PROFITABILITY OF PIG FARMS IN POLAND AFTER INTEGRATION TO THE EU

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Abstract. The research study aimed at determining force and directions of impact of the selected factors on the return on equity of pig farms in Poland between 2005 and 2010. Nine hundred and fifty one farms, specialised in the production of pigs for slaughter, which had gathered data within Polish FADN, were subjected to a detailed analysis. The research showed that the pig market is characterised by price volatility determining profitability of pig production and influencing a generated level of income and profitability of pig farms. The decomposition of return on equity with the use of Du Pont pyramid showed that within the first years following Poland's accession to the EU, the changes in ROE were the most influenced by return on sales, and in 2010, it was the asset turnover ratio. The direction of the return on sales ratio's influence on ROE was positive, and that of asset turnover ratio was changing within the subsequent years. The capital structure ratio had the lowest influence on changes of return on equity.

Key words: return on equity, pig farms, Du Pont analysis.

JEL code: Q12, D24

Introduction

Enterprise efficiency is one of the most significant categories in the market economy and it determines development of enterprises. It means a relative volume of financial result which shows efficiency of committed capital and property as well as consumed resources in a business activity. Profitability is measured by means of profitability indices in a form of profit to different economic values ratio. These constitute a synthetic measure of evaluation of efficiency and effectiveness of the whole enterprise's functioning in the context of achievement of its basic objectives including profit and growth. These are also used to evaluate profit generating capacity of enterprise management in connection to committed resources.

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Profitability indices allow for finding a common denominator for different effects of economic decisions, making them directly comparable (Szymanska E., 2007).

The pig market in Poland is characterised by great price volatility which determines pig production profitability and influences the level of income generated from the production of pigs for slaughter. As a response to information on buying prices coming from the market, agricultural producers take up actions that lead to changes in pork supply. Price fluctuations are especially painful for big farms specialised in production of pigs for slaughter. These constitute a serious obstacle in production planning and they limit possibilities of investment with regard to volatile equity capital resources and a limited access to credits (Szymanska E., 2012).

Poland's accession to the EU has caused a change in farming conditions for the producers of pigs for slaughter. An important fact was implementation of direct payments to agricultural land and adopting the European Union regulations in the cereal and fodder market. What is more, the producers of pigs for slaughter and processing plants were obliged to apply the European Union sanitary standards in pork producing and processing as well as to consider the environmental protection requirements. Additionally, the forms of interventions in the pig market have changed. However, Poland's integration to the EU has not eliminated cyclical fluctuations which influence the profitability of pig farms and; especially, efficiency of exhausting equity capital. The research study aimed at determining force and directions of impact of the selected factors on the return on equity of pig farms in Poland between 2005 and 2010.

Materials and methods

The research used studies of the literature on the subject and data of mass statistics of the Central Statistical Office (CSO). Nine hundred and fifty one farms specialised in the production of pigs for slaughter, which had functioned within the frameworks of Polish FADN (Farm Accountancy Data Network), have been carefully analysed. The basic criterion for selecting farms for the analysis was the share of pigs in sales value of minimum 60% and continuity of accounting data gathering between 2005 and 2010. The sample was composed of the same farms throughout the whole analysed period.

Profitability of the analysed farms was determined on the basis of the return on equity ratio. In order to determine the return on equity ratio in the pig farms properly, instead of net profit, income from a family farm without farmers' and their families' own labour costs have been used. Still, from the synthetic perspective, the return on equity ratio does not provide numerous interpretation possibilities since it only enables one to find out whether the achieved profitability is a result of high agricultural income or low equity capital (Bieniasz A., et al., 2008). The structural system called the "pyramid of indicators" provides much more knowledge within the scope of cause and effect relationships. This allows for (Bednarski L., et al., 1993):
- explaining directions and possibilities of reaching a goal defined in the system by a proper synthetic indicator;
- showing positions of the particular indicators in the system, hence, indirectly, also in the economic reality.

Using the models of relationships (including pyramids) by management of enterprises facilitates the both monitoring the changes in the analysed profitability and their reasons. This provides a sufficient foundation for identification of threats and weak points in a business activity of an enterprise. These models are indispensable tools of the all-embracing evaluation of enterprise functioning.

The research study took the structure and interrelationships between profitability indices into consideration on the basis of the cause and effect relationships pyramid, known as Du Pont analysis (Golas Z., 2009). In connection to the above-mentioned fact, the following financial ratios were defined (Sokolowska E., 2012; Serpinska M., Jachna T., 2006):

- return on equity ratio (ROE), which determines a rate of return on the capital employed in a farm by its owner. This ratio may show a significant outside capital support (risky strategy) or a considerable share of equity capital in a farm (more conservative strategy);
- return on assets ratio (ROA) shows the rate of return on assets and; in some cases, the fact of using a financial leverage supporting a financial activity of a farm. Therefore, this relationship is especially useful in comparing farms.
- return on sales ratio (ROS) defines operational effectiveness and it is calculated as agricultural income to revenue on sales ratio. It determines the amount of profit units generated by each sales unit. The lower this indicator, the higher sales value has to be obtained to achieve a specific amount of agricultural income;
- total asset turnover (TAT) means sales revenue to assets ratio. It determines efficiency of using enterprise's assets in generating revenue;
- equity multiplier (EMT) is a measurement of an enterprise's financial leverage. It constitutes assets to equity capital ratio. It determines the structure of committed equity capital and gives information on the level of financing the assets with borrowed capital.

To calculate the impact of the particular ratios (return on sales, total asset turnover and equity multiplier) on increase or decrease in on the return on equity ratio, the partial differences method has been used. This method consists in simultaneous distinguishing individual partial deviations and partial deviations expressing the joint impact of factors as well as in treating them as separate elements of analytical analysis (Bednarski L., et al., 1996).

According to the partial differences method, the impact of the analysed factors on the return on equity was determined in the several following stages:
1. Determining absolute deviations of the analysed ratios.
2. Determining the impact of a change of ratio level on the level of deviation of the return on equity ratio.
3. Determining the joint impact of the combination of the two subsequent factors on ROE changes.
4. Calculating the joint impact of the all three factors on ROE deviations.
5. Comparing the sum of partial deviations and the absolute deviation of ROE.
6. Determining the force and direction of the impact of partial changes on ROE.

Research results and discussion

Most authors agree that enterprise performance can be the best described by profitability ratios. In empirical research are used such profitability ratios as ROA, ROE and ROS. Circiumaruet et al., (2010) have analysed the 2008 data from seventy three manufacturing companies, and dealt with the impact of three factors – return on sales, asset activity ratio, and financial leverage – on ROE, using univariate regression analysis. A correlation was found between ROS and ROE, however, the impact of ROS on ROE was not identified. A linear relationship was not found between asset activity ratio, financial leverage and ROE.

Kabajeh et al., (2012) have looked at a small sample of companies (twenty eight enterprises) in the period of 2002 - 2007. The results revealed a positive relationship between return on assets, ROE, return on investment and market price of shares. Kasilingam and Jayabal (2012), using the example of one company (time period 1996 - 2009), have analysed profitability and solvency. They have discovered that there is a positive relationship between ROE and assets – to - equity ratio, as well as the assets activity ratio.

Stocker (2005), by analysing ROE of companies in different countries, have concluded that return on equity is directly related with economic freedom. A recommendation was put forward that in order to receive a higher return on investment one must choose countries, where an increase in economic freedom is expected. As pointed out by Liesz (2002), the DuPont model is significant in order to illustrate the relationship of balance sheet and profit or loss account items, as a result of which it is possible to work out strategies for improvement of ROE.

The issue of profitability is also important in agriculture. In this study the return on equity in the pig farms was subjected to a detailed analysis. This issue is particularly important because of the difficult situation of live pig producers in Poland. The pig market is very unstable; mainly due to fluctuations in pigs for slaughter prices, as well as, agricultural inputs prices, which are difficult to predict. A significant issue is also great fragmentation of pig farms and the resulting too small production scale hindering the achievement of satisfying economic effects and capital accumulation. The cyclical fluctuations in the pigs for slaughter market are quite well presented by the profitability ratio. It is reflected by; among others, pigs for slaughter buying prices to the rye price ratio (Figure 1).

After Poland’s accession to the EU, the profitability of the production of pigs for slaughter improved considerably since pig buying prices rose and cereal prices dropped. In 2005, an increase in pig population was recorded together with a considerable decrease in porker buying prices. However, thanks to a decrease in cereal prices, the profitability of pig production was
relatively decent. In the next year, low buying prices caused considerable deterioration of profitability of pig production in Polish market. Additionally, cereal price behaviour was unfavourable which resulted from low supply. Weak pig market's situation became even worse in 2007 and it stayed that way till the mid 2008. As a result of the unfavourable economic situation, there was a deep reduction of pig population. In November 2008, there were 14.3 million pigs handled in Poland. In the subsequent year the downward trend in pig population was not stopped. Only the record buying prices in the first three quarters of 2009 and high profitability of pig production led to a temporary increase in pig population in the country which amounted to 10.9 million in 2010 and was higher than in the previous year by 3.6%. However, in 2010, the market conditions worsened. Fodder prices were similar while pig buying prices dropped considerably. As a result, producers started resigning from pig breeding. From the beginning of 2011, there was an increase in pig and fodder prices. Still, fodder price development was higher and; ultimately, fodder prices increased by almost 23.0% in comparison to the previous year. The increase in pigs for slaughter prices by almost 17.5% did not make up for breeders' loss in relation to higher fodder prices. As a result, in 2012, the pig population dropped to 11.6 million and, in 2013, to 11.1 million.

![Graph showing the ratio of buying prices for pigs for slaughter to rye prices and changes in pig population in Poland between 2005 and 2010.](source:author’s construction based on CSO data)

**Fig. 1.** Buying prices for pigs for slaughter to rye prices ratio and changes in the pig population in Poland between 2005 and 2010

The research was conducted in the relatively big farms both in relation to the area and livestock. The average utilised agricultural area (UAA) in the analysed units was 30.75 ha in 2005 (Table 1). By 2010 that area increased up to 33.05 ha. However, pig population increased in the analysed period from 59.5 to 68.5 livestock units (LU). Those were the farms specialised in the production of pigs for slaughter. The share of pigs in the production value
was high and it constituted from 65.2 to 75.4%. The average level of agricultural income was the lowest in 2006 and 2008 when it was; respectively, PLN 67.2 and 69.5 thousand per farm. The highest level of income was reached by the farms between 2009 and 2010 - approximately PLN 90.0 thousand per farm. Despite cyclical fluctuations in the pig market, the farmers invested a part of their financial resources in the further development of farms. The highest amount was invested in 2006; approximately PLN 28.7 thousand per farm, and the lowest amount was spent in 2008; it was only PLN 1.5 thousand.

Table 1

<table>
<thead>
<tr>
<th>Years</th>
<th>Utilised agricultural area</th>
<th>The number of livestock units of pigs</th>
<th>The share of pigs in the production value</th>
<th>Agricultural Income in thou. PLN</th>
<th>Net Investment in a thou. PLN</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>30.27</td>
<td>59.5</td>
<td>74.0</td>
<td>67.2</td>
<td>11.0</td>
</tr>
<tr>
<td>2006</td>
<td>30.43</td>
<td>66.5</td>
<td>71.5</td>
<td>74.4</td>
<td>28.7</td>
</tr>
<tr>
<td>2007</td>
<td>31.26</td>
<td>66.1</td>
<td>65.2</td>
<td>70.0</td>
<td>12.9</td>
</tr>
<tr>
<td>2008</td>
<td>31.71</td>
<td>65.3</td>
<td>72.5</td>
<td>69.5</td>
<td>1.5</td>
</tr>
<tr>
<td>2009</td>
<td>32.41</td>
<td>69.0</td>
<td>75.4</td>
<td>89.9</td>
<td>17.0</td>
</tr>
<tr>
<td>2010</td>
<td>33.05</td>
<td>68.5</td>
<td>67.2</td>
<td>90.0</td>
<td>14.3</td>
</tr>
</tbody>
</table>

Source: author’s construction based on FADN data

In order to evaluate the economic situation of the analysed farms, the return on equity ratio has been used. Return on equity is one of the most important measurements of economic advantages for owners of any kind of enterprises operating within the market economy. The ability of capital accumulation through generation of profits is a decisive factor in connection to development or cessation of a business; regardless of a branch, in the long run.

In the analysed period, the return on equity of the farms changed according to the trends in production profitability. Within first two years after the EU accession, this ratio was, on average, 16.22 and 16.87% (Table 2). Subsequently, as a result of economic downturn in the pig market, this ratio was reduced to 15.43% in 2008. In the next two years it was over 17.1%. The return on assets ratio showed similar trends; still, it was lower by approximately 3 percentage points (pp). Its lowest value was recorded between 2007 and 2008 and the highest between 2009 and 2010.
### Profitability indices in the analysed farms

<table>
<thead>
<tr>
<th>Years</th>
<th>The size of ratios</th>
<th>Absolute deviations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ROE</td>
<td>ROA</td>
</tr>
<tr>
<td>2005</td>
<td>16.22</td>
<td>13.75</td>
</tr>
<tr>
<td>2006</td>
<td>16.87</td>
<td>14.10</td>
</tr>
<tr>
<td>2007</td>
<td>15.43</td>
<td>12.81</td>
</tr>
<tr>
<td>2008</td>
<td>14.47</td>
<td>12.11</td>
</tr>
<tr>
<td>2009</td>
<td>17.74</td>
<td>14.92</td>
</tr>
<tr>
<td>2010</td>
<td>17.13</td>
<td>14.50</td>
</tr>
</tbody>
</table>

*Source: author’s construction based on FADN data*

The return on sales ratio fell within the range from 39.62% in 2006 to 31.5% in 2008. In the next two years the return on sales was increasing and in 2010 it reached a similar level to the one from 2005 - 36.63%. Unlike other ratios, the return on sales ratio increased in 2010. The total asset turnover maintained similar value throughout the whole analysed period and it was from 0.36 to 0.42. Only in 2006 and 2010, its decline has been recorded. Even less considerable fluctuations concerned the equity multiplier between 2005 and 2010. It fell within the range of 1.18 - 1.20, and since 2007 this ratio did not decrease.

In order to determine the decisive factors in connection to the value of the return on equity ratio, it was decomposed with the use of the Du Pont model (Figure 2). According to the model, return on equity is dependent on return on sales, total asset turnover and a capital leverage which mechanism consists in the fact that an increase in debt is, on the one hand, reflected in a decrease in the share of equity capital, on the other hand, in an increase in profit related to equity capital (Wedzki D., 2006).
Fig. 2. **Du Pont Model in the analysis of enterprise efficiency**

Between 2006 and 2009, the return on sales ratio had the most considerable impact on a change in return on equity in the pig farms. The impact was the highest at the beginning of that period, and the lowest at the end (Table 3). Simultaneously, the trend of this ratio was positively correlated with the trends of return on equity in the farms. The situation changed in 2010 - then, the total asset turnover ratio had the highest impact on the change of return on equity. Between 2006 and 2008, changes in that ratio were negatively correlated with the return on equity of the farms, and between 2009 and 2010 it was a positive correlation. In 2010, decreasing sales per unit of assets contributed to a decrease in the return on equity.

The capital structure ratio had the lowest impact on changes in return on equity. In 2006, 2008 and 2010, that ratio was positively correlated with the changes in the return on equity ratio and its impact was higher. Nevertheless, in 2007 and 2009, the impact of the capital structure ratio was lower and the direction of relationship was negative.

*Source: author’s construction.*
Table 3
The impact of return on sales, total asset turnover and capital structure on the return on equity of the analysed farms

<table>
<thead>
<tr>
<th>Years</th>
<th>Impact of changes of factors on size of deviation ROE</th>
<th>Strength of impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ROS</td>
<td>ATO</td>
</tr>
<tr>
<td>2006</td>
<td>1.42</td>
<td>-1.00</td>
</tr>
<tr>
<td>2007</td>
<td>-1.85</td>
<td>0.30</td>
</tr>
<tr>
<td>2008</td>
<td>-1.65</td>
<td>0.81</td>
</tr>
<tr>
<td>2009</td>
<td>1.90</td>
<td>1.45</td>
</tr>
<tr>
<td>2010</td>
<td>0.49</td>
<td>-0.98</td>
</tr>
</tbody>
</table>

Source: author’s construction based on FADN data

The calculations showed that the highest decrease in return on equity in the analysed farms in comparison to the previous years was recorded in 2007 (by 1.44 pp). The following changes had an influence on the above-mentioned situation:
- decrease in return on sales caused a decrease in ROE by 1.85 pp;
- increase in total asset turnover contributed to an increase in ROE by 0.30 pp;
- change in the capital structure had an impact on the improvement of ROE by 0.10 pp.

A different situation took place in 2009. Then, the return on equity ratio in comparison to the previous year increased by 3.27 pp. This resulted from the following changes:
- increase in return on sales caused an increase in ROE by 1.90 pp,
- increase in total asset turnover contributed to an increase in ROE by 1.45 pp,
change in the capital structure had an impact on the reduction of ROE by 0.08 pp.

Conclusions, proposals, recommendations

1. After Poland’s accession to the EU, the conditions of pig production have changed as a result of the free flow of goods and adopting legal as well as veterinary and sanitary regulations binding in the Member States. However, the integration has not eliminated cyclical fluctuations in the pig market. As a result of changes in pig production profitability and an increase in livestock import from other EU states, the economic situation of some producers of pigs for slaughter in Poland has deteriorated. In turn, this resulted in the reduction of pig livestock. Between 2006 and 2013, pig population in Poland decreased by 41.3%.

2. The changes in production profitability in the market of pigs for slaughter determined profitability of pig farms which is evaluated by means of different indices. Still, from the synthetic perspective, they do not provide numerous interpretation possibilities. The structural system of profitability indices in a form of Du Pont pyramid provides much more knowledge within the scope of cause and effect relationships.

3. The research study concerning the pig farms gathering accounting data in Polish FADN showed that return on sales had the highest impact on changes of ROE; especially, in the first years following the EU accession. The situation changed in 2010 where the total asset turnover ratio had the highest influence in return on equity. The direction of the return on sales ratio’s influence on ROE was positive, and that of asset turnover ratio was changing within the subsequent years. The capital structure ratio had the lowest influence on changes of return on equity.

4. With regard to the considerable influence of the return on sales ratio on the return on equity, the managers of pig farms should pay special attention to this ratio, analyse production structure and volume of output as well as sales price. Conducting such analyses will enable them to make rational decisions in running pig farms.

Acknowledgements

The project was funded by the National Science Centre on the basis of decision DEC-2013/09/B/HS4/03606.

Bibliography


