

# Productivity Growth in Agriculture under the CAP

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## Background

Productivity growth is inevitable for the long-term success of agricultural development.

## Research Question

How did agriculture in new member countries do in terms of productivity growth after EU integration?

## Background

Productivity growth is inevitable for the long-term success of agricultural development. Various studies conducted by IERiGZ – PIB confirmed that the food processing sector developed in a competitive way in Poland. The agricultural production sector did fine. Agricultural producers were better off under the CAP in Poland. Consumers must have been better off. This study is an effort to enhance our understanding on agricultural development of Polish agriculture to new member countries under the CAP environment.

## Research Question

How did agriculture in new member countries do in terms of productivity growth after EU integration?

## Methodology

A Solow type growth accounting model was used to explain output growth by productivity growth and total input growth.

Data: National level aggregated data with five input variables (land, labor, fertilizer, machinery and livestock)

Scope: Changes in TFP (total factor productivity) contribution in output growth were examined for the data from 1995-2003 VS. 2004-2009.

A production function is assumed to be in the following form.

$$Y = A(t) F (N, L, M, F, S) \quad (1)$$

The growth in output can be approximated and decomposed into in the following form for the discrete data assuming constant return to scale.

$$\begin{aligned} \frac{Y_2 - Y_1}{Y_1} * 100 = & \frac{A_2 - A_1}{A_1} * 100 + W_L \frac{L_2 - L_1}{L_1} * 100 + W_N \frac{N_2 - N_1}{N_1} * 100 \\ & + W_F \frac{F_2 - F_1}{F_1} * 100 + W_M \frac{M_2 - M_1}{M_1} * 100 + W_S \frac{S_2 - S_1}{S_1} * 100 \quad (2) \end{aligned}$$

1: Base Year, 2: Current Year, Y: Output, L: Labor, N: Land, F: Fertilizer, M: Machinery, S: Livestock, A: Total Factor Productivity (Technological Change Factor, residual term) and W: Weights on inputs

The weights on the input variables can be production elasticities or cost shares of individual inputs under the assumptions of a Cobb-Daglas type production function and the existence of competitive equilibrium. As the available time-series data are limited and the estimation of a production function is difficult, and also the information on cost shares is limited, a set of weights from a previous study by Hayami and Ruttan (1985) was used.

# What did we observed after 2004?

## Examination of sources of Growth in EU Agriculture up to 2006

		Old Members	New Members	Poland
<b>1995-2003</b>				
	Output Growth	0.4	1.1	1.4
	1. Total Input Growth	-1.6	-2.0	-2.8
	2. Productivity(TFP) Growth	2.0	3.2	4.1
<b>2004-2006</b>				
	Output Growth	-1.7	-1.7	2.8
	1. Total Input Growth	-2.9	-2.2	0.0
	2. Productivity(TFP) Growth	0.9	0.5	2.8

# Sources of Growth among New Members

	New Members	Poland	Hungary	Czech Republic	Lithuania
<b>1995-2003</b>					
Output Growth	1.1	1.4	-0.1	0.2	2.0
1. Total Input Growth	-2.0	-2.8	-0.6	-1.6	-3.5
2. Productivity(TFP) Growth	3.2	4.1	0.6	1.9	5.6
<b>2004-2006</b>					
Output Growth	-1.7	2.8	-4.2	-1.0	-4.2
1. Total Input Growth	-2.2	0.0	-4.3	-2.0	-0.8
2. Productivity(TFP) Growth	0.5	2.8	0.1	1.0	-3.5

How did agriculture of new member countries do in terms of productivity growth right after EU accession?

□ Difference in performance of production has increased. Diversification was observed.

1. Polish agriculture did much better than the average of new members. So did Czech Republic.
2. Hungary did little below the average.
3. Lithuania did poorly.
4. Is this because of unique reasons for new member countries or the CAP?

# Next examination

Comparison of the performance and sources of growth between new members and old members would produce the answer to the question about the reason for diversion in performance in new member countries after 2004.

The answer is that the diversion in performance is not only the phenomenon observed by new member countries after 2004. The diversion might be more due to the CAP in recent years with more flexibility in national policies.

**Table 1 Growth Accounting Results in New Member Countries: Before and After 2004 Comparison**

	1995 (1) ~ 2003 (2)										2004 (1) ~ 2009 (2)									
Annual Growth Rate (%)	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI
Change in TFP $\left(\frac{A_2 - A_1}{A_1}\right) * 100$	4.5	1.9	5.5	0.6	1.9	5.6	4.1	0.5	7.2	-0.3	4.8	4.2	3.7	3.7	-3.0	-0.1	0.4	-2.5	-5.1	0.6
Change in Total Input $\left(\frac{I_2 - I_1}{I_1}\right) * 100$	0.0	-1.6	-5.0	-0.6	-0.5	-3.5	-2.8	-1.7	-3.6	-0.7	0.0	-3.9	-0.4	-2.0	0.1	-1.8	-0.6	-2.5	-2.1	-1.2
Change in Output $\left(\frac{Y_2 - Y_1}{Y_1}\right) * 100$	4.6	0.2	0.5	-0.1	1.4	2.0	1.4	-1.2	3.6	-1.0	4.8	0.3	3.3	1.7	-3.0	-1.9	-0.2	-5.0	-7.2	-0.6

**Table 2 Growth Accounting Results in Old Member Countries: Before and After 2004 Comparison**

	1995 (1)~2003 (2)														2004 (1)~2009 (2)													
Annual Growth Rate (%)	AT	BE-LU	DK	FI	FR	DE	GR	IE	IT	NL	PT	ES	SE	GB	AT	BE-LU	DK	FI	FR	DE	GR	IE	IT	NL	PT	ES	SE	GB
Change in TFP $\left(\frac{A2-A1}{A1}\right)*100$	2.2	1.1	4.0	2.2	1.0	2.7	-1.3	3.1	1.6	2.6	0.4	3.7	2.5	2.7	-0.2	2.651	-2.96	2.893	5.12	-3.5	6.351	2.303	-0.58	1.908	3.718	-1.43	1.104	
Change in Total Input $\left(\frac{I2-I1}{I1}\right)*100$	-1.5	-0.9	-2.5	-2.2	-1.5	-2.2	-0.7	-2.3	-1.6	-2.0	-1.6	0.5	-1.7	-2.2	-1.45	-2.29	-1.41	-2.72	-1.94	-2.0	0.119	-1.02	-0.73	-1.05	-0.38	-1.28	-0.7	
Change in Output $\left(\frac{Y2-Y1}{Y1}\right)*100$	0.7	0.2	1.5	0.0	-0.5	0.5	-2.0	0.7	-0.1	0.6	-1.3	4.1	0.9	0.5	-1.65	2.3	0.363	-4.37	0.174	3.178	-5.5	6.47	1.287	-1.31	0.863	3.34	-2.71	0.409

**Table 3 Growth Accounting Results in New Member Countries: Before and After 2004 Comparison (Mean Value and Its Variability)**

	1995 (1) ~ 2003 (2)		2004 (1) ~ 2009 (2)	
Annual Growth Rate (%)	Mean Value	Standard Error	Mean Value	Standard Error
Change in TFP $\left(\frac{A2 - A1}{A1}\right) * 100$	3.15	0.81	0.66	1.09
Change in Total Input $\left(\frac{I2 - I1}{I1}\right) * 100$	-2.01	0.52	-1.43	0.39
Change in Output $\left(\frac{Y2 - Y1}{Y1}\right) * 100$	1.14	0.59	-0.77	1.16

Table 4 Growth Accounting Results in Old Member Countries: Before and After 2004 Comparison (Mean Value and Its Variability)				
	1995 (1)~2003 (2)		2004 (1)~2009 (2)	
Annual Growth Rate (%)	Mean Value	Standard Error	Mean Value	Standard Error
Change in TFP $\left(\frac{A2 - A1}{A1}\right) * 100$	3.15	0.37	0.66	0.82
Change in Total Input $\left(\frac{I2 - I1}{I1}\right) * 100$	-2.01	0.21	-1.43	0.22
Change in Output $\left(\frac{Y2 - Y1}{Y1}\right) * 100$	1.14	0.37	-0.77	0.85

## Observations from the Growth Accounting Results

1. In both new and old EU member countries, agricultural production measured in value added has not increased in the latter part of the 2000s. Changes in TFP still play significant roles in output changes.

## Observations from the Growth Accounting Results

2. Variability increased in performance among new member countries after 2004. The standard error for the annual growth rate doubled. The same trend has been observed among old member countries. The variability among new member countries is slightly larger than among old member countries.

3. For new and old EU member countries, agricultural production measured in value added has not increased in the latter part of the 2000s. Changes in TFP still play significant roles in output changes.

What will I do to make the study results more comprehensive?

→ I will conduct a growth accounting study on the food processing sector using the data from the EU-KLEMS. I will examine if the development of the food processing sector in new member countries is based on the growth in TFP.

# What are common with Japan

1. Making agriculture competitive while protecting domestic markets is a challenge. CAP should be modified to promote sustainable development of agriculture based on TFP growth.
2. Economic costs and benefits of agricultural policies need to be considered. About half of agricultural GDP is spent on agricultural policies in Japan.
3. Structural reforms and associated adjustment in the labor market need to be carried out to keep up with the economic growth in non-agricultural sectors. .
4. Food security is a national concern in Japan. Bulky agricultural products with high calorie contents are imported in Japan; High valued agricultural products are domestically produced. The UK has the opposite approach. Poland and the EU might have to choose which approach to take.
5. Conservation of the natural environment and rural areas is needed. Climate change problems need to be solved through the efforts by agriculture.