Is there any „farms´ productivity rule“?

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Abstract: This article aims to explore the relationship between productivity of farms in different locations, of different size, with different production orientation and their subsidies. The share of agricultural subsidies on the agricultural revenue is 20% using the total sample of farms. When focusing on the size groups, this share is 19% in very large farms, 28% in the middle sized and 30% in small sized. Regarding the production orientation this share is 1.5 times higher in the medium and small farms (compared to the very large ones) in all the production orientations (field, milk, mixed, cattle breading). Taking the above-mentioned information into account, the paper gives some insights in the subsidies' development in the relation with the Czech Republic agrarian structure and economic efficiency of farms.

Keywords: agricultural productivity, farms productivity size structure, production orientation, productivity differentiations factors
JEL Classification: O13, Q13, Q18

1 Introduction

The transition to the long-term sustainable EU economy that should use the sources in the environmentally responsible way is changing the Common Agricultural Policy (CAP) as well. The more attention is paid to the benefits of agriculture for the environment, the landscape creation, the generational change of farmers and income parity. However, the assurance of enough food in the good quality and price still remains one of the main CAP´s aims. The EU conception document "The Future of Food and Agricultural" forms the aims for the next years CAP in the above-mentioned sense. The document also gives the EU member states higher responsibilities for the CAP realization.

The development of the size structure of agricultural companies remains one of the open questions of the CAP EU as well as its managing. This topic is of special interest and controversy in the Czech Republic, as it relates to the subsidies' allocation to the farms of different sizes. The size structure development is the matter of interest of a lot of authors already for a long time. e.g. Boehlje (1992, 1999), Alen a Luech (1998), Ahearn et al.. (2009), Hoggart a Paniagua (2001), Savillse (2001), Cochrane (1958). The farms development in the transition economies is the special issue of Swinnen (2009). The important CAP part are the farms subsidies. Weight, Williams (1998), Tracy (1993), Devadors, Chot (1991), Herringsmayer (1991), Swinnen (1994) or Grega (2005) deal with the reasons of the subsidies. Based on their findings, the main reasons are the economic ones; however, the political, social and environmental points of view are important as well. The subsidies are economically justified in case when the operation of "free market" decreases the society well-being.

The aim of the paper is to express, what kinds of farm´s specifics are the most connected to the productivity differentiation. These „specifics" are the farm's size, production orientation, location in different agroecological conditions and subsidies. The paper findings extend the previous research of the authors dealing with the efficiency of the farms of different size structure (Svobodová et al., 2022) and follow up the research on impact on companies´ size on the regional development (Redlichová et al., 2019).

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2 Methods

The main data source for this research is the Farms Accountancy data Network of the Czech Republic (FADN CZ), what is the part of FADN EU database created mainly for Common Agriculture Policy purposes. The responsible institution is the Institute of Agricultural Economic and Information in Prague. The methodological principles of survey and data processing are stated by Hanibal et al. (2017) and Macháčková et al. (2020).

The measurement of the farm and the monitoring of the farms´ size structure could be based on input-output indicators. Commonly used characteristics are the area under cultivation, number of employees, volumes of capital or the agricultural production (Zdráhal and Bečvářová, 2013). In this research we have used output criterion of farm economic size, called "standard output (SO)", as it is defined by FADN EU methodology. Ii is the sum of annual standardized production of the farm. Besides this indicator, the acreage and number of employees are also considered. The natural conditions differences are expressed by dividing the farms in groups based on ANC, e.g. mountain ANC (ANC M), others ANC (ANC O) and location out of ANC (non ANC = N ANC).

The sum of consumption, depreciation and cost for external factors (wages + rent + interests), what is used in FADN methodology, is adjusted by the value of unpaid labor. This value is based on the average personal costs for paid worker (AWU) in small, medium and large farms of the research sample, what is 324 K CZK (13 208 EUR). The total value of cost including this unpaid labor is signed as "adjusted costs = AdC".

The research is focused on financial revenues from the agricultural production and the operational subsidies. These are calculated as total operational subsidies minus subsidies for renewable energy sources.

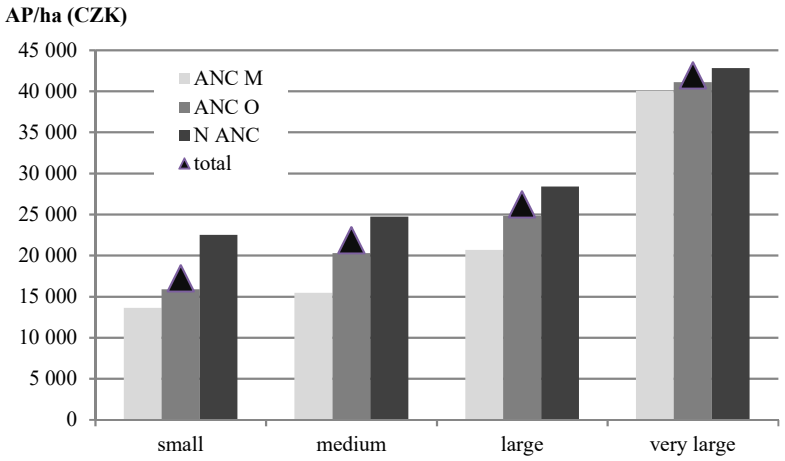
All the outcomes represent the average value of the time series 2015 – 2020.

3 Research results

3.1 Productivity

The results of the differences in the productivities levels among the farms of different sizes confirm the relation with the economic size of the farm and prove the benefits of larger extend of company (economy of scale). The productivity and economic efficiency are inevitable criterions of the farms size development.

Figure 1 The productivity in the farms of different sizes and agricultural conditions (2015 – 2020 average)



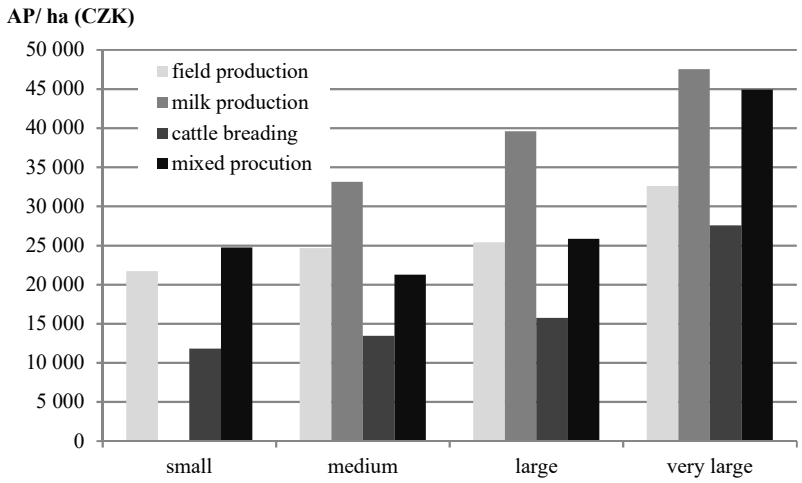
Source: Own processing, 2022 (data: FADN CZ)

Note: AP = agricultural production

The data on land productivity in the regions with different agroecological conditions bring the base information on the land and land conditions usage intensity. The analysis outcome that could be seen on the Figure 1 clearly presents higher production factors productivity of very large companies compared to the small and medium ones. The others size groups are not so substantially differentiated.

The differentiation of the total production factors (labor as well as material) productivity levels in the companies of different production orientation are presented in Figure 2. The data here show the following:

Figure 2 The productivity in the farms of different sizes and production orientations (2015 – 2020 average)

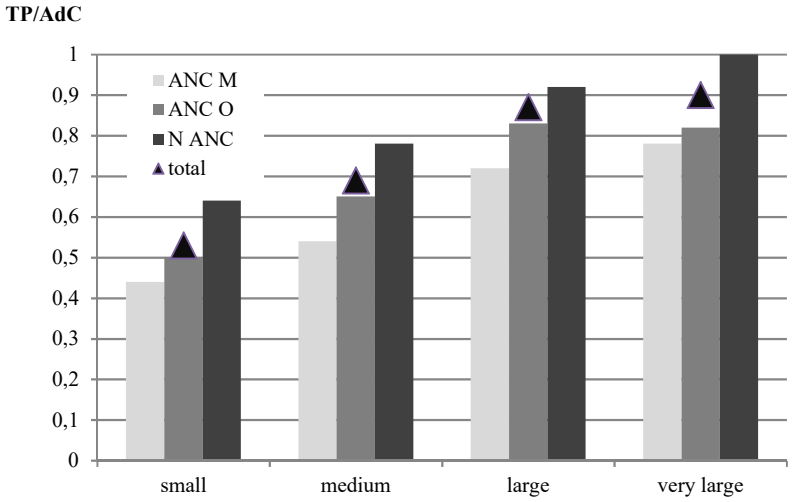


Source: Own processing, 2022 (data: FADN CZ)

Note: AP = agricultural production

- the highest intensity is reached by the milk farms, while the differences among the size groups are smaller compared to the farms oriented on other productions;
- the differences in the intensities are quite low in the field production farms, the highest are in the cattle breading farms;

Figure 3 Total factor productivity in the farms of different sizes and agricultural conditions (2015 – 2020 average)

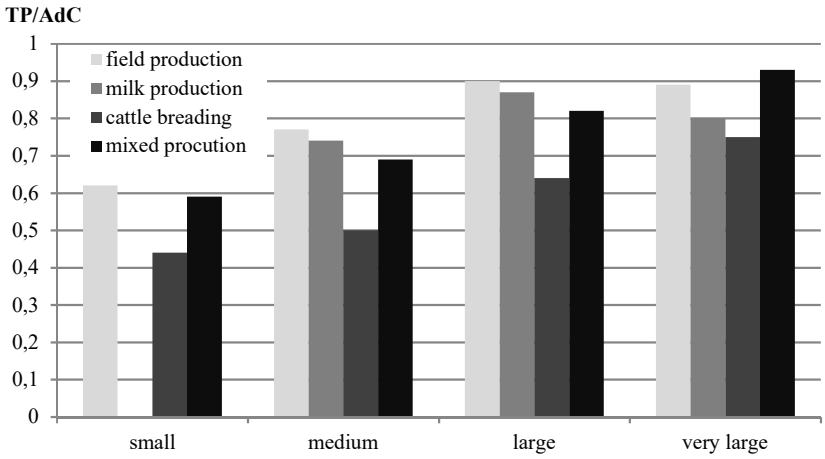


Source: Own processing, 2022 (data: FADN CZ)

Note: TP = total production; AdC = Adjusted Costs

The total factor productivity overview (Figure 3) in different agroecological areas gives the information on the usage of labor and material under specific land and climate. Not surprisingly, the lowest productivity is in the group of mountain ANC and the highest in the areas without natural constraints.

Figure 4 Total factor productivity in the farms of different sizes and production orientations (2015 – 2020 average)



Source: Own processing, 2022 (data:FADN CZ)

Note: TP = total production; AdC = Adjusted Costs

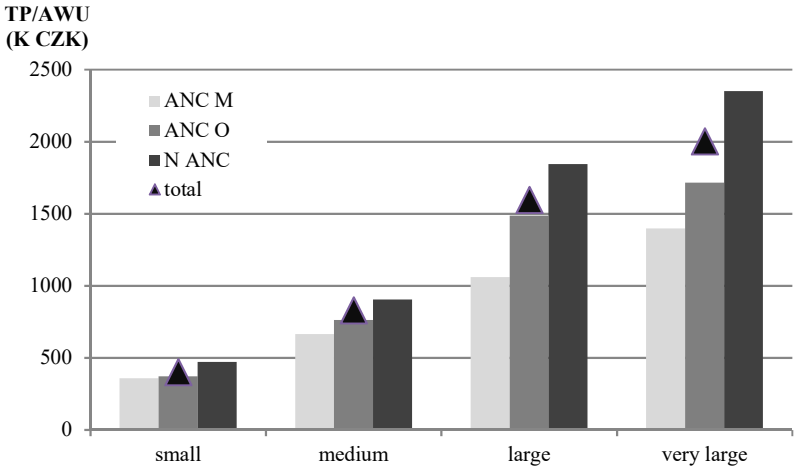
Figure 4 shows the same analysis focusing on the production orientation.

- the levels of total factor productivity among the groups of farms of different production orientation is less balanced in small and medium farms, the large farms have more balanced level;
- the companies oriented on field production reach the highest total productivity, while the differences among the size groups are relatively smaller;
- the lowest total productivity is in the cattle breading orientation. The differences among the farms of different sizes are also the more evident.

The most significant differences among the size groups of farms have been found in the labor productivity as well (Figures 5 and 6). The small farms are on the 20% level of the labor productivity compared to the very large ones; the medium ones are on the 40% level. These results correspond to the more developed substitution of labor by technique and higher innovation activity of large and very large companies in terms of technique and technology reproduction. The similar results of Novotná et al. (2021) show technological investment having the greatest positive impact on the growth of labor productivity and on a decline in labor intensity in low technology enterprises.

The differences of the labor productivity among the farms located in different agroecological conditions Figure 5) are substantially lower. The levels of ANC M and ANC O are 59%, resp. 73% of the N ANC level.

Figure 5 The labor productivity in the farms of different sizes and agricultural conditions (2015 – 2020 average)

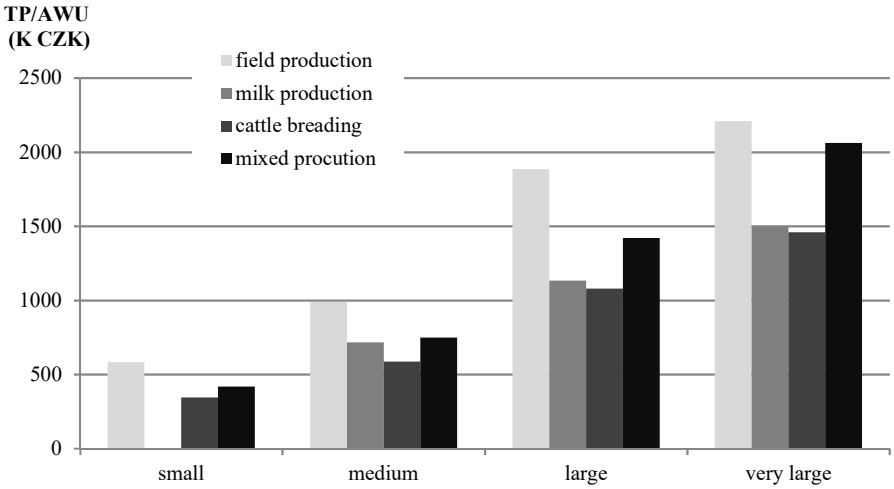


Source: Own processing, 2022 (data: FADN CZ)

Note: TP = total production; AWU = annual working unit (2 000 working hours per a year)

While evaluating the labor productivity differences it is necessary to keep in mind the methodological limitation of the research data about the unpaid labor. The ratio of this kind of labor on total AWU is 87% in small and medium farms, 43% in large farms and 0.5% in vary large farms.

Figure 6 The labor productivity in the farms of different sizes and production orientations (2015 – 2020 average)



Source: Own processing, 2022 (data: FADN CZ)

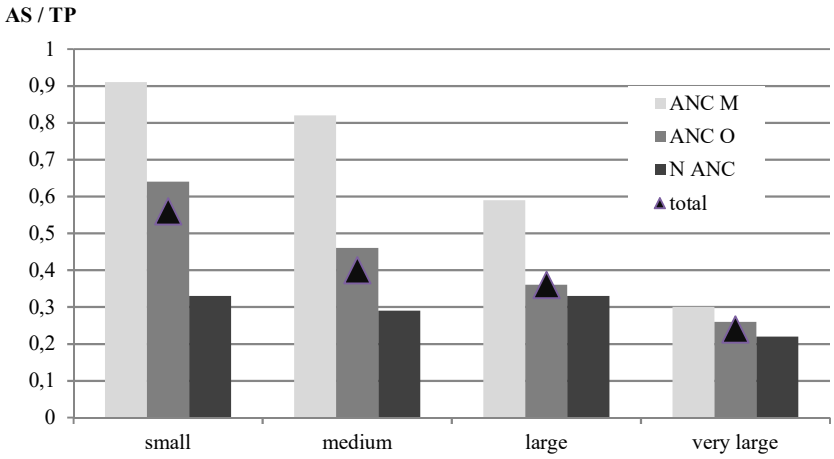
Note: TP = total production; AWU = annual working unit (2 000 working hours per a year)

Figure 6 shows the same comparison of size-based differentiation of labor productivity however, taking the production orientation into account (not agroecological conditions). The smallest differences among the size groups are in field production and milk production, more evident differences are in the rest production orientations, e.g. cattle breading and mixed production. These differences in the labor productivity in the farms of different sizes and production orientations are connected to the different levels of agricultural intensities as well as different employment, what is the sign of different level of substitution of labor by technique.

3.2 Level of Subsidies

The important criterion when evaluating of the state subsidies in agricultural is the value of subsides compared to the value of production.

Figure 7 Agricultural Subsidies per one unit of Agricultural Production in the farms of different sizes and agricultural conditions (2015 – 2020 average)



Source: Own processing, 2022 (data: FADN CZ)

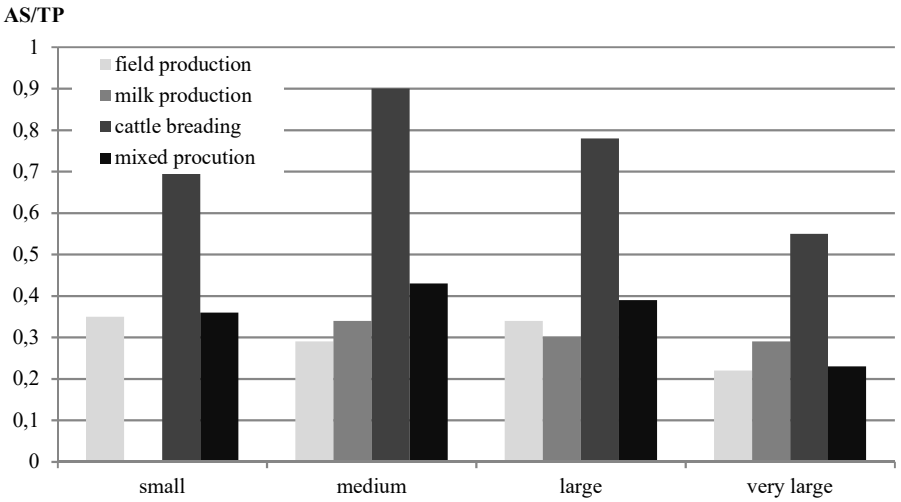
Note: AS = agricultural subsidies; TP = total production

The data in Figure 7 demonstrated significant differences among the farms located in different agroecological conditions. The differences in the levels of subsidies it could be seen in the groups of small and very large companies. The highest share of subsidies is in the case of small companies operating in mountain ANC (47.6 %), the smallest very

large farms out of ANC (17.8%). The average value of this share is 19.8% in total, while the farms in mountain ANC gain 1.5 higher subsidies per production unit compared to farms out of ANC. In the small farms this ratio is 2.3. The highest value of this indicator 0.91 was in the group of the least efficient farms, the smallest value 0.22 the most efficient companies.

The companies oriented on field production, milk and mixed production obtained on one unit of agricultural production the subsidy of 0.26. Concretely the very large farms get 0.25, large and middle 0.35 and small 0.36. The small farms therefore obtained on one unit of agriculture production 1.4 times higher subsidies compared to the very large ones.

Figure 8 Agricultural Subsidies per one unit of Agricultural Production in the farms of different sizes and production orientation (2015 – 2020 average)



Source: Own processing, 2022 (data: FADN CZ)

Note: AS = agricultural subsidies; TP = total production

The highest subsidy support for one production unit among the different production orientation farms is in the cattle breading. This is given by the prevailing location of this type of farms in the worse agroecological conditions and the applied extensive land management on the permanent grass lands. The most dependency on subsidies in the mountain ANC where observed by Lososová and Kopta already 5 years ago (Lososová and Kopta, 2017). The exogenous solution of these mainly peripheral areas was also proposed by Chmelíková and Redlichová (2020).

4 Conclusions

For the present Czech agriculture the substantial differences in the economic efficiency among the different sized companies are typical. The very large companies reach quite higher productivity level compared to small and medium ones, what is evident in different production orientations as well as different agroecological conditions.

The state subsidies are the essential part of financial sources of agricultural companies. In the research sample the average subsidies share was 20%. In small companies was this share 30%, medium 28%, large 27% and very large 19%. The subsidies on one unit of production are the highest in the small and medium companies. Compared to the very large companies is the subsidy support 1.5 times higher. This is valid for the field production orientation, milk and mixed production. In the cattle breading is this share 1.6.

The subsidy policy damps the impact of different productivity level of different size and production orientation. This is connected with the subsidies provision rules, what are oriented mainly on the land acreage. The obtained information leads to the conclusion that the operational subsidies in CAP EU substantially contribute to the compensation of the price transmission in the un-perfect competition of food verticals of agribusiness.

The economic efficiency differentiation of the different size groups of agricultural companies is one of the main characteristics of Czech agricultural. In the period under observation the results show the higher productivity of very large companies compared to the small and medium ones. The similar results are reached among the size groups of all the production orientations. The knowledge of the economic efficiency differentiation of Czech farms in the period of 2015 – 2020 support the positive evaluation of the Czech agriculture size structure development. This structure is one if the assumption of the Czech agricultural competitiveness. The necessity of considerable share of subsidies on the total financial sources of farm opens the question on the efficiency of antitrust policy in the agribusiness sector.

The differences in the subsidies to production rations in the different size of companies and production orientation lead to the topic of editing of allocation methods of subsidies, taking the criterions of products structure and performance measurement into account.

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