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Industry Differences in Productivity—In Agriculture and Tourism by Lake Balaton, Hungary

Zsuzsanna Bacsi [1], Lóránt Dénes Dávid [2,3,*] and Zsolt Hollósy [1,4,*]

[1] Institute of Agricultural and Food Economics, Hungarian University of Agriculture and Life Sciences, HU-2100 Gödöllő, Hungary
[2] Faculty of Economics and Business, John von Neumann University, HU-6000 Kecskemét, Hungary
[3] Institute of Rural Development and Sustainable Economy, Hungarian University of Agriculture and Life Sciences, HU-2100 Gödöllő, Hungary
[4] Institute of Economics, Faculty of Social Sciences, Eötvös Loránd University, HU-1053 Budapest, Hungary
* Correspondence: dr.david.lorant@gmail.com (L.D.D.); hollosy.zsolt.istvan@uni-mate.hu (Z.H.)

Abstract: The paper compared the performance of firms in agriculture and in tourism in two countryside areas of Hungary, assessing 2613 firms for 16 years (2004–2019). The data are from tax reports of all firms of the analysed areas. Agriculture and countryside tourism depend on environmental factors, thus they are more seriously affected by adverse environmental events than other production or service industries. The research was aimed at identifying differences between the two industries, and reveal time patterns and size-related traits of performance. Labour force, sales revenues, total assets, labour productivity, and total factor productivity (TFP) were analysed with descriptive statistics and panel regression analysis. Results reveal that the performance of firms in these industries differ significantly regarding total assets, sales revenues, labour force, and labour productivity, but does not differ in TFP, and differences are associated either with average levels of indicator values or their temporal tendencies. Our results underline that firm performance considerably differs by firm size, smaller firms are generally more labour-efficient than larger ones, and labour efficiency is positively impacted by total asset level, but TFP is not. Agriculture was found to be not less efficient than tourism, contrary to general assumptions.

Keywords: industry characteristics; firm efficiency; firm size; agriculture; tourism; panel regression

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Citation: Bacsi, Z.; Dávid, L.D.; Hollósy, Z. Industry Differences in Productivity—In Agriculture and Tourism by Lake Balaton, Hungary. *Sustainability* **2022**, *14*, 11809. https://doi.org/10.3390/su141911809

Academic Editor: Gema Cárdenas

Received: 26 August 2022
Accepted: 16 September 2022
Published: 20 September 2022

1. Introduction

The theory of industrial organisation says that industry structure is a central determinant of firm performance, therefore firm performance differences should be considered with regard to the industry they operate in [1]. However, empirical studies about firm performance are not abundant, due to the unavailability of firm-level data, and most of them deal with the manufacturing sector.

Empirical and theoretical studies indicate that two groups of factors influence firm profitability, namely internal factors and external factors. Internal factors include, inter alia, firm size, growth rate, capital structure, solvency, and liquidity [2–4]. External factors refer to industry-level and macroeconomic-level factors, e.g., market concentration, GDP, and inflation [4,5].

Differences in firm performance between industries were found to be low by Rumelt [6], accounting only for 9–12% of all variability among firms, in contrast with earlier results by Schmalensee [7], who found that industry determined about 20% of all variation among business units. McGahan and Porter [1] analysing not only manufacturing, but agriculture, mining, and services, found wide variations by economic sectors. Their findings indicate that industry effects accounted for firm profitability variability to the highest extent in the services sectors: in lodging and entertainment (above 60%), commerce (42%), transport

(39%), followed by the primary sectors of agriculture and mining (29%), while in manufacturing, this proportion was only 11%. Therefore, as McGahan and Porter [1] conclude, it is not very reasonable to generalise findings from the manufacturing industries to the other sectors of the economy. They also found in their research spanning the years from 1981 to 1994, that the effect of time influence variability in firm profitability only to a low, approximately 2%, extent.

In economic growth theory, it as an established fact that productivity growth is less rapid in agriculture than in manufacturing. This thought is a core element in many theories of economic development, and Martin and Mitra summarises it from Adam Smith to David Ricardo to Karl Marx to William A. Lewis, to Raul Prebisch—for exact references to these works see [8] (p. 3). However, as early as in 1964, Schultz [9] already argued that small farmers and other small businesses make very efficient use of the technology available for them [9]. Economic policy also makes use of the belief in differing productivity growth rates across industries, taking higher total factor productivity (TFP) growth rates in manufacturing as a reason to be biased against agriculture [10]. Therefore, comparisons of productivity growth in agriculture and other industries is an important topic, not only of academic interest, but also for policy making [8]. Martin and Mitra [8] analysed a relatively wide range of countries, to investigate the extent to which productivity growth rates converge across economic sectors. Empirical studies on the growth rates of labour productivity or TFP in the USA, and in several other countries, found that productivity growth in the 1970s, the 1980s, and in the first few years of the 1990s was much faster in agriculture than in other sectors of the economy [8,11–14]. Martin and Mitra [8] also found that annual growth change was around 2–3% in agriculture on average in 50 assessed countries between 1967 and 1992.

Nguyen and Nguyen [15], analysing 1343 companies of 6 sectors (wholesale and retail trade, services, agriculture, manufacturing, mining, and transport) between 2014 and 2017, found that besides other factors, firm size (measured by total assets) and capital structure have significant positive impacts on firm profitability measured by return on assets (ROA) and on return on sales (ROS), while these have no significant impact on return on equity (ROE). Similar findings are supported by many empirical studies [16–20], for various countries and years.

The present paper deals with two industries (agriculture and tourism) and focuses on the determinants of firm performance, i.e., revenues and productivity, comparing the effects of firm size, labour force, assets, and the tendencies of temporal change from 2004 to 2016.

The main goal of the paper was to reveal the relationship between firm characteristics and firm performance in two non-manufacturing industries (agriculture and tourism), focusing on the impacts of industry differences. Similar approaches were carried out mainly in the field of manufacturing, and results for the primary and the tertiary sector are fairly scarce, especially in the Central and Eastern European region.

1.1. Firms Size and Firm Performance

An extensive and increasing literature provided evidence of differences in firms' behaviour, even within the same industry [21,22], while the demography of firms reflect significant changes over time. Many firms enter the market each year, while similarly high numbers close down due to various reasons, even in expanding industries. Some firms play disproportionally important roles in employment, others are main contributors to output value and growth. Therefore it is of outstanding importance to have a clear picture about firm demography and participation in employment, production, and capital accumulation.

The analysis of firms' behaviour is often constrained by the lack of detailed data. Many research publications are available for the United States, while studies for other countries are often scarce [21,22]. Firms, however, show a rather heterogeneous pattern regarding their size, growth, capital structure, and productivity; each new firm entering the business scenery with a different initial size and abilities, often starting small, some of them becoming successful, and others failing within a short time. Competition distinguishes winners from losers, and the accumulation of experience and assets, in turn, strengthens survivors.

It is a well-established fact, that regardless of country or industry, firm size distribution is predominated by small enterprises, resulting in a consistently skewed asymmetric firm size distribution. This phenomenon is almost identical across industries and is strikingly constant over time since the 1950s [23].

The role of firm size distribution is analysed from many viewpoints, including job creation and destruction [24], country specialisation models [25], income and sales [26,27], capital structure [28], and productivity [8,15,29–32].

Degryse et al. [28], analysing the capital structure of Dutch firms, find that capital structure significantly differs by firm characteristics and industries. They state that total assets, as an indicator of firm size, considerably influence capital structure and profitability (measured by ROA), while tax rate (measured by the ratio tax paid and of before tax profit), also considerably influences the operation of firms, but to varying degrees in different industries.

Decker et al. [31] uses TFP and labour productivity to analyse the efficiency tendencies of manufacturing firms in the US, and finds that labour productivity change differs across industries. Their findings say that labour productivity shows increasing dispersion within industries since 2000, and TFP is higher for firms with higher equipment level (i.e., total tangible assets, or investments). A recent study [29] reveals that dispersion in productivity considerably increased in the past 10–15 years, measured either as real value added per worker (labour productivity) or as multi-factor productivity (MFP), and this is explained mostly by within-sector productivity differentials across firms, rather than by cross-sectoral differences. According to the resource-based theory of business performance, the nature and extent of a firm's resources affect its competitive advantage and its performance [27]. Barbieri and Mshenga [1], analysing farms in the USA, found that the number of employees and the size of the financial resources of farms, as well as their length of operation, significantly influences their annual level of income and profitability. Farms in business for longer, and those having more employees or more tangible assets, achieved significantly higher annual gross sales than the others.

As firm size seems to be an influential component of firm performance, it is important to know the distribution of firms in an industry by size. An extensive study about several sectors and countries [23] reveals—similarly to other empirical results [30,31,33]—that small enterprises make up the vast majority of firms, but they contribute much less in employment, while there are important sectoral differences in the distribution of firm size, with manufacturing firms being larger than services firms. Firm size distribution tends to be markedly skewed in West Europe, with small and medium size enterprises (SMEs) accounting for at least 95% or more of the total national business count, while medium-scale firms typically account for another 5–10%, and large enterprises only represent about 1–5%, while the relative proportions of firms in each size category remained constant between 1983 and 2003 [34]. Similar proportions were found during the last decade of the 20th century in Canada and the USA [35], as well as by Poschke [32] for 12 European countries in 2010, and by Sup Cho [36] for Korea in 2013, emphasising distribution differences by industries.

The relationship between firm size and productivity is a controversial issue, and while most studies refer only to the manufacturing sector, a few research findings describe results for non-manufacturing firms, i.e., services and agriculture [35]. In the last decade of the 20th century in Canada and the USA, firm size was found to be positively related to labour productivity and TFP in both the manufacturing and non-manufacturing sectors, including accommodation and food services [35]. However, in agriculture, small firms clearly showed higher labour productivity than large ones, and a negative size-productivity relationship was found in retail trade. The TFP results are similar, but stronger for non-manufacturing than for manufacturing firms. In another study covering several countries in 2013 labour productivity, measured by value added per worker, it was found to be increasing with firm size in manufacturing and in services, too [37]. According to another analysis for Australian farms between 1989 and 2002 a positive relationship was found between farm size and TFP, helping to explain why farms become larger, a widely observed phenomenon in the structural adjustment process of agriculture in developed countries [38]. The same positive relationship of farm size and TFP was established for French farms between 1885 and 2007 [39]. Berlingieri et al. [40] provide systematic cross-country evidence on the links between firm size, productivity, and pay based on micro-aggregated firm-level data for the period of 1994–2012 for 17 countries, in both manufacturing and non-financial market services. Their findings show, that although labour productivity increases with size in manufacturing, the non-financial services sector shows different behaviour, with the smallest firms being more productive than medium size firms, and about as productive as large ones. As the above studies indicate, the positive link between size and productivity seems to prevail in manufacturing, but it is not so clear in other economic sectors; agriculture and services often show an opposite behaviour.

1.2. Agriculture and Tourism—Industries Linked by Natural Resource Dependence

Tourism and agriculture represent two of the main natural resource-dependent industries. The dependence of agriculture on natural resources (land and climate) is obvious. Countryside tourism often attracts tourist by its natural beauty, pleasant climate, landscape, and water for recreation purposes. Thus, with the current global climate change crisis under way, they both face similar challenges of sustainability in many respects. Nature-based enterprises use nature as a core element of their product/service offering [41]. Although tourism and agriculture do not consist only of such enterprises, natural resources are undeniably core elements in their activity. Therefore they both depend on environmental conditions, and these provide serious limitations on their possibilities of growth and development. However, large-scale agriculture achieved near-manufacturing-like efficiency and technology development, with standardised products and large volumes of outputs [42]. The same is true for the tourism industry, where mass tourism introduced the unified product turned out in bulk—as is seen in industrialised charter tourism directed typically to seasides and nature-related holidays [43]. This common feature makes it reasonable to deal with these two industries, focusing on their similarities or differences.

As Sharpley and Craven [44] describe, environmental disasters often hit agriculture and countryside tourism with similar severity. The 2001 foot-and-mouth disease in Britain caused severe losses to the farming sector, but it had a nearly parallel effect on tourism, too, as domestic and international visitors did not want to, or were not allowed to visit the affected areas. This underlines the fact of how deeply agriculture and tourism are intertwined in shaping the socioeconomic landscape of the countryside. Government measures often focus on relief measures for the farming sector, but may overlook the needs of rural tourism. The example of Britain shows that while the government put nearly the entire countryside under quarantine, the potential impacts on the tourism industry were either ignored or not even considered, although its share in the national economy was about four times as high as of agriculture. An agricultural activity itself may be a major attraction for tourists, and competition may be experienced in a particular area suitable for both farming and for recreation. Focusing only on possible economic benefits from agriculture may ignore a potentially far larger source of added revenues from tourism and the accompanying multiplier effects on local businesses related to tourism, such as hotels and restaurants [45]. Agriculture, besides producing food and raw materials, is an important factor in the culture and visual attractions of the countryside, and provides its historical background, but tourism became a major factor in shaping the rural socioeconomic scenery, and generating income and employment for the rural population. The similar vulnerability of tourism and agriculture to the changing environmental conditions, while their major importance is in global output and employment, justifies the comparison of for their firm-level performance [46].

1.3. The Study Area: Lake Balaton, Zala and Somogy Counties in Hungary

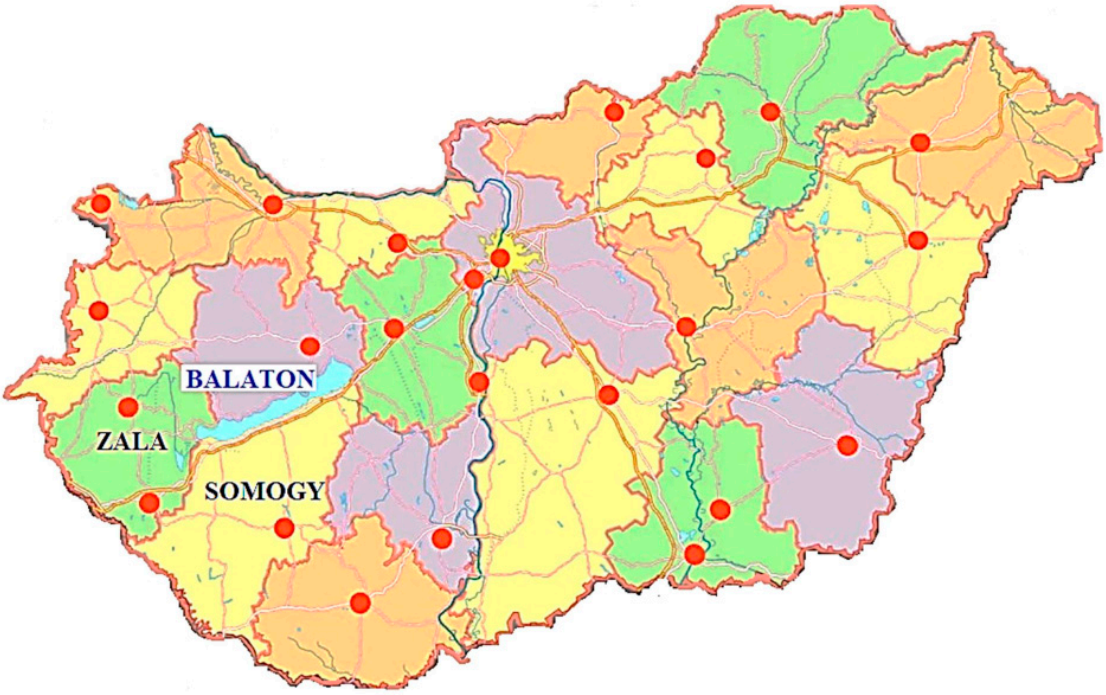
The current research focuses on two industries: agriculture and tourism, and two counties (NUTS-3 territorial units in Hungary) Somogy and Zala, neighbouring the unique natural area of Lake Balaton. As these counties are far from the capital of Hungary, located by the lake, their tourism industry is mainly based on nature-related assets, typically, though not exclusively, water-based holiday tourism. As the lake is located at the borders of the analysed two counties, the largest parts of their areas have no real connection to holiday tourism, people earn their living from other industries, and agriculture plays an important role in that.

Zala county is located in western Hungary, neighbouring county Somogy, and Lake Balaton. Agricultural production was the economic base of the county for centuries, although the soil and natural conditions are not favourable. Animal husbandry as well as the fruit and grape culture are still significant. With the discovery and exploitation of crude oil, from the 1960s Zala became a centre of crude oil production, though crude oil supplies were mostly exhausted by the 1990s. However, the county's proximity to Western Europe attracted many foreign companies to the region, and that improved its economic position. Electronics and chemical industries, metallurgy, food processing, engineering, wood products, and textiles are the main components of the county's industrial sector, while the services sector dominates the local economy. Tourism is mostly based on Lake Balaton, and on spas and fishing in other areas of the county [47–51].

Somogy county is situated in south-western Hungary. It is bordered by Lake Balaton to the north and by Zala county to the west. It is Hungary's most sparsely populated county. Somogy occupies the entire southern shore of Lake Balaton. The county's southern boundary is formed by the Drava River. Somogy has extensive forests and swamplands, and the southern part of the county is largely a forested flatland. Agriculture plays an important role in the economy of the county. The main crops are cereals, grapes, and other fruits; forestry is also important, as are fish and game breeding. Other important economic sectors are the food-processing industry, computers, electronics, and optical products. The Balaton area is the focus of the county's tourist industry, although rural tourism is developing in the backlands, and there are a few significant health resorts and spas as well [47–51].

Lake Balaton is the largest lake of Central Europe, located in the middle of Transdanubia. Its area is 598 km^2, its length is 77 km in Hungary. At its widest point, the lake is about 14 km across, and the maximum depth is 11 m. The climate of the region is continental, with warm and sunny weather from May to October. In colder winters the lake is often covered with ice. The prevailing winds are from the northwest, therefore the south-eastern shore of the lake is subject to erosion of its banks by wave action. The regions around the lake are rich in plant and animal life. The southern border of the lake is very fertile, and the volcanic soils to the northwest form the basis of a noted wine-growing region. The catchment area of Lake Balaton is 5212 km^2, nearly nine times larger than the lake's surface area (593 km^2). It is dominantly agricultural land: about 62% is in agricultural use, while 26% is forest. Agriculture nevertheless lost its importance due to the development of the tourist industry in the second half of the 20th century. Tourism in the lakeside is the main source of income of the coastal settlements, offering a variety of leisure and recreational activities for tourists, with resort centres, luxurious hotels, and private apartments around the lake. About 32% of the businesses are directly related to tourism, which is a good indicator for showing the strength of the tourism sector in the regional economy. The Lake Balaton tourism industry plays an important role in the national economy too: about one third of tourism revenues of the country are generated in this area [47–51].

The location of the researched area, and some key socioeconomic indicators are presented in Figure 1. As Figure 1 shows, the analysed counties produce a higher share of their GDP from agriculture, and a lower share from tourism, in spite of bordering a major holiday destination of the country. However, even with a 4% share, tourism is an important sector of the economy in both counties, though mainly concentrated to the lakeshore areas.



	Somogy	Zala	**Hungary**
Population (persons)	301,929 (3.1%)	268,648 (2.7%)	**9,772,756** (100%)
Area km²	3784 (6.5%)	6065 (4.1%)	**93,025** (100%)
GDP million HUF	949,528	979,243	**47,513,912**
Share of GDP, AG	*11.0%*	*6.5%*	*3.9%*
Share of GDP, TU	*4.0%*	*4.0%*	*6.8%*

Figure 1. Lake Balaton with counties Somogy and Zala. Source: [50,51].

2. Materials and Methods

2.1. Research Questions

Our paper focuses on the following research questions, referring to agriculture and tourism in counties Somogy and Zala:

- What is the composition of firms by size, and how did it change over time between 2004 and 2019?
- What is the relationship of firm performance (productivity) and firm size?
- Are there identifiable patterns of size and performance in different geographical areas?
- What changes can be identified during the analysed 16 years?
- Is there any significant difference between agriculture and tourism in the above aspects?

2.2. Hypotheses

Relying on the main goal of the paper described in the Introduction, the following hypotheses are defined:

Hypothesis 1 (H1). *The performance of agricultural firms measured by productivity indicators and revenues significantly differ from that of tourism firms.*

Hypothesis 2 (H2). *Firm size, assets and labour force significantly influence firm performance both in agriculture and tourism, while the extent of this influence differs by industry.*

2.3. Data

For the years of 2004–2019 our database contains the following data for all firms (companies only) being in business in 2019 in tourism or in agriculture in County Somogy and County Zala:

- Total assets (in 1000 HUF), denoted by: TA, and its standardised form: z-TA.
- Sales—gross revenue (in 1000 HUF), denoted by: SR, and standardised: z-SR.
- Labour force, available only for 2008–2019 (in persons): LF and z-LF.
- Total factor productivity, measured as SR/total cost: TFP and z-TFP.
- Labour productivity, measured SR/LF, in 1000 HUF/person: LP and z-LP.
- Two counties by Lake Balaton: county Zala is denoted by Z, county Somogy by S.

The two industries were specified by their NACE codes, as:

- Agriculture, denoted by AG: covering the following sectors: A01—crop and animal production, hunting and related service activities; A02—forestry and logging; A03—fishing and aquaculture.
- Tourism, denoted by TU: covering I55—accommodation; and I56—food and beverage service activities.

A note on currencies and financial data: Financial values are measured in Hungarian Forint (HUF). The value of HUF to EUR underwent considerable weakening during the analysed time period, with a relatively stable HUF between 2004 and 2010 (1 EUR being 245 HUF in 2004, 240 in 2008 September, and 260–270 till 2010 July). Then, 1 EUR reached 300 HUF by the end of 2011, fluctuating between 300 and 320 until the end of 2018, 330 in September 2019, 350 in March 2020, fluctuating around 360 from September 2020 to March 2022, and then with a steep slope reaching 412 by July 2022. For this reason, transforming HUF values to EUR would give a distorted picture, as companies manage their business in Hungary mostly in HUF. Though agricultural exports and tourism revenues are obviously affected by the exchange rate, Hungary is also dependent on importing inputs from abroad, therefore the benefits and losses arising from changing exchange rates cannot be thoroughly handled in this paper. Our data are derived from tax returns of firms and are measured in current HUF every year. These values are handled without correcting for annual price level changes, as the average inflation rate affects different industries differently, so by using the same correction, a distorting effect would be introduced to the dataset. Therefore, we use current values, keeping in mind that during the analysed years, a considerable increase in price levels took place in Hungary.

Table 1 gives a detailed structure of the firms comprising the sample of analysis, for altogether 2564 firms. The total database included 2613 firms, though the full set of data was not available for all of them. Therefore, some of the summary tables refer only to a smaller number of firms, depending on the actual availability of data.

Table 1. The distribution of the analysed firms by county and industry.

All	N	%	County	N	%	All	County S%	100%
S-AG	754	29.4%	S	1444	56.3%	100%	AG	52.2%
Z-AG	498	19.4%	Z	1120	43.7%		TU	47.8%
S-TU	690	26.9%	**Industry**	**N**	**%**	**All**	**County Z%**	**100%**
Z-TU	622	24.3%	AG	1252	48.8%	100%	AG	44.5%
Total	2564	100.0%	TU	1312	51.2%		TU	55.5%

Source: Authors' own construction.

2.4. Methodology

To analyse the impact of firm size on profitability measures, the standard definition of small, medium, and large firms was considered [52]. This definition uses the number of employees, the size of total assets, and the size of annual sales revenue to classify firms into four groups. Categories are defined for each of these indicators, and then a firm belongs to a category if it is a labour force indicator and at least one of the sales or the assets indicators fit the relevant category for the past 2 years. Our financial data are provided in HUF, with constantly changing EUR/HUF exchange rates during the assessed period, while the asset and revenue categories are defined in EUR. Therefore, to avoid the distorting effects of changing exchange rates, in the rest of the analysis, only the employee-related size categories will be applied, with their category codes used in variable size:

- Micro-enterprise (Size = 1, denoted by S1): the labour force in persons is $\leq$10.
- Small enterprise (Size = 2, denoted by S2): the labour force in persons is $\leq$ 50 but >10.
- Medium enterprise (Size = 3, denoted by S3): the labour force is $\leq$ 250 but >50.
- Large enterprise (Size = 4, denoted by S4): the labour force in persons is > 250.

Firm distributions by employee-based categories were analysed by year, and compared by industry and county, applying descriptive measures. Then the full dataset, as a panel database, was used to analyse industry effects compared to the effects of year and location to explain the evolution of total assets, sales revenues, and labour force. Finally, the tendencies of TFP and labour productivity were examined again by industry and county.

2.5. Methodology for Analysing Panel Data

Our dataset contains 2613 enterprises and 5 variables (labour force, total assets, sales revenues, TFP, and labour productivity) for 16 years (except for labour force and labour productivity, where no data were available for 2004–2007), i.e., more than 180,000 values. This is accompanied with industry and county code variables, and size category codes. The variable series were checked for normality, but due to large skewness, kurtosis, and outliers and extreme values, no usual transformations succeeded to transform them to normal distribution. However, as data were derived from financial reports of firms, each outlier and extreme value contains true information. Therefore, we decided not to exclude these from the analysis. To make extreme values more accessible to statistical analysis, standardisation was applied (z-score transformation, where the z-score of value x is (x − mean)/standard deviation, resulting in transformed variables of zero mean and 1.0 standard deviation).

To analyse the same enterprises for many years, i.e., to carry out panel data analysis, the mixed linear model (LMM) of SPSS was applied [53,54] to identify fixed and random effects. In all our models, industry was considered for fixed effects, with county and size category, to see if industry characteristics, firm size, and geographical location significantly influence firm performance during time.

The LMM structure is as follows: the dataset contains n observations (j = 0, . . . , n − 1, referring to years 2004, . . . , 2019) for N subjects (I = 1, . . . , N firms), for which matrix X denotes the set of variables observed. X(i) is the matrix of independent variable values for subject i, its rows containing the actual observations for the individual years. We wish to determine the influencing factors of a selected trait (y) of firms, for which we have n measurements over time (n years). The standard format of LMM is given as [55,56]:

$$y(i) = X(i) \times B + V(i) \times b(i) + e(i)$$

where

- y(i) = [y(i,1), . . . , y(i,n)] denotes the vector of n measurements (1, . . . , n) over time for subject i (firm i), for the selected trait of firm i;
- X(i): n × p matrix of p variables and n observations for firm i, representing the variables having fixed effects on firm i;
- V(i): n × q matrix of q variables and n observations for firm i, representing variables having subject-specific effects on firm i;
- B: a p × 1 vector of regression parameters fixed for all firms;
- b(i): q × 1 vector of subject-specific regression parameters;
- e(i): n × 1 vector representing random effects and errors for firm i.

The panel models for total assets, labour force, sales revenues, labour productivity and TFP (or their standardised values), as dependent variables have the following parameters:

- z-TFP; z-SR: N = 2613 firms, n = 16 observations (years 2004–2019), with the following variables as independent variables in X and V: county, industry, z-TA, size, year, and their interactions. It is a research question: which of these have the same fixed effects and which have subject-specific effects? Year was also included as a random effect variable.
- z-LF; z-LP: the same parameters were used, but the time span was shorter (n = 12), as employment data were only available from 2008 to 2019.
- z-TA: the parameters were the same as for z-TFP and z-SR, with the exception, that z-TA, as the dependent variable, was obviously omitted from the independent variables.

In the rest of the paper the following notations will be used for groups of firms:

- S-AG-S1: county Somogy-agriculture-size1 firms;
- S-TU-S1: county Somogy-tourism-size1 firms;
- Z-AG-S1: county Zala-agriculture-size1 firms;
- Z-TU-S1: county Zala-tourism-size1 firms;
- Similar notations apply for S2, S3, and S4.

3. Results

3.1. The Annual Changes in Firm Sizes

Firms were compared by their size categories in each year. As Figure 2 shows for three example years, the micro and small enterprises (S1 and S3) represent the largest proportions in each year. They represent about 94–98% of all firms, and the share of medium or large firms is only 2.12% on average, without any significant change by time. As Figure 2 illustrates, there is a difference between tourism and agriculture, tourism has higher proportions of S1 firms and SMEs (S1 and S2 firms together), and their share shows an increasing trend by time. The increasing trend for the smaller size categories is visible in agriculture, too, but the proportion of medium and large firms is considerably higher at the beginning of the assessed time period. As an overall pattern, the high proportion of micro-enterprises is prevalent in both industries. This may have a serious impact on technological development and efficiency, because micro-enterprises usually have scarcer resources for developments. Counties do not differ in this respect; the largest difference is not more than 1.6 percentage points (for S2, small enterprises).

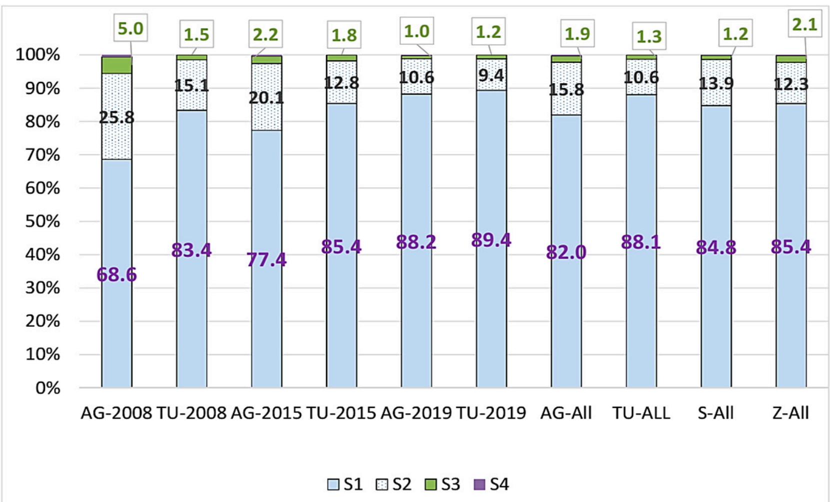


Figure 2. Proportion of firms by size categories in agriculture and tourism.

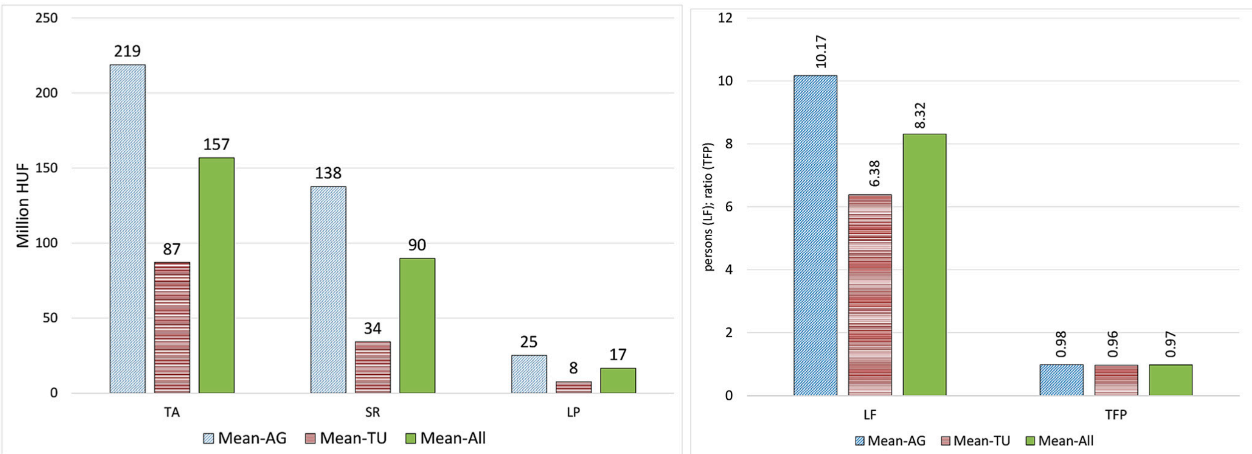
Micro-firms are important employers in both counties, but their share in total employment is only 30% in 2019. Small and micro-enterprises together, however, employ nearly 70% of the total workforce, and this proportion is growing with time. The very few medium and large-size companies employ nearly the same proportion of labour as the much more numerous micro and small enterprises (Table 2).

Table 2. The employment share by categories in tourism and agriculture.

	Share in Total Labour Force		
Staff Category	2008	2015	2019
micro-enterprises (S1)	20.4%	30.0%	30.0%
small enterprises (S2)	38.5%	39.7%	39.9%
medium enterprises (S3)	27.9%	21.6%	22.1%
Large enterprises (S4)	13.1%	8.7%	8.0%
Total	100.0%	100.0%	100.0%

3.2. Descriptive Statistics of Staff, Total Assets, and Sales Revenues and Productivity

Means, standard deviations and coefficients of variation for total assets, labour force, sales revenues, labour productivity, and TFP are given in Figure 3 and Table 3. Tourism has lower averages than agriculture in each indicator, but its average TFP is only slightly lower (98%), while in all other indicators, tourism is only at 25–66% of the mean of agriculture. The variability of data—described by the coefficient of variation—is higher in agriculture for labour force and total assets, while it is higher for labour productivity, TFP, and sales revenues in tourism. Overall, for both industries, the largest variability is experienced in TFP, followed by labour force.



(**a**) (**b**)

Figure 3. Means of firm indicators for tourism and agriculture, all years. (**a**) Total assets (TA), sales revenues (SR), and labour productivity (LP); (**b**) labour force (LF) and total factor productivity (TFP).

Table 3. Means and standard deviations of indicators in tourism and agriculture.

	Labour Force	Labour Productivity	Total Assets	Sales Revenues	TFP
Years	**2008–2019**		**2004–2019**		
AG-Mean	10.17	25,224.13	218,921.1	137,662.5	0.982
St.deviation-AG	12.81	8540.96	245,743.8	56,140.6	0.552
Coefficient of variation.%	125.9%	33.9%	112.3%	40.8%	56.2%
TU-Mean	6.38	7681.55	87,014.6	34,217.6	0.965
St.deviation-TU	2.11	7494.54	51,733.0	24,869.0	1.884
Coefficient of variation.%	33.1%	97.6%	59.5%	72.7%	195.2%
All-Mean	8.32	16,518.53	156,861.4	89,824.5	0.975
St.deviation-All	8.86	5939.15	138,090.0	35,974.0	1.168
Coefficient of variation.%	106.6%	36.0%	88.0%	40.0%	119.8%

3.3. Productivity and Firm Size

Comparing employment size categories, the productivity of firms differs by industry in each size category, too. This is illustrated by Table 4, showing labour productivity and

TFP for the years 2008, 2015, and 2019. Labour productivity is much higher in agriculture than in tourism for all size categories and years, and it is higher in smaller firms than in larger ones. In tourism, the micro (S1) firms are the most labour-efficient, while S2-firms are less efficient than S1 and S3. In agriculture, labour efficiency decreases with increasing size categories. There is an increasing trend in labour productivity, which is much slower for S1 in agriculture, but quite even in tourism.

Table 4. Productivity changes by firm size and industry, 2008, 2015, and 2019.

Size	Industry	2008	2015	2019	2008	2015	2019	% Change, 2019/2009	
		Labour Productivity (1000 HUF/Person)			TFP, Rate of Output/Input			LP	TFP
micro (S1)	AG	34,667.11	31,803.04	35,663.69	0.881	0.905	0.881	102.9%	100.0%
	TU	8478.35	9306.27	13,385.42	0.946	0.927	0.998	157.9%	105.5%
	Total	21,396.57	19,687.61	23,605.75	0.913	0.917	0.941	110.3%	103.1%
small (S2)	AG	18,950.56	29,269.05	32,096.53	0.892	0.894	0.863	169.4%	96.7%
	TU	5552.23	6145.70	9282.64	0.943	0.964	1.033	167.2%	109.5%
	Total	14,520.46	19,948.92	21,130.20	0.911	0.925	0.950	145.5%	104.3%
medium (S3)	AG	12,889.85	25,414.60	31,195.49	0.740	0.790	0.810	242.0%	109.5%
	TU	7331.16	9013.55	11,957.91	1.040	1.056	1.046	163.1%	100.6%
	Total	11,778.11	17,897.45	20,096.89	0.826	0.944	0.979	170.6%	118.5%
large * (S4)	AG	16,047.48	18,128.24	18,891.11	1.090	0.942	0.965	117.7%	88.5%
	Total	16,047.48	18,128.24	18,891.11	1.090	0.942	0.965	117.7%	88.5%

* For TU there were no firms in S4 category.

TFP, however, is higher in tourism in every size category and year than in agriculture, and medium size firms (S3) are the most efficient in this respect (there were no large companies of category 4 in the sample), though S2 companies (small enterprises) are nearly as productive. For agricultural firms, the micro-category shows no noticeable growth, small enterprises, and large enterprises (S1 and S4), and both show a little decrease (of 5–10%), while medium enterprises produce an increase from 2008 to 2019, S1 and S4 having the highest TFP values.

Thus we can conclude that smaller sizes do not show less efficiency than larger sizes, these firms employ probably less administrative staff and utilise their relatively scarce resources to the maximum in order to survive and possibly grow. The industries differ considerably, agriculture being more efficient in labour productivity, while tourism is more efficient in TFP (Table 4).

3.4. Annual Patterns of Total Assets, Labour Force, Sales Revenues, and Productivity

To evaluate annual tendencies in more detail, mean values were computed separately for industries. The trends of annual means are clearly different for the two sectors with regard to labour force, total assets, sales revenues, and labour productivity, but TFP has no clearly distinguishable pattern. This is reflected by the regression lines fitted to the annual mean values, the parameters of which are presented in Figure 4.

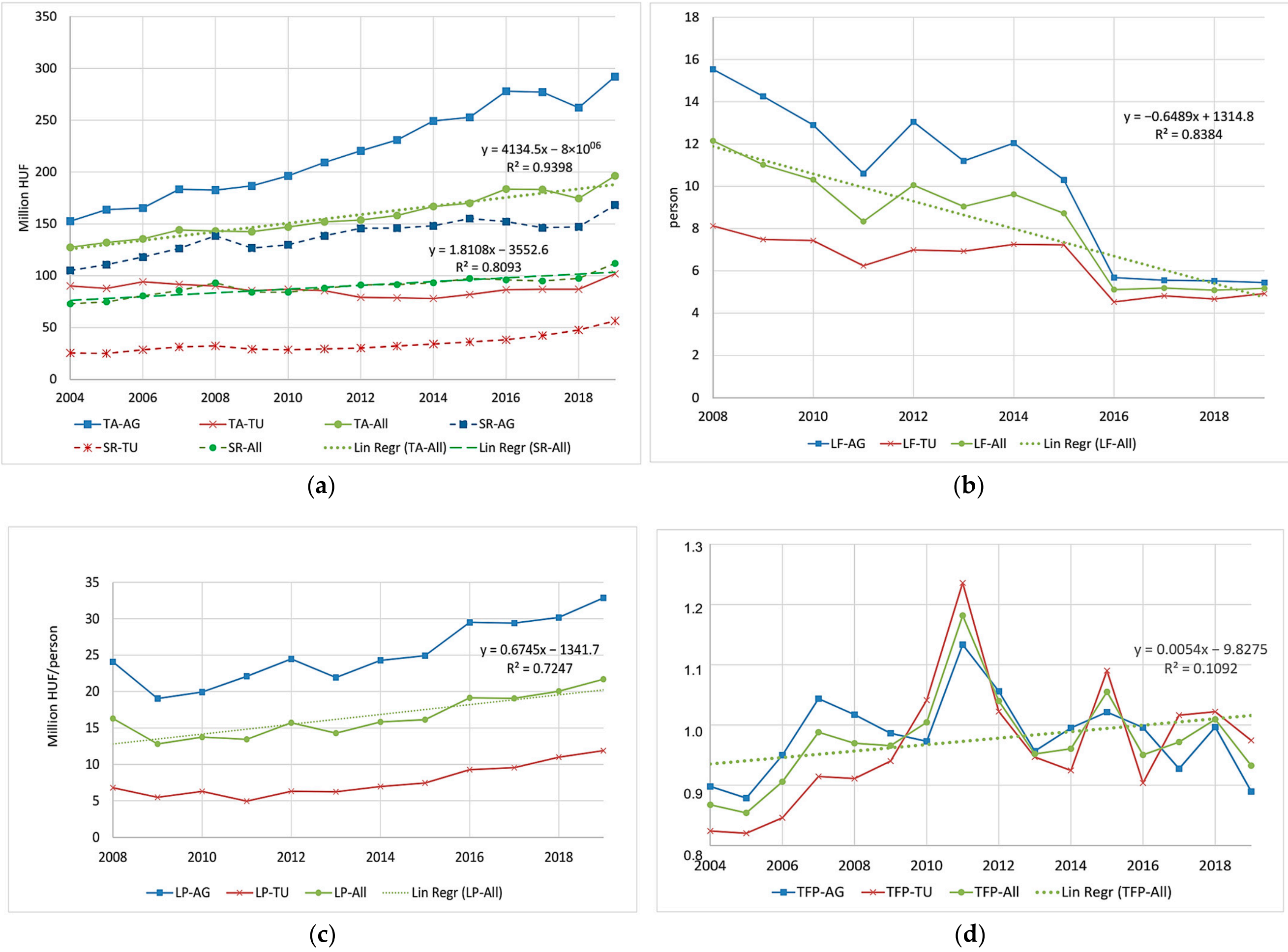


Figure 4. Annual means of assets, sales labour force, labour prodctivity, and TFP. (**a**) Total assets (TA), (**b**) labour force (LF), (**c**) labour productivity (LP); and (**d**) total factor productivity (TFP). Note: sales revenues and total assets are in 1000 HUF, data for labour force and labour productivity are available only from 2008.

As is shown in Figure 4, total assets show an increasing trend in agriculture; while in tourism it does not show any change by time, the two industries are clearly different in their annual mean values. Annual mean sales revenues show an increasing trend in both industries, but agriculture has about three times as high values as tourism. The same pattern holds for labour productivity.

The annual mean labour force levels show definite decreasing patterns in both industries, agriculture starting from a higher value in 2008 than tourism. The decreasing trend in agriculture is much faster than in tourism, and the employment levels of the two industries converge to a nearly equal level by 2019. In TFP, no clear trend can be identified. TFP values are dispersed between 0.8 and 1.1 except for 2011, when they are between 1.1 and 1.25. No clear tendency can be seen comparing the industries; during the 16 years, tourism has higher means in 6 years and agriculture in 10 years.

Fitting a regression line to the overall values, the R2 values, indicating goodness of fit, are quite high for both industries and all indicators except for TFP, where the small R2 and the very small slope in the regression equation indicate the lack of any identifiable time pattern. Negative slopes for labour force, and positive slopes for total assets and sales revenues suggest that increasing labour productivity is as much the result of using more technological resources as employing less human resources. We must note that total assets and sales are measured at current price levels not corrected for inflation, thus the annual growth rates during 2004–2019 of about 3% include the average annual inflation rate of 2.58% during these years.

3.5. Results of the Panel Analysis

The analysis of annual means indicates that tourism and agriculture possess clearly different characteristics. However, the means fail to grasp the fact that the annual samples are not independent, but contain the same firms, allowing panel regression analysis to distinguish fixed effects from random effects (if any). Therefore, a more detailed panel analysis is carried out.

Total assets, labour force, sales revenues, labour productivity, and TFP (z-score transformed values) were analysed with industry, county, and year as independent variables. The size categories and total asset values (except for TA as the dependent variable) were also included, together with the random effects of year in the analysis. Industry effects—either by themselves, or in interaction with time—were found to have significant fixed effects, except for z-TFP as dependent variable. The random effects of year were also significant (Table 5).

Table 5. Fixed and random effect parameters—results of LMM.

Fixed Effects Parameters [a]	**z-TA**	**z-SR**	**z-LF**	**z-LP**	**z-TFP**
[County = S]	6.45410 **	12.683821 **	18.2430 **	−1.249686 **	−0.020224
[County = Z]	6.46905 **	12.623063 **	18.2446 **	−1.184355 **	−0.050850
[Ind = AG]	0.02025	0.252176 **	0.0063	0.534609 **	0.012508
[Ind = TU]	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]
[Staff size category = 1]	−6.63116 **	−12.878746 **	−18.3218 **	0.924821 **	−0.022349
[Staff size category = 2]	−6.23685 **	−12.528507 **	−17.7591 **	0.704919 *	−0.038611
[Staff size category = 3]	−4.70080 **	−10.811344 **	−15.4018 **	0.423471	−0.029199
[Staff size category = 4]	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]
Year (year = 0 is 2004)	−0.00141	0.006575 **	−0.0062 **	0.008841 *	0.005599 *
[County = S] * year	0.00408	−0.001788	−0.0001	0.008263	−0.002819
[County = Z] * year	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]
[Industry = AG] * year	0.01801 **	−0.003491	−0.0036 *	−0.003832	−0.000671
[Industry = TU] * year	0 [b]	0 [b]	0 [b]	0 [b]	0 [b]
Z-Total_assets		0.214369 **	0.1207 **	0.072120 **	−0.000963
Random Effect variances					
Residual	0.239040 **	0.143097 **	0.116614 **	0.401488 **	0.235750 **
Year	0.004778 **	0.002163 **	0.000149 **	0.005081 **	0.001522 **
$\mathbf{R^2}$	0.717 **	0.667 **	0.769 **	0.648 **	0.449 **

[a]. Estimates of fixed effects. [b]. This parameter is set to zero (baseline). **. Significant at 0.01 level. *. Significant at 0.05 level.

Looking at the actual effects in more detail, the analysis results are shown in Table 5 giving the actual estimates of fixed effects and random effect variances.

Industry-fixed effects are significant for z-SR and z-LP and the industry and year interactions are significant for z-TA and z-LF. Thus the industries differ in their total assets, sales revenues, labour force, and labour productivity, but not in TFP. The earlier found differences in TFP are more the results of subject-specific differences, than industry-specific traits. The fixed effect of counties is significant for all dependent variables, except TFP. Year has a significant fixed effect on all indicators except z-TA, but its impact is significant for total assets in interaction with industry, i.e., the time slope of agriculture is positive, differing from the zero slope of tourism. County–year interactions are not significant for any dependent variable, meaning that the time slopes for the same groups of firms are the same in both counties.

Looking at the variables of size categories, all these categories significantly differ in their fixed effects on total assets, sales revenues, and labour force, but regarding labour productivity, the two largest categories do not differ, and for TFP, none of the size categories differ.

The random effects variances of the year are also significant, although rather small compared to any of the fixed effects, and especially to the residual variances, which measure the variances caused by factors not included in our models. The model fits, i.e., the R2 values between the observed and the predicted values, are reasonably good, with the smallest value found for z-TFP (0.449), while for the other dependent variables, it is between 0.648 and 0.769.

To make the parameters easier to interpret, a summary table is presented describing individual fixed effects for each county, industry, and size combination (Table 6). The individual fixed effect parameters are computed by using the baseline value and adding the relevant estimate for the specific group when it is significant. The baseline group is Z-Year = 0 − TU-S4, i.e., county Zala in 2004, tourism industry, and large firms; and all parameters in Table 5 give the difference to this baseline group.

Table 6. Specific parameters for specific groups of firms for the fixed-effect equations.

	Const	**SlopeYr**	**Const**	**SlopeYr**	**Const**	**SlopeYr**	**Const**	**SlopeYr**	**Const**	**SlopeYr**
	z-TA		**z-SR**		**z-LF**		**z-LP**		**z-TFP**	
Z-AG-S1	−0.1621	0.0180	−0.0035	0.0066	−0.0771	−0.0098	0.2751	0.0088	0.00	0.0056
Z-AG-S2	0.2322	0.0180	0.3467	0.0066	0.4856	−0.0098	0.0552	0.0088	0.00	0.0056
Z-AG-S3	1.7682	0.0180	2.0639	0.0066	2.8428	−0.0098	−0.6497	0.0088	0.00	0.0056
Z-AG-S4	6.4690	0.0180	12.8752	0.0066	18.2446	−0.0098	−0.6497	0.0088	0.00	0.0056
s-AG-S1	−0.1771	0.0180	0.0573	0.0066	−0.0788	−0.0098	0.2097	0.0088	0.00	0.0056
S-AG-S2	0.2172	0.0180	0.4075	0.0066	0.4839	−0.0098	−0.0102	0.0088	0.00	0.0056
S-AG-S3	1.7533	0.0180	2.1247	0.0066	2.8411	−0.0098	−0.7151	0.0088	0.00	0.0056
S-AG-S4	6.4541	0.0180	12.9360	0.0066	18.2430	−0.0098	−0.7151	0.0088	0.00	0.0056
Z-TU-S1	−0.1621	0.0000	−0.2557	0.0066	−0.0771	−0.0062	−0.2595	0.0088	0.00	0.0056
Z-TU-S2	0.2322	0.0000	0.0946	0.0066	0.4856	−0.0062	−0.4794	0.0088	0.00	0.0056
Z-TU-S3	1.7682	0.0000	1.8117	0.0066	2.8428	−0.0062	−1.1844	0.0088	0.00	0.0056
Z-TU-S4	6.4690	0.0000	12.6231	0.0066	18.2446	−0.0062	−1.1844	0.0088	0.00	0.0056
s-TU-S1	−0.1771	0.0000	−0.1949	0.0066	−0.0788	−0.0062	−0.3249	0.0088	0.00	0.0056
S-TU-S2	0.2172	0.0000	0.1553	0.0066	0.4839	−0.0062	−0.5448	0.0088	0.00	0.0056
S-TU-S3	1.7533	0.0000	1.8725	0.0066	2.8411	−0.0062	−1.2497	0.0088	0.00	0.0056
S-TU-S4	6.4541	0.0000	12.6838	0.0066	18.2430	−0.0062	−1.2497	0.0088	0.00	0.0056
Coef_zTA				0.2144		0.1207		0.0721		0.0000

Therefore, the actual equations describing the fixed effects for the county industry-size groups and years are of the following structure, with relevant parameter values given in Table 6.

$$\text{z-Depentent} = \text{Const} + \text{SlopeYr} \times \text{Year} + \text{Coef\_zTA} \times \text{z-TA}$$

The different parameters clearly show that industries differ in their initial value from 2004 (see the Const column), or in their time dependence (column of slopeYr), and by their size-related traits, too. The exception is TFP, where no significant difference was found in any of these aspects, i.e., neither county, nor industry, nor size, showed any significant impact, only time had a small positive effect on its evolution.

Altogether we may conclude that tourism and agriculture considerably differ regarding total assets, sales revenues, and labour productivity, while spatial differences also influence these indicators. Industries, however, show different growth rates by time with regard to employment. Regarding the effects of size, smaller firms have less assets and lower sales revenues, but higher labour productivities in both industries.

Employment shows a decreasing pattern in time, but the decrease is about 50% faster in agriculture than in tourism, so, starting from a much higher employment rate at the beginning of the time period, agricultural firms end up with no more workforce on average in 2019 than tourism firms. At the same time, total assets in tourism do not increase by time, while there is a moderate increase in agriculture. Regarding revenues, both industries show the same increase by time, but initial differences in the advantage of agriculture prevail throughout the analysed time period. As agriculture firms reflect rising total assets and decreasing labour force, this indicates an increasing level of mechanisation and exchange of human inputs for fixed assets. This trend does not exist in tourism, where, being a service industry, the delivered product depends crucially on personalised human contributions. Therefore, there is much less of a chance of swapping labour for technology. Looking at the productivity indicators, labour productivity increases in time at the same rate in tourism and agriculture, but agriculture has an initial better position, therefore its advantage is kept throughout the years. However, this is not so in TFP, where practically no difference can be identified between the two sectors. With better labour productivity in agriculture, it means that capital assets—although of lower values than in agriculture—are used more productively in tourism. Another (not surprising) finding is that higher asset levels are beneficial for sales revenues and labour productivity, and allow for employing more labour; but contrary to the general assumptions, they have no impact on total factor productivity—i.e., increasing total assets does not necessarily mean investment in more productive technology in these two sectors.

Finally, firm sizes also impact firm performance in all aspects (total assets, sales revenues, labour force, and labour productivity) except TFP, and micro and small firms turned out to be more labour efficient, in spite of having less assets, less staff, and less sales revenues. As TFP did not show any difference in size, this means that by their higher labour productivity, small firms can compensate for their lower capital assets and less resources. Thus, returning to our original research questions, the following answers can be given:

The research focused on five questions and proved the following:

1. Regarding the composition of firms by size and temporal changes, our findings show that in both industries, the micro-enterprises dominate the industrial structure, and their share increases with time.
2. Regarding the relationship of firm performance (productivity) and firm size, we can state that labour productivity is higher in micro-enterprises than in larger ones, while TFP does not show any difference with regard to firm size. There is a slight improvement by time, but its speed is similar in both industries and all the four size categories.
3. Regarding differences of size and performance in different geographical areas, our results show that labour productivity is somewhat better in Zala than in Somogy, both in tourism and in agriculture. The labour force is also somewhat higher in Zala, having higher values than Somogy, and both counties showing a decreasing trend with time. However, regarding TFP, the two countries show no difference. The total asset levels and sales revenues are also higher in Zala than in Somogy, and in agriculture, both assets and sales increase with time—the speed is the same in both counties. However, in tourism, neither county shows any increase in assets, but both show the same pattern in both industries. Regarding TFP, the two counties show no difference at all.
4. Temporal changes were discussed above. It is worth pointing out that while labour force decreases with time, all the other indicators show positive changes.
5. Differences between the two industries were also mentioned above, and, as a summary, we can say that except for TFP, the two industries considerably differ. Regarding sales revenues and labour productivity, the two industries differ in their mean levels, and regarding total assets and labour force, they differ by the rate of temporal change, with tourism changing slower than agriculture.

4. Discussion

Our paper analysed two industries, agriculture and tourism, in two countryside areas of Hungary, assessing more than 2500 firms for 16 years (2004–2019), going up to the last pre-Covid year. The research is unique in that it relies not on a small sample but on individual data of the full population of agricultural and tourism firms operating in the area. The motivation for choosing these two industries for comparison was that both agriculture and countryside tourism depend to a great extent on environmental factors, including the actual weather patterns of the years. Therefore they may be more seriously affected by adverse environmental events than other production or service industries. Our research question was whether the performance of firms in these industries differ to a considerable extent, and if yes, how. We also intended to reveal the patterns of their evolution by time, their productivity indicators, and the structure of these industries by firm size. The analysed indicators, namely total assets, labour force, sales revenues, labour productivity, and total factor productivity at the firm level, as well as the classification by size based on the labour force numbers, were the basis of our research.

The research was aimed at filling, at least partially, a research gap, namely, that relatively little research results are known about the relationship between firm characteristics and firm performance outside the manufacturing sector; results are scant for agriculture and tourism, and especially for the less developed regions of Europe. The choice of Hungary and its two rural regions, can be taken as a sample for Central and Eastern Europe, where business characteristics, such as firm size, assets, the traditional ways of doing business, and entrepreneurial approaches are rather similar, while they may differ from the more researched regions of the USA and Western Europe.

Our findings are partly in line with earlier empirical results and theoretical considerations, and partly show different patterns and new aspects.

Our findings establish the existence of significant differences between the analysed two industries, one from the productive sector, and one from the services sector, thus proving the first research hypothesis. Firm characteristics (assets, labour force, sales revenues, and productivity indicators) were found to moderately change with time, and the change was in the positive direction, except for labour force, where a definite decreasing trend was revealed. This is in line with many earlier research findings [1,8,31,33].

Our results are in agreement with Nguyen and Nguyen [15] that the level of total assets has a positive impact on firm performance (sales revenues and labour productivity). However, it is worth mentioning that sales revenues may show different trends than total revenues [57]. An analysis of European farm performance in a similarly long time period, based on the FADN database of the EU, showed that farmers may become wealthier in terms of assets, but their incomes do not considerably increase, because the growing importance of the environmental and social functions of agriculture in the European Union provide an increasing share of farm incomes not from product sales, but from environmental or social subsidies [57]. Our results show that with higher assets, the employment levels and sales revenues increase, as well as labour productivity, and in this respect, there is no difference between tourism and farming. This partially, but not fully, supports our second hypothesis. The difference in these findings underlines, that patterns elicited from industry means may change when deeper analysis reveals individual time dependencies in panel data.

Our results also show that, contrary to the general economic thought, productivity growth is not slower in agriculture than in other sectors of the economy (in our case, tourism). This is in agreement with research results from the 1990s [8,13]. Additionally, contrary to these earlier findings, our analysis showed no faster productivity growth in agriculture than in tourism, either.

Regarding the influence of firm size, earlier studies usually established a positive relationship between firm size and TFP or labour productivity in agriculture and in services [35,37–39]. Our results, however, indicate that labour productivity is as high—or even higher—in small businesses as in larger ones, which is similar to the findings by Berlingieri et al. [40]. Contrary to earlier studies, total factor productivity was found to be indifferent to size or industry.

Firm size distribution was found to be dominated by micro and small enterprises (the same findings as in Schaper et al. [34], Poschke [32], and Sup Cho [36]), but according to our findings, agriculture started with more medium and large firms than tourism in 2004, but by 2019 this levelled out, due to a much faster decrease in agricultural employment levels, which is in line with Sup Cho's findings [36] about Korean service firms.

The present paper suggests that agriculture and tourism firm performances considerably differ, even if they are located in the same geographical region. The current results refer to two important non-manufacturing sectors, for which empirical results are rather scarce, especially for a long period of 16 years. We could establish that size, industry, and asset levels can explain industry differences outside the manufacturing sector, too.

These results have implications for policy making. Traditionally, based on the knowledge of the manufacturing sector, the most productive firms were associated with large size—either by employment or by asset level. Today, this seems to be shifted in agriculture, and especially in tourism: the advantage of large firms is disappearing with time. The most productive firms are not necessarily the largest ones in terms of labour force. Labour productivity can be higher in firms employing only a few workers, with higher asset levels of mechanisation and automatisation in agriculture and in tourism, too. Therefore the gains arising from higher productivity are enjoyed by fewer workers, and that can lead to possible wage discrepancies. As TFP levels are not directly explained by asset levels, nor by labour force categories, there is a chance that with high labour productivity, there are high asset levels that make capital productivity low, and vice versa, which may make TFP about the same.

Author Contributions: Conceptualisation, Z.B., L.D.D. and Z.H.; methodology, Z.B. and Z.H.; software, Z.B.; validation, Z.B., L.D.D. and Z.H.; formal analysis, Z.B. and Z.H.; investigation, Z.B.; resources, Z.B. and Z.H.; data curation, Z.B.; writing—original draft preparation, Z.B., L.D.D. and Z.H.; writing—review and editing, Z.B., L.D.D. and Z.H.; visualisation, Z.B., supervision, L.D.D.; project administration, L.D.D.; funding acquisition, L.D.D. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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