Tangible fixed assets in Czech small and middle-sized farms

Jana LOSOSOVÁ[*], Radek ZDENĚK[**], Jaroslav SVOBODA[***]

Abstract

The aim of this paper is to analyse the development, structure and efficiency of tangible fixed assets in the Czech farms and identify the factors that affect it. The data of farms in the period of 2003 to 2018 were used and sorted by the size of these farms. This paper evaluates the proportional development between the development of the volume of the tangible fixed assets and the volume of revenues. The development of tangible fixed assets and their structure in the reference period points to the efforts of farms to invest primarily in self-farmed land is taken into consideration. It turns out that investment activities are more affected by the overall economic situation of the farm and operating subsidies than by the possibility of drawing capital support.

Keywords: agriculture, tangible fixed assets, investments, small enterprises, middle enterprises

Introduction

The transformation processes that took place in Czech agriculture in the 1990s were intensified by the European integration processes after the EU enlargement in 2004. Nevertheless, Czech agriculture differs in many aspects from the agriculture of other EU countries. The main differences can be seen in the higher average size of the farm, the high degree of rented land utilisation and the high proportion of legal entities. According to the Czech statistical office (CZSO) data, 60% is represented by small farms whose standard production is less than 25 000 EUR. These subjects manage only 5% of agricultural land in the Czech Republic with a share of 4% of the total number of farmed animals. Medium-sized enterprises with production up to 500 000 EUR are 33% of the total. A large part of the Czech Republic's agricultural

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production is concentrated in large agricultural holdings with a standard production of over 500 000 EUR. Large farms utilize 66% of the total agricultural area and breed 76% of the total livestock (CZSO 2018). The size of farms is also related to the largest volume of a labour force per entity and, conversely, to a low share of labour force per farmed land area.

The Czech agriculture with fixed assets according to Farm Accountancy Data Network (FADN) at an average of 2463 EUR / ha in 2017 is still below the EU average (24th place) and the gross investment value of 284 EUR / ha is below the EU average. Lack of investment capital and knowledge is considered as a very limiting factor in the growth of labour productivity. The low level of investment affects the cost and efficiency of agricultural production and thus the overall competitiveness of agricultural production. For these reasons, it seems important to monitor the development and structure of fixed assets in farms and, above all, to find out the motivation of farmers to invest.

According to the Ministry of Agriculture Czech Republic (Green Report 2017) the volume of loans to agriculture, especially long-term investment loans, grew in the last years. Investment in machinery and equipment decreased in 2016 but, in contrast, investment in buildings has risen. Investment in buildings and building reconstruction is expected to have a positive impact on animal welfare and improve the quality of crop and livestock production and also positively affect groundwater and surface water protection and climate protection as well. Investment for the purchase of agricultural land has been growing in recent years, which is also related to the long-term gradual decline in the share of rented land in the total utilized agricultural area in the Czech Republic.

1. Literature review

Investment is viewed as an important aspect to enhance agricultural productivity and the key to promoting long-term growth (Rosenzweig and Binswanger, 1992; Roy and Pal, 2006; Bathla, 2017; Nilsson, 2017; Quiroga *et al*., 2017). The agricultural sector provides livelihood directly and indirectly to a significant portion of the population, especially in rural areas. The low level of investment in agriculture negatively affects long-term development, affects decisions on environmental management (Kabaivanov and Markovska, 2019, p. 131) and food safety.

Drawing on fixed asset theory, (Nelson *et al*., 1989, p. 971) hypothesize that it is more difficult to dispose of capital which is specific to agricultural production than to add to the stock of specialized capital. This implies that periods of disinvestment (through depreciation) will be greater than those of investment in agriculture. Thus, in any given year, net agricultural investment is likely to be negative (depreciation is higher than gross investment). Because investment is

irreversible, farmers only invest during years when profits are high and/or borrowing costs are low.

Rosenzweig and Binswanger (1993) find that the agricultural investment behaviour of farmers reflects their risk aversion, with poorer farmers accepting lower returns in exchange for lower risk. The larger farms have higher rates of farm investment on a per hectare basis. There may also be a direct effect (Latruffe *et al*., 2010, p. 363) whereby decoupled subsidies add to the internal pool of finance available to the farmer and reduce the requirement to seek external finance. Support through 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 main argument is that an investment subsidy can form an incentive for firms to invest while the support is in effect. The analysis (Antonelli *et al*., 2015, p. 109) has shown that EU investments seem to be driven, largely, by agricultural and energy policies instead of resource scarcity.

Bojnec and Latruffe (2007, p. 9) investigated determinants of investment decisions of Slovenian farms using a standard accelerator model and an augmented accelerator model. The farm income compared to assets experienced fluctuations that are less substantial than the ones of change in real sales to assets or the ones of gross investment to assets. The greater volatility in real sales and in gross investment than in farm income can be explained by some income support policies that mitigated market instabilities on farm incomes during the farm adjustments on regional integration and EU membership. During the analysed period (1994-2003), some farms had been constrained in their investment behaviour by the low availability of own resources or credit, which indicate that investments in Slovenian farms were driven by growth in real sales and by growth in real farm income. Further research deals with assessing whether specific conditions (such as small farm size, preventing farms getting bank loans; or a specific type of farming, which is not highly supported) increased the negative effect of financing constraints on investments.

According to Bokusheva and Čechura (2017, p. 4), large farms are in a better position to exploit economies of scale and to invest in productivity-enhancing technologies than small-scale farms. This may explain the increasing gap in TFP growth between farm groups by size in France and England. At the same time, larger farms in France, West Germany and England appear to exhibit larger persistent

technical inefficiencies. This latter result suggests that while improving productivity by adopting new technologies and practices, large farms in those countries may persistently fail to improve efficiency with which these technologies and practices are implemented. Management of large farms differ from that of individual farms and may demand additional managerial abilities and skills. It may also require serious adjustments in farm organisational structure.

Investment outlays depend on expected sales, available alternatives, expected profitability and availability of finance. In this paper, we proceed from the assumption that the rapid growth of land rent (Lososová *et al*., 2017) has an impact on the development of the structure of tangible fixed assets in Czech farms. We also examine the impact of investment subsidies on the growth of tangible fixed assets.

2. Methodology

The aim of this paper is to analyse the development, structure and efficiency of tangible fixed assets in the Czech farms and the impact of public support on investments in agriculture. This paper uses the data from the own databases of farms during the period from 2003 to 2018. The database consists of an own survey, which involves the collection of production and financial indicators of farms operating throughout the Czech Republic in various production and climatic conditions. The crucial data are collected from financial statements and statistics that are obligatory to be published (Balance sheet, Profit loss statement, Annual statement on the harvest, Statement on sowing areas) completed by an original questionnaire, which contains among other things information about structure of land and subsidies. In individual years, the size of the sample fluctuates from 85 to 149 farms; their utilised agricultural area is 4–7% of the agricultural land of the Czech Republic.

The structure of farms differs to some extent from the FADN database. The differences are due to the collection of data from the balance sheet and profit and loss statement (i.e. double-entry bookkeeping), which are compiled almost exclusively by business corporations and cooperatives. According to the area of cultivated land, these are mostly farms with a utilised agricultural area above 500 ha. The area of land for legal persons significantly exceeds the area of land for natural persons (CZSO, 2018). Therefore, it is possible to generalize our results only for the small and middle-sized farms that are legal entities.

The European Union rules (Annex I to Commission Regulation (EC) No 800/2008) were used to structure farms by size. According to this definition, the size of the enterprise is one of the criteria taken into account when providing investing support under the Rural Development Programme. Since micro farms and large farms were observed in the group from 0 to 5 in a particular year, only the prevailing groups of small and middle-sized farms were assessed. The sample contains in average 60% small farms. The average small farm in the reference period farmed

between 1000 and 1200 ha and the average middle-sized farm farmed between 2200 and 2500 ha of agricultural land.

This paper evaluates the relationship of tangible fixed assets (*TFA*) and its groups to total assets, and furthermore the relative age (*RA*) of assets expressed as the proportion of accumulated depreciation (TFA_{cor}) on tangible fixed assets brutto (TFA_{br}),

$$RA = TFA_{cor} / TFA_{br}.$$

The renewal coefficient (C_R) of the *TFA* is expressed as the ratio of the increase in the *TFA* to the value of *TFA* in the previous period,

$$C_R = (TFA_1 - TFA_0) / TFA_0.$$

Gross investment is the sum of the increase in *TFA* with depreciation and the amortized cost of assets sold; net investments are gross investments adjusted for depreciation.

The evaluation of technological development types, i.e. the relationship between tangible fixed assets and farm revenues (*R*) is not sufficiently addressed in economic theory or practice. As a rule, the assessment of investment effectiveness is carried out before the investment project is implemented and then several years after the investment is put into operation. The objective of this assessment is to evaluate the acquired investment. The objective of the technical development type evaluation is to assess the proportional development between the development of *TFA* and farm revenues. The relationship between the volume of production and the condition of TFA is referred to as the efficiency of tangible fixed assets,

$$E = R / TFA,$$

where *E* is the efficiency of the tangible fixed assets. The type of technical development is expressed by the efficiency index, I_E.

If the *TFA* efficiency index is equal to one, it is called a neutral type of technological development where index revenues grow as fast as the *TFA* index, and so *TFA* efficiency does not change, and the development is extensive. If the *TFA* efficiency index is greater than one ($I_E > 1$), it is called an economical type of technical development. The volume of tangible fixed assets increases in proportion to the volume of revenues. As a result, the relative savings of *TFA* and other relative savings resulting therefrom are realized. If the *TFA* efficiency index is less than one ($I_E < 1$), then it is in the state of demanding technical development, which leads to a relative exceedance of long-term tangible assets and other indicators related to it (Střeleček and Lososová, 2003, p. 152).

The assessment of the change in *TFA* effectiveness was addressed in terms of the effect of total revenues at constant 2018 prices (adjusted for inflation). The dynamics of *TFA* effectiveness breaks down to the causal effects of revenue dynamics and tangible fixed assets:

$$\Delta E = \Delta E_R + \Delta E_{TFA}$$
$$\Delta E_R = \log I_R / \log I_E \cdot \Delta E$$
$$\Delta E_{TFA} = - \log I_{TFA} / \log I_E \cdot \Delta E$$

Where Δ – difference operator; I – index; ΔE_R – absolute change of effectiveness of tangible fixed assets due to revenues; ΔE_{TFA} – absolute change of effectiveness of tangible fixed assets due to tangible fixed assets.

As a reciprocal value, *TFA* change can be expressed in terms of the effect of total revenues at constant 2018 prices (adjusted for inflation) and the effect of *TFA* effectiveness. The *TFA* dynamics breaks down into causal effects of the revenue dynamics and the *TFA* effectiveness:

$$\Delta TFA = \Delta TFA_R + \Delta TFA_E$$
$$\Delta TFA_R = \log I_R / \log I_{TFA} \cdot \Delta TFA$$
$$\Delta TFA_E = - \log I_E / \log I_{TFA} \cdot \Delta TFA$$

Where ΔTFA – absolute change of tangible fixed assets between periods; ΔTFA_R – absolute change of tangible fixed assets due to revenues; ΔTFA_E – absolute change of tangible fixed assets due to effectiveness of tangible fixed assets.

To quantify the relationship between investment subsidies and gross investment, a simple linear regression based on yearly time series was used. To evaluate the suitability of the model, the determination coefficient R^2 is used.

3. Results

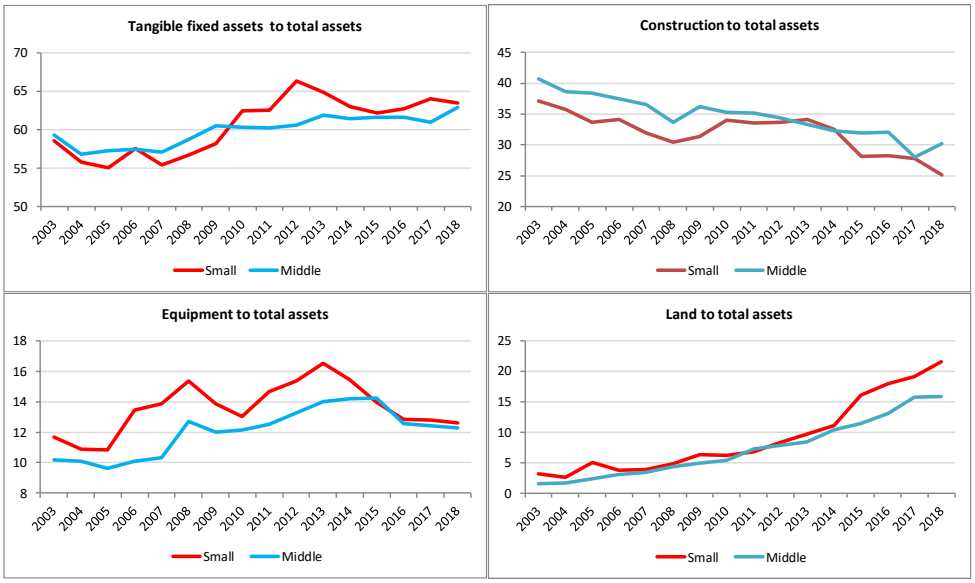
Tangible fixed assets in the average farm increased during the reference period from EUR 1.9 million in 2003 to EUR 4.1 million in 2018. Buildings represent the highest share of TFA, even though their share in the TFA is decreasing over time in favour of land and machinery. The analysis of TFA structure points to the efforts of farms to modernize production through the renewal of machinery and equipment, as well as to purchase farmed land. The share of tangible movable assets compared to TFA in the average farm increased from 17.4% to 19.7% during the reference period and the share of land to TFA increased from 3% in 2003 to almost 30% in 2018. During the reporting period, land value grew faster in small farms (by 23% per year). These trends are shown in Figure 1, which shows the development of the TFA and its groups share compared to the total assets of the average farm, structured according to their size.

The *TFA* share to total assets was growing in the average farm, while at the same time it was growing faster for small farms. However, the structure of tangible fixed assets changed significantly during the reference period. The share of the value of buildings compared to total assets fell from 40% in 2003 to less than 27.5% in 2018. The share of machinery and equipment compared to total assets rose slightly from 10.3% to 12.5% and the biggest change is seen in the increase of land value. Its share compared to total assets increased from 1.79% in 2003 to 18.8% in 2018. The development of this indicator is more dynamic in the average small farm.

The Czech farms still farm on a high share of rented land in comparison with other EU states. The price of the land regarding land rent was characterized by a relatively significant price remanence till 2008. The result of this remanence under

the high growth rate of ground-rent was an unrealistic high interest rate. This situation means a clear advantage for lands owners and a disadvantage for land leaseholders (Střeleček *et al*., 2010, p. 558). Price of agricultural land increased 2.8 times from 2008 till 2017 (MZe, 2019), the land rent doubled in the past five years and the average growth pace has been 18 % annually (Lososová *et al*., 2017, p. 99). For these reasons, it is not surprising that the value of the land of an average farm increased 22 times during the reference period and the average growth pace was 22.9 % annually.

Figure 1. Shares of *TFA* types to total assets in average small and middle-sized farm (%)

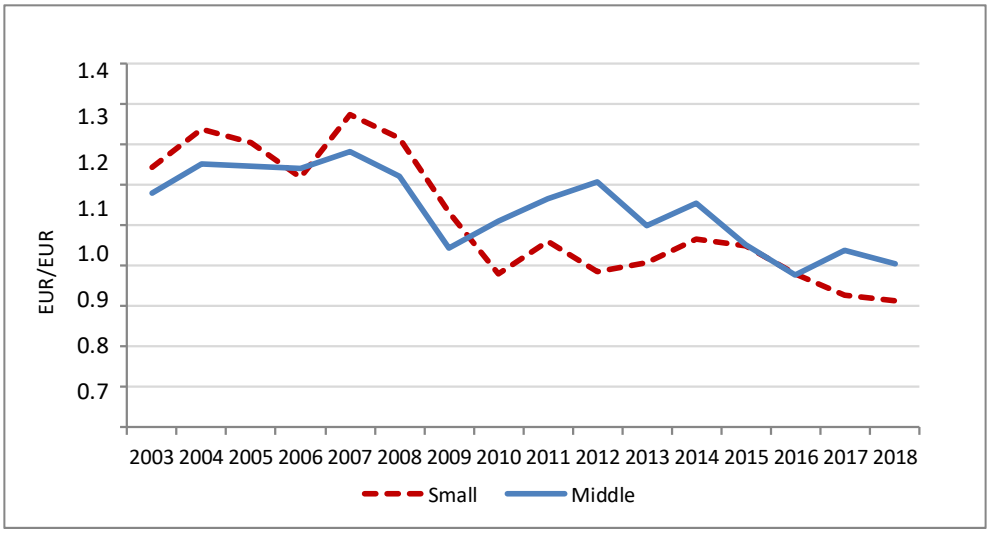


Source: Authors' representation.

Considering that the relative *TFA* age was growing, the growth rate of tangible fixed assets is not sufficient to cover the value of simple reproduction of assets. The relative *TFA* age grew from 49% in 2003 to 54% in 2018, growing faster in middle-sized farms. Buildings became obsolete the fastest. The relative age of machines and equipment oscillates at around 75%.

The development of the renewal coefficient shows a year-on-year fluctuation. The negative value of this indicator was indicated in the years 2009 and 2014. The increase in *TFA* renewal for the whole reference period was 3.5 in the average small farm and 1.7 in the average middle-sized farm, which means that the *TFA* renewal in the average middle-sized farm took more than double the time in comparison with the small farm.

Figure 2. *TFA* efficiency in average small and middle-sized farm (EUR / EUR in fixed prices)



Source: Authors' representation.

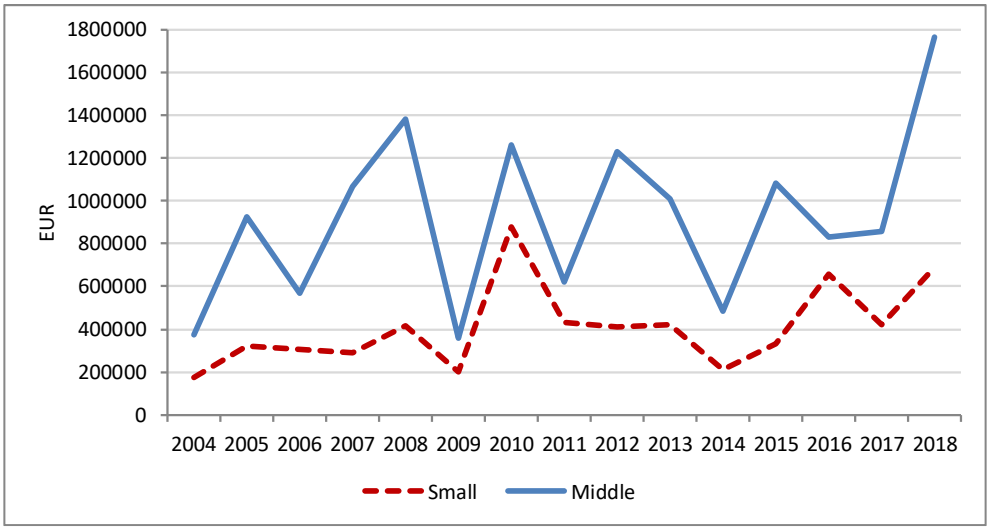
During the reference period, the *TFA* growth rate was faster than the total revenues growth rate, which means a significant downward trend in the efficiency of tangible fixed assets. If we adjust the total revenues and *TFA* for inflation, then the *TFA* efficiency in the average farm fell from 1.09 to 0.86 in 2018 (see Figure 2). The *TFA* efficiency index was less than 1 during the reference period, which means that a fund-intensive type of technical development was implemented leading to a relative excess over the *TFA* value. A fund-intensive type of technical development means a decrease in efficiency below the level of extensive development. Extensive development is characterized by investments that are expanded in terms of content with unchanged parameters. In this case, the increase in production is the same as the increase in capital goods and there is no relative change in fixed assets.

The causes of the decrease of *TFA* efficiency differ in various groups of farms. Their influence on the efficiency change may be quantified using, for example, logarithm indices. The decrease of *TFA* efficiency may be explained above all by a dynamic growth of *TFA* rather than the growth of revenues. There is a bigger influence in the case of small farms. However, there was also an increase of the total revenues, so the total decrease of *TFA* efficiency is just slightly higher than in the case of middle farms. The relative exceeding of *TFA* means that the production increment is lower than the *TFA* increment and the *TFA* efficiency decreases. The relative exceeding of *TFA* in a small and a middle farm may be explained mainly by the slow growth of revenues. The relative exceeding of *TFA* of the small farms caused by a slow revenue growth is 1 563 544 EUR and the relative exceeding of

TFA by 608 299 EUR may be explained by the decrease of *TFA* efficiency. Considering the middle-sized farms, the relative exceeding of *TFA* influenced by the decrease of the efficiency is 904 400 EUR and 2 642 482 EUR influenced by the slow growth of revenues.

Low efficiency of *TFA* requires effective investments. The development of gross investments (see Figure 3) is characterized by rapid fluctuations in particular years with a slight tendency toward growth which is of 7.5%, during the reference period, considering an average farm.

Figure 3. Gross investment of average farms according to their size (EUR)



Source: Authors' representation.

According to Czech accounting regulations, the subsidy means free payments provided directly or indirectly under special legal regulations. Subsidies also include grants provided free of charge to entities for a specified purpose from European Community funds or public budgets of a foreign state and grants provided under a special legal regulation. A subsidy is also understood to mean the waiver of a part of the fees if the law allows it and the competent authority has set the waived part of the subsidy fees. The actual accounting is based on the type of grant. These are classified as:

a) subsidies granted to cover costs (operating or financial) that are recognized in revenues (operating or financial); or

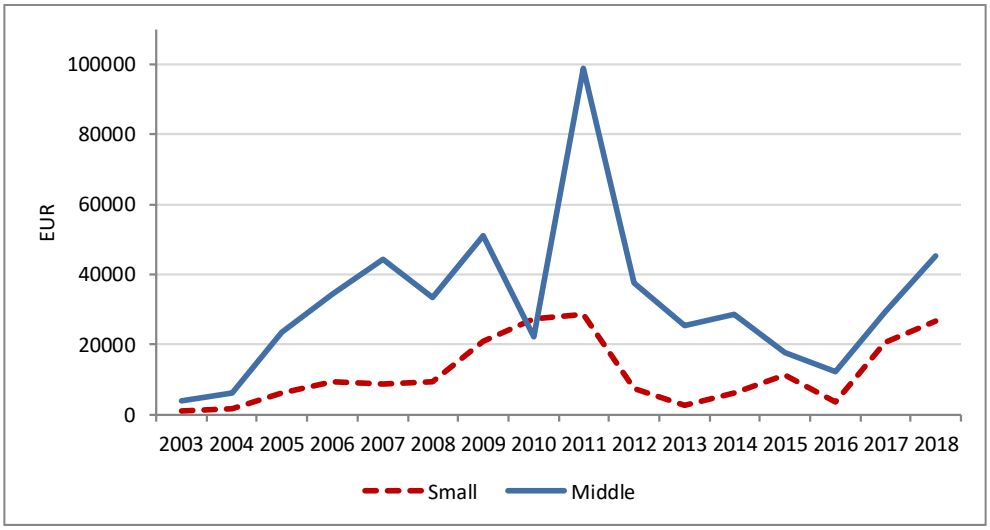
b) subsidies for the acquisition of tangible and intangible fixed assets, technical improvements and interest subsidies included in the cost of acquisition, which reduce the costs for the acquisition of this type of asset.

In practice, it can often happen that since the entitlement to the subsidy, which is recorded as a receivable (or active accruals), their actual payment is provided in the following accounting period. However, to adhere to the accrual principle, the revenue, reduction of the entry price of fixed assets respectively, is recognized in the period in which the claim arose. In the case of a 100% subsidy on fixed assets, such assets are recorded in off-balance-sheet accounts.

The investments in agriculture are supported by European funds and national sources. The EU member states drew financial sources from the EAGGF (European Agricultural Guidance and Guarantee Fund) in the period of 2004–2006. In the following period from 2007–2013, they drew sources from the EAFRD (Agricultural Fund for Rural Development) and nowadays it is still possible to draw sources from this fund for investments in agriculture within approved Programmes of Rural Development designed for the years 2014–2020.

The total amount of financial sources provided to farms has increased since 2003 and reached its peak in the period 2009–2011. In recent years, there has been a decline of the subsidies supporting investments (see Figure 4). However, the tendency is slightly increasing within the whole reference period.

Figure 4. Investment subsidies of average farms according to their size (EUR)



Source: Authors' representation.

A lot of works literature deals with the effects of various types of subsidies on investment (Viaggi *et al*., 2011; Rizov *et al*., 2013; O'Toole and Hennessy, 2015; Michalek *et al*., 2016). The major concern of evaluation studies is assuring the causality between programme measures and estimated effects (Bergschmidt, 2009; Blandford *et al*., 2010; Margarian *et al*., 2010). Programme effects might show time

lags or even underlie other dynamics. Since establishing agricultural investments often requires long timespans, Hoffmann, *et al*. (1997), Forstner (2000) and Bradley *et al*. (2010) point out that chosen observation periods might be too short to enable the measurement of the full implementation and success of investments.

To analyse the relationship between the amount of gross investments and the investment subsidies, we may use a simple linear regression equation derived from the yearly time series presented in Figures 3 and 4. The correlation coefficient expressing the dependence of the gross investments on the amount of the investment subsidies equals 0.037. Therefore, there is no statistical evidence that the development of the gross agricultural investments was influenced by the total amount of the investment subsidies. At the same time, we may say that this independence may be influenced by a time delay, which means that the amount of investments and the amount of investment subsidies are not related or bounded to the same time period.

Using regression analysis to express this relationship considering the delay of the gross investments to the investment subsidies by one year, then the correlation coefficient equals 0.442, which means a middle strong dependence. At the same time, the regression coefficient *b* expressing the relationship between the total amount of investments and the amount of investment subsidies equals 6.748 (when constant a = 441 729). The determination index of this simple linear model is R^2 = 0.196. We may say that approximately 20 % of the variability of the amount of investments may be explained by the variability of the investment subsidies (see Table 1).

Table 1. Dependence of gross investments on investment subsidies of the average farm in the previous period

	Regression coefficient *(b)*	**Constant *(a)***	**Correlation coefficient *(r)***	**Determination coefficient *(R^2)***
Small farm	10.802	301 380	0.508	0.2578
Middle farm	6.232	752 446	0.364	0.1327
Total	6.748	441 729	0.442	0.1956

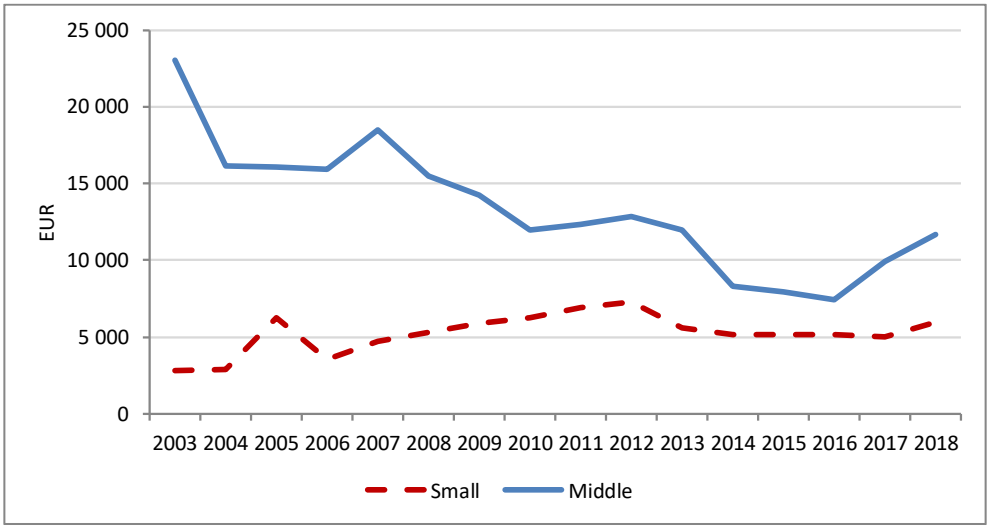
Source: Authors' calculations.

If the delay is one more than a year, then the correlation coefficient decreases so that the investment subsidies influence the gross investments to the biggest extent in the subsequent period. The influence of the investment subsidies on the gross investments in the subsequent period is more significant in small-sized farms, where 26 % of the variability of the investments may be explained by the variability of the

investment subsidies. By increasing the subsidies by 1 EUR, the gross investments increase by 10.8 EUR in the subsequent period (see Table 1).

In the Czech Republic, the Supporting and Guarantee Agricultural and Forestry Fund (SGAFF) was founded in 1993 and this fund provides guarantees on loans, partially subsidies the loans interest and leasing increases and supports expenses on agricultural insurance. The efficiency of the public sources within the SGAFF is dealt with, for instance, by Bečvářová (2006, p. 320), who claims that this subsidy form is an important component of the subsidy system in agriculture. The crucial criteria in the decision-making process about allocation of the provided loans were not the various natural conditions, but the farms' economic results and prosperity which are evaluated also as crucial criteria in the decision making system about efficient restructuralisation in agriculture and regarding a possible increase of its competitiveness. Janda (2006, p. 431) analyses the cost to the Czech state budget of the SGAFF. In the paper, the author shows that the SGAFF portfolio has sufficient value to cover the expected costs of the credit guarantees and subsidies offered by the fund. Čechura (2008, p. 486) states that the activities of the SGAFF significantly support the investment activities of farmers and that the SGAFF contributes to a more efficient use of capital which helps to increase the competitiveness of the Czech agriculture. His work suggests that the lower the interest rate paid by a farm, the lower the optimal consumption and so the farmer is willing to use a higher rate of capital in production. The initial capital is then more effectively used.

Figure 5. SGAFF support provided for compensation of loan interest in average small and middle-sized farm (EUR)



Source: Authors' calculations.

The development of loan interest subsidies provided by the SGAFF to an average farm has a tendency to decrease by 5% annually on average (see Figure 5). A modest increase of 5 % on average is evident for small farms. Correlation analysis was used to quantify the relationship between the amount of gross investments and the loan interest subsidies. The correlation coefficient equals 0.059. Therefore, it cannot be claimed that the development of the gross agricultural investments was influenced by the amount of loan interest subsidies. Not even a shift of the interest subsidies on investments in a following period proves such a dependency.

Conclusions

During the reference period, the *TFA* growth rate is quicker than the growth of the total revenues representing a significant decreasing tendency of *TFA* efficiency. This effect is more obvious in the case of small farms. The efficiency index of the *TFA* was lower than 1 both in small and middle-sized farms in the last years of the reference period, which means that a financially demanding type of technical development was conducted, leading to a relative exceeding of *TFA* and to a decrease of the efficiency of *TFA* under the level of the extensive development.

A low level of *TFA* and an insufficient level of *TFA* efficiency require effective investments. The amount of investments depends on the availability of one's own financial sources, access to bank loans and the amount of subsidies. The favourable development of profitable agriculture and the decreasing loan interest rates influenced loan growth in agriculture in the reference period. Long-term investment loans grew quicker. The investments in farms were partially supported by investment subsidies within Axis I of the Rural Development Programme and also by subsidies partially covering loan interest and guarantee of loans provided by the SGAFF.

The development of *TFA* and of their structure in the reference period showed an effort of farms to renew their machinery and to upgrade their technologies. There was, above all, an evident tendency to invest in their own agricultural land. The growth of the share of land was faster in small farms. The increase in the share of land in assets is accelerated by the rising market price of agricultural land (the trend of price growth is exponential (Severová *et al*., 2017, p. 328) and can be expected in the future). The efforts to buy new land probably influence the growth of the relative age of *TFA*, mainly due to the deterioration of buildings, as the farms do not have enough financial sources to renovate them.

The dependence of farms on operating subsidies is increasing and their impact on income and profit has been proven (e.g. Lososová and Zdeněk, 2013, p. 558). It is obvious that the investment activities are also more influenced by operation subsidies (that influence the cash flow) than by capital subsidies and this is mainly in small farms. It is, therefore, possible to say that the main reason for *TFA* renewal in agriculture is not the possibility of the drawing of subsidies on investment

projects, but rather the overall economic situation of farms together with a regular intake of entitled subsidies on operation activities and conditions of bank loans.

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