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MANAGEMENT AND BUSINESS ADMINISTRATION STUDIES PH.D.  
SCHOOL**

**A REVIEW OF THE ECONOMIC ENVIRONMENT OF PIG MEAT  
PRODUCTION IN HUNGARY**

**Thesis of the doctoral (PhD) dissertation**

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## 1. INTRODUCTION

**Pig meat production** plays an important role in producing meat both for meat consumption within Hungary and for **export**. The **pig sector** has always been a key industry in Hungary. The achievements and development of Hungarian pig meat production were characterised by opposing trends in the 1990-s. **As a result of change in the political system, the market and economic environment underwent a rapid change.** The Hungarian pig industry had to face a lot of problems in the years following the political system change (the disbanding of the COMECON, the drop in effective demand in Central Eastern European countries and the restructuring of the export markets: i.e. a shift of focus from the Eastern region to the EU market).

Following the EU enlargement Hungary became part of a “closed” market. The new **economic environment for agriculture brought about profound changes in pig meat production, too.** It seems reasonable to count with a number of – partly – positive and – to quite a large extent – negative impacts of these new conditions in the years to come. **The market players in order to be able to react to such external and internal impacts, must be familiar with their economic environment.** The European Union sets the framework conditions for Hungarian pig meat production, which could offer us unique opportunities for our catching up and improving on our viability. At the same time **the sector will grow only if the participants of this supply chain are able to leverage these opportunities.**

Given its size and agricultural production potential, Hungary does not have a determinant role in the global pig meat market. Hungary is **not going to be a leading country in the EU market, either.** Instead, our role could be like that of a small enterprise operating in a market that is dominated by large corporations, trying to survive in the niches not addressed by the others. To achieve this we need to be aware of the behaviour of the “giant corporations”. **The production and export structure should be adapted to the requirements of the European Union** and in addition to this, the competitive position of the pig industry should be maintained also.

The EU is trying to imply that we are going to be successful in the grain sector, but not in the pig meat sector. This is despite the fact that **it in fact does matter whether the grain is sold in its original form or “stuffed in skin”.** It also should be noted that the European Union will offer significantly more opportunities – than are available at present – for **structural adjustment**; on the one hand the **Community’s support scheme is more predictable**, as it makes longer term planning possible, while on the other hand the farmers will have access to considerable investment and development grants within the framework of **rural development programs**. Apart from development grants the **payments available for compliance with community standards** also have a key role. These payments that do not directly support the farmers, but are intended to help them improve their competitiveness could be crucial for ensuring the viability of pig meat production, i.e. the sector gradually reaching a critical situation.

Any review of the **economic environment** for pig meat production is a **very complex task.** A full in-depth analysis of this topic would run beyond the framework and size limits of this paper. That is why I consider necessary the restricting of the theme of this dissertation.

This dissertation is **intended to focus on special sub-areas**, particularly the production of the agricultural “raw material”. The economic environment is a term that can be interpreted in a very broad sense, consequently in this paper I focused on the **sector-specific economic environment** that I considered essential. Having reviewed the relevant literature I am going to highlight the following factors that determine the economic environment of pig meat production: review of the cyclicity of the pig population/pig meat production/the buying-in price of pig meat and the seasonality of production and prices, the correlations of fodder prices and pig-for-slaughter prices, an international comparison of natural effectiveness and production costs, operational concentration, the EU market regulation and WTO negotiations (export refunds and import restrictions), the EU enlargement. This approach means that I am not going to cover economic policy issues (financial policy, tax policy, exchange price policy) in this dissertation, as I regard these to be the fundamental attributes of this sector. The changed consumer habits, quality assurance and food safety, veterinary health, animal welfare, environmental and fodder issues are factors that have a delicate influence on agriculture, and within it pig meat

production, however discussion of these topics would not be possible within the limits of this dissertation.

## 2. OBJECTIVES

My research was primarily aimed at finding answers to the questions that are of the highest interest for sector players in the “transitional” period following Hungary’s EU accession. In the EU member states with highly developed pig meat producing the **pig cycle** phenomenon is still present according to TRÉGARO and LOSSOUARN [2002], nevertheless these authors have not provided an empirical evidence for this statement. For this reason in this dissertation have addressed the question whether cyclicity (population, pig meat production, price) can be demonstrated in the EU member states with developed pig meat production (Denmark, the Netherlands, France, Spain, Germany). Following the change of the political system several Hungarian authors (GUBA [1995], ALVINZCZ *et al.* [1992], TÓTH [2003]) pointed to the fact that the pig cycle phenomenon reappeared in the Hungarian pig sector. For this reason, I consider it important to demonstrate – using an empirical method – the type and duration of the cycles existing in the Hungarian pig population, pig meat production and the development of the purchase price. Annual **seasonality** is a special form of the pig cycle, as it determines the market opportunities, market niches for certain periods. But the purpose of all these studies is to explore the developments going on in the EU and the Hungarian market.

The old EU-15 member states are characterised by up and running and “predictable” **market regulation**. Following the introduction of CAP (Common Agricultural Policy) – within the framework of the EU market regulation – the pig sector received payments in order to ensure the self-sufficiency of the Community in pig meat production. Consequently this paper will analyse the correlations between regulation and pig meat production, too. Issues such as **economies of scale**, the production structure and the regional location of the production units are also focus items for agro economists. In my review I tried to shed light on the extent by which **operational concentration** in the pig meat populations of the individual countries has changed in the major EU pig meat producing countries, and furthermore I extended these studies to the Hungarian pig sector as well.

**Competitiveness** hinges on the crucial factor that in raw material production the farmer should produce a product unit with as low **expenditure and unit costs** as possible. The international comparison of **natural efficiency** and the **production costs** is a therefore a key focus in this dissertation paper. The **fodder costs** represent 60 to 70 percent of the variable costs of the pig meat production phase in the agriculture. For this reason I have considered as crucial the examining of the buying-in prices of **fodder** used in the course of pig-for-slaughter production and the actual **pig-for-slaughter buying-in prices**. Knowing well the supply and the demand is essential for becoming familiar with the operation of agricultural markets, including the pig market. Thus the Hungarian pig market has been analysed in this dissertation with the help of simple linear models. The results of this model and the representation of the demand-supply curves provide us a picture about the behaviour of the pig market players.

Hungary joined the European Union together with seven other Central and Eastern European countries. As a result, the intensifying **market competition** is not only going on with the developed pig meat producing countries of the EU-15, but also with the **new member states**. Thus in this paper I have analysed the pig sectors of the major Central and Eastern European competitors (Poland, the Czech Republic and Romania). In the past decade, close to 30 percent of the Hungarian pig meat production was sold in foreign markets. The time period and the target market of selling a given product are material factors for the Hungarian traders. In this thesis paper I performed calculations regarding the seasonality (seasonal index) of the key pig meat products, the concentration of the target markets (Herfinhal index) and the export competitiveness of the products (SSI index).

Following the accession to the EU one of the most important questions concerned the pattern by which the income position of Hungarian producers would eventually develop in the years to come. The income realised on slaughter pig production will determine the portion of the farmers that will be able to stand their grounds in the competition.

This dissertation is EU-centered, as our successful integration in the European Union is one of the greatest challenges of our epoch. For Hungary the EU-15 states represent the “developed Europe”. Now that we have joined the EU, the players of the Hungarian pig meat sector will be subject to the same regulatory and competitive environment as apply to the old EU member states. And so, last but not

least, one must find an answer to the question of what manoeuvring ground is allowed for the Hungarian pig meat sector by the economic environment, and how the Hungarian market players will be able to adapt to the changed circumstances.

### 3. MATERIALS AND METHODS

#### 3.1. Measurement of cyclicity and seasonality

Most of the studies analysing the pig sector mention that the output volume of the industry and the prices are characterised by cyclical changes, however they fail to go into in-depth analyses of these phenomena. In my dissertation I have examined in detail the trends characterising the pig industries of the major pig-keeping EU member states, Hungary and Poland. I assumed that pig cycle exists in the developed pig meat producing EU member states in the way the pig population, pig meat production volume and pig meat purchase prices keep changing. Core data for this review were drawn from the Eurostat Newcronos database. The Eurostat database contains four-month (up to 2004) statistics of the pig population, while monthly statistics on pig meat production and purchase prices.

People involved in regulating the market processes have been preoccupied with the development of price oscillations and pig cycles for decades. The *cobweb theorem* for describing delayed catching up has been present in classical economic literature to this day.

Three authors laid down the foundations of the cobweb theorem to describe the progress of market processes in 1930: the American SCHULTZ [1930], the Dutch TINBERGEN [1930] and the Italian RICCI [1930]. COASE and FOWLER [1937] concluded that the lack of market information influenced in fact the progress of the hog cycle. It is difficult for the producers to predict exactly the reaction of the meat industry to demand, and the way the meat industry would adjust its production in the short run if the size of the breeding stock starts to fluctuate. EZEKIEL [1938] assumed that the supply of the commodities under review would be entirely inflexible in the short term, in other words the “period to be reviewed should be determined to be short enough to prevent any modifications in the supply in the given period, such as the supply of cotton and potato, as soon as the yearly produce is harvested.”

New methods were used to address the problem over the past two decades compared to those used before: vector autoregression (KAYLEN, 1988), demand demography models (ROSEN *et al.*, 1989), periodically recurring production response (Hayes and Schmitz, 1987) and chaos models (CHAVES and HOLT, 1991; STREIPS, 1995). According to KÖVESI [1973] the hog cycles recur usually with a four-year periodicity. The duration of hog cycles is influenced by fattening methods, the mean fattening weight and the pig species. The hog cycles progress according to a specific mechanism. KÖVESI [1973] sums up the essence of this mechanism as follows. As feed prices increase, the live pig price and the feed price ratios deteriorate, and as a result, production profitability suffers. In response to this, pig farmers will reduce production and as a result, the live pig supply will follow a decreasing tendency. In turn, reduced production will result in reduced demand for feed, which leads to a drop in feed prices. Poorer live pig supply will induce an increase in the live pig price. KORNAL [1981] in his study pointed out that the phenomenon of hog cycle subsisted even in the socialist economic environment. BRÓDY's [1983] fundamental work stimulated a new wave in the study of economic cycles. VIZVÁRI *et al.* [1999a] in their paper demonstrated that studying the way producers estimated the future price of the product was a major element in creating the so-called cobweb models intended to describe the dynamic characteristics of the markets. VIZVÁRI *et al.* [1999a] came to the conclusion that intuition and instincts played a greater role than well-weighed, analytic business rationale in the price forecasts of family farms. BRÓDY [1999] in his review studied the existence of economic cycles based on spectrum analyses, for which he relied on the data series of annual growth rate. In his analyses the “power” of the individual cycles as observed in the data series is a value obtained as the squared sum of its sine and cosine components. This indicator measures the deviation and amplitude of the cycle. The ratio of the two components will determine the “phase” (i.e. the starting point or shift) of the cycle. His paper characterised the economic cycles as constantly recurring production-related processes lasting for shorter or longer periods that could depart from their smooth balanced pattern and start self-repeating deviations. The intensity of the oscillation was

measured by the amplitude of the deviation.

HOLICS ed. [1992] described the method for breaking up a complex signal into its components. This is named Fourier analysis after its inventor. The French mathematician FOURIER demonstrated as early as in 1822 that every periodic function can be broken up into harmonic vibrations of various amplitude and weighted phases. The conversion of a function from one descriptive domain into another is called transformation. There is a strong correlation between the progress of the time function and the weight factors of the series expansion units as described by Fourier ( $a_n$ ,  $b_n$ : Fourier-coefficients). In Fourier's series theorem the so-called trigonometric polynomials are used to approximate a given  $f$  function:

$$f(x) = \sum_{i=0}^{\infty} (a_n \cos(nx) + b_n \sin(nx))$$

If an  $f$  function can be expressed as a trigonometric series, then it is periodic according to the  $f 2\pi$  formula. In the course of analyses it is sufficient to concentrate on one  $2\pi$ -long interval. The purpose of this method is to break down a complex time series into its cyclical components, which allows for quantifying as closely as possible the functions that are difficult to describe using the formulas of a general methodology, with the help of sine and cosine functions, in a restricted domain. In my calculations I relied on a simplified version of this method, using only cosine functions, which nevertheless produced reliable results in practice. The formula of the functions that I used has always been

$$t_k = \cos(2\pi * k * t / T),$$

where  $T$  referred to the number of observations, in other words the number of retrospective time periods for which we know the quantities under review. The length of the time period was either expressed in months or four-month (third-year) periods in line with the EU statistics. The variable  $t$  naturally stands for time, while  $k$  is a positive integer parameter between 1 and 15. For higher value of the length of cycle is too short to interpret.

$$\begin{aligned} t_1 &= \cos(2\pi * t / T); t_2 = \cos(2\pi * 2 * t / T); t_3 = \cos(2\pi * 3 * t / T); t_4 = \cos(2\pi * 4 * t / T); t_5 = \cos(2\pi * 5 * t / T); \\ t_6 &= \cos(2\pi * 6 * t / T); t_7 = \cos(2\pi * 7 * t / T); t_8 = \cos(2\pi * 8 * t / T); t_9 = \cos(2\pi * 9 * t / T); t_{10} = \cos(2\pi * 10 * t / T); \\ t_{11} &= \cos(2\pi * 11 * t / T); t_{12} = \cos(2\pi * 12 * t / T); t_{13} = \cos(2\pi * 13 * t / T); t_{14} = \cos(2\pi * 14 * t / T); t_{15} = \\ &\cos(2\pi * 15 * t / T) \end{aligned}$$

These functions were used as the independent variables of linear regression while the dependent one was either the livestock or the market price or the production. There is a cycle if the coefficient has a high absolute value. The cycle length is expressed as  $Th/k$ , where  $h$  means the length of the time period. If the cycle length is to be expressed in years, then  $h=1/12$  where monthly data had been used, and  $h=1/3$  where data had been given for four-month periods.

Since the period under review defines a frequency, only this frequency and the cosine functions (corresponding to its multiples) with weights other than zero can be shown in the Fourier semi-series that I have used. In the EU member states the buying-in prices due to fundamental changes in 2004 developed differently from the cyclical trend observed so far, and as a result I arrived at quite poor determination coefficients. Therefore in the case of buying-in prices I attempted to define the frequency that best fits to the time series including with its harmonics. Based on the maximum correlation value the following frequencies were obtained:

For Denmark  $T=163$  length units;

For the Netherlands  $T=163$  length units;

For France  $T=163$  length units;

For Spain  $T=167$  length units;

For Germany (since the time series was reviewed for the period 1995 to 2004 only)  $T=105$  length units;

Even more significant changes occurred in the Hungarian pig industry in 2004, thus here I calculated the best frequencies for the total pig stock, the slaughter animal production and the prices. Based on the maximum correlation value the following frequencies were obtained:

For Hungary (pig stock)  $T = 21$  length units

For Hungary (slaughter pig production)  $T = 97$  length units

For Hungary (slaughter pig price)  $T = 116$  length units.

### 3.2. A study of seasonality

Annual cycles constitute a special version of cyclicity, which is known as seasonality. In my analysis of seasonality I tried to explore the extent and ratio by which the time series value is caused to deviate from the basic pattern by the seasonal effect. The volume of products released and the buying-in prices are characterised in the pig market by regular movements within a year's period (i.e. seasonality). The development of pig meat prices is influenced by several factors, for instance the amount of slaughter pigs offered by the producers in the market and the demand of the processing industry. The demand for live pigs fundamentally determines the consumer demand for processed pig meat products. The seasonality observable in "farmgate" prices ultimately originates from the seasonality of demand and supply.

Seasonality has been analysed in regard to the pig meat production and the pig meat buying-in prices in EU member states, which have a dominating role in respect of pig meat production (i.e. Denmark, the Netherlands, France, Spain, Germany) and in Hungary. The EU market has always been a critical market for Hungary and that is why we need to see clearly the market situation now that Hungary has become an EU member.

### 3.3. Measurement of operational concentration

The temporal length of the cycles is substantially influenced by the operational structure in a given country, as well as its concentration. Concentration is indicative of imbalance, which characterises the distribution of a group or a population. The general economic term of concentration refers to cluster formation and convergences in economy. When analysing concentration the distribution of a multitude,  $x$  criteria by frequency and value figure are compared. The centeredness of a value on low number of units is called concentration. Imbalance is often expressed with the help of a concentration curve also known as the Lorenz curve.

KERÉKGYÁRTÓNÉ and MUNDRUCZÓ [1995] distinguish absolute and relative concentration. In distinguishing absolute concentration two forms of representation of concentration can be used. The representation form of concentration is determined by the nature of the given economic phenomenon, i.e. the type of multitude. Absolute concentration exists when the value figure is associated with a low number of units (for instance: concentration in the energy industry and car manufacturing). Relative concentration occurs when the value figure is distributed unevenly across the units of the multitude, regardless of the desirable influence of the power of the multitude (concentration of personal income).

In essence, absolute concentration refers to the size of the units, while relative concentration refers to the difference or dispersion among the unit sizes. The number of items in the multitude ( $n$ ) and their mathematical average ( $\bar{x}$ ) are used to characterise absolute concentration. The item number of the multitude can measure the degree of concentration in that it shows the number of units associated with the given value figure. The mathematical average on the other hand expresses the average size of the units. Relative concentration in fact represents the dispersion of the values.

The following methods can be used to measure relative concentration:

- concentration table;
- quantitative distribution;
- Lorenz curve.

I have used the Lorenz curve to describe concentration. The Lorenz curve is a graph positioned in a unit-size square that shows the cumulated relative value figures ( $z_i'$ ) as a function of the cumulated relative incidences ( $g_i'$ ). Points of the Lorenz curve are  $P_i(g_i'; z_i')$ . The starting point is referred to as  $P_0(0;0)$ , while the endpoint as  $P(1;1)$ . The Lorenz curve is a general analysis tool for relative concentration. The greater the concentration the farther the curve will be positioned from the diameter of the square. If all groups have equal production, or their outputs are identical, the curve will match perfectly the diameter of the square (straight line at  $45^\circ$ , or  $\text{tg}(\acute{\alpha})=1$ ), since among the individual units lined up by their sizes, and in the class ranges the cumulated relative frequencies match regularly the corresponding cumulated relative value figures ( $g_i'=z_i'$ ).

KOPÁNYI ed. [1996] demonstrated the strong correlation between the Gini coefficient and the Lorenz curve. The Gini coefficient in fact refers to a ratio of the area (inequality gap) between the Lorenz curve and the equality curve, and the area below the straight line at  $45^\circ$ . The value of the Gini coefficient thus falls reasonably in the range between 0 (perfect equality) and 1 (absolute inequality).

$$G=1-\sum_{i=0}^n|z_{i-1}'+z_i'| |g_{i-1}'-g_i'|$$

### 3.4. Measurement of foreign trade concentration

In the course of analysing the foreign trade volume of Hungarian pig meat products I relied on the database of Kopint-Datorg, which contained the foreign trade data in accordance with the HS system, with an 8-digit accuracy. As target markets I identified the European Union and the former CEFTA countries, as these are the most important markets for our pig meat products. The main indicators used in the course of foreign trade analyses: the Herfindhal index and the SSI-index. KERÉKGYÁRTÓNÉ and MUNDRUCZÓ [1995] emphasised the other important general indicator of concentration, i.e. the Herfindhal index/indicator that expresses in a square sum the participation of units in the value figures:

$$H=\sum_{i=1}^n Z_i^2$$

The Herfindhal index is a straight indicator of the measure of concentration. Its maximum value is 1, this meaning total concentration. The H index is in fact the mathematical average of the share in the value figure weighted against itself. TÖRÖK [1996] concluded that the sector specialisation indicator (SSI) can be used for analysing the existing national competitiveness in a selected target market.

$$\text{SSI}_{ai}=(X_{ain}/X_{ai})/(X_{an}/X_a), \text{ where } (a = \text{Hungary, } n = \text{European Union})$$

$X_{ain}$  = Hungary's export of  $i$  food to the target market (for instance: EU);  
 $X_{ai}$  = Hungary's total export of  $i$  food to all markets;  
 $X_{an}$  = Hungary's total export of all products to the target market (for instance: EU);  
 $X_a$  = Hungary's overall export.

The products, whose index comes close to (or exceeds) 1, are considered to be competitive export products, since their share of the industry export comes close to (or exceeds) the share of total exports destined to the EU in the whole of the national economy.

## 4. RESULTS

### 4.1. Conclusions and recommendations

#### *The pig industry situation*

The **Hungarian pig industry** is traditionally export oriented, as the volume of production in the past decades continually exceeded the volume of consumption. The pig meat produced in excess of the demand in Hungary was typically sold to few specific target markets in the years 2000 to 2003. Fifty percent of export sales was destined to the EU, and close to 10 percent to the CEFTA countries, while the share of other markets (mainly Japan and South Korea) was close to 40 percent. The market entry chances of Hungarian export products were clearly shaken in the past years. The reasons for this should be seen in the fast growth of international agricultural trade, the aggressive commercial expansion of the developed countries and the successful agriculture development programs in certain regions of the developing world. As a result of all these factors **Hungary's presence in the global trade of pig meat products has gradually shrunk and became smaller.**

The development of the HUF exchange rate since the first half of 2001 has clearly ruined the price competitiveness of Hungarian pig meat production. Hungary's position in the field of pig meat sales – due to the low volume and poor degree of processing compared to global trade – is that of a **price taker** instead of a price maker, thus the achievable export price is not driven by the Hungarian market situation. Moreover, the pig meat export to the European Union (our major export market) has not received export subsidisation. All these processes have contributed to the overall **weakening of the competitive position of Hungarian pig meat export.**

Changes in the consumption habits as observed in the past decade, have also had an unfavourable impact on the market situation of products made of pork meat. **Pork meat consumption in Hungary has stagnated for some years** and presently it is no longer the most sought meat type. No significant increase in domestic effective demand is expected. And so no material increase in domestic market sales can be expected in the near future, either. In the major pig meat producing EU member states and Hungary the **pig meat purchase price has experienced a decreasing tendency** in the period 2001 to 2003. Nevertheless, the prices in Hungary have often been significantly higher than the community price level through longer periods. Consequently, **our pig meat and live pig import volumes increased substantially** over the past four years. Most of this import originated from the EU member states.

The **development of pig population** in Hungary is **influenced by the pig cycle** also. The price of slaughter pig, the fodder prices and their correlation has a major impact on pig-growers' decisions, particularly on the activities of farmers producing lower volumes for sale. The progress of the product cycle in the past years was accompanied by the reduction in pig population, thus the current pig headcount barely exceeds that of 1951. The development in the Hungarian pig population, slaughter pig purchase and the buying-in prices is characterised by shorter cycles than those observed in the EU member states with highly developed pig industry.

## *Trends in the pig industry*

The **viability** and competitiveness of **primary processing has a fundamental influence on the future perspectives of the pig industry**. In the EU member states that can boast of a fully developed pig supply chain, primary processing is clearly connected to the agricultural phase and is typically owned by raw material producers. Further processing and finished product manufacturing are performed in processing plants growing out of the trading organisations.

A clearly perceivable structural change has commenced in the processing industry in Hungary, which has had a major impact on agricultural production, too. As a result, **primary processing has been clearly distinguished and separated from finished product manufacturing**. Although the players of Hungarian slaughter pig production are not distinguished by regulation at organisational level, as a result of differentiation of consumer demand such distinction did take place at the market level, in other words the “household” producers/farmers will no longer be suppliers of the processing corporations. Nevertheless, the analysis of the past months’ trends provides ground for the assumption that more and more small producers will drop out from production for the market because of tight competition. At the same time the farmers producing for self-support and direct sale will subsist, since they have never sold their products to the processing industry.

A concentration process has commenced in the past years among economic organisations. Nevertheless, this took place in such a way that while the number of operating plants got reduced, the pig population count also decreased. The size of the pig population, the number of operational units and their regional distribution are fundamentally determined by the number of slaughterhouses remaining in a given region. Because of closing the slaughterhouses the regional source area for slaughterhouse procurements might also change, which in certain regions might bring about reduction in the pig population, while in better positioned regions the size of the population could grow further. And all this could determine whether the further processing plants and the finished product manufacturers base their production on the Hungarian raw materials or eventually turn to using pig meat originating from other EU member states.

The future perspectives of the **Hungarian pig industry are greatly influenced by the development of community regulations**, and through them the payments granted, which in turn fundamentally influence the producers’ decisions. Due to our endowments and traditions, we are capable of producing special, highly processed animal products. Nevertheless, EU regulations as they are being implemented in Hungary seem to orient the producers toward grain production instead (although as our experience in 2004 shows, intervention will not solve all the problems), and does not encourage further processing, particularly in meat production. Whether grain is sold in its original form or in the form of animal products of substantial added value, is not at all an irrelevant issue from the aspect of effectiveness.

The developments of the past period and the trends expected for the near future – both from market and regulatory aspects, in other words both the external and the internal factors – point ahead to a situation in which there will be **two agricultural producer groups** to determine fundamentally the production structure of the pig industry of Hungary. On the one hand a producer segment whose members have readied themselves solely for **production for the market** and are able to sell their products to the processing industry in the competitive sphere, and on the other hand the group of producers, who **consume the products they make themselves or sell directly to the consumers**, i.e. typically those who are not suppliers to the meat industry. The future of these two producer groups can be defined and described accurately. It is important to note that the individual segments should be handled separately, since they struggle with different problems, and so the solutions to their problems could be also differing. Competitiveness, selection or concentration should be interpreted differently for each producer group.

The „**big ones**” striving for economies of scale are capable of implementing competitive goods production. At the same time their number got reduced continually over the past year. The number of large factories is estimated to be in the range 500 to 600 based on statistics of the Hungarian Statistical Bureau (KSH). The average count of pigs in their keeping was 3 884 heads on December 1, 2004, while the average sow count was 365 heads. The large operations must comply strictly with the animal welfare and environmental requirements of the EU. The most difficult and seemingly the most cost-intensive task to resolve by these producers are the handling, utilisation and disposal of slurry in these farming units. To make things more difficult, as a result of rearranging the land ownership structure, the pig-farms now have no (or hardly any) agricultural land for placing the manure.

Although the **household producers and the farmers of the intermediate sphere** (i.e. individual farmers) represented “already only” approximately 40 percent of overall pig meat production in 2004, the number of the farmers concerned was **in the magnitude of 200 thousand**. Given the current social and labour market situation in Hungary, it does not serve the interests of any of the parties that the said farmers be deprived of even this slight income source that they now have. At the same time it must be recognised that a part of the products grown by them – with some exceptions – will not be processed, as practically they fall outside the sphere of commodity production for commercial purposes. A further argument for maintaining the production of these **household farms** is that there is effective **consumer demand** for products grown this way in Hungary. For traditional and social<sup>1</sup> reasons consumption from self-produce and products purchased directly from the farmer represent a relatively high percentage. The ratio is expected to become lower in the years to come, however experience of the past few years suggests that this reduction will not be a dramatic or fast process, but much more likely the result of a gradual and lengthy change.

Consequently I do not expect the most severe problems and the most effective realisation of “selection” to be seen in these parts of the sector. In my opinion the “**intermediate**” **sphere** might get into the worst situation, i.e. the producers that are not large and efficient enough to shift to goods production, but are too large for consuming all their products themselves or selling them directly to consumers. Their situation will be even more difficult as the processing industry will probably be more unwilling to buy up their products (this tendency is already visible, see: Pick Rt.), thus they will not be able to save the decision about their future operation. Basically they have three choices. First, to develop their production and producing environment, i.e. become a real “**producing-for-the-market**” **farming units**. Obviously this is the most risky alternative, moreover most of the organisations belonging to this intermediate sector are unable to finance such investments, thus probably this will be the option chosen by the fewest farmers. As for the majority, the necessitated solution for them will be **giving up production** or **changing for production for self-support and direct sale** (or perhaps entering the black market economy). From the aspect of the Hungarian agriculture and the three critical sectors reviewed I expect the greatest changes in this producer category (consisting of some tens of thousand units). These developments are the determinant factors with regard to the future of these sectors.

#### *Development goals in the pig industry*

A substantial portion of the output of overall pig meat production is produced by farms **producing for the market**, i.e. those that sell the slaughter pigs grown to the meat industry. The future position of this producer group is clearly dependent on efforts to **realise or develop competitiveness**. There are three fundamental options for improving the competitiveness of farms producing goods for the market:

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<sup>1</sup> For instance: in many small villages there are no (or very few) grocers’ and people prefer buying fresh home-made milk, cheese or participating in pig-killings etc.

- to improve efficiency;
- to strengthen vertical co-ordination;
- to organise and operate horizontal co-ordination.

**Efficiency improvement** is an obvious task, since **price competitiveness** is the crucial factor for staying in competition. Hungarian producers can maintain or improve their existing positions, if they are able to compete in price with the players of other EU member states, otherwise their processing industry might relatively smoothly shift to import raw material purchasing. As a result of increasing the efficiency of operation, **the reduction of costs** is obviously an expectable tendency in the production-for-market sphere. Nevertheless, it is important to note that this path is not without risks. This is because efficiency in general can be improved by developments implemented through investments or by increasing the size of the economic operation, but in many cases the costs of such investments or expansions are so high that most of the savings from increased efficiency are eventually lost.

**Vertical co-ordination** plays an extremely important role in implementing competitiveness at the sector level. As clearly shown by the example of Western European, competitive countries, the key factor with regard to the competitiveness of the whole industry is long-term, predictable vertical relationships. The form in which this relationship is embodied – i.e. cooperatives, cross ownership, long term contracts etc. – is of secondary importance with regard to the outcome. As the processing industry structures have been set up in Hungary, and it is unlikely that the agricultural producers – otherwise struggling with lack of funds – could acquire a share in food industry ownerships, the most evident solution is to set up **long-term, agreement-based contractual relationships**. The strengthening of vertical co-ordination all in all would make future more predictable and designable for the pig raisers, and would improve competitiveness at all-industry level.

The third key factor is **horizontal co-ordination**, something practically indispensable for interest enforcement. The interest enforcing power of the agricultural production phase – if the farmers are unorganised – is minimal compared to that of the processing industry, this latter being completely insignificant in comparison with the interest enforcing power of the trading community. Horizontal co-ordination or organisation among the farmers producing for the market is essential for enforcing the interests within the supply chain. Typically, by establishing horizontal co-ordination, competitiveness or efficiency will not improve, but as a result of **increased interest enforcing power** the situation of the agricultural phase might improve, and thus farmers might eventually find themselves in a better income position.

It is the problems of the producers belonging to the “**intermediate**” sector that is most difficult to solve adequately. Naturally, in this producer community improving the vertical relationships or interest enforcement capability could be important factors. However in many instances this is not enough for survival, either, since because of their sizes, these organisations are often incapable of efficient production. A possible solution could be supporting the **developments** required for growth or on contrary, aid provided for **terminating the production**. In the case of certain producer groups the **specialisation** of production to focus on the manufacturing of special agricultural raw materials could offer a survival alternative, provided there is effective demand from the processors’ side.

The decisions of the group of „**household farmers**” are the hardest to influence, since these decisions are often born from other than rational considerations. Irrespective of this the situation of this producer segment could be reinforced also, for which the best example is offered by Austria. The uniting of forces, or at least common (horizontal) co-ordination are naturally required for this achievement, too. The goal has been to **provide for**, develop and regulate the **direct selling from the household**. In Austria these agricultural farmers producing for direct sale control strictly the

operation of the direct selling system in a given region, thus their market share has not decreased significantly in the past period. There are institutional conditions for the operation of this system, and the government is responsible for providing these conditions. It is essential that the required circumstances be in place for this type of production, i.e. assistance should be provided to the farmers in the areas of **food safety, hygiene and veterinary health**.

The Hungarian pig industry has to face a number of problems now that Hungary has become an EU member state, nevertheless despite all these difficulties there is a future for this sector. This is partly due to the fact that home demand cannot be covered solely from import pig meat required for finished meat product manufacturing. On the other hand the typical taste of the Hungarian consumers cannot be changed in the short and medium term. From the aspect of pig fattening in Hungary the fact that the industry possesses all the necessary economic, ecologic (fodder producing) and human conditions is an important factor. All in all, these findings suggest that pig fattening, slaughtering and processing in Hungary do have a future. The pig sector does possess the basic potential required for producing competitive pork products.

#### **4.2. New scientific results**

1. I analysed the supply function of the Hungarian pig market with linear and non-linear regression equations. These equations produced the same results in all cases, and thus the conclusions drawn were also similar. Accordingly, in a favourable market situation (low input prices, high slaughter pig buying-in prices) the competitive part of the Hungarian pig sector is capable of producing up to 520 thousand tons of pig-for-slaughter (live weight). At the same time in unfavourable market situation (high input prices, and low slaughter pig purchase prices) production might fall back to as low as 420 thousand tons. The odds for future development of the Hungarian pig sector will be substantially determined by how quickly the competitive producers are able to react to unfavourable market conditions.

2. With the help of the Fourier analysis I was able to demonstrate cyclicity in the developed pig meat producing EU member states, too, in respect of the pig population, pig meat production and pork purchase prices. In the EU-15 member states a cycle lasts much longer than in Hungary and Poland, and the pig cycle has a flattening tendency. As for the pig population, according to my calculations, as long as 10 plus year-long cycles exist, while in meat production cycles exceeding the 10-year period are also typical. On the other hand 9 year periods exist in the price cycles. Long cycles are caused partly by predictable market regulation and partly by concentrated production structures. The fluctuation demonstrated in pig meat production is greater in extent than that observed in the pig population. In Hungary the cycles of the pig population are 3.5 years long, those of slaughter pig production are 4 years long, while the average purchase price cycle is approximately 4 years long. Nevertheless in Hungary, due to the atomised production structure, some of the market players (small producers) are able to adapt flexibly to the changed market conditions. This fast reaction capability makes the dynamism of the Hungarian market more sensitive to the economic environment. In summary the EU-15 member states with advanced pig-farming cyclical trends of differing lengths could be observed: in the development of pig population, pig slaughtering and pork meat prices. A flattening tendency can be observed in the development of pig count. Based on regression calculations and comparisons, several short cycles could be shown to exist within a longer one. The longest and flattest cycles could be seen in Denmark in the pig population count. Based on cyclicity analyses, it is concluded that in the EU member states where pig raising is well organised and in an advanced stage, the flattening of the pig cycle and low amplitude can be observed. It is expected that in the years to come the supply chain will get better organised in Hungary, too, thus a similar flattening could take place in the development of the pig cycles in Hungary and thus the amplitudes will be smaller here also.

3. The trends that characterise the pig meat output and purchase prices in the key pig meat producing EU member states have been analysed in this dissertation. The EU market has always been crucial for Hungary, and so the market players of now EU-member Hungary should be clearly

aware of the market situation. Most importantly, an opportunity for selling Hungarian pork could open in the summer months, provided that red meat consumption does not fall back due to climatic reasons. Based on my calculations it is evident that the market position of Hungarian pork meat is fundamentally determined by price changes in the EU market and the seasonality of production output. Thus Hungarian exporters should pay attention to the seasonal changes of pig meat product sales within a year, and the product amounts in the market.

4. The concentration measurement tools widely used for this purpose in economic literature are the Lorenz curve and the Gini coefficient calculated from the curve values. Economists use these two illustrative tools for analysing the distribution of incomes. But they are also perfect in agricultural economics, for analysing operational structure. The EU pig industry is characterised by extensive concentration, however a more heterogeneous picture is revealed when the individual countries are studied. Surprisingly, the two EU member states considered to be the most developed economies (Denmark, the Netherlands) are the countries where the lowest degree of concentration is found, and where the value of the Gini coefficient has shown a decreasing tendency over the past twenty years, and in 2003 it but slightly exceeded 0.5, which indicates a mediocre concentration. On the other hand in Italy the Gini coefficient had a very high value. With the help of the Lorenz curve and the Gini coefficient I managed to substantiate that the pig population has an unequal distribution among the production units in the Hungarian pig sector, since the value of the Gini coefficient was 0.79. In Hungary the pig population is concentrated around two polar extremes in approximately 50% ratios, i.e. distributed between the individual farmers and the business organisations, respectively. Close to 51% of the Hungarian pig population was grown in farms keeping more than 2000 animals (0.5 percent of the total number of farms) in 2003. The shape of the Lorenz curves and the values of the Gini coefficients lead me to the conclusion that the more organised the supply chain (i.e. buying-in price fixed in advance for the producer, quantity, share of profit) in a country (see: Belgium, Denmark and the Netherlands), the more likely that the Gini coefficient value will be around 0.50-0.60. On the other hand in the “less” organised countries where pig growing shows a “poorer” regional concentration (see: United Kingdom, France, Germany, Italy) the token for the producers’ interest enforcing capability is the improvement of their production size.

5. My analysis of the costs, natural efficiency and international competitiveness of the Hungarian pig sector has revealed a number of contradictions. The international and Hungarian natural indicators need to be handled with reservations, since for instance it is impossible to clearly define the contents of the feed in the case of fodder-related indicators. In Hungary the fodder costs represent close to 60 percent of the relevant specific prime costs. In the fattening phase the amount of feed used for producing one unit of pork meat exceeds the same value in the countries with developed pig farming, by a significant extent. On the other hand Hungary enjoyed comparative advantages in the field of slaughter pig production back in 2002, based on the cost data analysed in this dissertation. Poor utilisation of fodder is a complex problem attributable to the content value of the fodder apart from the genetic bases of the pig population and the technologies used for pig-raising. If the market recognises this cost level, it could happen that the Hungarian pig sector is able to maintain its competitive position.

## CURRICULUM VITAE

LEVENTE NYÁRS was born on December 12, 1976 in Budapest. He first studied in the Nagy László Elementary and Grammar School. He passed his school leaving (GCE) examination with excellent grades in 1995.

He then attended the University of Agriculture, Gödöllő (also known as Szent István University), studying agro economics, economic and agriculture engineering at the Department of Economics and Social Sciences from 1995 to 2000. He graduated with excellent results in the year 2000.

As a university student he participated in the scientific research program for university students. His paper titled “Sustainable pig-breeding in Hungary” earned him the first prize award at the Student Researchers’ Conference of the Department of Economics and Social Sciences in 1999.

Language skills:

English “C” type (i.e. written and oral) intermediate level state language examination (1995),

French “C” type (i.e. written and oral) beginner level state language examination (2001).

He has worked for the Sectoral Economics Department of the Agricultural Economics Research Institute since September 1, 2000, and has been a research fellow since 2005. His specialised research field is the economic analysis of pig, poultry and beekeeping industries, with particular focus on international correlations, including EU accession and its impacts.

He took part in a number of expert projects for the Ministry of Agriculture and Rural Development, for instance: background materials for the scenarios of EU talks (pig and poultry sectors), FAO animal breeding country report, recommendation for the guaranteed, target and intervention prices of slaughter pig for the year 2003.

He was admitted to the Doctoral School of Management and Organisational Sciences, Szent István University in 2000. He got his doctoral final certificate in November 2003. His institutional defence was held in February 2005.

His Publications

Scientific papers published in Hungarian: 8,

Contributions to scientific books in Hungarian: 1,

Publications in foreign language journals: 2,

Hungarian presentations appearing in conference publications: 5,

Foreign language presentation appearing in conference publications: 5,

Other publications in print or electronic format: 7.

The candidate has participated in five international conferences to date. He chaired the beekeeping economics section at the 2<sup>nd</sup> *European Scientific Apicultural Conference* in Balatonlelle in September 2002.

# LIST OF PUBLICATIONS

List of publications related to the topics of this doctoral dissertation

## Scientific publications (books, contributions to books, articles, research reports)

### Contributions:

*Book-parts published in the Hungarian language*

1. **Nyárs L.** (2004): Sertéshizlalás (2.4.). Baromfi (2.5.) 42-47 pp. In: Erdész Ferencné-Nyárs L.-Popp J.-Potori N.-Papp G.-Radócné Kocsis T.-Udovecz G. Vőneki É.: A versenyképesség javításának főbb tényezői és feladatai a főbb magyar termékek körében. EU Tanulmányok V.: Versenyképesség a mezőgazdaságban. ISBN 963 216 405 9

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5. **Nyárs L.-Vizvári B.** (2005): Szezonális jelenségek az EU néhány fontos országának sertés piacán. *Gazdálkodás XLIX.* (2) 53-62 pp. ISSN 0046-5518
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*Participation in Hungarian R + D competition (not as consultant)*

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**Scientific publications (books, contributions to books, articles, research reports)**

**Scientific papers**

*Scientific Articles in periodical Journals*

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2. **Nyárs L.** (2002): *A világ mézpiacának helyzete és középtávú kilátásai.* [5 p] In: *Absztraktok és Előadások. XLIV. Georgikon Napok.* Keszthely. 2002. szeptember 26-27. [CD:\GN2002\Agrárpolitika\ea\Nyárs.pdf ] ISBN 963 9096 78