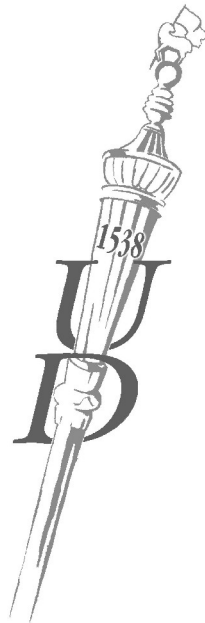


**University doctoral (PhD) dissertation abstract**

**AGRICULTURAL VALUE PROCESSES IN HUNGARY AND  
IN SOME EU MEMBER STATES**

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## **1. INTRODUCTION, OBJECTIVES**

About six years have passed since Hungary's EU accession. This six years' period is rather short if we wish to evaluate the impacts of the accession from all aspects and what is more ultimately. Furthermore, it would not be reasonable to draw a line between the period of EU membership and the period preceding it since the preparation for the accession has already started much earlier. However, it is worthwhile to provide an overview presenting where Hungary has arrived on the way of converging and whether during the last ten years the country could get closer to the level of the developed Member States.

The latter question is especially justified in the case of countries or regions, which are economically interdependent, such as the Member States of the EU. As a result of the common economic policy the Member States should get in principle closer to each other. In addition, the regional policy of the EU – the aim of which is to promote solidarity – provides direct and targeted financial assistance to the converging of the less developed areas (regions). However, one of the consequences of the continuous enlargement is that the differences in the development of the Member States are increasing; therefore, creating a uniform level of development is getting more and more difficult. Initially the six founding EEC members had the same economic level but today the EU includes 27 Member States, the economies of which are largely different. Therefore, it is an important question whether it can be expected that in such a heterogeneous community the diminishing or equalization of the differences between the developed and less developed Member States can be expected or not.

The above mentioned questions are even more relevant to Hungary's agriculture. The accession of Hungary has changed the management conditions of farming and consequently it has largely changed the conditions of the development of agriculture.

The Common Agricultural Policy (CAP) is one of the most complicated and detailed regulatory systems of the EU, which by providing rather uniform economic policy ensures very similar conditions for economic development. It is worthwhile to analyze whether the (almost) uniform economic conditions do provide assistance for the new Member States – among others also for Hungary – in converging to the old Member States in a rather short period and leading to the equalization of the differences; that is, to convergence? But in addition to convergence, which is of course the primary goal, but the insurance of the income required for the subsistence of the market players of the sectors cannot be neglected and it is also a fundamental aim. One of the fundamental objectives of the CAP is to protect the

agricultural producers and the consumers by stabilizing the agricultural markets and since the – CAP reform of 2003 this is more emphasized – to provide a fair and socially accepted income and welfare for the agricultural population. The increasing and improving of agricultural income stability is the result of the former and a condition of the latter. In order to ensure a balanced income development the agricultural policies in the continental Europe intervened traditionally and are still intervening in agricultural processes. CAP by the help of the quotas controls the production volumes of the main agricultural commodities and by the intervention eased/is easing the difficulties of sale and is keeping the price fluctuations of the agricultural commodities at a low level; by the more and more emphasized farm subsidies schemes will strengthen the income position of the enterprises and the profit generated from year to year by the market players of the sector. Ensuring income stability has always aimed by the Hungarian agricultural policy.

The title of my dissertation is: 'Agricultural value processes in Hungary and in some EU Member States'. The expression of '**value processes**' actually indicates that the dissertation does not deal with the comparison of natural indicators – which due to the aggregate and international character of the comparison would not been possible at all – but it analyzes the financial indicators, the development of the outputs, inputs and efficiency of the sector. In my dissertation the word '**result**' means the output categories of the Economic Accounts of Agriculture, providing the database for the analysis; from which I evaluate the output, the gross value added and the operating surplus/mixed income. Furthermore, I evaluate the inputs (intermediate consumption, compensation of employees, depreciation); the agricultural policy measures (subsidies and taxes) as well as the efficiency in terms of area and annual work unit.

In addition, the expression of value process indicates that the evaluation is performed over time, and indicates also its **dynamic**; one dimension of which is the long-term trend, i.e., convergence and the other is the accompanying fluctuation, that is, stability. In this context I aimed to test the following hypotheses:

- The agricultural policy measures aiming to increase income stability had a favourable impact on income development both in the Member States selected and Hungary.
- In the agriculture of the EU as a result of the CAP the differences among the Member States are gradually diminishing in terms of agricultural outputs, inputs and incomes. The Hungarian agriculture could join in this converging process.

Based on the above my objectives were the following:

- to study the methodology of agricultural income stability analyses,
- by the help of a comparative analysis to reveal the development of the value processes of the Hungarian agriculture compared to some Member States selected,
- to analyse the stability of agricultural incomes, reveal the influencing factors and to present their effects on stability,
- to overview the fundamental definitions of convergence, the macroeconomic models and empirical studies,
- to evaluate whether the theoretical models of macroeconomic level apply also to the agricultural sector,
- to perform the comparative efficiency analysis between the Hungarian agriculture and the individual Member States as well as the EU average.
- to study the current convergence and divergence processes of the EU Member States,
- to analyse whether the performance indicators of the Hungarian agriculture got closer to the EU average.

The tests are of two dimensions they are not only performed over time but they are also spatial tests. I evaluate the performance indicators of the Hungarian agriculture in contrast to the EU average (EU-15, EU-27) and to the agricultural indicators of some Member States selected, namely to Austria, Denmark, France and Portugal. I tried to form as much as possible a heterogeneous group (level of development, implementation of CAP, size) for the comparison and to select the countries with this aim since the comparison can only provide a realistic picture in this way. The countries taken into account were selected from the EU-15 representing the level Hungary aims to converge to and these are the countries which had already implemented the CAP before Hungary's accession. **Denmark** is one of the most developed countries and is a founder member of the EEC and it has been implementing the CAP since the beginning. The agriculture plays an important role in the national economy, since the share of agricultural area accounts to about 60%; this is similar to Hungary. **France** is determinant in the agriculture of the EU; the profitability of this sector determines the EU average due to its large weight and its agricultural structure is similar to those of Hungary's. **Portugal** is a less developed country in the EU-15, that is, compared to Denmark it represents the other extreme. The Portugal agriculture has an important role in employment – similarly to Hungary – and regarding the economic development this country is even more similar to

Hungary than the other Member States. **Austria** is one of the countries, which was integrated only later in the EU, that is, it started the implementation of the CAP later. Geographically it is a neighbouring country and the historical background of the two countries is similar (up to the 70-ies the agricultural production of the two countries were at the same level and the differences started to increase only later.) The similarities between the selected countries and Hungary were also confirmed by other authors. The investigation performed on the Member States of the EU-25 on the basis of two main components (the first component was the total income, PSE, equipment supply, gross investment, investment subsidies, average farm size and the second component was the SGM and the capital efficiency) resulted that all the countries analysed – with the exception of Denmark – got into the same cluster together with Hungary (BARANYAI, 2009). The topic besides being timely has also been justified by another factor. The international literature on income stability available is large; especially on economic development and convergence. However, in contrast to the large international literature the literature on the Hungarian model analyses is rather limited in both fields and especially dealing with the analyses at sector (agriculture) level.

## 2. RESEARCH METHODS APPLIED

The analyses aiming to test the hypotheses, the data used and the „pricing” of those are summarized in Table 1.

### 2.1. *Income stability*

In order to test the **first hypothesis** I performed income stability analyses. In the first step I reviewed six papers in detail dealing with the stability of agricultural income. On the basis of these I found that for stability analyses no uniform methodology has been developed yet. However, the application of a uniform methodology is hardly possible since the various aspects of stability are to be approached differently. The only common feature was that the extent of stability was defined by standard deviation.

The method I applied characterizes the stability/instability of agricultural incomes by the help of residual standard deviation. Residual standard deviation is the indicator accepted for characterizing the function fitting of trend calculations; it is the average deviation of the time series from the trend. Residual standard deviation can only hardly be evaluated by itself, especially in comparisons, where the basic data are largely different. Therefore, it is reasonable to express the residual standard deviation as the average of the time series, that is, to determine the relative residual standard deviation (SZÜCS, 2002). By the help of residual standard deviation the agricultural income stability of the Member States can be characterized.

The test of economic variables of agriculture in international context is very difficult due to lacking constant time series. From among the databases available the data collected and published by EUROSTAT, that is, the data of the Economic Accounts for Agriculture (EAA) including the output of the agriculture of the Member States of the European Union cover the longest period. The data of EAA have been collected and published regularly by the Statistical Office of the European Union since 1964 and the data of most Member States are available for long periods. The data collection for the Hungarian EAA started only later, in 1996 and first the data of 1998 were published<sup>1</sup>.

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<sup>1</sup> The detailed description of the database can be found in the publication of the Hungarian Central Statistical Office entitled 'Economic Accounts of Agriculture 2006'.

**Table 1 The main characteristics of scientific hypotheses and connecting tests**

Description	I. hypothesis		II. hypothesis	
	Comparative analyses of the main agricultural financial characteristics	Analyses of income stability and the influencing factors	Comparative analyses of efficiency	Convergence analyses
<b>Method of analyses</b>	Traditional statistical analyses	Income stability investigation (residual standard deviation)	Traditional statistical analyses	$\sigma$ - and $\beta$ -convergence analyses, the procedure analysing the convergence of the Member States to the EU averages
<b>Datas</b>	<b>Gross value added</b>		<b>Egy főre, illetve egy hektárra vetített</b>	<b>Egy főre, illetve egy hektárra vetített</b>
	Output of the agricultural industry	<b>Operating surplus/mixed income</b>		
	Total intermediate consumption	Output of the agricultural industry	• <b>Gross value added</b>	• <b>Gross value added</b>
	Fixed capital consumption	Total intermediate consumption	• Output of the agricultural industry	• Output of the agricultural industry
	Compensation of employees	Gross value added	• Total intermediate consumption	• Total intermediate consumption
	Other taxes and subsidies on production	Fixed capital consumption	• Fixed capital consumption	• Fixed capital consumption
	Operating surplus/mixed income	Compensation of employees	• Compensation of employees	• Compensation of employees
			• Operating surplus/mixed income	• Operating surplus/mixed income
<b>Prices</b>	Nominal price and deflated price	Nominal price	Nominal price and constant price	Nominal price and constant price on purchasing power parity

Source: Own construction.



In the stability tests **income** is the category of the operating surplus/mixed income. In EAA the operating surplus is the output after deducting the intermediate consumption, fixed capital consumption, compensation of employees and taxes on production and increased by subsidies on production. Its value indicates the result of farming (including the non-paid labour) independent of the costs of financing.

**Table 2 Relationships of the input and output categories in the EAA**

Output of the agricultural industry				
Total intermediate consumption	Gross value added			
	Fixed capital consumption	Balance of other taxes and subsidies on production	Compensation of employees	Operating surplus/mixed income

Source: author's own figures prepared on the basis of the publication entitled „Economis Accounts for Agriculture, 2006”

In order to avoid the effect of the various time series on the results obtained and to help the comparability in the case of the four countries the tests were performed in two versions, firstly for the whole time series (1990-2008) and secondly for partial time series (1998-2008), by which the comparison with Hungary is also possible. In my dissertation I laid special emphasis on the period of 1998-2008 enabling the comparison also with the Hungarian agricultural data.

Before performing the tests I analysed in detail the outputs and inputs of the Hungarian agriculture in contrast to the indicators of the countries selected. I performed the comparative analysis by the help of the statistical indicators. From the ratios I applied distribution ratios (e.g., share of intermediate consumption in output), dynamic ratios (e.g., price index) and from the means arithmetic (e.g., EU-15) and geometric mean (e.g., annual growth rate). The comparative analysis is connected to the income stability tests; consequently, I laid the emphasis first of all on presenting the financial indicators calculated at current prices. However, it would not be reasonable to evaluate the change of output of the sector only at current prices since regarding the change the real values are important. Therefore, the change deflated by the inflation is also presented. In the comparative analysis the **gross value added** is important, the increase of which represents also the aim of the current agricultural policy.

## **2.2. Convergence**

**In order to test the second hypothesis** first, I have reviewed the fundamental definitions of convergence, the macroeconomic models and the empirical studies. From among the various

definitions of convergence the results of **absolute convergence** analysis answer the question how to diminish the differences in economic development among the countries. In the absolute convergence theory two different types of convergence can be distinguished; i.e.,  $\beta$ - and  $\sigma$ -convergence.

One part of the holdings converges in accordance with sigma if the standard deviation of the real GDP per capita is decreasing over time.  $\beta$  provides the rate of convergence or divergence. I performed the convergence test by cross sectional procedures. The application of the cross sectional approach is reasonable first of all because of the short time series. The time series test would lead to further data losses due to the lag, which would make the evaluation of the results impossible.

For the  $\sigma$ -convergence I applied the method of MCCUNN és HUFFMAN (2000) and for  $\beta$  estimation I used the equation applied also by SALA-I-MARTIN (1996).  $\sigma$ - and  $\beta$ -convergence tests target a group of countries and the tests do not provide information on the converging or diverging of a definite country. Therefore, the application of a complementary procedure is also required, which can provide information on an individual country. For this aim I used the short version of the method of BEN-DAVID (1993), which was also applied by SOARES AND RONCO (2000) in their paper analysing the EU Member States.

In the **convergence analyses** the level of development is indicated by the generally applied purchasing power parity (PPP) per capita. In agriculture the gross value added per capita (hereinafter agricultural GDP) calculated also on purchasing power parity corresponds to this data. By the help of the EAA I performed the convergence analysis not only for the gross value added but also for agricultural output, operating surplus, and inputs calculated by employee numbers and agricultural area. The reason of this latter is that in the case of the data per annual work unit it is difficult to determine what generated the improvement. Whether the improvement was due to the increase of the output/value added/income volume, or to the decreasing number of employees. However, the size of agricultural area does not vary or vary only slightly from year to year, therefore, in the development of the indicator calculated per hectare the numerator (output, value added or income) has a more significant role.

The data calculated on the purchasing power parity might also be of current prices or constant prices. In the convergence analyses the taking into account or filtering the price changes might also be justified. If we consider the price convergence as part of the convergence process than the application of constant price indicators is not required but if we wish to analyse the convergence in terms of efficiency than filtering the price change is required by

all means. Both might be interesting for the agricultural sector; therefore, I think it is useful to perform both of them for the dissertation.

### 3. MAIN STATEMENTS OF THE DISSERTATION

#### 3.1. *Income stability*

The output of the Hungarian agriculture increased dynamically; between 1998 and 2008 the rate of increase exceeded the average rate of the EU-15 and EU-27 as well as that of the Member States selected (Table 3). Regarding the development of the indicator, 2004 was an outstanding year, in this year the output of the agricultural sector increased by about 20% to the previous year. This increase was due mainly to crop production. The reason of the increase was not due to the volume increase – as it increased only slightly – but this was rather due to the rapid price increase caused by the differences between the international and Hungarian price levels. Among the countries analysed the Hungarian agricultural price level was the lowest. In fact the performance of the Hungarian animal husbandry stagnated. In this sector neither the prices nor the volume of the output increased.

**Table 3 Increase of the agricultural output and intermediate consumption**

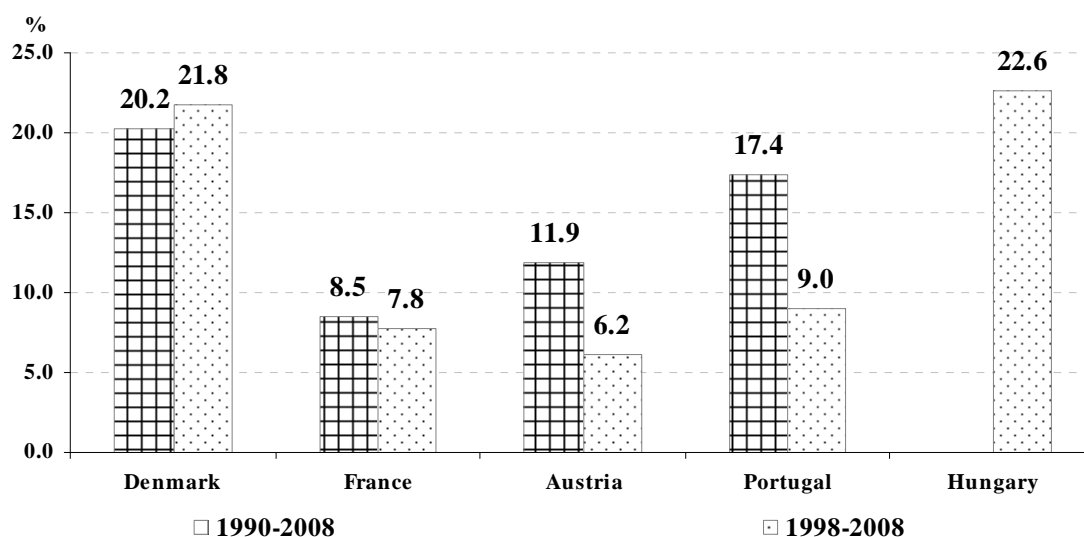
Description	Output of the agricultural industry (2008/1998)	Intermediate consumption (2008/1998)	Difference
EU-27	121.1	145.0	-23.9
EU-15	114.6	138.3	-23.8
Denmark	121.0	142.5	-21.6
France	109.9	130.9	-21.0
Hungary	162.6	191.2	-28.6
Austria	121.3	124.6	-3.2
Portugal	124.0	142.5	-18.5

Source: author's own calculation based on EUROSTAT database.

The inputs increased, however, and its rate was higher than that of the outputs. The highest rate of increase could be seen in intermediate consumption accounting for a large proportion in the input, even in international context. By comparing the increase of intermediate consumption with that of output we can see in each of the countries selected and even in the EU-15 and EU-27 it exceeded the increase of production (Table 3). The difference of the two growth rates exceeded the EU average only in the Hungarian agricultural sector (23.8 and 23.9 per cent).

Owing to the rapid price increase of the inputs the income proportion of the output is decreasing. In the majority of the countries analysed this led to absolute income decrease. In spite of the increasing output maintaining the volume of the agricultural income is not ensured even at nominal values. A definite income increase at current prices could only be seen in Hungary while the real income development is even there uncertain. In most

countries the income changes, which vary by countries entailed improved nominal income stability. The only exception was Denmark, where essentially the income stability remained unchanged. **By comparing the income stability of the Member States analysed with the stability of operating surplus of the Hungarian agriculture we can see that the latter is lagging behind significantly (Figure 1).**



**Figure 1 Stability of operating surplus**

Source: author's own calculation based on EUROSTAT database.

I have determined and presented the effects of the influencing factors – price, volume, sectorial diversification, intermediate consumption, fixed capital consumption, compensation of employees and agricultural measures (taxes and subsidies) – on income stability also numerically but not in detail.

From among the factors influencing the income the effects of price and volume were similar in France and Hungary, in these countries their effects were favourable; but in Austria, their effects on stability were unfavourable. The effects of the two factors were different in Denmark and Portugal. In the case of the former volume had a positive and prices had a negative effect on the fluctuation, while in the latter case it was just the opposite. By conferring the effects of volume and price we can see that in most Member States analysed the price level is more determinant regarding the output stability than volume.

To determine the level of diversification numerically I calculated relative entropy. On the basis of these I found that in France and Portugal, where the diversification of the sector is favourable the stability of the operating surplus is higher and shows an increasing tendency. However, in Denmark, where the value of the indicator is high; i.e., the level of

diversification is low; the income level of the sector is less balanced than in the other Member States. From among the two main sectors of the four Member States analysed crop production proved to be less stable, while in Hungary the case was just the opposite.

The almost consequent increase of the inputs modified the nominal income development generally into the direction of stability while their rate of increase exceeding the output made the real income uncertain.

By taking into account the balance of subsidies and taxes, that is, the results obtained on the basis of factor income was more favourable than the income calculated without subsidies and taxes (i.e., than the net value added, Table 4); this way we can say that agricultural policy could provide assistance to the stabilization of income.

**Table 4 Stability of net value added and stability of factor income**

Description	Net value added		Factor income	
	Standard deviation	Relative standard deviation (%)	Standard deviation	Relative standard deviation (%)
<b>1990-2008</b>				
Austria	246.4	16.64	236.3	10.29
Denmark	377.7	19.62	302.6	14.42
France	1799.4	8.61	1394.7	6.24
Portugal	282.7	15.10	261.1	11.69
<b>1998-2008</b>				
Austria	152.3	12.58	119.4	5.19
Denmark	373.5	23.34	270.8	14.22
France	1213.7	5.88	1 248.4	5.49
Portugal	202.4	11.19	155.3	6.81
Hungary	137.7	9.54	268.9	14.52

Source: author's own calculation based on EUROSTAT database.

**In this respect the only exception was Hungary** – apart from France, where the income stability was almost steady – **where the income calculated without taking into account the taxes and subsidies seemed to be more stable than by considering the effects of agricultural policy measures.**

The Hungarian agricultural policy - in spite of the countries analysed - could not contribute to increase the stability of the nominal income in agriculture, which can be primarily linked to regulatory reasons. This is also underlined by the statement of Szabó P. (2007), that is, the income generated by agricultural production in the new Member States cannot be projected well and the income situation of the producers is also much more uncertain than in the old Member States.

However, it is also true that the transition of the Hungarian agriculture has not been finished yet. Therefore, the current situation cannot be compared to the agriculture of the West European countries with long histories of market economies. The subsidies paid to the Hungarian farmers have largely contributed to increasing the profitability but the amounts paid are still lagging behind those of the other Central European countries.

Furthermore, it is also true that if by taking into account only the period elapsed since Hungary's EU accession the income situation of the sector has definitely improved. Since then the sector has not made losses and in each year since 2004 the income has even increased compared to the previous years and it did not decrease. In fact the EU accession and then the introduction of the CAP made the output of the sector more stable in each year following the accession.

Implementing income stability is not only the task of agricultural policy but also the task of the producers. The producers can also contribute to income stability, for example by increasing the bargaining power of the producers' organisation, increasing the diversification of the sector and through agricultural insurances. The task of agricultural policy is partly to assist the utilisation of these opportunities and partly to increase the income levels through development and income compensations.

### **3.2. *Convergence***

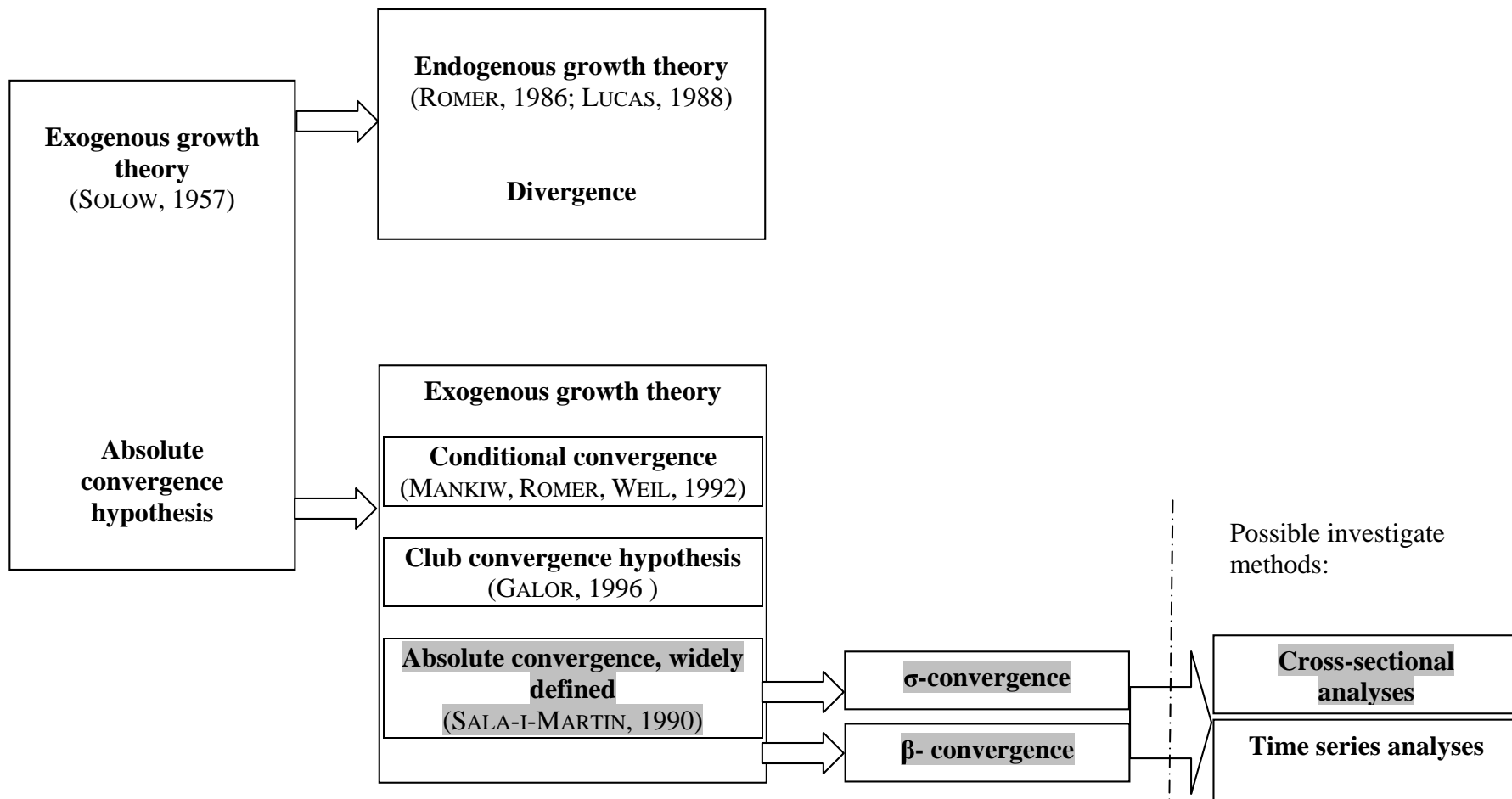
**In order to test the second hypothesis** first, I have reviewed the fundamental definitions of convergence, the macroeconomic models and the empirical studies. From the convergence theories the **absolute convergence hypotheses**, which is based on the neoclassical growth model, was the earliest (Solow-model, SOLOW, 1956). According to this poor countries can converge to rich ones. The marginal productivity of the countries of low capital supply per capita is higher, therefore their growth rate is also higher than that of the rich ones; therefore, convergence will automatically be implemented and the income differences will diminish. However, the absolute convergence theory has not been proved in practice. On the basis of empirical tests only a slight correlation can be identified between the growth rate and the starting level of capital supply per capita (BARRO, 1992). In addition the method applied for empirical testing of the model was also criticized (QUAH, 1993). Consequently, in the eighties a new growth theory appeared. The main point of the endogenous growth theory was to abolish the assumption of diminishing returns. The source of the constant and growing capital return playing a key role in the model was the human capital (representing a part of capital stock), which is suitable for reproduction. The endogenous growth theory – in contrast to the

conclusions of the neoclassical model – projected in advance the steady existence of the national income growth rates per capita in the various countries, which indicates the increase or at least the maintaining of the current income differences.

The most recent empirical literature on the comparison of the growth rates of various countries were not inspired by the results of endogenous growth theory. The renaissance of the growth theory led to the more sophisticated and precise analysis of the earlier growth models. The fundamental neoclassical model has been completed and up-dated (BARRO, 2005); the empirical analyses published most recently have significantly confirmed the interpretative power of the model in growth processes. In the case of similar countries, which are in close and intense relationships (e.g., OECD countries or the states of the USA) the hypothesis of absolute convergence seemed to be acceptable (MELLÁR, 2005). This was also confirmed by empirical tests. „When only a small group of countries or regions was analysed, where the factors determining the growth were identical, or at least were very similar the hypothesis of absolute convergence proved to be true (for example, the states of the USA, the member states of Japan)” (LIGETI, 2002).

The field of convergence analysed by the thesis is presented in Figure 2.





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**Figure 2**      **Determination of the topic of the dissertation within theory of convergence**  
(Coloured blocks shows the procedures analysed in the dissertation)  
Source: own construction.

All theoretical models are of macroeconomic level. The question is whether the theories developed at national level can also be applied to the various sectors of the national economy or the characteristics and special features of the sectors require various theoretical assumptions. I have summarized in a separate subsection those agricultural characteristics, which have to be taken into account when adapting the macroeconomic hypotheses to agriculture. I found that the application of macroeconomic growth models in agriculture is limited due to the diverse characteristics.

Before the convergence analyses I have also analysed the situation of the Hungarian agriculture compared the agriculture of the EU in terms of efficiency. For the comparison I used the EU average data and the data of the four countries selected.

**Regarding the efficiency the lagging behind of the Hungarian agriculture was significant compared both to the countries analysed and the EU average.** The difference is outstanding especially in the case of the per capita indicators; even in 2008 the indicators of the Hungarian agricultural sector accounted for only 26-32% of the EU average data; while the same indicator referring to area efficiency accounted for 45-55%.

**Table 5 The efficiency of the Hungarian agriculture in terms of employee numbers and area compared to the EU average**

Description	Per capita				Per hectare			
	1998	2008	1998	2008	1998	2008	1998	2008
	in the percentage of EU-15		in the percentage of EU-15		in the percentage of EU-15		in the percentage of EU-15	
Nominal price								
Output of the agricultural industry	17.1	31.6	32.6	54.2	37.2	54.9	47.4	65.4
Total intermediate consumption	19.7	35.4	36.9	60.3	42.8	61.6	53.6	72.8
Gross values added	14.6	26.0	28.2	45.1	31.7	45.2	41.1	54.5
Fixed capital consumption	11.4	25.3	22.6	46.4	24.8	44.0	32.8	56.0
Compensation of employees	17.5	33.6	33.5	58.1	37.9	58.5	48.7	70.1
Taxes	2.8	6.4	5.3	11.5	6.1	11.1	7.7	13.8
Subsidies	11.6	39.3	23.3	69.3	25.2	68.3	33.9	83.6
Operating surplus	15.2	30.6	29.3	51.9	33.0	53.2	42.7	62.7
Constant price								
Output of the agricultural industry	20.3	30.1	38.2	53.3	44.0	52.3	55.6	64.4
Total intermediate consumption	27.9	30.5	50.9	53.4	60.6	53.1	74.0	64.4
Gross values added	12.9	28.2	28.0	50.9	28.0	49.0	40.7	61.4

Source: author's own calculation based on EUROSTAT database.

However, the rates of 2007 exceeded in succession those of 1998, which indicates the convergence in terms of efficiency.

The rates of intermediate consumption (first of all at current prices but also at constant prices), and of compensation of employees compared to the EU averages both in terms of annual work unit and hectare efficiencies exceeded those of the output. This means that regarding the convergence of efficiency Hungary is lagging behind on the side of outputs compared to the side of inputs.

The absolute  $\beta$ - and  $\sigma$ -convergence analyses of the agriculture of the Member States of EU-27 indicated significant convergence for all output and input elements regarding the hectares and number of employees. Proceeding from output to income convergence proved to be more and more rapid; this means that the development of inputs and balance of taxes and subsidies contributed to diminishing the differences among the Member States.

**Table 6 Results of the  $\sigma$ - and  $\beta$ -convergence analyses**

Description	Per capita		Per hectare	
	EU-15	EU-27	EU-15	EU-27
<b>Nominal price</b>				
<b>Output of the agricultural industry</b>	<b>Divergence (?)</b>	Convergence	<b>Divergence</b>	Convergence
Total intermediate consumption	<b>Divergence (?)</b>	Convergence	Convergence (?)	Convergence
<b>Gross values added</b>	Convergence (?)	Convergence	<b>Divergence</b>	Convergence
Fixed capital consumption	Convergence (?)	Convergence	-	Convergence
Compensation of employees	Convergence	Convergence	Convergence (?)	Convergence
<b>Operating surplus</b>	Convergence	Convergence	Convergence	Convergence
<b>Constant price</b>				
<b>Output of the agricultural industry</b>	<b>Convergence</b>	<b>Convergence</b>	<b>Convergence (?)</b>	<b>Convergence</b>
Total intermediate consumption	Convergence	Convergence	Convergence	Convergence
<b>Gross values added</b>	<b>Convergence (?)</b>	<b>Convergence</b>	<b>Convergence</b>	<b>Convergence</b>

Notice: in the table ? means, that the results are not significant.

Source: EUROSTAT adatok alapján saját ábra.

**The tendencies characterizing the inputs and outputs were a slightly contradictory.** From among the former ones the convergence of gross value added per capita could be seen, while in the case of output per capita divergence could be found; however, neither of them was significant. At the latter ones the intermediate consumption per capita diverged, while the same per hectare converged; but neither of them was significant. **This means that in EU-15 the differences seem to be persistent.** Only the operating surplus indicated such a definite convergence.

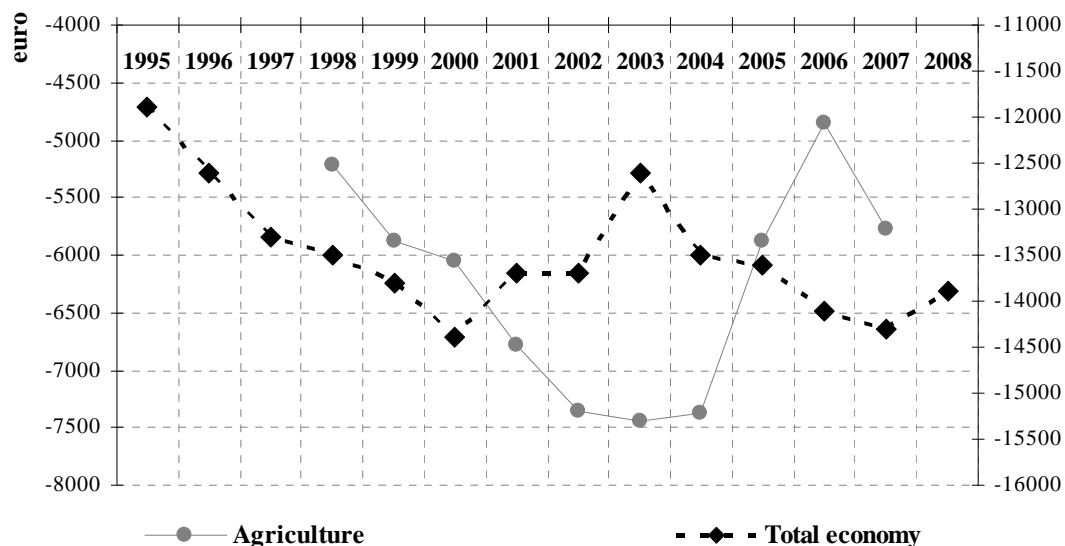
In EU-27 the rate of convergence of the data per employee numbers exceeded in each case the data per area, which **indicates the important role of employee number; the permanent and significant diminishing of which might largely determine the convergence.**

From the results of the analyses of the efficiency indicators calculated at current and constant prices the latter proved to be more favourable regarding the convergence and it can be concluded that the development of prices did not facilitate but rather it slowed down the convergence process.

The  $\sigma$ - and  $\beta$ -convergence calculations performed for the entire EU provided information on all Member States analysed and so I have performed further calculations for the convergence or divergence of the individual Member States to the EU averages.

The procedure analysing **the convergence of Hungary to the EU averages** has proved the assumption; this could already be seen at the comparative analysis. **The analyses indicated the convergence of the Hungarian agriculture in terms of all output and input categories.** This is not surprising regarding that the gross value added and especially the operating surplus show that the year of 2004 was a turning point in the sector. The lagging behind to the EU average has continuous been growing up to then, in 2003 it reached its maximum and then it started to decrease significantly (Figure 3).

These are worth underlining since the tendencies characterizing the whole national economy are adversary. The converging process of the Hungarian economy, that is the convergence to the a new growth process started in 1997 (DEDÁK, 2003), but following the highest converging rate, that is, 4.6 percent of 1999-2003, the converging process stopped and in terms of the GDP per capita value it has not been continued since the accession. It can be presumed that the reasons are macroeconomic problems, and the stabilization program imposed on the economy in 2006 (HALMAI, 2008). These are all worth. These all have to be appreciated since at the time of Hungary' accession the agriculture was in a much weaker position than the other sectors of the economy (BURGERNÉ, 2003).



**Figure 3 GDP per capita differences from EU average in the Hungarian agriculture and total economy**

Source: EUROSTAT adatok alapján saját ábra

In spite of all these maintaining the convergence of the Hungarian agriculture in the long term does not seem to be a realistic vision due to several reasons.

The main financial data characterizing the performance of the agricultural sector indicate positive changes even if the pre-accession process was full of failures and omissions and in numerous other fields (import, competitiveness) no favourable changes can be seen. However, according to SASSI (2006) the level of competitiveness is not a prerequisite of convergence but the convergence process is strongly determined by the factors of competitiveness.

The indicators per one annual work unit or per one hectare are the bases of the convergence tests provide a unilateral picture on the development of a sector but the process in the background remain uncovered. In Hungary the output of the sector has continuously been increasing but as it has already been mentioned the reason of the increase was not due to the volume increase – as it increased only slightly – but this was rather due to the rapid price increase caused mainly by the development of the world market. The increase of the output was exceeded by that of the inputs especially by those of intermediate consumption which resulted the continuously decrease of the income proportion of the output. Also the input increase was not caused by the volume increase but it was rather due to the price increase. Consequently this did not result additional profit or efficiency improvement. The price increase of the inputs exceeded those of the outputs, thus the terms of trade decreased and the sector got into a more unfavourable situation; this also slowed down the convergence process.

Without the subsidies – which diminish or compensate the unfavourable effects caused by the terms of trade – no convergence could be seen at all.

Converging to the more developed countries is a natural process and it is a characteristic of the transition countries and it is also strengthened by the EU integration (BRASILÍ ÉS GUTIERREZ, 2004). However, it cannot be expected that the agriculture of these countries will reach the average level of the EU. Besides, convergence in agriculture is possible only to certain degree due to the differences in natural conditions; and to the different steady-state<sup>2</sup> of the Member States caused by the different employee numbers and capital supply varying by countries.

Until the amount of the subsidies paid to the Hungarian farmers is continuously increasing, the convergence will continue. When the subsidies reach the upper limit the convergence process will certainly stop or at least slow down. Because the tendencies of the agriculture of the developed European countries are similar (stagnating volume, increasing terms of trade) to those of the Hungarian agriculture and the convergence effect originating from the economic integration can be perceived it cannot be expected that the process turns back. But it cannot be expected that the Hungarian agriculture will reach the level of EU-15. Rather the vision described by HALMAI (2007) seems to be more realistic, namely: „following the accession the new Member States will go through a transition process leading to significant convergence. However, the rate of convergence will decrease by time and later it might be interrupted. A realistic option is that the convergence of the new Member States could reach three fourth of the GDP per capita of EU-15. This means that following an initial convergence process the EU-10 countries will form a rather stagnating „convergence club”.

This vision might be modified on the short term by the present **economic crisis** and on the long term by the **climate change**, that is, by agricultural policy measures aiming to adapt to the changes and to diminish their negative effects.

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<sup>2</sup> Steady state: a long term equilibrium state or a consolidated state. It is a growing process when all markets are in equilibrium, that is, demand is equal to supply.

#### 4. NEW RESULTS OF THE DISSERTATION

1. Based on the literature I presented the history, the main characteristics of convergence theories with special emphasis on the neoclassical theory (paradigm). I collected those agricultural characteristics which are different from the characteristics of the macro-economy. **I found that the application of macro-economic growth models in agriculture is limited due to the diverse characteristics.**

2. I performed income stability tests on the basis of the operating surplus generated by the Economic Accounts of Agriculture. **I found that regarding income stability the Hungarian agriculture is lagging behind the more developed Member States.**

3. I analysed the factors having an effect on income stability and I also presented their effects numerically. **I found that during the period analysed the Hungarian agricultural policy – in contrast to the Member States analysed – could not assist unfortunately the balanced income development.**

4. I performed  $\sigma$ - and  $\beta$ -convergence tests for the agricultural sectors of the Member States of the EU. **I proved that the convergence process in the Member States of EU-27 is definitely proceeding on both outputs and input sides. While in EU-15 the differences are becoming steady.**

5. I performed convergence tests for analysing the behaviour of the individual Member States. **The analysis of the convergence of the Hungarian agriculture to the EU averages confirmed the convergence in the cases of all output and input categories; this means that during the last decade the Hungarian agriculture got closer to the more developed Member States.**

6. I also performed convergence tests for all the indicators per hectare. **The differences obtained and compared to the data calculated on the basis of employee numbers underlined that the dynamic employee number decrease (namely, of labour productivity increase) plays an important role in convergence.**

## **5. RESULTS FOR PRACTICAL UTILIZATION**

The research cannot be considered completed due to several reasons. On the one hand, because during the preparation of the analysis new questions have arisen which can only be answered by further research and on the other hand, by getting farther from the accession it is worthwhile to perform from time to time such an evaluation. By the lengthening time series other types of convergence and stability tests can also be performed. For the above tests the present dissertation might provide a good starting point and can be used in the evaluation of the results as a base for the comparisons.

The results of the research might be useful for the agricultural administration and might provide a starting point for the decision making of agricultural policy; and in addition it can also be used in education.



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## NOTES

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