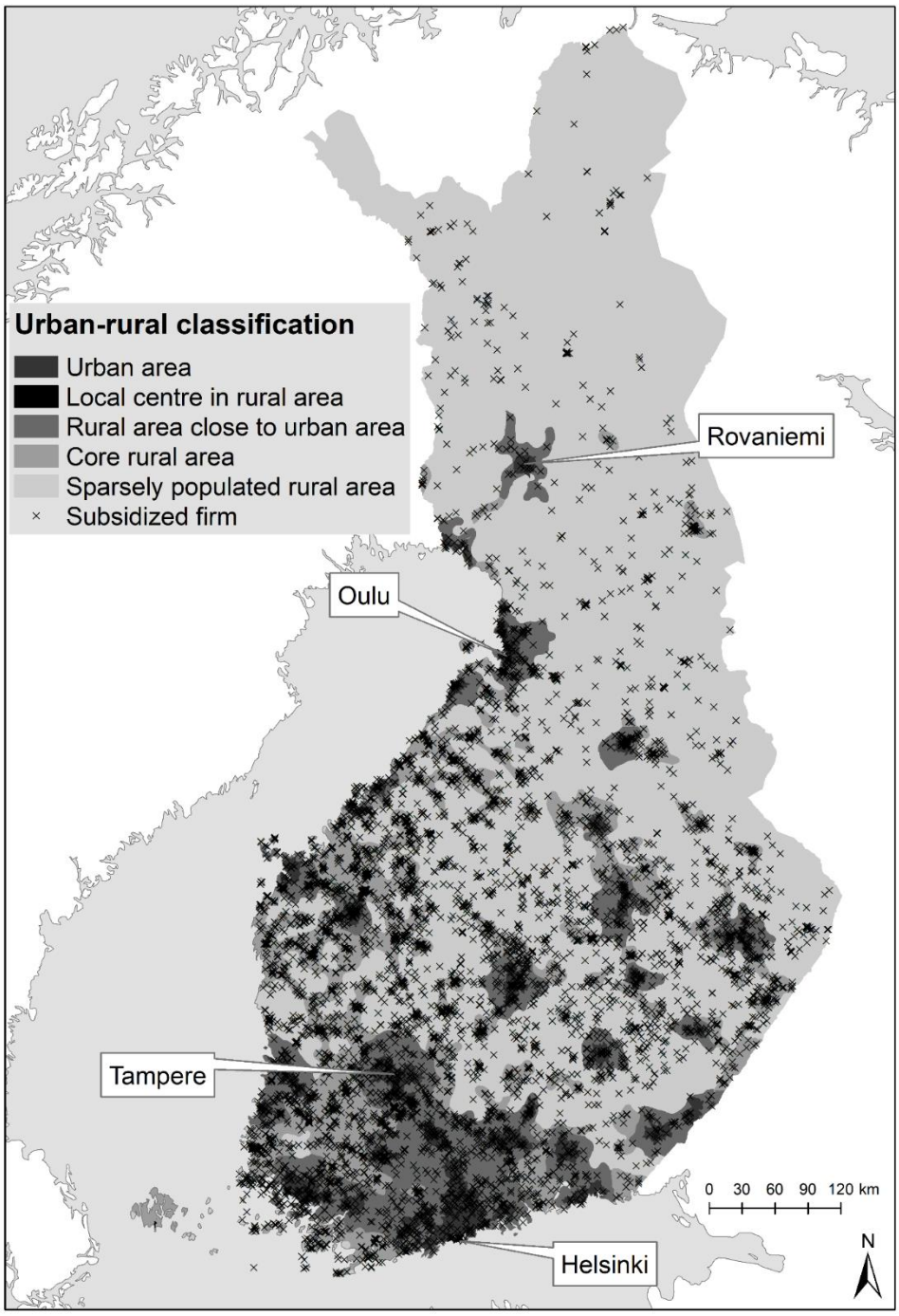


Fig 1. Urban-rural classification and location of the subsidized firms. Source: Helminen et al. 2020 & own analysis

Tab 1. Statistics from urban and rural areas. Source: Statistics Finland (2020) & own calculations

	Urban areas	Local centre in rural area	Rural area close to urban area	Core rural area	Sparsely populated rural area	Total
Population 2014	3 770 400	325 379	396 155	613 985	298 641	5 471 753
Population Δ 2005–2019 (%)	12.0	-4.5	-0.9	-11.5	-20.2	4.9
Net migration 2005–2019 (persons)	81 057	-7117	-15 351	-64 423	-49 755	-55 589
Median income 2014 (€)	23 620	20 715	22 288	20 195	19 034	22 606
Unemployment 2014 (%)	13.4	14.9	12.4	13.0	17.6	13.5
Demographic dependency ratio 2014	0.53	0.68	0.66	0.71	0.73	0.57
Number of firm subsidies 2007–2013 (n)	1502	678	1329	3391	1994	8894
Public firm subsidies 2007–2013 (million €)	46.3	19.2	32.8	90.5	49.6	238.3
Public firm subsidies 2007–2013 (€/pop)	**12.3**	**59.0**	**82.8**	**147.4**	**166.1**	**43.6**
Public firm subsidies 2007–2013 (%)	19.4	8.0	13.8	38.0	20.8	100

3.2 Aims and implementation of the RDP for Mainland Finland

The RDP for Mainland Finland 2007–2013 aimed to promote employment, improve the conditions for entrepreneurship and food production and contribute to environmental management and the development of rural services. The main objectives of Finland's rural development strategy were to preserve a viable and active countryside, improve the state of the environment and promote the sustainable use of renewable natural resources (Ministry of Agriculture and Forestry 2007). To achieve this aim, the strategy needed to respond to the permanent challenge created by the remote, northern location and adverse climate, abundance of water bodies and low population density in respect of preserving and improving the viability of rural areas. The strategy aims to reinforce the position of Finnish rural areas to keep up with regional, national and international development as globalization proceeds. In implementing the strategy, the following three key areas together with their common principles have been specified and was applied in the preparation and implementation of the RDP (Ministry of Agriculture and Forestry 2007):

1. improving the profitability of agriculture and forestry in a sustainable and ethically acceptable manner throughout Finland,
2. promoting and developing the competitiveness of firms, generating new entrepreneurship and entrepreneur networks to diversify rural livelihoods and improve employment,
3. strengthening local self-directed actions to enhance rural vitality and quality of life.

The Finnish RDP had 24 different actions compiled into four lines of action. Priority Axis 1 aimed at improving the competitiveness of agriculture and forestry, priority axis 2 the environment and living conditions in rural areas, priority axis 3 the quality of life in rural areas and to diversify the rural economic structure, and priority axis 4 aimed at developing rural communities with a Leader and action groups approach. The subsidies for firms were directed from Axes 1 and 3. (Ministry of Agriculture and Forestry 2007.) Table 2 contains statistics about the distribution of subsidies between axes. The share of public funding from total investments of the subsidies is 26 percent.

In Finland, the subsidies programme is designed in such a way as to minimize the distortion of competition in the field of the subsidized firm. Therefore, the subsidies of the rural development programme have focused primarily on research, product development, education, internationalization or other intangible development activities of the company or to improve the long-term competitiveness of small and medium-sized enterprises.

Tab 2. Subsidies of the rural development programme in subsidized firms in 2007–2013 (million €). Source: own elaboration

Axis	***Public***		***Private***		***Total***	
	€	***%***	***€***	***%***	***€***	
111 Vocational training and information activities	***€***	1.268	39.9	1.914	60.1	3.182
	%	0.5		0.3		0.4
123 Increasing the value added of agricultural and forestry products	***€***	41.030	20.3	160.772	79.7	201.802
	%	17.2		24.1		22.3
311 Extending economic activity outside agriculture	***€***	28.737	28.6	71.695	71.4	100.432
	%	12.0		10.7		11.1
312 Support for business start-up and development	***€***	167.521	27.9	433.565	72.1	601.086
	%	70.2		64.9		66.3
Total	***€***	238.557	28.6	667.946	71.4	906.504

4. Data

4.1 Database of the study

The database of the of the subsidized firms was received from the Finnish Agency of Rural Affairs. The database covered the full time span of the development programme 2007–2013 and contained detailed information on the subsidies granted to individual firms from the RDP for Mainland Finland. In total, 5696 firms received subsidies from the rural development programme. The recipient firms whose subsidized projects were concluded at the end of 2013 have been considered for the analysis. Because the database used in the analysis is compiled from different data sources, firms with no business identity code have been left out from the final database. Also, firms whose production units were located outside mainland Finland or whose address was unknown or some other important information was missing have been excluded from the database. After these reductions, the number of the firms examined is reduced to 4842, comprising 1116 start-ups and 3726 existing firms. The database contains the following information on the firm: business identity code, industrial classification, address, axis of the subsidy and the amount of the subsidy. The firms were geocoded based on their address and their areal class was spatially added from the urban-rural classification system. The database of the subsidies was completed using the Register of Enterprises and Establishments and the Register of Public Corporations maintained by Statistics Finland. The Business Register provides information from the service database formed from the Register of Enterprises and Establishments. It covers all enterprises, corporations and private practitioners of trade that are liable to pay value added tax or have paid employees. The Business Register data includes enterprises' addresses, branches of industry, size categories of personnel and turnover, start of operation and importer/exporter data (Statistics Finland 2018).

To estimate the effect of the subsidies on the subsidized firms, it is therefore necessary to construct this *counterfactually*, i.e., to establish a reasonable scenario capturing what would have likely happened to the subsidized firms if they had not received it (e.g., Morgan & Winship 2007; Khandker et al. 2010). This counterfactual analysis requires a *control group*, i.e., a group of firms which should be as similar as possible to the group of firms that received the subsidies in all respects except for the subsidies themselves. From the Business Register, we also obtained the randomly sampled control group which comprised of a group of firms that were of the same size in terms of personnel and turnover, branch of industry and firm location as our *treatment group,* which were funded from the RDP for Mainland Finland. Furthermore, the results obtained must always be interpreted from the point of view of the counterfactual analysis model used: the model is never a complete understanding of reality, but a carefully constructed comparison that tells more about the effectiveness of the subsidies than we would otherwise know without such a comparison (Rosenbaum & Rubin 1983; Austin 2011). The counterfactual evaluation is used because, for example, a comparison of simple averages between subsidized and control firms may not reveal the real impact of the public support on the subsidized firms due to the fact that the firms also differ in terms of characteristics other than that of just receiving subsidies (Austin 2011).

Tab 3. Description of the subsidized and non-subsidized firms. Source: own elaboration

Variable	Subsidized firm	Non-subsidized firm	t-test/Khi^2 test	p-value
Average turnover size class in 2008	2.6	3.4	27.124	<0,001
Industrial category: Agriculture(%)	11.3	3.0	272.090	<0,001
Industrial category: Services (%)	37.8	53.9	267.250	<0,001
Average number of employees in 2008	1.7	3.2	1.948	0.051
Not exporter (%)	91.2	94.2	42.604	<0,001
Location: rural centre (%)	8.9	6.4	21.930	<0,001
Location: rural area close to urban area (%)	13.6	8.4	73.188	<0,001
Location: core rural area (%)	39.7	12.2	1024.501	<0,001
Location: sparsely populated rural area (%)	20.4	5.7	1765.310	<0,001
Location: urban area (%)	23.1	64.3	1765.302	<0,001

The subsidized and the non-subsidized firms have different background characteristics because it was only possible to find control firms for the subsidized according to certain background characteristics (Table 3). The control firms were selected from Statistics Finland's database in such a way that the size by turnover and employees, industrial category and location of the control firm were as similar as possible to the subsidized firms. As it was not possible to extract the control firms from the database by urban-rural category, the control firms were located in urban areas more often than the subsidized firms (Table 3). For reasons related to firms' locations, the control firms were also more often from service sectors than the subsidized firms (Table 3). The subsidized firms are also slightly smaller in turnover than the non-subsidized control companies, but the difference in the number of employees is not statistically significant at the 5% significance level (Table 3). However, the differences between subsidized and non-subsidized firms emphasize the need for matching methods, i.e., the need for subsidized companies to be screened for as similar a non-subsidized company as possible. Therefore, some of the subsidized firms were left out of the analyses because no control firm could be found for them. The total number of firms by adding the control and treatment groups in our database was 10 043.

4.2 Regression models to estimate the impact of subsidies on firms

Regional development trends demonstrate the need for place-based development and new employment opportunities for rural areas. To examine and test the impact of RDP subsidies on employment changes in firms, we estimate three regression models based on the method used in previous study (Porro & Salis 2018). The outcome variable is the employment change ($dEmp_i$) between the year that subsidies were granted and 2014. Based on the employment change, the firms are classified into 2 classes: if the employment change is positive, the firm is classified as class 1 and class 0 if the employment change has not been positive after the subsidies were granted. The employment change is explained with the variables describing the type of subsidies, the firm's character and its location. Thus, the first attempt to evaluate the impact of the RDP makes use of a binary treatment model: all the firms that were subsidized are classified 'treated'. The first regression model can be written as follows:

$$dEmp_i = \alpha + \beta_1 Subs_i + \beta_2 Firm_{i2008} + \beta_3 Location_i + \varepsilon_i \quad (1),$$

where the employment change of firm ($dEmp_i$) is explained with a dummy variable of Subs indicating whether the firm received subsidies (coded as 1) or not (coded as 0). Employment change is also explained by the other variables that contain information about the subsidized firm such as when the firm was established, the branch of industry it belongs to, the number of employees and classification of export orientation. The locational variables that are used to explain employment change are dummy variables indicating whether a firm is located in a local centre of a rural area, rural area close to an urban area, core rural area or sparsely populated rural area. The explanatory variables in row vectors of Firm and Location are described in more detail in Appendix 1.

To investigate the possible different effectiveness of the eight different types of subsidies implemented, an eight-level version of model (1) is also estimated. The second model can be written as follows:

$$dEmp_i = \alpha + \beta_1 Subs_i Type_k + \beta_2 Firm_{i2008} + \beta_3 Location_i + \varepsilon_{i.} \quad (2),$$

where $SubsType_k$ is a dummy variable indicating recipient firms participating in the k:th type of subsidies (coded as 1 if subsidy is from type k, k=1,…,8, and 0 if not). The Firm and location variables are the same as above. The model identifies the types of subsidies that are linked to the increase in the number of jobs in firms.

The sharpest results are obtained when we consider the interactions between the eight programmes and the treatment levels (low/high), estimating an eight-level model as follows:

$$dEmp_i = \alpha + \beta_1 SubsForms_i * Level_j + \beta_2 Firm_{i2008} + \beta_3 Location_i + \varepsilon_i \quad (3),$$

where $Level_i$, (j = 1,…, 5), represents the five levels of the eight types of the subsidies in classified as quintiles. In this way in the third model, it is possible to evaluate the impact of treatment levels or different quintiles on subsidized firms.

4.3 Evaluation methods

The regression models represented above are estimated using data generated by matching methods commonly applied to analyse the impacts of the RDP on the subsidized firms (Michalek et al. 2020). The idea of matching is to find comparable firms for subsidized firms that have not received business support from the Rural Development Programme 2007–2013, but which are as similar as possible with the subsidized firms based on the background information from the Register of Enterprises. The matching method aims at achieving the benefits of a randomized experiment in observational data (Rosenbaum & Rubin 1983; Austin 2011). Matching makes it possible to assess the impact of subsidies on employment change more reliably than the traditional regression models without matching because it allows the estimation of the impact of financial subsidies comparing the performance of recipient firms to that of firms whose applications to the policy were rejected or that did not benefit from any public intervention (Lee 1996). At the same time, the magnitude of the causal effect can also be estimated between the group of firms (Rosenbaum & Rubin 1983). Without matching, there is a threat that the results would be biased.

For the purposes of this study, the equation for matching can be expressed as following:

$$Subs_i = \alpha + \alpha_{1i} Turnover2008 + \alpha_{2i} Employ2008 + \alpha_{3i} YearSubs + \alpha_{4i} Age + \alpha_{5i} Orientation + \alpha_{6i} Category + \alpha_{7i} Service + \alpha_{8i} Agriculture + \alpha_{9i} Commercial \quad (4),$$

where Turnover2008 denotes the turnover of the firms in 2008, Employ2008 denotes the number of employees of the firm in 2008, YearSubs denotes for the year of the subsidy, Age denotes for the foundation year of the firm, Orientation denotes the dummy variables indicating firm orientation for export (coded as 1), Category denotes the dummy variable of the urban-rural category where the firm is located (local centre in a rural area, rural area close to an urban area, core rural area and sparsely populated rural area), Service denotes the dummy variable indicating whether a firm is classified as a service firm, Agriculture denotes the dummy variable indicating whether the firm is operating in agriculture and Commercial denotes the dummy variable indicating whether the firm is operating in commercial services. The matching of the firms is made with a genetic matching method (Genetic matching) from the Matching package of R (Sekhon 2011). The utilized method is presented in more detail in the article by Diamond and Sekhon (2005). The summary plot of the covariance balance before and after conditioning confirms the balance of the matched database (Figure 2).

In addition to matching, to control for possible selection bias because matching may enlarge the effect of possible confounding variables (Heckman et al. 1997), the Heckman (1979) correction method adding the inverse Mills ratio to all the estimated models was applied. This means that analysis try to control self-selective processes that can make applicant firms different from non-applicant ones (Porro & Salis 2017). The correction method of the inverse Mills ratio is described in more detail in the literature (e.g., Greene 2003; Toomet & Henningsen 2008). In practice, the method tries to correct the error caused by the non-

response by weighting the distribution of the respondents so that the distribution corresponds to the (random) distribution of the population. Here, we assume that the application process and selection criteria of the RDP of Mainland Finland might imply some self-selective processes that can make subsidized firms different, to some extent, from non-subsidized ones. For this reason, we also estimate the significance of possible biases induced by unobservable features of applicant firms, using the Heckman correction procedure. In fact, the selection criteria of the RDP of Mainland Finland steer evaluation approach to use matching methods because the requirement for the random allocation of support makes it impossible to use randomized controlled trial-based evaluations for government interventions (Dalziel 2018).

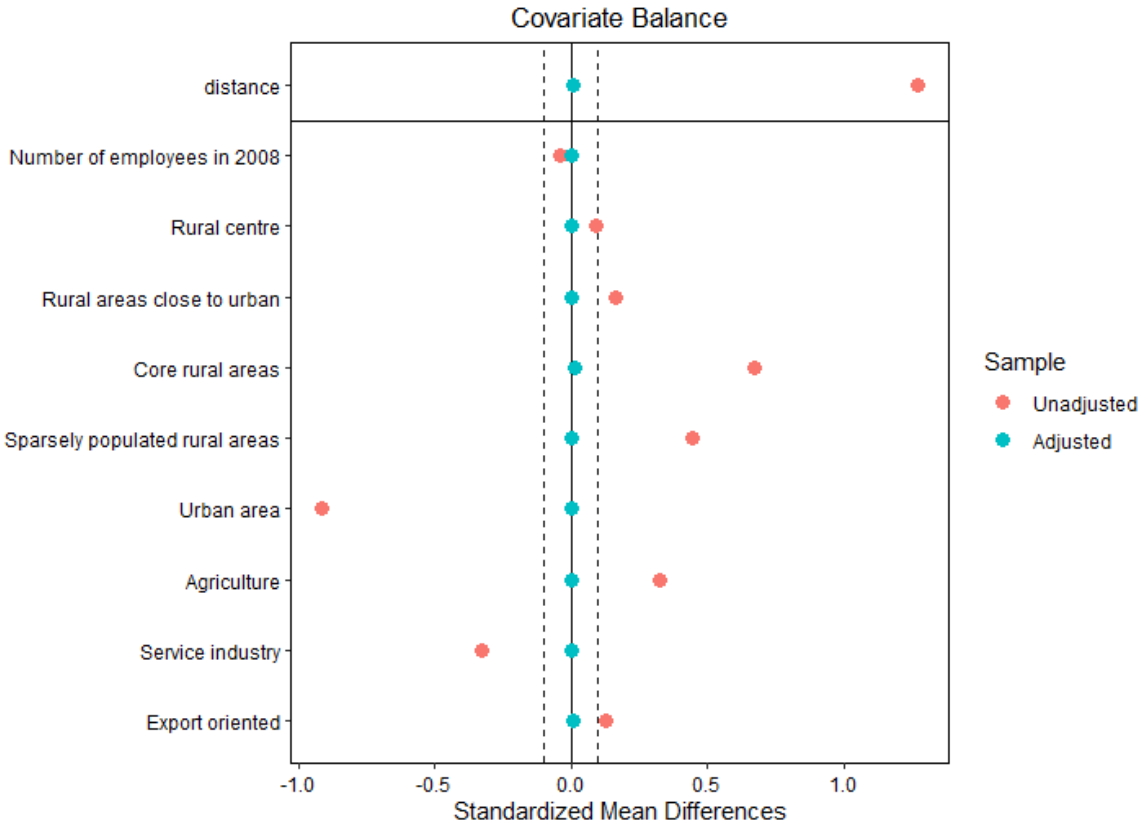


Fig 2. Covariance balance plot before and after conditioning. Source: own elaboration

5. Results

5.1 Descriptive statistics of the subsidized firms

The total number of subsidized firms was 5696 of which 505 firms corresponding for 8.9 percent of the subsidized firms have closed by the end of 2014. A total of 2838 growing firms which were able to increase the number of jobs after being subsidized were recorded in the database 2838 which corresponds to about 49.8 percent of the subsidized firms (Table 4). In the growing firms, the number of jobs increased from the year of granting to 2014 by a total of 5249 jobs, which means that on average, the growth in the number of jobs in subsidized firms was 1.8 jobs per firm. However, in total, the change in the number of jobs in all companies that received subsidies were 3112 between 2008–2014 (Table 4) because not all firms were able to grow. The statistics indicate that more than 65 percent of both public subsidies and private funding were allocated to growing firms (Table 4). The rest of the subsidies were allocated to firms whose employment had fallen since the subsidy was granted. Less than a third of the public subsidies and private funding have been targeted at stagnating firms and around 4 percent to firms that have closed by the end of 2014 (Table 4).

Tab 4. Descriptive statistics from the firm development and subsidies. Source: own elaboration

Variable		Growing firm	Stagnating firm		Total
			in operating	closed	
Number	n	2838	2353	505	5696
	%	49.8	41.3	8.9	100.0
Jobs 2017	n	12 089.6	4222.3	0	16 311.9
	%	74.1	25.9	0.0	100.0
Growth of jobs 2008–2014	€	5249	-1742.3	-394.9	3111.8
	%	168.7	-56.0	-12.7	100.0
Public subsidies (million €)	€	135.396	63.016	8.858	207.27
	%	65.6	30.1	4.4	100.0
Private funding (million €)	€	385.704	158.409	22.891	567.005
	%	68.0	27.9	4.0	100.0
Public subsidies € /job	€	25 794.6	-36 168.3	-22 431.0	66 607.8

Based on the distribution of the subsidies, the growing firms received most of the funding from business development support from “vocational training and information measures” and investment support from the measure “adding value to agricultural and forestry products”. In these types of subsidies, a relatively small part of public subsidies was allocated to companies that have closed by the end of 2014 (Table 5). The third type of subsidy, which is directed at growth firms, is 'extension of economic activities outside agriculture'. From this subsidy, more than 90 percent had been allocated to growth firms and only 0.7 percent were allocated to firms that have closed (Table 5). Relatively, the most ineffective subsidy was investment subsidies from the measure "extension of economic activities outside agriculture" because 9 percent of this subsidy was allocated at companies that have closed their operation (Table 5).

Tab 5. Distribution of the public subsidies by firm development and type of subsidies. Source: own elaboration

Axis	Type of subsidies		Growing firm	Stagnating firm		Total
				Operating	Closed	
111 Vocational training and information activities	Business development subsidies	€	0.954	0.217	0.034	1.205
		%	79.2	18.0	2.8	100.0
123 Increasing the value added of agricultural and forestry products	Investment subsidies	€	30.453	7.200	1.057	38.711
		%	78.7	18.6	2.7	100.0
311 Extending economic activity outside agriculture	Investment subsidies	€	6.064	3.223	0.951	10.238
		%	59.2	31.5	9.3	100.0
	Business development subsidies	€	0.348	0.033	0.003	0.383
		%	90.7	8.6	0.7	100.0
	Business start-up subsidies	€	0.235	0.100	0.010	0.345
		%	68.1	29.0	3.0	100.0
	Total	€	6.646	3.356	0.964	10.966
312 Support for business start-up and development	Investment subsidies	€	87.761	47.831	6.050	141.642
		%	62.0	33.8	4.3	100.0
	Business development subsidies	€	3.093	1.804	0.345	5.242
		%	59.0	34.4	6.6	100.0
	Business start-up subsidies	€	6.490	2.609	0.408	9.506
		%	68.3	27.4	4.3	100.0
	Total	€	97.343	52.243	6.803	156.390

5.2 Impact of subsidies on firms

The regression results from the model I seem to support subsidized firm for growth. Table 6 shows the results of the regression model without matching, with matching and with matching corrected using the Heckman correction. The most reliable interpretations of impacts of the subsidies on the development of the number of jobs in firms are made from the Heckman-corrected model, which, in addition to matching, considers the effect of selection in the results. The results of these regression models are mostly parallel. The only difference is that in regression models based on matched data, the size of the firm declines the growth probability. Also, the matched data-based models differ from the model without matching since in these models, the regression coefficient of the subsidized firms is significant and in the model without matching the regression coefficient is insignificant (Table 6).

The regression coefficients show that the regression coefficients for subsidies are positive, suggesting that receiving subsidies has increased the growth prospects of firms and therefore subsidized firms are more likely to increase number of jobs than non-subsidized firms (Table 6). In other words, without the subsidies, business growth would have been weaker in the rural areas. The Heckman correction confirms the above interpretation even though the selection bias was not a serious problem in this case as the IMR is not statistically significant (Table 6).

Of the other explanatory variables, the job growth is increased by the firm's export orientation (Table 6). The growth of jobs is weakened by the firm's location in the core or sparsely populated rural areas, as the regression coefficients of both categories of regions are negative (Table 6). Thus, subsidies seem to reduce the locational disadvantage of the rural areas for growth (Lehtonen 2015). Other variables in the regression models are not significant indicating that industry or size of the firm is not generally related on the growth of rural firms (Table 6).

Tab 6. Results from the regression model I. Source: own elaboration

Variables	Growth of jobs 2007–2014		
	Data without matching	Matched data	Matched data with Heckman correction
Subsidized start-up	**0.759*** (0.069)**	**0.858*** (0.072)**	**0.261*** (0.027)**
Subsidized firm	0.052 (0.048)	**0.198*** (0.050)**	**0.110*** (0.026)**
Agriculture	0.051 (0.082)	0.060 (0.085)	-0.005 (0.023)
Services	-0.005 (0.043)	-0.014 (0.045)	-0.001 (0.016)
Employees 2008	0.0002 (0.001)	**-0.010* (0.006)**	-0.002 (0.007)
Exporter	**0.438*** (0.049)**	**0.450*** (0.061)**	**0.102*** (0.015)**
Location: rural centre	-0.081 (0.094)	-0.019 (0.098)	-0.001 (0.033)
Location: rural area close to urban area	**-0.146** (0.074)**	-0.082 (0.077)	-0.019 (0.026)
Location: core rural area	**-0.203*** (0.072)**	**-0.164** (0.075)**	**-0.054** (0.024)**
Location: sparsely populated rural area	**-0.213*** (0.082)**	**-0.151* (0.086)**	-0.043 (0.027)
Location: urban area	-0.077 (0.060)	-0.063 (0.064)	-0.020 (0.021)
Constant	-0.034 (0.065)	-0.084 (0.070)	0.473 (0.463)
Observations	10,321	9,425	9,425
Log Likelihood	-7,042.294	-6,415.091	
Akaike Inf. Crit.	14,108.590	12,854.180	
rho			-0.130
Inverse Mills Ratio			-0.064 (0.581)

Note: *p<0.1; **p<0.05; ***p<0.01

Regression model II focused on investigating the effectiveness of the eight different forms of subsidies. The results of the regression model demonstrate that not all the subsidies impact positively on job growth in the firms. Using matching data and the Heckman correction, there were 10 subsidies that were positively linked to job growth in the regression model (Table 7). The IMR value in the Heckman-corrected model is negative and significant, which means that the regression coefficients of the 5regression model are downward biased. This also means that growth firms apply for support, so the public support reaches growth firms better than other firms. On the other hand, it should be noted that subsidies are related to the activities which must have growth objectives. The types of subsidies that have a positive effect on the development of supported firms are investment and start-up subsidies for start-ups and existing firms under measures 311 and 312. For existing firms, also investment subsidies from the measures 123 and business development subsidies from measure 312 seem to increase growth in subsidized firms (Table 7).

Tab 7. Results from the regression model II. Source: own elaboration

Variables	Growth of jobs 2007–2014		
	Data without matching	Matched data	Matched data with Heckman correction
M111: Business development for s-u	0.594 (0.897)	0.673 (0.898)	0.186 (0.205)
M123: Investment subsidies for s-u	0.340 (0.276)	0.155 (0.298)	0.071 (0.074)
M311: Business development for s-u	10.866 (119.468)	10.842 (119.468)	0.645 (0.487)
M311: Business start-up subsidies for s-u	1.100 (1.167)	1.072 (1.169)	0.279 (0.245)
M311: Investment subsidies for s-u	**1.073*** (0.362)**	0.609 (0.391)	**0.188* (0.096)**
M312: Investment subsidies for s-u	**0.838*** (0.072)**	**0.922*** (0.079)**	**0.263*** (0.025)**
M312: Business development for s-u	0.132 (0.278)	0.390 (0.306)	**0.140* (0.075)**
M312: Business start-up subsidies for s-u	**0.919*** (0.221)**	**0.932*** (0.233)**	**0.247*** (0.054)**
M111: Business development	**0.661* (0.371)**	0.478 (0.403)	0.111 (0.090)
M123: Investment subsidies	**0.355*** (0.123)**	**0.523*** (0.137)**	**0.191*** (0.037)**
M311: Business development	0.452 (0.511)	0.520 (0.536)	0.164 (0.127)
M311: Business start-up subsidies	0.974 (0.604)	**1.229* (0.669)**	**0.406*** (0.148)**
M311: Investment subsidies	-0.055 (0.137)	0.034 (0.144)	**0.080** (0.038)**
M312: Investment subsidies	**0.116** (0.048)**	**0.194*** (0.052)**	**0.115*** (0.021)**
M312: Business development	-0.110 (0.111)	0.051 (0.122)	**0.064** (0.032)**
M312: Business start-up subsidies	**0.679*** (0.111)**	**0.622*** (0.121)**	**0.189*** (0.032)**
Agriculture	0.039 (0.085)	0.071 (0.090)	-0.008 (0.025)
Services	0.019 (0.042)	-0.005 (0.045)	-0.002 (0.016)
Employees 2008	0.0003 (0.001)	**-0.012* (0.006)**	-0.0004 (0.002)
Exporter	**0.396*** (0.047)**	**0.431*** (0.061)**	**0.102*** (0.015)**
Location: rural centre	-0.134 (0.091)	-0.019 (0.099)	0.007 (0.033)
Location: rural area close to urban area	**-0.168** (0.072)**	-0.094 (0.077)	-0.013 (0.026)
Location: core rural area	**-0.210*** (0.070)**	**-0.164** (0.076)**	**-0.043* (0.024)**
Location: sparsely populated rural area	**-0.197** (0.079)**	**-0.150* (0.086)**	-0.034 (0.027)
Location: urban area	-0.038 (0.058)	-0.048 (0.064)	-0.016 (0.021)
Constant	-0.090 (0.063)	-0.112 (0.070)	0.467*** (0.045)
Observations	10,900	9,425	9,425
Log Likelihood	-7,400.036	-6,389.309	
Akaike Inf. Crit.	14,852.070	12,830.620	
rho			-0.181
Inverse Mills Ratio			-0.089** (0.043)

Note: *p<0.1; **p<0.05; ***p<0.01

Other explanatory variables affect regression model II in the same way as in model I. In the regression models, all the regression coefficients for urban-rural categories are negative, which means that locational disadvantage is associated with the decline of job growth in subsidized firms. The finding can be interpreted also in a way that the firms located in these areas need interventions if the impact of locational disadvantage on their development is to be reduced. In terms of absolute value of the regression coefficients, the highest value is in core rural areas, which indicates that job growth has been slightly less likely in core rural areas than in other rural categories (Table 7).

Tab 8. Results from regression model III. Source: own elaboration

Variables	Growth of jobs 2007–2014		
	Data without matching	Matched data	Matched data with Heckman correction
M111: Business development for s-u	0.679 (0.560)	0.648 (0.556)	0.095 (0.067)
M123: Investment subsidies for s-u	0.155 (0.113)	0.171 (0.118)	**0.051* (0.028)**
M311: Business development for s-u	2.194 (23.894)	2.184 (23.894)	0.130 (0.095)
M311: Business start-up subsidies for s-u	0.874 (0.778)	0.840 (0.774)	0.097 (0.077)
M311: Investment subsidies for s-u	0.212 (0.147)	0.193 (0.146)	**0.061* (0.035)**
M312: Investment subsidies for s-u	**0.367*** (0.029)**	**0.394*** (0.031)**	**0.105*** (0.007)**
M312: Business development for s-u	0.093 (0.107)	0.147 (0.115)	**0.053** (0.026)**
M312: Business start-up subsidies for s-u	**0.394*** (0.093)**	**0.406*** (0.095)**	**0.105*** (0.019)**
M111: Business development	0.199 (0.157)	0.253 (0.163)	0.054 (0.034)
M123: Investment subsidies	**0.189*** (0.049)**	**0.289*** (0.054)**	**0.090*** (0.013)**
M311: Business development	0.285 (0.198)	0.349 (0.220)	**0.088** (0.045)**
M311: Business start-up subsidies	0.189 (0.213)	0.167 (0.212)	**0.105* (0.056)**
M311: Investment subsidies	**0.089* (0.049)**	**0.102** (0.050)**	**0.046*** (0.012)**
M312: Investment subsidies	**0.105*** (0.017)**	**0.135*** (0.018)**	**0.054*** (0.005)**
M312: Business development	0.007 (0.043)	0.057 (0.045)	**0.031*** (0.011)**
M312: Business start-up subsidies	**0.280*** (0.046)**	**0.279*** (0.047)**	**0.080*** (0.011)**
Agriculture	0.040 (0.086)	0.065 (0.090)	0.005 (0.024)
Services	0.026 (0.043)	0.016 (0.045)	0.012 (0.015)
Employees 2008	0.0002 (0.001)	**-0.022*** (0.006)**	0.002 (0.009)
Exporter	**0.390*** (0.051)**	**0.393*** (0.062)**	**0.082*** (0.016)**
Location: rural centre	-0.131 (0.094)	-0.041 (0.099)	0.012 (0.032)
Location: rural area close to urban area	**-0.234*** (0.074)**	**-0.146* (0.078)**	-0.018 (0.026)
Location: core rural area	**-0.295*** (0.072)**	**-0.217*** (0.075)**	**-0.043* (0.024)**
Location: sparsely populated rural area	**-0.307*** (0.082)**	**-0.206** (0.086)**	-0.033 (0.027)
Location: urban area	-0.054 (0.061)	-0.045 (0.065)	-0.019 (0.021)
Constant	-6.423 (23.917)	-6.753 (23.917)	-1.393** (0.622)
Observations	10,321	9,425	9,425
Log Likelihood	-6,973.658	-6,338.628	
Akaike Inf. Crit.	13,999.320	12,729.260	
rho			0.939
Inverse Mills Ratio			0.675 (0.750)

Note: *p<0.1; **p<0.05; ***p<0.01

Table 8 broadens the perspective on the impact of the subsidies on the development of subsidized firms. In regression model III, the job development of firms is explained in more detail by the forms of support related to different measures and levels of the subsidies, which have been added as an interaction term to the regression model. Regression models increase the information of regression models I and II as the high levels of the subsidies are associated with higher growth probabilities of the jobs. The interaction term also increases the number of statistically significant subsidies because there are 12 statistically significant subsidies in the regression model which use matched data and the Heckman correction (Table 8).

6. Discussion and conclusions

The results showed that subsidies from the RDP had a positive impact on the development of subsidized firms. The evidence is consistent with some earlier international studies that analysed the effects of public subsidies on job creation (Asvapp 2012; Cerqua and Pellegrini 2014). Results imply that there are country specific differences in RDPs, which might be explained by differences in the implementation and allocation of the public support for firms. In Finland, the subsidized firms seem to have increased their productivity with new investments and business ideas and, thus, have been able to create more jobs. The results give a more positive picture from the subsidies than previous general comparisons where most of the subsidies did not support the renewal of the subsidized firms (Pietarinen 2012). This could be explained by the fact that the analysis in this study utilized detailed data from single firms from the databases of the Business Register. These findings are supported by the quantitative final evaluation of the 2007–2013 RDP where the subsidies were seen to be important because they enabled the investment projects to be implemented earlier or on a larger scale than without the subsidies (Pyykkönen et al. 2016).

Despite the positive impact on job creation, it should be noted, however, that not all forms of the subsidies had a positive impact on job creation. With start-ups, five of the eight subsidies had a positive impact on employment while with operating firms seven of the eight subsidies had positive impact on employment, and therefore, it is important to note that not all forms of the subsidies had impact on the growth of subsidized firms. This suggest that part of the subsidies more probably maintain economic activity in rural areas than create employment growth, which also can explain differences between countries or regions within countries in earlier studies (e.g., Asvapp 2012; Porro & Salis 2018). It should also be noted that the differences between regression models II and III were relatively small which support the earlier views that large subsidies are ineffective (Asvapp 2012).

In addition to the statistical significance of the measures, the effectiveness of the RDP was well illustrated by the fact that about 50 percent of the subsidized firms were growth firms in the number of jobs, and they accounted for almost three quarters of the subsidies. From the point of view of developing the effectiveness of subsidies of the RDP, it is noteworthy that, as a whole, public subsidies were directed based on regression models to effective forms of subsidies, which explained the growth of companies in a statistically significant way. Through these statistically significant forms of subsidies, funding for start-ups with job growth accounted for 69 percent of public funding granted for start-ups. The corresponding proportion for operating growth companies was 64 percent. These figures indicate not only the success of the local authorities in detecting growth firms but also that different types of the subsidies were able to support growth.

In general, the reasons why the subsidies worked well in Finland might be related to the fact that the share of public support of total investments in firms was relatively small and amount of the subsidies were also generally small, which indicates the subsidized firms had a real willingness to develop and grow because the public support did not exclude other privately funded investments. The evidence indicates that these substitution effects are at least moderate and did not increase the inefficiency of the firms. In Finland, there were also precise rules for subsidies which recognized growth-seeking companies, which did not distort local competition but underlined the importance and role of the local authorities in successful implementation of the RDP. The important role of the local authorities can also strengthen the possibilities of the RDP to execute place-based policies within the RDP. The findings of the study provide an incentive

to include subsidies as part of the RDP and support diversification with off-farm enterprises and promotion of rural entrepreneurship in order to improve the standard of living in rural areas.

The implication of the analyses of this study for RDP impact analyses is that the approach using matching combined with the Heckman correction can provide important insights into the impact of subsidies on job creation in subsidized firms when evaluating RDPs. Similar methodology can be used to evaluate RDP or other type of regional development programmes in other regions or countries if databases are available. The estimated results in this paper as such cannot be straightforwardly generalized to other countries or time periods or to other types of development programmes (e.g., EU regional policy) because the implementation details of each period or programme are different (e.g., in terms of the eligible sectors, the eligible types of firms), and the implementation of the same programme differs as well. This narrow focus of the RDP evaluations has been identified as one key problem in the comparison of the national and regional experiences (Lillemets et al. 2022).

The main critic of the matching methods and the results of this study relate to the selection of the covariates and control firms. Thus, it should also be noted that the list of covariates to control for selection bias was limited and would need more attention in future studies. Improvements would require development work among statistical authorities to combine datasets with each other. The systematic analysis of the control firms would be essential because most of the subsidies are allocated in the rural areas where business conditions are often poor. It would require, for example, extending and integrating business register data with other data sources including more information about the location of firms.

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Appendix

A1. Variables used in the regression models (M1=model1, M2=model2, M3=model3).

Variable	M1	M2	M3	Description of the variable	Row vector
Dummy subsidized	x	-	-	The firm has received business support in 2007–2013; coded as 1 if the firm has received subsidy and coded as 0 if not.	Support
M111: Business development	-	x	x	111 Business development subsidy for vocational training and education; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
M123: Investment subsidies	-	x	x	123 Investment subsidy for Adding value to agricultural and forestry products; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
M311: Business development	-	x	x	311 Investment subsidy for extending economic activity beyond agriculture; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
M311: Business start-up subsidies	-	x	x	311 Business development for extending economic activity beyond agriculture; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
M311: Investment subsidies	-	x	x	311 Business start-up subsidy for extending economic activity beyond agriculture; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
M312: Investment subsidies	-	x	x	312 Investment subsidy for business creation and development; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
M312: Business development	-	x	x	312 Business development subsidy for business creation and development; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
M312: Business start-up subsidies	-	x	x	312 Business start-up subsidy for business creation and development) ; coded as 1 if the firm has received subsidy and coded as 0 if not.	Type of support
Years from subsidy is granted	x	x	x	Time in years between the granting of firm subsidies and 2014.	Firm
Start-up	x	x	x	A start-up firm	Firm
Agriculture	x	x	x	The industry of the firm is agriculture defined in accordance with Statistics Finland's Standard Industrial Classification 2008 (TOL 2008).	Firm
Services	x	x	x	The industry of the firm is services defined in accordance with Statistics Finland's Standard Industrial Classification 2008 (TOL 2008).	Firm
Employees 2008	x	x	x	Total number of employees in 2008.	Firm
Exporter	x	x	x	A firm is an exporter if the value of its goods exports is (relates to both intra-EU and extra-EU trade): a) over EUR 12 000 per year and divided over at least two months, or b) over EUR 120 000 per year	Firm
Location: rural centre	x	x	x	Firm locates in local rural centre, a dummy variable.	Area
Location: rural area close to urban area	x	x	x	Firm locates in rural area close to urban area, a dummy variable.	Area
Location: core rural area	x	x	x	Firm locates in core rural area, a dummy variable.	Area
Location: sparsely populated rural area	x	x	x	Firm locates in sparsely populated rural area, a dummy variable.	Area
Location: urban area	x	x	x	Firm locates in urban area, a dummy variable.	Area