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FOR AGRICULTURE AND FOOD INDUSTRY

Labour productivity and technical equipment supply in the agriculture of the new EU member countries from the aspect of investments

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Aims of the research

- analyzing economical aspects of efficiency of technical development
- to explore the changes of factors which influenced the means and labour efficiency
  - in the last 15 years in the former 15 member countries of the European Union
  - **in new member EU countries**

Introduction

- Factors of the technical development:
  - Biological (species)
  - Chemical (fertilizers, pesticides)
  - Technical (machinery)
  - Human (labour).
- Widespread analysing method of technical development efficiency is the calculation of partial efficiency.

Material and methods

Partial efficiency

$$\frac{y}{L} = \frac{y}{K} \cdot \frac{K}{L}$$ where

y/L = productivity (total output/labour (AWU))
y/K = capital efficiency (total output/machinery)
K/L = technical equipment (machinery/labour)

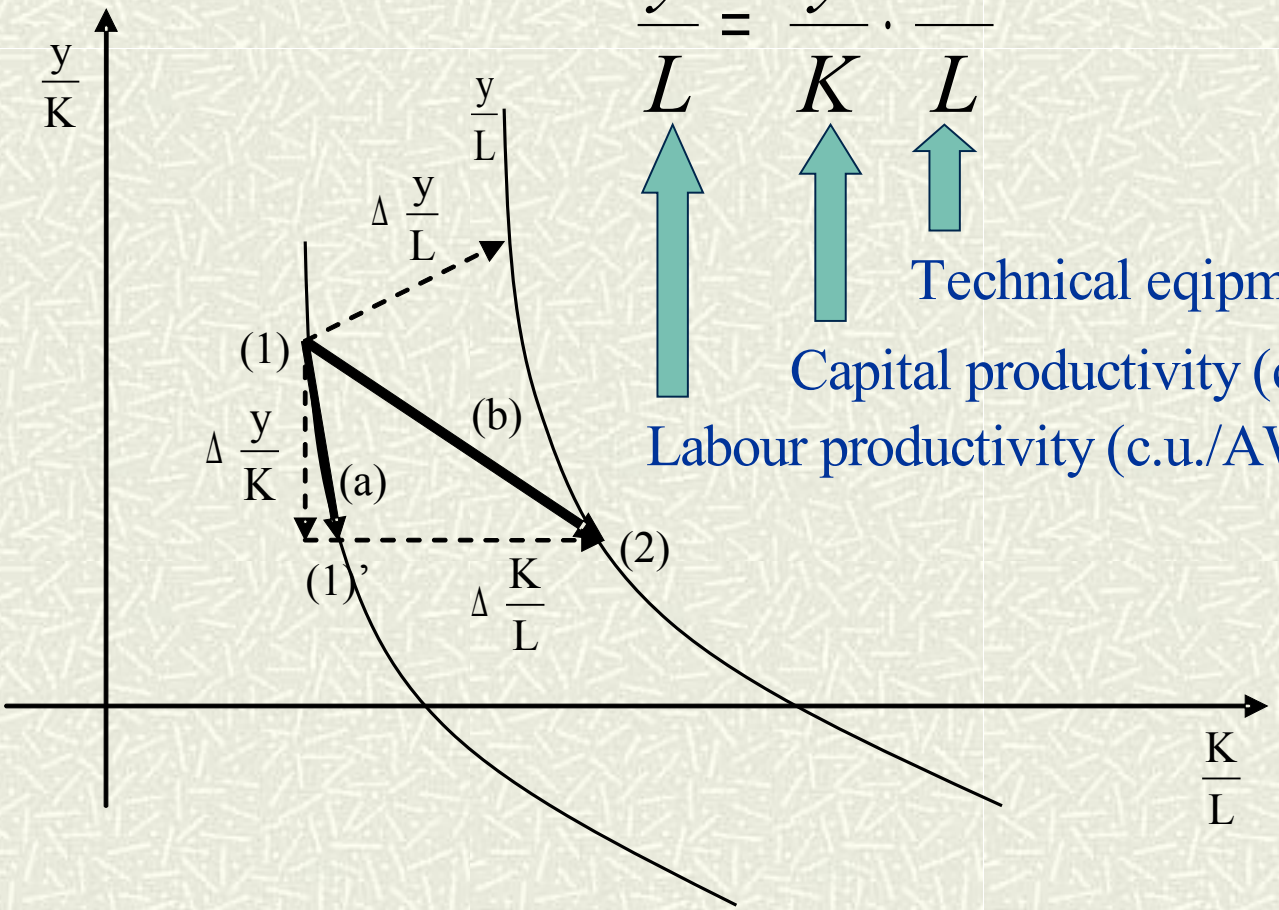
Longitudinal (panel) examination of changes

Database

- Farm Accountancy Data Network (1989-2006)
- EUROSTAT

Parcial efficiency

$$\frac{y}{L} = \frac{y}{K} \cdot \frac{K}{L}$$



Technical eqipment(c.u./AWU)

Capital productivity (c.u./c.u.)

Labour productivity (c.u./AWU)

Longitudinal (panel) examination of changes

			Criterium				to date t		
			x_1^{t+1}	x_2^{t+1}	…	x_n^{t+1}			
			Analysis value				Z_t	Proportion of change	
Criterium	x_1^t	Analysis value	$z_{1;1}$	$z_{2;1}$	…	$z_{n;1}$	$\Sigma z_{i;1}$	$\Sigma z_{i;1} - z_{1;1}$	$\frac{\Sigma z_{i;1} - z_{1;1}}{z_{1;1}}$
	x_2^t		$z_{1;2}$	$z_{2;2}$	…	$z_{n;2}$	$\Sigma z_{i;2}$	$\Sigma z_{i;2} - z_{2;2}$	$\frac{\Sigma z_{i;2} - z_{2;2}}{z_{2;2}}$
	…		…	…	…	…	…	…	…
	x_n^t		$z_{1;n}$	$z_{2;n}$	…	$z_{n;n}$	$\Sigma z_{i;n}$	$\Sigma z_{i;n} - z_{n;n}$	$\frac{\Sigma z_{i;n} - z_{n;n}}{z_{n;n}}$
to date t+1		Z_{t+1}	$\Sigma z_{1;i}$	$\Sigma z_{2;i}$	…	$\Sigma z_{n;i}$			
		Proportion of change	$\Sigma z_{1;i} - z_{1;1}$	$\Sigma z_{2;i} - z_{2;2}$	…	$\Sigma z_{n;i} - z_{n;n}$			
			$\frac{\Sigma z_{1;i} - z_{1;1}}{z_{1;1}}$	$\frac{\Sigma z_{2;i} - z_{2;2}}{z_{2;2}}$	…	$\frac{\Sigma z_{n;i} - z_{n;}}{z_{n;n}}$			

Source: own construction on the basis of NÁBRÁDI – FICZERE NAGYMIHÁLY [2008]

Number of agricultural holdings in the European Union

	Number of agricultural holdings[1)]	Distribu-tion	Utilised agricultural area[2)]	Distribu-tion	Gross value added[3)]	Distribu-tion	Agricultural labour force[4)]	Distribu-tion
	1000 pcs	%	1000 ha	%	M EUR	%	1000 AWU	%
EU-27	9 870.6	100.0	164 051	100.0	127 162	100.0	9 804	100.0
EU-15	6 238.6	63.2	130 547	79.6	116 758	91.8	6 290	64.2
Czech Republic	45.8	0.5	3 606	2.2	1 004	0.8	152	1.6
Germany	**412.3**	**4.2**	**17 035**	**10.4**	**13 909**	**10.9**	**689**	**7.0**
Greece	**824.5**	**8.4**	**3 805**	**2.3**	**6 349**	**5.0**	**614**	**6.3**
Spain	**1 140.7**	**11.6**	**25 690**	**15.7**	**22 450**	**17.7**	**998**	**10.2**
France	**614.0**	**6.2**	**29 632**	**18.1**	**21 281**	**16.7**	**914**	**9.3**
Ireland	135.3	1.4	4 307	2.6	1 711	1.3	160	1.6
Italy	**1 963.8**	**19.9**	**14 710**	**9.0**	**25 019**	**19.7**	**1 476**	**15.1**
Latvia	126.6	1.3	1 734	1.1	237	0.2	137	1.4
Lithuania	272.1	2.8	2 837	1.7	417	0.3	222	2.3
Hungary	**773.4**	**7.8**	**5 864**	**3.6**	**1 747**	**1.4**	**463**	**4.7**
Netherlands	**85.5**	**0.9**	**1 924**	**1.2**	**8 147**	**6.4**	**186**	**1.9**
Austria	173.8	1.8	3 263	2.0	2 190	1.7	175	1.8
Poland	**2 172.2**	**22.0**	**15 906**	**9.7**	**5 689**	**4.5**	**2 274**	**23.2**
Portugal	359.3	3.6	3 722	2.3	2 338	1.8	455	4.6
United Kingdom	**280.6**	**2.8**	**16 761**	**10.2**	**7 160**	**5.6**	**336**	**3.4**

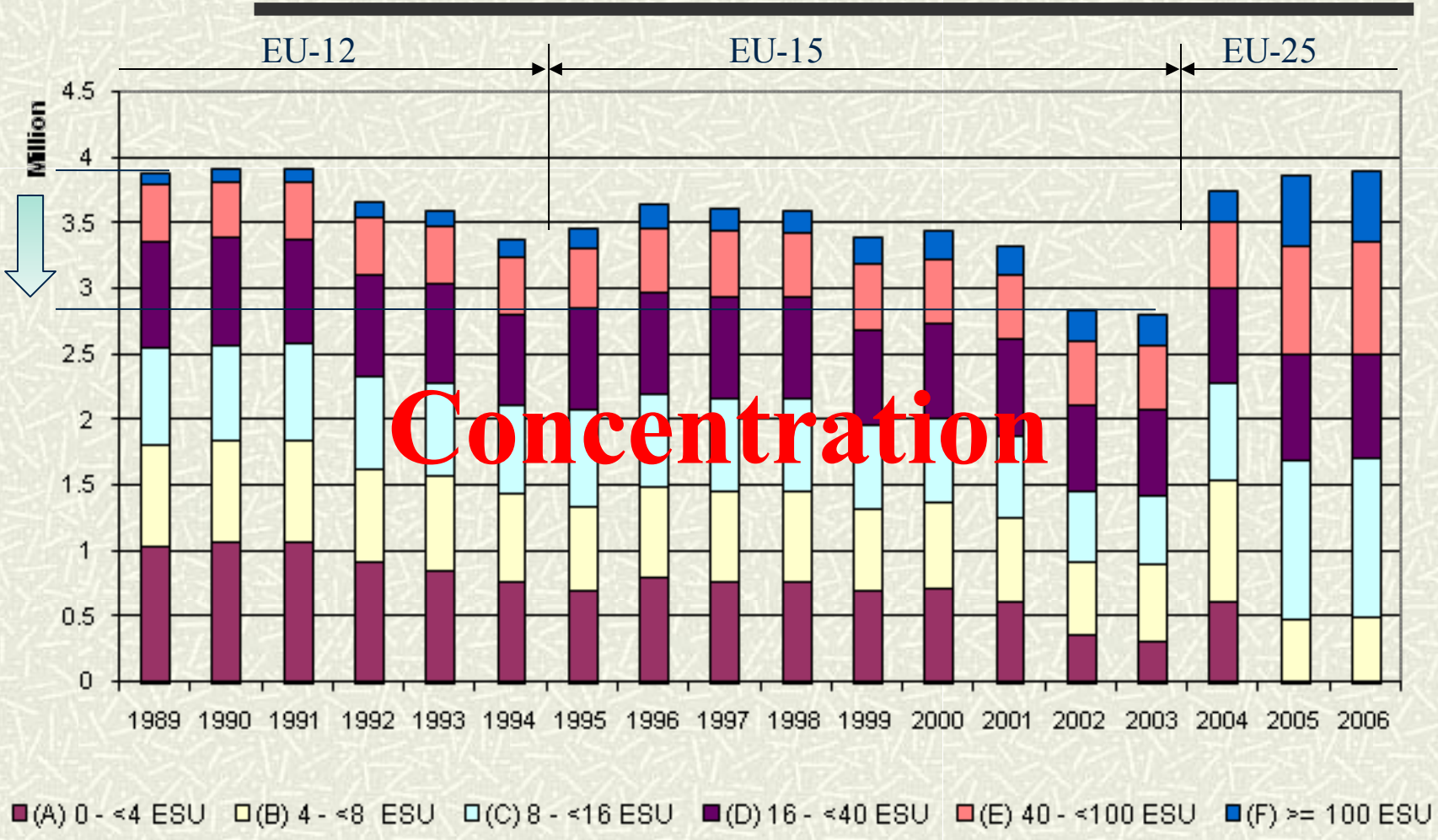
Number of farms in categories of economic farm sizes (1990=100%) (%)

	0 - <4 ESU	4 - <8 ESU	8 - <16 ESU	16 - <40 ESU	40 - <100 ESU	>= 100 ESU	Total
EU-25	41.0	97.4	99.1	102.9	112.9	230.7	85.0
Germany	52.7	52.7	39.0	91.8	93.1	1321.6	63.6
Greece	69.8	77.7	99.5	138.2	287.9	9.4	86.9
Spain	22.8	50.9	68.5	132.8	307.6	312.4	67.7
France	63.5	63.5	43.3	46.4	91.1	240.0	70.0
Italy	17.4	76.0	84.6	90.8	91.0	135.2	58.7
Netherlands	63.3	63.3	63.3	77.4	59.4	125.5	68.3
United Kingdom	65.5	215.3	12.9	76.4	90.7	130.8	97.0

Proportion and distribution of invested assets in EU countries in 2006 (%)

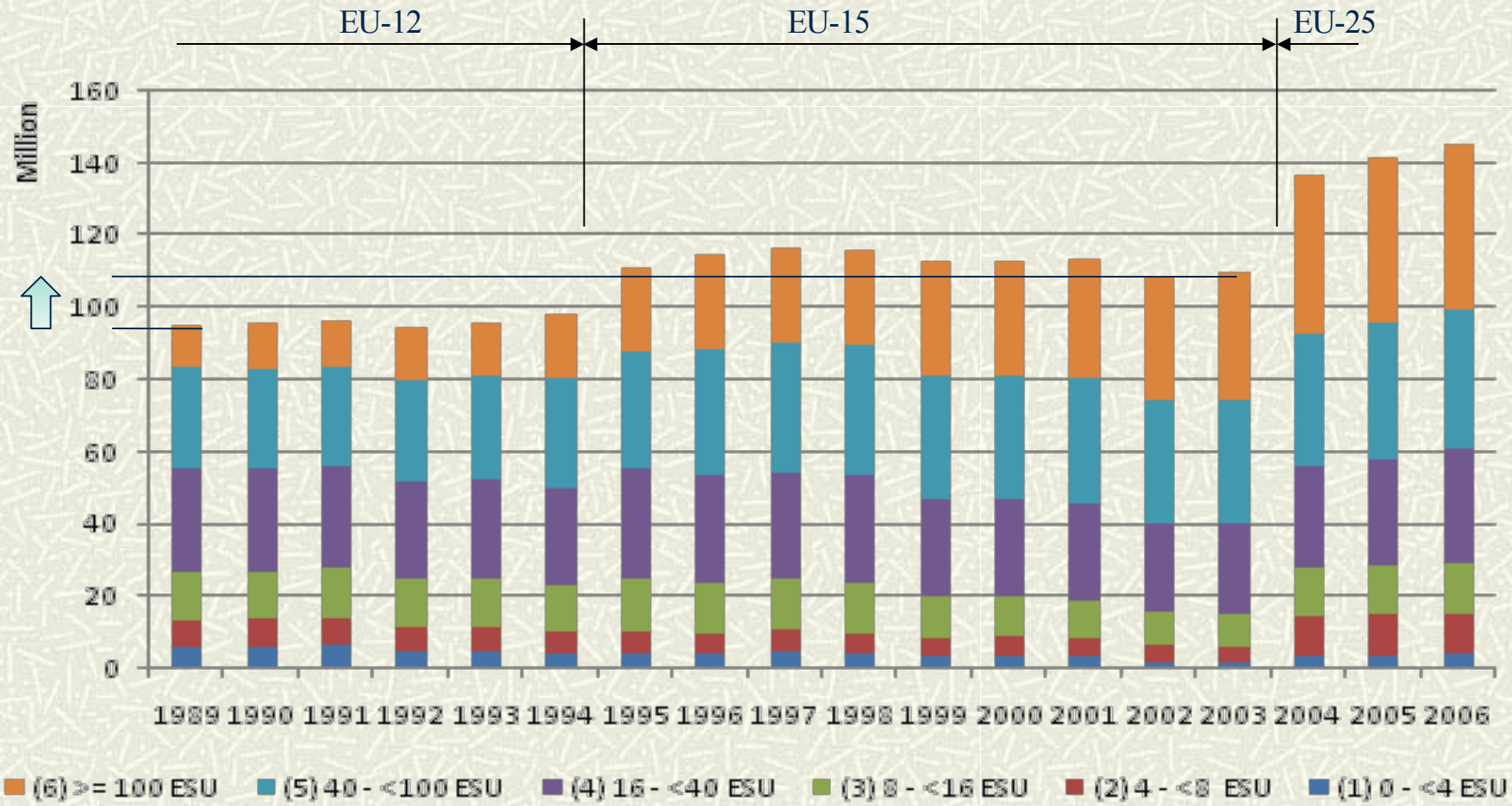
Country	Number of represented farms	Rate of total fixed assets in total assets	Rate of land, permanent crops and quotas in total fixed assets	Rate of buildings in total fixed assets	Rate of machinery in total fixed assets	Rate of breeding livestock in total fixed assets
Code in FADN	SYS02	SE-441	SE-446	SE-450	SE-455	SE-460
EU-15						
Means	213169	76.4	59.5	21.3	14.0	5.3
Minimum	1710	31.5	28	4.4	2.2	2
Maximum	748570	95.9	90.9	56.5	29.4	15.7
Standard deviation	255639	18.8	19.7	15.0	7.2	4.0
New members (Central and Estern European countries)						
Means	98046	71.25	34.89	35	24.78	5.34
Minimum	1380	45.1	3.6	5.8	8.6	2.4
Maximum	757240	96.2	83.3	80.9	43.2	8.7
Standard deviation	232979	18.0	23.9	20.3	12.9	2.0

Changes in number of farms of the EU-12/15/25 countries



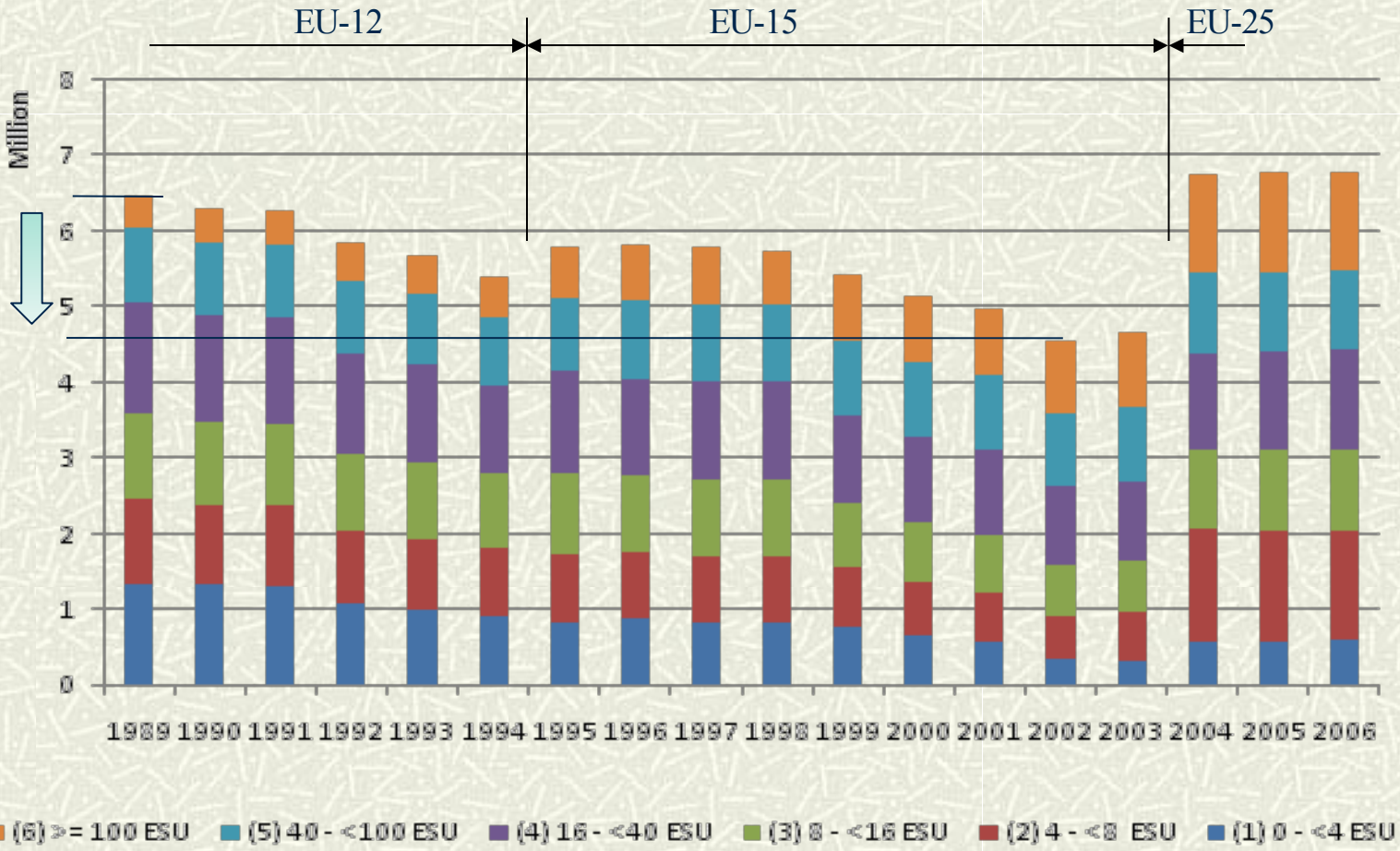
Source: based on FADN, own construction

Total land used by the represented farms of the EU-12/15/25 countries



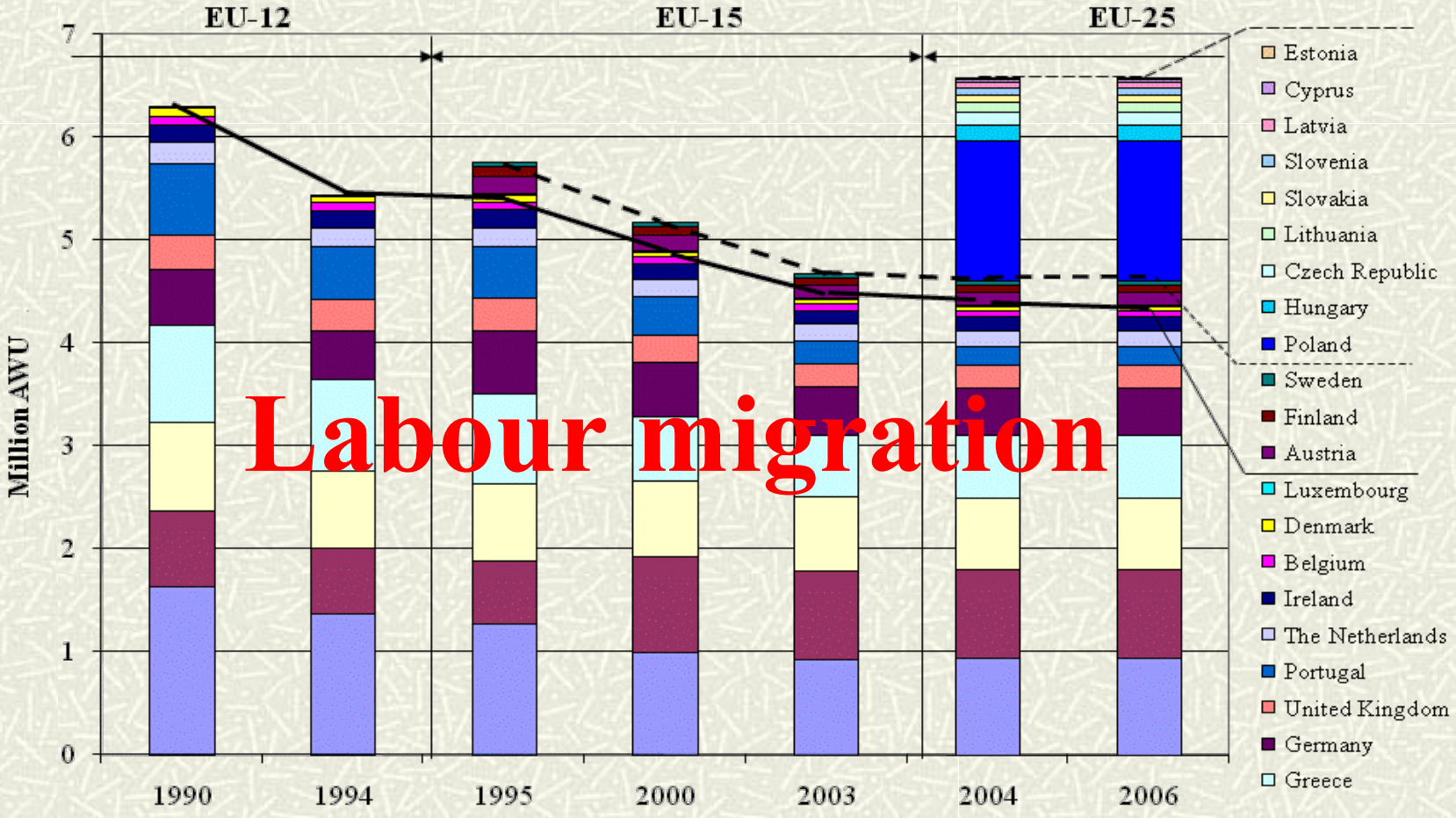
Source: based on FADN, own construction

Changes of labour the farms of the EU-12/15/25 countries (according to economic farm size)



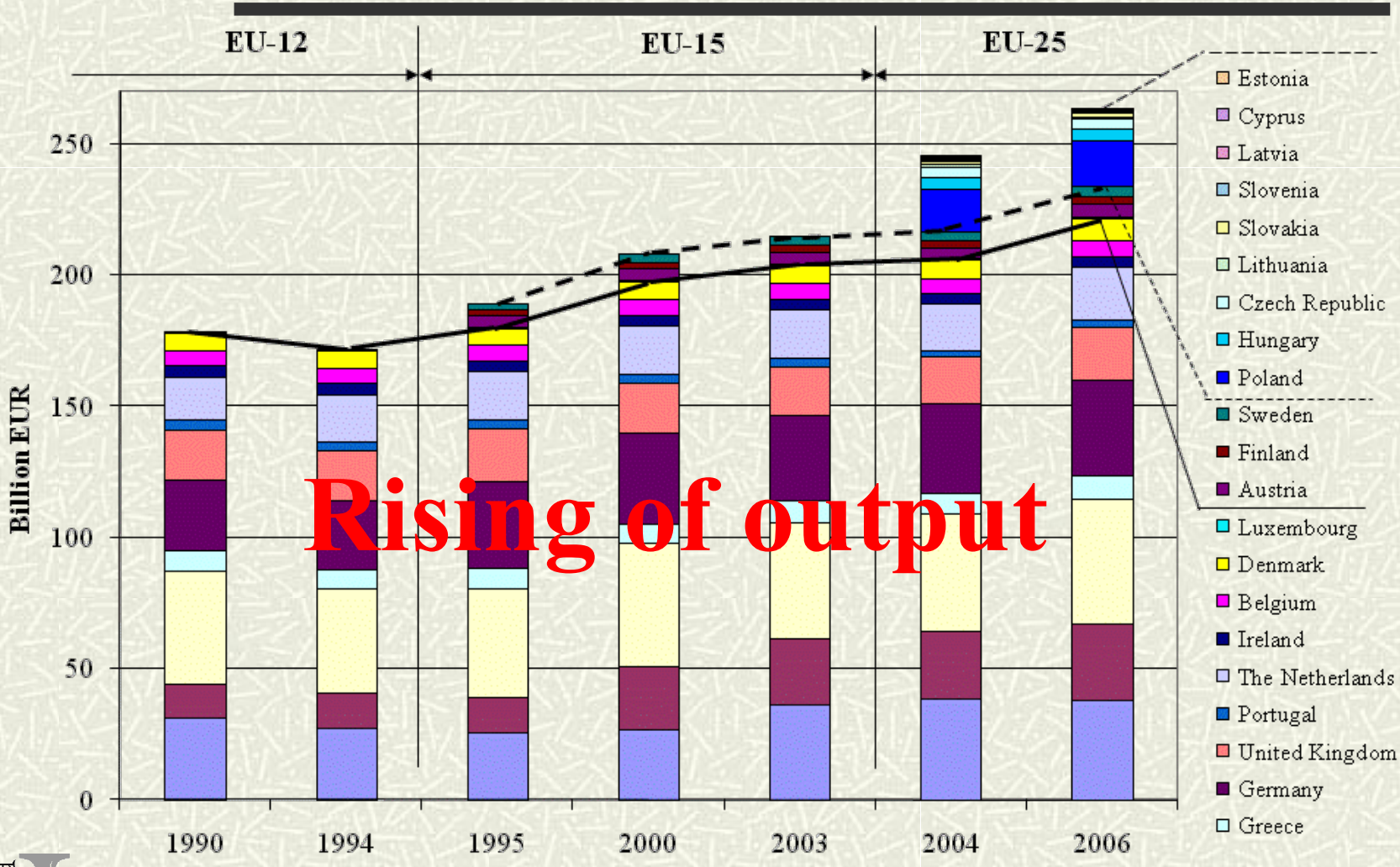
Source: based on FADN, own construction

Changes of labour in the farms of the EU-12/15/25 countries



Source: based on FADN, own construction

Changes of total output of the farms in the EU-12/15/25 countries



Source: based on FADN, own construction

Changes of natural productivity of labour in the EU-12/15/25 country groups (ha/AWU)

Year	Labour natural productivity index for all the represented farms						
	0 - <4 ESU	4 - <8 ESU	8 - <16 ESU	16 - <40 ESU	40 - <100 ESU	>= 100 ESU	Total
1990	4.7	7.5	12.6	21.0	29.9	30.7	16.6
1995	4.9	7.4	13.9	23.8	35.0	36.8	20.1
2000	5.6	7.5	14.6	24.3	36.9	39.4	23.2
2004	6.5	7.8	13.1	24.2	37.6	35.3	21.5
Member countries	Labour natural productivity index in field crop production in 2004						
	0 - <4 ESU	4 - <8 ESU	8 - <16 ESU	16 - <40 ESU	40 - <100 ESU	>= 100 ESU	Total
EU-25	8.0	10.2	18.4	31.8	55.2	54.8	31.2
Germany	41.6	41.6	..	31.5	50.2	67.7	..
Greece	4.5	6.0	8.1	12.4	17.3	..	..
Spain	12.6	23.7	36.0	54.1	85.2	24.3	42.3
France	52.4	52.4	19.2	35.0	61.9	76.0	55.8
Italy	19.2	7.7	12.5	17.5	30.6	35.4	17.1
Netherlands	19.3	19.3	19.3	12.2	18.1	37.8	21.6
United Kingdom	63.7	63.7	..	56.3	65.6	88.3	..
Hungary	21.0	24.0	43.2	58.8	55.5	47.7	40.9
Poland	6.6	8.2	12.9	23.6	46.5	60.5	13.0

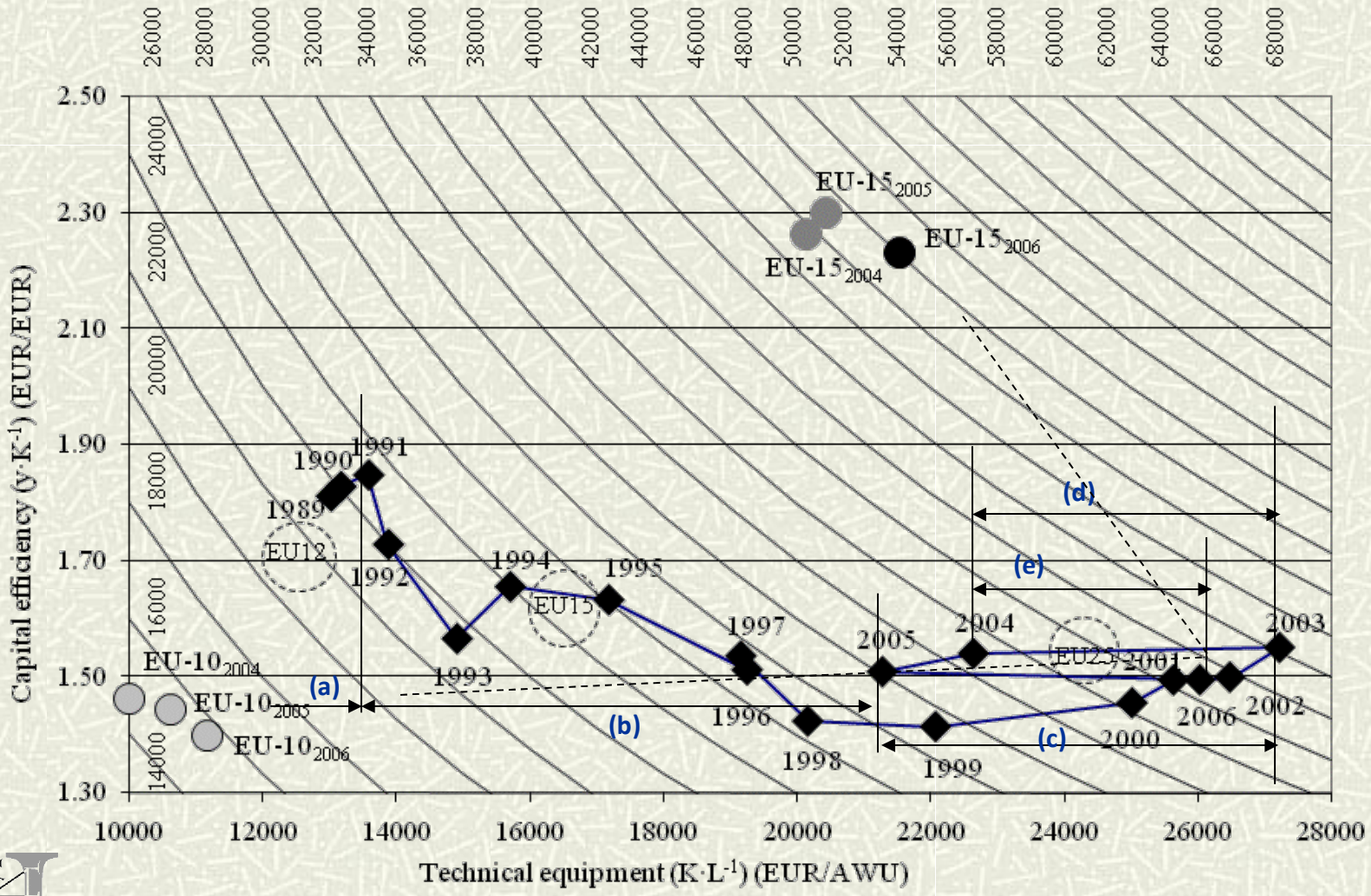
Productivity of labour in the EU-12/15/25 country groups

Year	Average of the EU-25 (EUR/capita)	Labour productivity compared to the EU-25 average (%)					
		0 - <4 ESU	4 - <8 ESU	8 - <16 ESU	16 - <40 ESU	40 - <100 ESU	>= 100 ESU
1990	15441	117.6	63.2	62.5	97.8	108.7	100.0
1995	17990	115.0	62.6	63.6	88.4	107.7	100.0
2000	20868	121.6	59.5	49.9	88.4	104.8	100.0
2004	18814	116.1	47.9	59.9	99.8	124.9	100.0
Member country	Deviation of labour productivity from the EU average (%)						
EU-25		100	100	100	100	100	100
Germany		167	160	..	207	100	89
Greece		10	17	61	65	20	..
Spain		12	22	76	87	71	70
France		156	152	..	140	86	78
Italy		92	28	83	109	90	111
Netherlands		271	265	643	15	171	191
United Kingdom		163	156	..	3	165	110
Hungary		..	15	65	64	33	39
Poland		12	18	46	50	40	51

Technical equipment in the EU-12/15/25 country groups

Year	Average of the EU-25 (EUR/capita)	Technical equipment compared to the EU-25 average (%)					
		0 - <4 ESU	4 - <8 ESU	8 - <16 ESU	16 - <40 ESU	40 - <100 ESU	>= 100 ESU
1990	25232	131.3	48.6	56.3	74.4	62.5	100.0
1995	27716	131.0	54.4	57.5	64.1	56.5	100.0
2000	32622	139.5	54.3	47.0	57.5	62.5	100.0
2004	29870	135.3	57.3	61.4	60.6	70.1	100.0
Member country	Deviation of technical equipment from the EU average (%)						
EU-25		100	100	100	100	100	100
Germany		149	143	..	102	108	119
Greece		14	22	67	80	53	..
Spain		13	17	35	44	49	47
France		161	156	0	96	101	72
Italy		101	39	115	118	151	121
Netherlands		133	131	309	21	156	190
United Kingdom		160	153	..	5	68	83
Hungary		..	39	120	104	86	105
Poland		23	28	93	103	102	115

Changes of labour efficiency of the EU-25 countries (1989-2006)

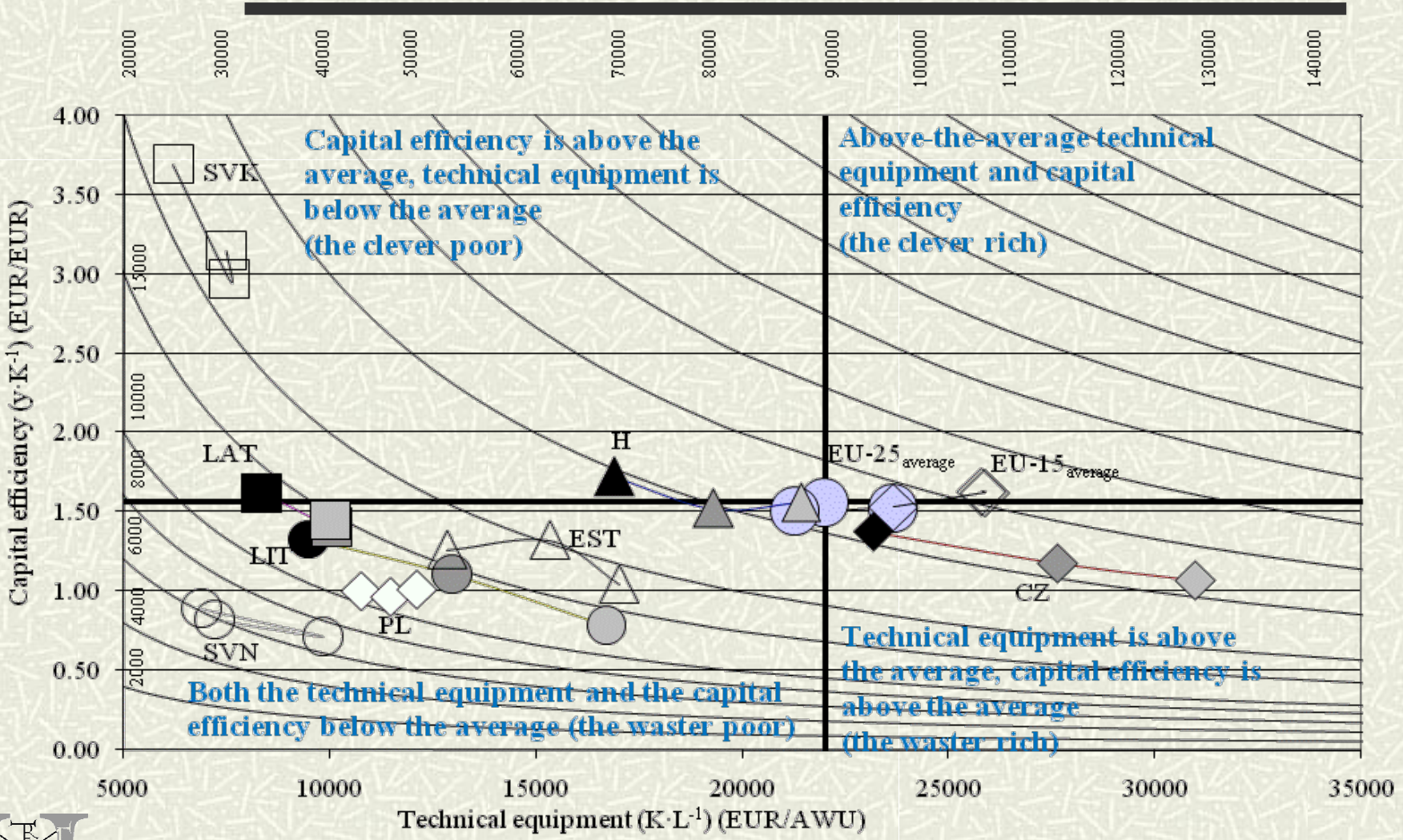


Source: based on FADN, own construction

Identification of groups in Descartes coordinate system, positioned on the basis of their deviation from the European Union average

Group mark	Description of group features	Description of group	Quadrant in Descartes coordinate system
G1	countries with asset supply and capital efficiency above the average	clever rich	1
G2	countries with asset supply below the average, but capital efficiency above the average	clever poor	2
G3	countries with asset supply below the average and capital efficiency below the average	wasting poor	3
G4	countries with asset supply above the average, but capital efficiency below the average	wasting rich	4

Changes of classification of the EU-10 countries according to partial efficiency (2003-2006)



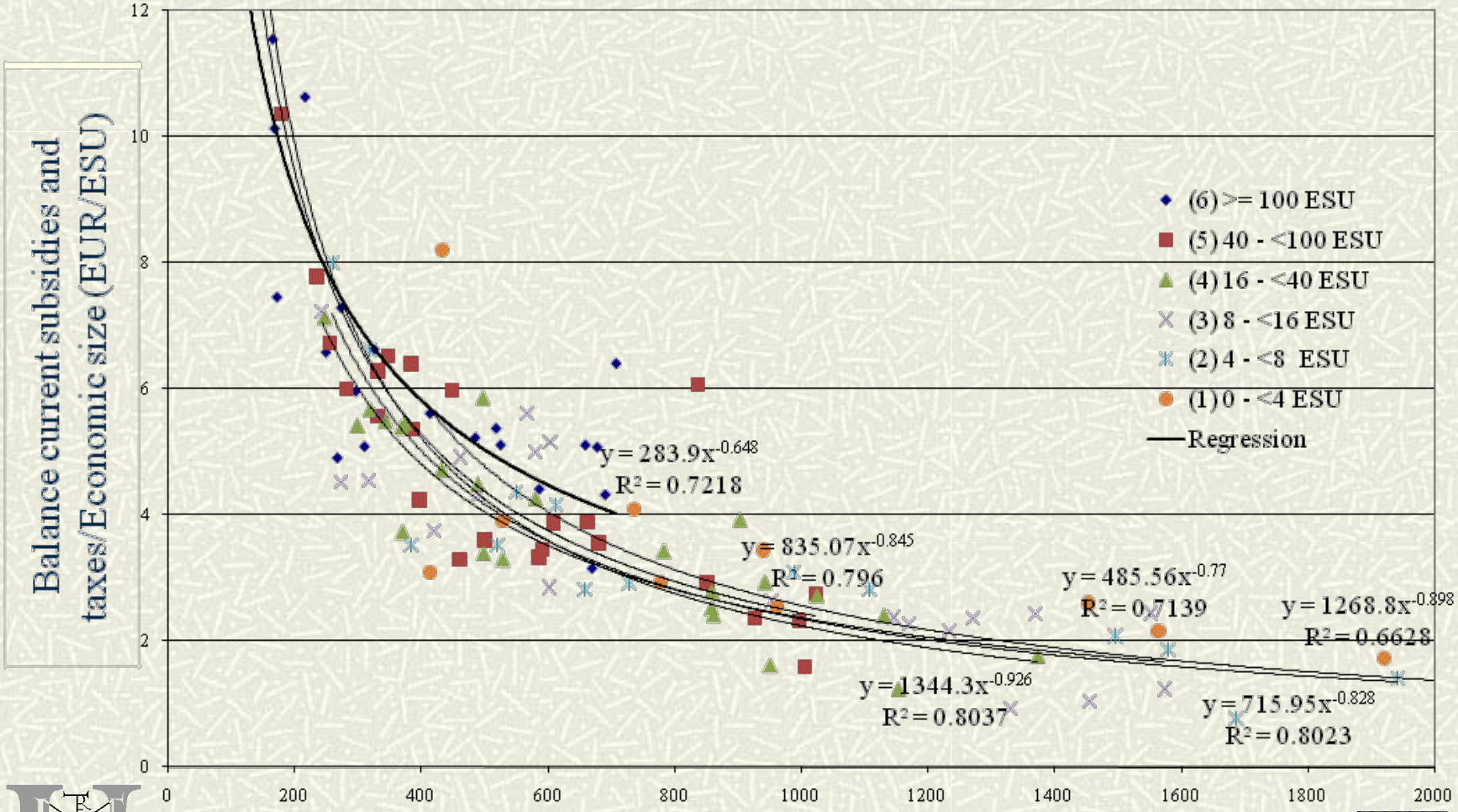
Source: based on FADN, own construction

Longitudinal examination of partial capital efficiency of total capital in the EU-15 member countries (1995/2000/2006)

Group	G1	G2	G3	G4	2000	Group	G1	G2	G3	G4	2006
G1	BEL, DAN			NED	3	G1	BEL			DAN	2
G2		FRA, UKI			2	G2	UKI	FRA ***SVK, HUN***	SUO		3+***2***
G3		SUO	ELL, ESP, IRE, POR	ITA	6	G3			ELL, ESP, POR ***LIT, EST, POL, SVN***	IRE, OST	5+***4***
G4			OST	DEU, LUX, SVE	4	G4				DEU, ITA, NED, LUX, SVE ***CZE***	5+***1***
1995	2	3	5	5	15	2000	2	1+***2***	4+***4***	8+***1***	15

Source: own construction on the basis of FADN

Correlation between output/subsidy ratio and economic size/subsidy ratio in the EU 25 countries depends on economic size of farms



Conclusions

- The production in a group of the countries (in most of the former member countries) is made with high input, which contributes to the more balanced production, but its cost impact is also considerable, which has a negative influence on their competitiveness;

- By forming efficiency groups it can be stated that the dominance of the wasting poor (countries with asset supply below the average, that use the capital fixed in assets with typically low efficiency) is significant (almost half of the member countries belong to this group and most of them come from the newly integrated countries);

Conclusions (cont.)

- In this comparison, the agriculture of the Central Eastern European countries belongs to those which are at competitive disadvantage. Hungary made extensive development (capacity increasing with significant capital use) in the preparation decade, it had climbed back to the former level (of the 1980s) concerning its output, which today is below the level of the most developed and even some of the medium developed countries;
- The countries of the region has some chance to become competitive if they can make a virtue of their poverty, which means that they produce on lower asset supply level with high capital productivity. That would put lower specific capital cost on the product unit. The different forms of cooperation among farmers can ensure appropriate framework to achieve this objective.

Thank you for your attention!