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EU farms' technical efficiency and productivity change in 1990 – 2006

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Abstract

In this paper we analyse and compare various efficiency indicators for a number of European Union (EU) countries: Belgium, Estonia, France, Germany, Hungary, Italy, The Netherlands and Sweden. The availability of long period datasets between 1990 and 2006, allow us to concentrate on the long time trends in technical efficiency especially in Old Member States. This study is the first which may provide a comprehensive overview on the development in farm level efficiency across eight European countries. Our main results are the following. Generally, all countries have relatively high levels of mean technical efficiency ranging from 0.72 to 0.92 for both field crops and dairy farms. Interestingly the majority of countries have better performance in dairy sectors in terms of higher levels of mean efficiency than in field crop production. A slightly decreasing trend however may be observed for all countries. Technical Efficiency estimates are largely in line with those obtained by previous studies. Stability analysis revealed that in average 60% of farms maintain their efficiency ranking in two consecutive years, whilst 20% improve and 20% worsen their positions for all countries. However, these ratios slightly fluctuate around these values for one year to next year. Mobility analysis ranks countries according to the mobility of SFA scores within the distribution. Farms in New Member States are more mobile than those in EU15. Total productivity changes are analysed in two steps. First, we do not find a definite trend in total factor productivity changes. Second, we address the question whether total factor productivity changes converge or diverge over time. Using panel unit root tests our estimations reveal a convergence of productivity across old EU member countries during analysed period. Finally, we decompose the total factor productivity changes into its main elements. Field crop farm indicators generally present significantly higher volatility than dairy farms. Random effect panel regression of Total Factor Productivity Change on its components shows Technological Change as being the significant positive driver for crop farms, whilst Technical Efficiency Change followed by Technological Change are the most important for dairy farms. In addition we do not find significant impacts of CAP reforms in 1992 and 2000 on total productivity changes.

I. Introduction

Most existing empirical studies focus on a single country's agricultural sector, thus the comparative analysis of the technical efficiency is rather scarce. We take into account the relative importance of specific subsectors and the rationale of compiling more homogeneous sample, separately focusing on the field crops (TF1) and dairy (TF41) sectors. The abundant research in farm efficiency is mostly due to the appearance of software packages- some freely available- and the increased availability of detailed farm survey data. Table 1 presents a brief overlook of some of the recent efficiency and productivity papers. We focused on field crop and dairy sectors of countries included in this research, presenting the main methodology, data source and time-span, and estimated mean technical efficiency.

Table 1. Overview of empirical studies of technical efficiency in field crop and dairy sectors of FACEPA countries

Paper	Sector	Period	Methodology	Data	Mean TE
			Germany		
Kleinhanß et al. (2007)	Live-stock	1999-2000	non-parametric, DEA	- FADN	-
Brümmer et al.(2002)	Dairy	1991-1994	parametric (output distance fct.), translog	specialised dairy farms in Schleswig-Holstein	0.95
Zhu and Oude Lansink (2010)	Crop	1995-2004	parametric (output distance fct.), Translog	FADN	0.64
			Netherlands		
Brümmer et al. (2002)	Dairy	1991 - 1994	parametric (output distance fct.), translog	FADN (highly specialised dairy farms)	0.89
Zhu and Oude Lansink (2010)	Crop	1995-2004	parametric (output distance fct.), translog	FADN	0.76
			Sweden		
Hansson, H. (2007)	Dairy	1998-2002	non-parametric, DEA, input (output) oriented	Farm Economic Survey, Agriwise, Swedish Dairy Association database	0.84 (0.82)
Larsen, K. (2010)	Crop	2001-2004	non-parametric, DEA, CRS (VRS)	FADN	0.52 (0.58)
Larsen, K. (2010)	Dairy	2001-2004	non-parametric, DEA, CRS (VRS)	FADN	0.65 (0.70)
Zhu and Oude	Crop	1995-	parametric	FADN	0.71

Lansink (2010)		2004	(output distance fct.), Translog		
			France		
Latruffe and Fogarasi (2009)	Crop	2001- 2004	non-parametric, DEA	FADN	0.47
Latruffe and Fogarasi (2009)	Dairy	2001- 2004	non-parametric, DEA	FADN	0.76
			Italy		
Barnes et al. (2010)	Crop		SFA	FADN	0.76
			Belgium		
Coelli et al. (2006)	Crop	1987- 2002	non-parametric, DEA, Malmquist TFP	FADN	TFPC of 1% p.a.
			Hungary		
Bakucs et al. (2010)	All farms	2001- 2005	parametric, SFA, translog	FADN	0.73
Latruffe and Fogarasi (2009)	Crop	2001- 2004	non-parametric, DEA	FADN	0.42
Latruffe and Fogarasi (2009)	Dairy	2001- 2004	non-parametric, DEA	FADN	0.85
			Estonia		
Vasiliev et al. (2008)	Crop	2000- 2004	non-parametric, DEA	FADN	0.74

Note: TE = technical efficiency; fct = function

Source: authors' compilation

With the exception of few studies (e.g. Barnes et al. 2010, that also estimates a metafrontier for several countries), most of the research done in Europe, focuses on a single country – one or several agricultural sectors. Besides estimating various efficiency indicators, most of these papers focus on determining the drivers of efficiency, i.e. socio-economic variables that influence farms' relative position towards the efficient frontier. The analysis of determinants of efficiency is not an objective of this study. Therefore, besides presenting a number of efficiency indicator estimations for each country and sector in the annex, here we analyse the general evolution of technical efficiency and total factor productivity change estimates, focusing on country wise similarities and differences, stability of farms' position within technical efficiency ranking, trend and convergence analysis. We investigate the issue of how relative performance of farms fluctuates in terms of technical efficiency over time. We may hypothesise that many poorly performing farms remain inefficient and some farmers are performing always efficiently. We can identify farms which are usually at the bottom or top of the efficiency ranking.

The rest of this paper is organised as follows. Section 2 describes the methodology, followed by the description of the datasets and variables employed in section 3. Section 4 presents the main results of the analysis in two steps. First we outline the results based on the SFA and DEA approaches. Then we present the trend and stability analysis of the efficiency results, followed by the Total Factor Productivity Analysis. Panel unit root tests are applied to analyse convergence and finally the decomposition analysis of TFPC indicators closes the chapter. The last chapter summarizes main results of the paper and concludes.

II. Methodology

The technical efficiency refers to the situation where it is impossible for a farm to produce more with given technology. There are two possibilities for farmers. First, produce larger output using the same inputs, second, produce the same output with less amounts of the overall inputs. In practice, the research and policy interests are focusing on the relative position in terms of efficiency of particular farms with respect to others. Consequently, the technical efficiency can be described by the relationship between observed output and some ideal or potential production. There is wealth of methodological and empirical literature focusing on the issues in efficiency and productivity (standard theoretical references Coelli et al., 2005; Kumbhakar and Lovell, 2000; while comprehensive overview on empirical research Bravo-Ureta et al. 2007). Two main approaches developed over time for analysing technical efficiency in agriculture are used in this paper: nonparametric data envelopment analysis (DEA) and the parametric stochastic frontier analysis (SFA). While the vast majority of empirical studies on technical efficiency in the agricultural sector mostly have utilized only one method to estimate their efficiencies, we apply both methodological approaches to measure efficiency. After obtaining efficiency estimates, a number of methodological approaches are employed to analyse first step results. In order to analyse the convergence of selected indicators in a panel framework, Ordinary Least Squares (OLS) on time trend, panel unit root tests and dynamic OLS analysis methods were applied. Stability analysis was used to evaluate the percentage of farms with stable (over a two year period), increasing or decreasing efficiency ranking.

II.1. Panel Unit Root analysis

Panel unit root tests provide an easy way to econometrically test stationarity, and thus convergence or divergence of total factor productivity change components. Panel unit root tests are similar, but not identical, to unit root tests run on individual series. Consider equation 1:

$$y_{i,t} = \rho y_{i,t-1} + X_{i,t} \delta_i + \varepsilon_{i,t} \quad (1)$$

where $i = 1, 2, \dots, N$ are cross-section units and $t=1, 2, \dots, T$ the observed periods, X_{it} possible exogenous variables, ρ_i the autoregressive coefficients, and the errors $\varepsilon_{i,t}$ are assumed to be mutually independent idiosyncratic disturbance terms. If $|\rho_i| < 1$, y_i is considered stationary, while if $|\rho_i| = 1$, the process contains a unit root. With panel unit root tests, there are two assumptions regarding ρ . First, the persistence parameters are common across cross-sections, that is to say $\rho_i = \rho$, for all i . Second, ρ_i can freely vary across cross-sections. There are a number of panel unit root tests assuming one of the above assumptions. Considering the well known low power properties of unit root tests, in this deliverable we employ a battery of unit root tests: Levin et al. (2002) method (common unit root process), Im et al. (2003) method (assuming individual unit root processes), ADF-Chi square and PP-Chi square.

II.2. Stability Analysis

Efficiency scores as such, do not reveal much about the fluctuation of farms' relative performance. From policy point of view however, it is an interesting question whether low performing farms are always inefficient and vice versa, i.e. farms with higher TE scores are efficient throughout the period. Policy relevance is given by the fact that chronically lower

performing farms may be targeted with specific measures in order to improve their efficiency scores. With large panel datasets however, due to sample attrition it is not feasible to follow the TE scores of given farms through longer time periods, therefore comparisons between consecutive years were done. We follow the stability analysis methodology outlined by Barnes et al. (2010). Yearly farm TE scores were classified by terciles, then transition matrices linking two consecutive years were constructed, that indicate whether the considered farm remained in the same tercile, or its relative position has worsened, or contrary, improved. The degree of mobility in patterns of SFA scores can be summarised using indices of mobility. These formally evaluate the degree of mobility throughout the entire distribution of SFA scores and facilitate direct cross-country comparisons. The first of these indices (M_1 , following Shorrocks, 1978) evaluates the trace (tr) of the transition probability matrix. This index thus directly captures the relative magnitude of diagonal and off-diagonal terms, and can be shown to equal the inverse of the harmonic mean of the expected duration of remaining in a given cell.

$$M_1 = \frac{K - \text{tr}(P)}{K - 1} \quad (2)$$

where K is the number of cells, and P is the transition probability matrix.

The second index (M_2 , after Shorrocks, 1978 and Geweke et al., 1986) evaluates the determinant (det) of the transition probability matrix.

$$M_2 = 1 - |\text{det}(P)| \quad (3)$$

In both indices, a higher value indicates greater mobility, with a value of zero indicating perfect immobility.

III. Data

EU FADN data were used for this paper. Two sectors were considered, based on the Type of Farming (TF) variables A28 (one digit TF) and A29 (two digits TF): field crop farms (TF1) and dairy farms (TF41). The following variables were used for the empirical analysis (EU FADN database code in brackets):

TO=Total value of Output in Euros (SE131)

TL=Total labour input in Annual Working Units, AWU corresponds to 2,200 hours, (SE010)

UAA= Utilised Agricultural Area (UAA) in hectares (SE025)

IC= Intermediate consumption in Euros (SE275)

FA= Fixed assets in Euros (SE441).

Efficiency was calculated with SFA and DEA with one single output (TO) and four inputs (TL, UAA, IC, FA). All variables in value were deflated by each country's consumer price indices. Data source is the FADN database from 1990 to the latest available year (2006) in case of "old" Member States and 2004–2006 for "new" Member States. Inconsistent data and outliers were removed from the initial datasets. Annex 1 contains the quantile distribution of the sample farms' area. Taking a closer look on the data a quite clear concentration process can be seen in all countries and in most of the quintiles. This process was even stronger in the dairy sector. Detailed descriptive statistics of the variables employed are presented in the annexes 2 and 3. To assess sample farm size changes between the start period (1990 except Hungary, Estonia and Sweden) and the end period (2006), tables 2., 3., and 4. compare the respective means of farms per country, along with the Gini coefficient, measuring the concentration index. Farm size is measured in Utilised Agricultural Area (UAA) for both field crop and dairy farms. In addition, size of dairy farms is also assessed using livestock numbers.

Table 2. Descriptive statistics and concentration index of field crop farms (UAA)

	Field Crop		Utilised Agricultural Area	
	start period		end period	
	mean	Gini coefficient	mean	Gini coefficient
Belgium	54.00	0.2975	73.87	0.3159
Estonia	230.11	0.4754	240.27	0.4824
France	80.89	0.3436	135.88	0.3323
Germany	47.11	0.3501	252.02	0.6358
Hungary	255.45	0.6671	240.05	0.6360
Italy	19.61	0.5081	50.96	0.6503
Netherlands	62.34	0.3220	82.81	0.3684
Sweden	83.61	0.2939	120.19	0.4515

Source: authors' calculations

Table 3. Descriptive statistics and concentration index of dairy farms (UAA)

	Dairy		Utilised Agricultural Area	
	start period		end period	
	mean	Gini coefficient	mean	Gini coefficient
Belgium	33.97	0.2739	50.95	0.2651
Estonia	204.22	0.5538	211.89	0.5603
France	46.86	0.2616	81.43	0.2786
Germany	38.72	0.2609	113.90	0.5716
Hungary	239.25	0.6981	270.66	0.7247
Italy	20.45	0.5126	43.66	0.5349
Netherlands	32.92	0.2927	51.55	0.3041
Sweden	40.62	0.2728	84.06	0.4076

Source: authors' calculations

Table 4. Descriptive statistics and concentration index of dairy farms (livestock units)

	Milk		Livestock unit	
	Starting period		End period	
	mean	Gini coefficient	mean	Gini coefficient
Belgium	83.59	0.2818	95.94	0.2510
Estonia	84.53	0.5913	97.42	0.5976
France	60.55	0.2546	90.32	0.2940
Germany	64.44	0.2740	136.58	0.4993
Hungary	234.69	0.6755	222.83	0.6867
Italy	35.54	0.4623	100.11	0.5491
Netherlands	106.99	0.2967	127.80	0.3216
Sweden	43.86	0.2795	80.22	0.4274

Source: authors' calculations

Tables 2 and 3 show an obvious concentration process happened in all analysed countries during the period. With the exception of Hungary, sample means of farm size for all countries do increase regardless of the sector or farm size measurement used. In some countries, average sample mean increased dramatically (e.g. field crop farm size in Germany increased fivefold¹, Italian field crop and dairy farm sizes trebled, Swedish, French field crop farm sizes doubled). In both tables the second column for both the starting and end period presents the Gini concentration index. The coefficient measures the inequality of a distribution, its value ranging between 0 (total equality) and 1 (maximum inequality). Generally the concentration index also increases between the start and end periods, but by far not as dramatically as farm size means. In Belgium, despite the increasing sample size mean of dairy farms, the concentration index actually decreased. The highest sample size means and concentration indices are reported for the New Member States, Hungary and Estonia. With the exception of these two countries however, interestingly, a higher sample size mean does not translate into a higher concentration index.

IV. Results

IV.1 Technical efficiency analysis

Annex 4 presents the estimated TE scores per country, sector and their respective descriptive statistics. Figure 1 presents the TE scores for field crop farms computed with SFA and DEA methods respectively. Figure 2 shows technical efficiency scores for dairy farms computed with SFA and DEA respectively. DEA estimates are generally lower than SFA estimates. Despite the differences between TE scores estimated with SFA and DEA, the relative position of countries is mostly the same. Notable exceptions are Italian dairy farms, which are located in the top of SFA estimations (figure 2 left) whilst being the lowest ranking when DEA was applied (figure 2 right). Results are plausible, when mean technical efficiency scores are computed they are largely in line with results obtained by previous studies. Some examples confirm this. Zhu and Oude Lansink (2010) employ the longest time-span in their research (see table 1), and focus on several of the countries represented in this deliverable, this paper may be used as a benchmark to assess our results. For German crop farms, average TE score obtained was 0.64, versus 0.48 (DEA) and 0.78 (SFA) computed in this study. Brümmer et al. (2002) report an average TE score of 0.95 for specialised German (Schleswig-Holstein) dairy farms, against 0.84 obtained in this paper, also using parametric methods. For the Netherlands, Zhu and Oude Lansink (2010) report a mean TE score of 0.76, versus 0.90 (SFA) or 0.62 (DEA) in this research. For Dutch dairy farms, Brümmer et al. (2002) present an average TE score of 0.89, we have obtained 0.88 (SFA). Swedish crop farms average TE score was estimated to be 0.71, estimations using same method within this deliverable report 0.77. For French dairy sector, average TE score obtained with DEA in this research was 0.60, Fogarasi and Latruffe (2009) computed 0.76 on a shorter time-span. Barnes et al. (2010) obtained an average TE score of 0.76 using SFA, comparable with 0.74 estimated in this paper with the same method.

¹ Mostly due to the German re-unification process, by incorporating large scale former DDR holdings into the sample.

Figure 1. Technical efficiency scores for field crop farms (SFA/DEA)

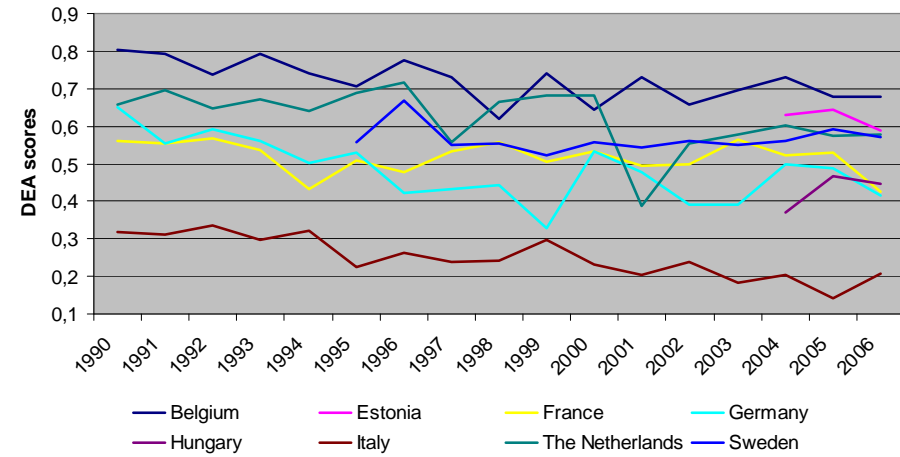
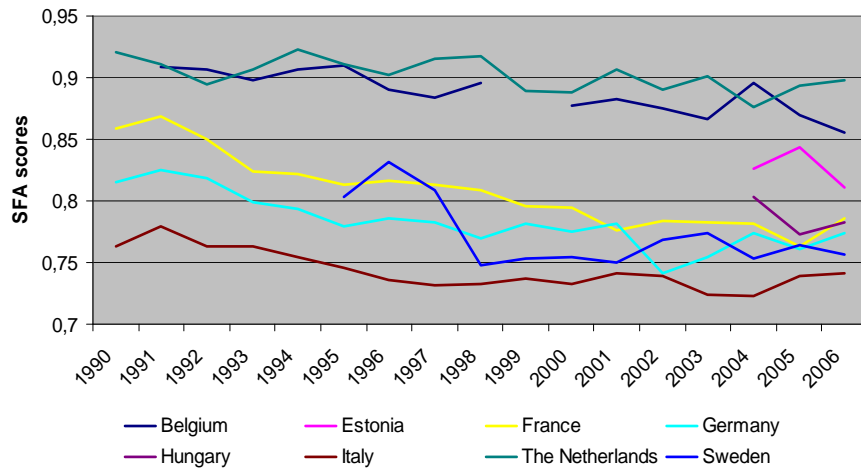
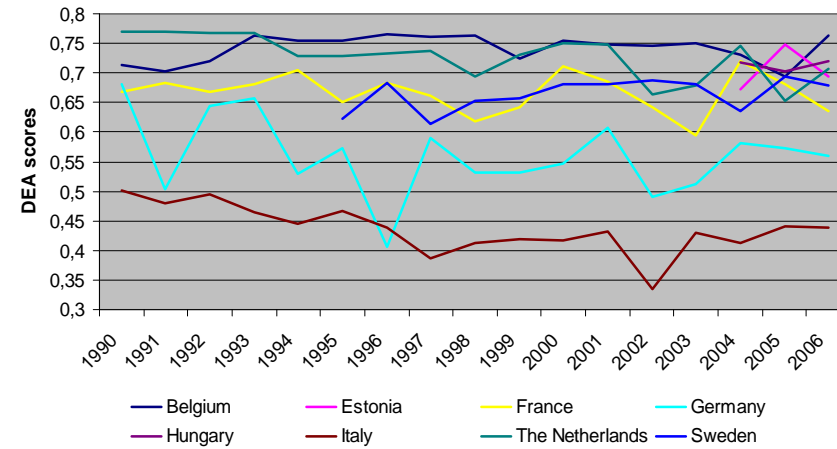
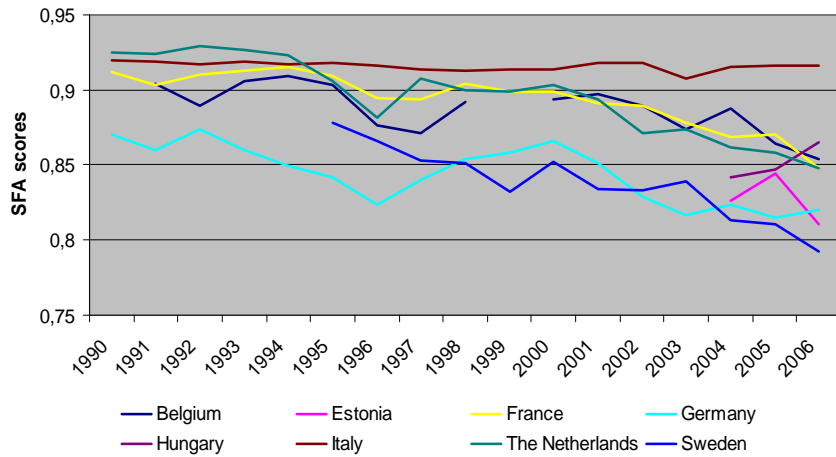


Figure 2. Technical efficiency scores for dairy farms (SFA/DEA)



IV.2. OLS on time trend

With simple visual inspection of the efficiency estimation figures, it is difficult to determine whether on long run average per country efficiency scores increase or decrease. We have therefore analysed this issue econometrically by regressing with OLS the TE scores for each sector and each country (for all years pooled together) on a single explanatory variable: the time trend. Table 5 presents the estimated coefficients of per country regressions of efficiency scores on an intercept and time trend as explanatory variable.

Table 5. OLS regression of efficiency scores on a time trend; coefficients' value and significance for the time trend in each country's and TF's regression

	DEA		SFA	
	Field Crop	Dairy	Field Crop	Dairy
Belgium	-0.009***	0.001	-0.003***	-0.002***
France	-0.005	-0.002	-0.007***	-0.004***
Germany	-0.020**	-0.005	-0.005***	-0.003***
Italy	-0.038***	-0.011**	-0.003***	-0.001**
Netherlands	-0.014**	-0.007***	-0.002***	-0.005*
Sweden	-0.001	0.005*	-0.005**	-0.007***

Note: ***, **, * significant on 1, 5 and 10% respectively.

Source: authors' calculations

Significant coefficients are small and negative across regressions, suggesting a decreasing average technical efficiency score for each country and sector included in the analysis. For France, when the dependent variable was computed with DEA, the time trend variable is not significant for either field crop or dairy farms. With SFA, all time trend coefficients are significantly negative in the six countries and the two sectors included in the regression. The regressions were not performed for New Member States since their sample covers only 3 years.

IV.3. Stability Analysis

Following the technique outlined in the methodology section, figures 3 to 10 present the results of the stability analysis for Belgium, Estonia, France, Germany, Hungary, Italy, The Netherlands and Sweden respectively. For each country, left hand graphs depict field crop, whilst right hand side graphs represent dairy farms. Simple visual inspection suggests a surprising stability of results across countries and sectors. Table 6 presents the mean values of the percentage of farms in consecutive years that remain in the same tercile, along those increasing or decreasing their respective terciles.

Table 6. Stability analysis results: percentage of farms in the same tercile during two consecutive years (averages for each country and sector)

	Field Crop			Dairy		
	increase	remain	decrease	increase	remain	decrease
Belgium	0.20	0.61	0.19	0.16	0.66	0.17
Estonia	0.26	0.46	0.28	0.28	0.46	0.26
France	0.19	0.61	0.20	0.20	0.59	0.20

Germany	0.20	0.61	0.19	0.21	0.59	0.20
Hungary	0.26	0.48	0.26	0.26	0.44	0.29
Italy	0.20	0.59	0.21	0.20	0.58	0.22
Netherlands	0.20	0.58	0.21	0.17	0.65	0.18
Sweden	0.18	0.65	0.17	0.21	0.58	0.21

Source: authors' calculations

Results are surprisingly stable: about 60% of all farms remain in the same tercile two consecutive years, whilst about 15-20% of farms decrease and increase their performance moving down or up a tercile. Results obtained in this section are in line with those of Barnes et al. (2010) for crop and dairy farming in England, Scotland, Wales and Northern Ireland.

On average, 15% (Estonia) to 24% (Germany) of field crop farms remained in the top tercile each year, 13% (Estonia and Hungary) to 17% (Belgium, Germany) in the middle tercile and 17% (Estonia, Hungary) to 22% (France) in the lower tercile (table 7). It is probably more interesting the percentage of farms that changed their terciles over the year. An average of 10% (France, Germany) to 15% (Estonia, Hungary) improved their performance by shifting into a higher (2 to 1 or 3 to 1) tercile, whilst almost the same, on average 10% (France) to 16% (Hungary) fell from the top or middle tercile to the lowest.

Table 7. Average change in technical efficiencies for field crop farms depending on their tercile movement

	Belgium	Estonia	France	Germany	Hungary	Italy	Netherlands	Sweden
Farms remaining each year								
tercile 1	0.224	0.150	0.222	0.243	0.173	0.211	0.226	0.226
tercile 2	0.174	0.133	0.164	0.169	0.134	0.160	0.155	0.181
tercile 3	0.208	0.173	0.222	0.202	0.171	0.215	0.201	0.240
Farms increasing each year								
tercile 2-1	0.081	0.093	0.082	0.083	0.100	0.089	0.084	0.078
tercile 3-1	0.030	0.058	0.022	0.025	0.057	0.031	0.026	0.017
tercile 3-2	0.091	0.115	0.089	0.084	0.103	0.083	0.094	0.083
Farms decreasing each year								
tercile 1-2	0.076	0.102	0.086	0.088	0.103	0.091	0.087	0.082
tercile 1-3	0.035	0.053	0.023	0.022	0.060	0.031	0.030	0.013
tercile 2-3	0.082	0.124	0.089	0.084	0.099	0.089	0.097	0.081

Source: authors' calculations

For dairy farm analysis (table 8), an average of 9% (France) to 24% (Belgium) remained in the top, 6% (France) to 18% (Belgium) in the middle and 10% (France) to 24% (Belgium) in the lower tercile over one year period. As for field crop farms, it is more of an interest to comment the percentage of farms improving or worsening their positions over the period. On average 9% (Belgium) to 19% (Estonia, Hungary) improved their technical efficiency scores by moving up one or two terciles, whilst a similar number, 9% (Belgium) to 19% (Hungary) fell from the middle or highest tercile to the lowest. It is interesting to note, that for both field crop and dairy farms, New Member States (Estonia and Hungary) register the highest average percentage of farms either dramatically increasing or decreasing their terciles, suggesting a highly unstable yearly performance. These countries also register the lowest percentages of farms that are stable in the same tercile during the year.

Figure 3 . Tercile stability analysis for Belgian field crop and dairy farms

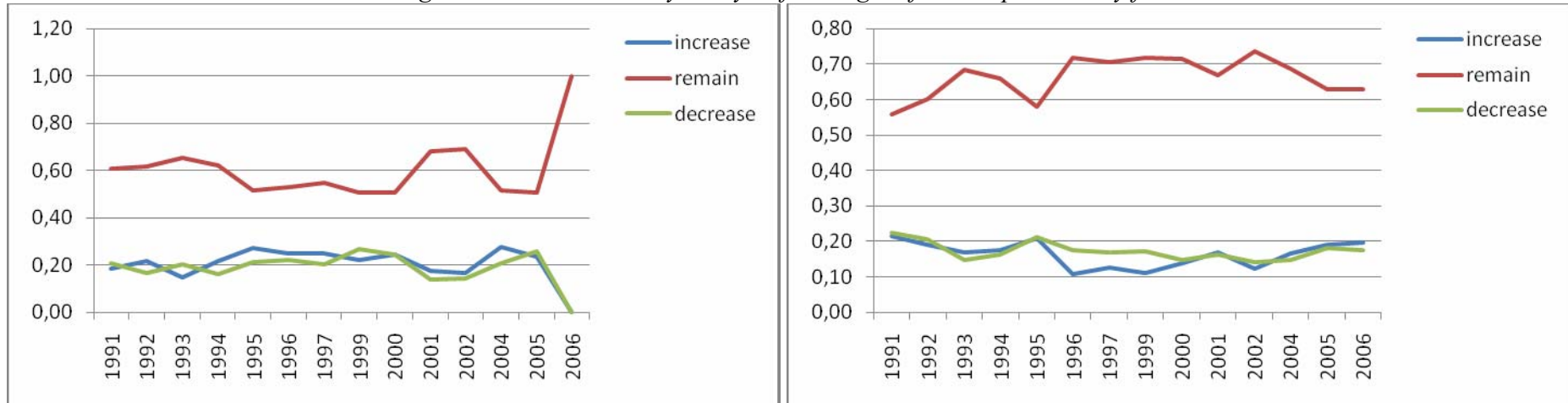


Figure 4 . Tercile stability analysis for Estonian field crop and dairy farms

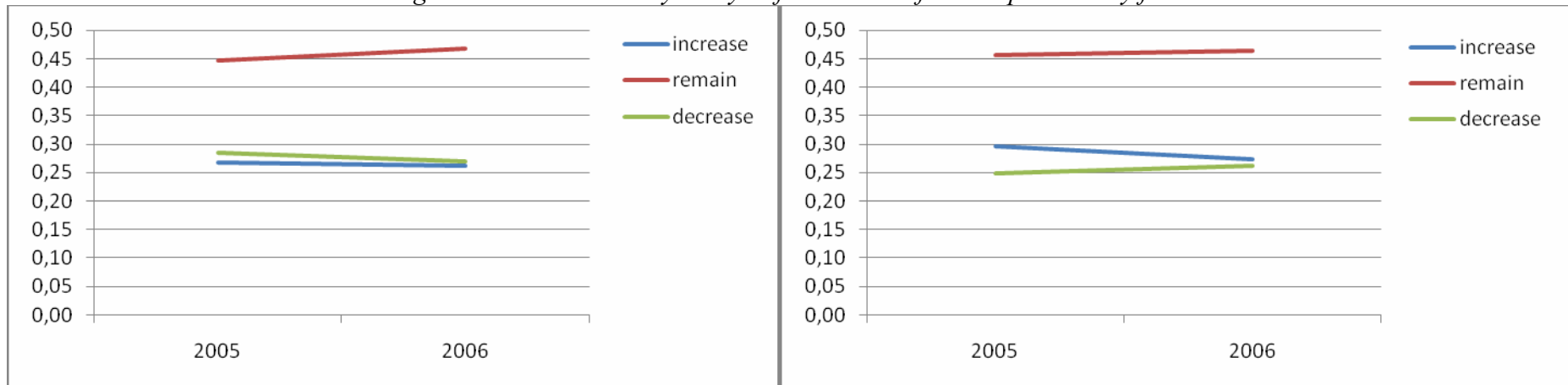


Figure 5. Tercile stability analysis for French field crop and dairy farms

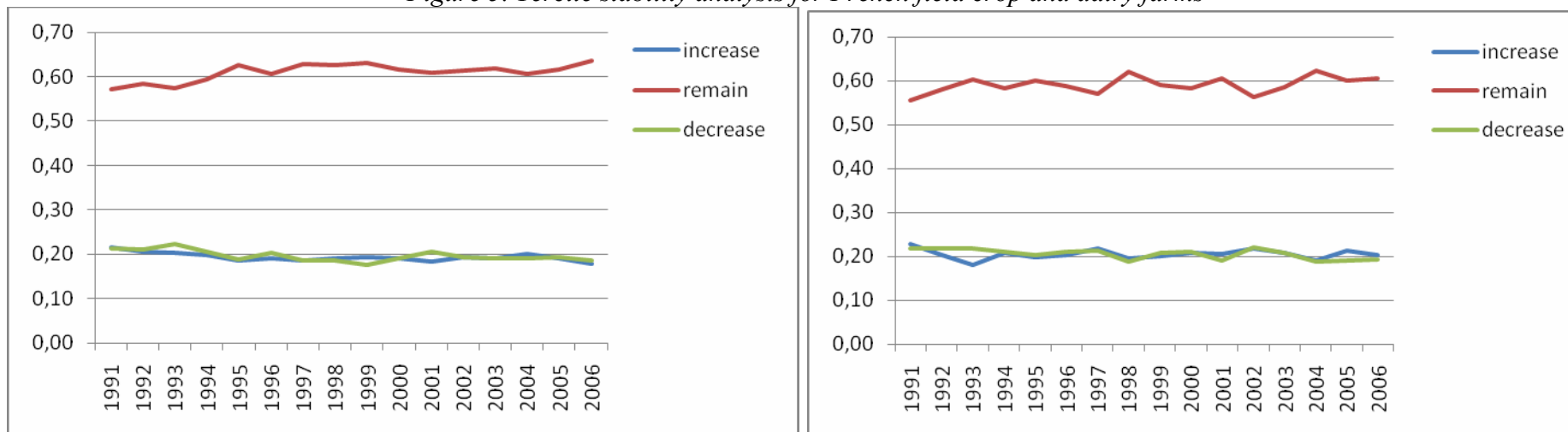


Figure 6. Tercile stability analysis for German field crop and dairy farms

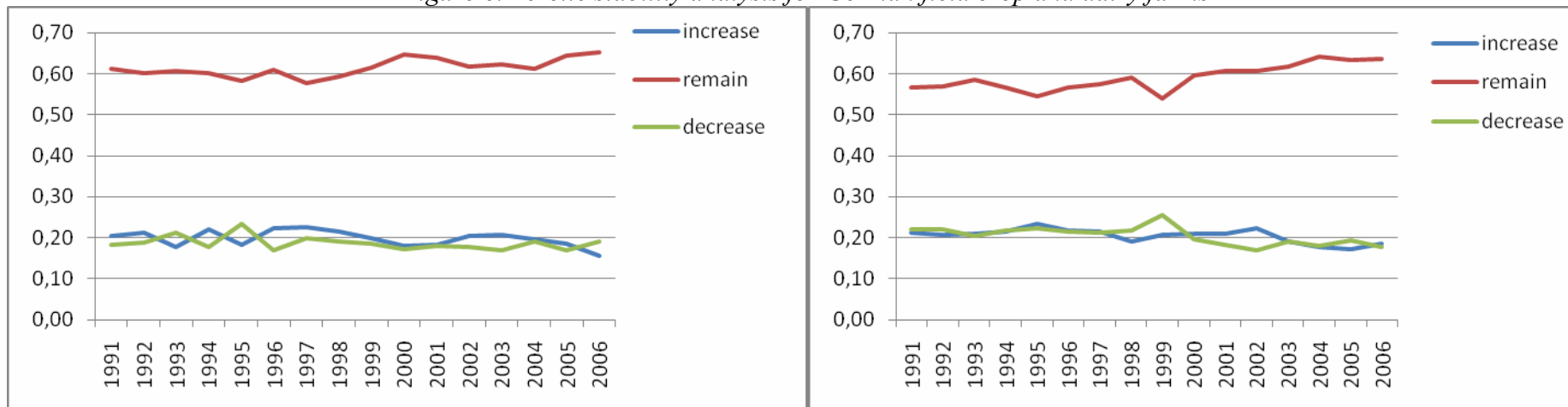


Figure 7. Tercile stability analysis for Hungarian field crop and dairy farms

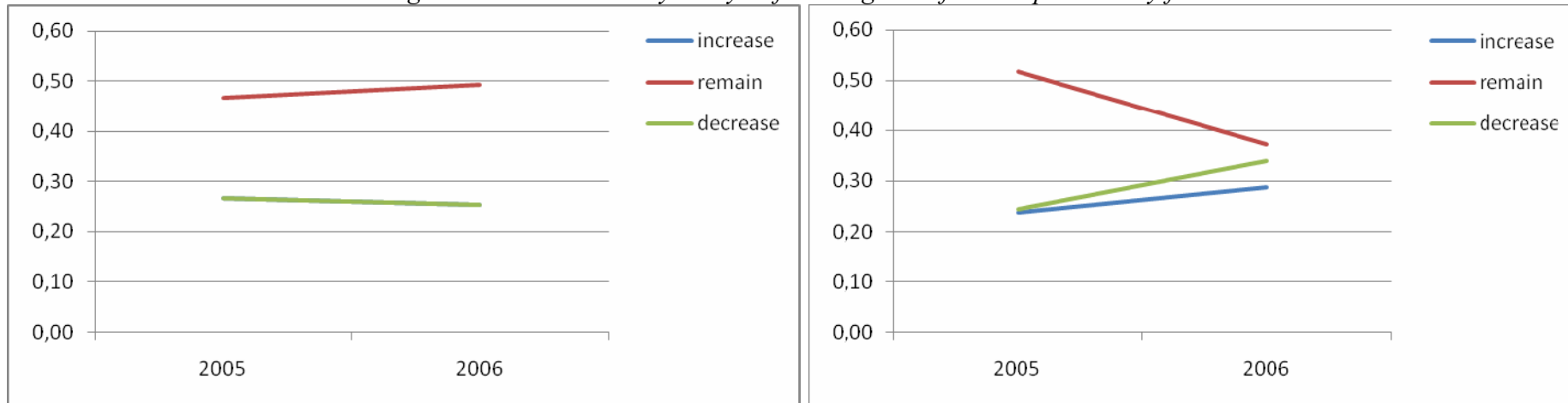


Figure 8. Tercile stability analysis for Italian field crop and dairy farms

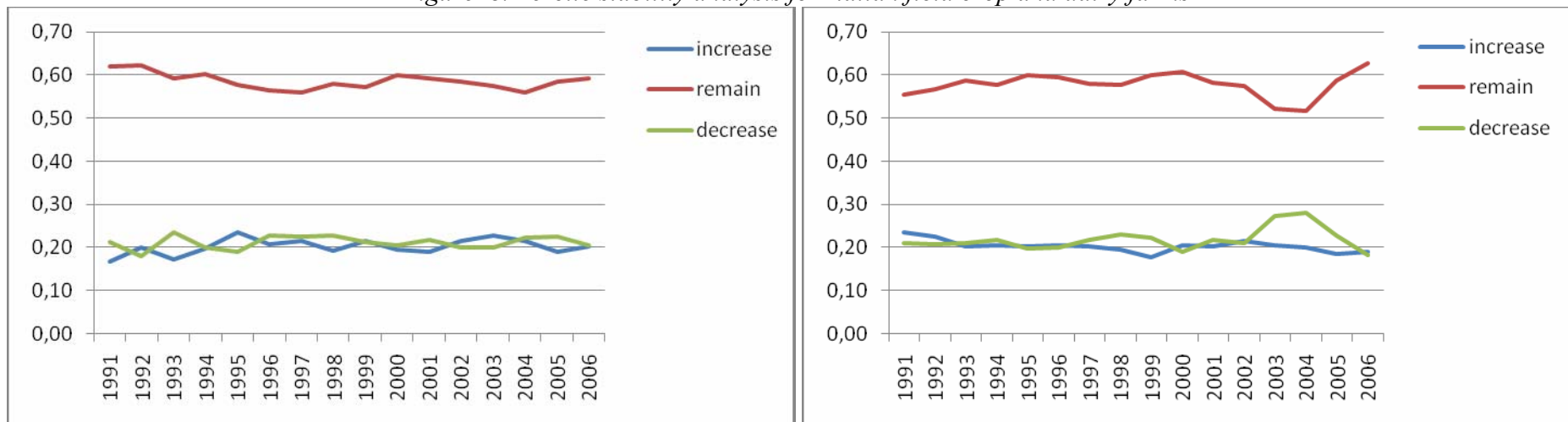


Figure 9. Tercile stability analysis for Dutch field crop and dairy farms

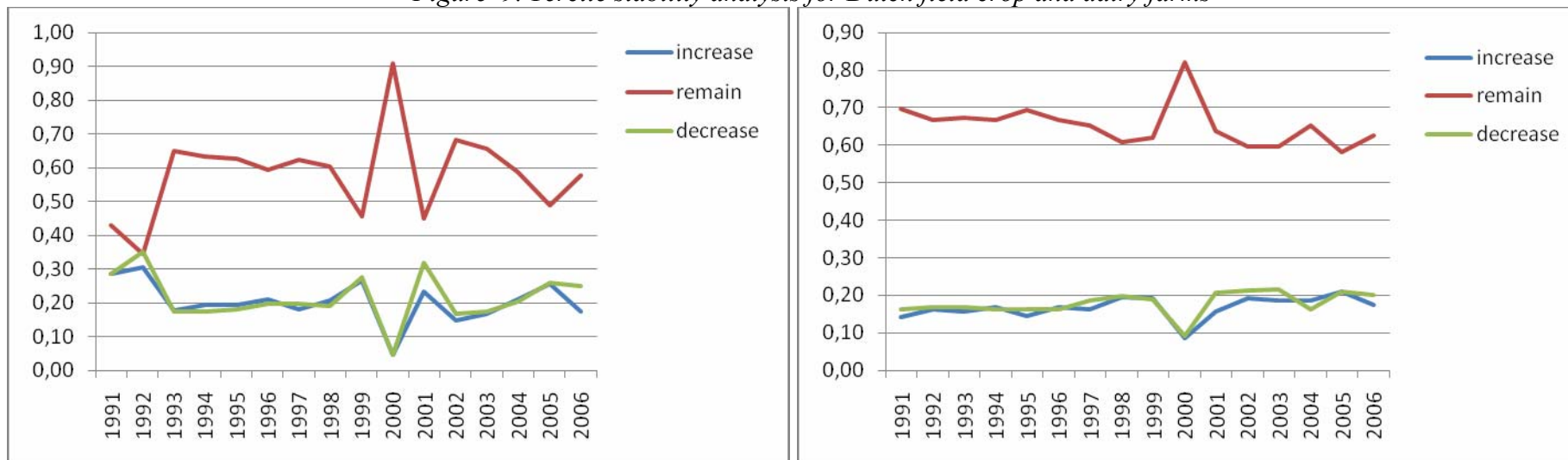


Figure 10. Tercile stability analysis for Swedish field crop and dairy farms

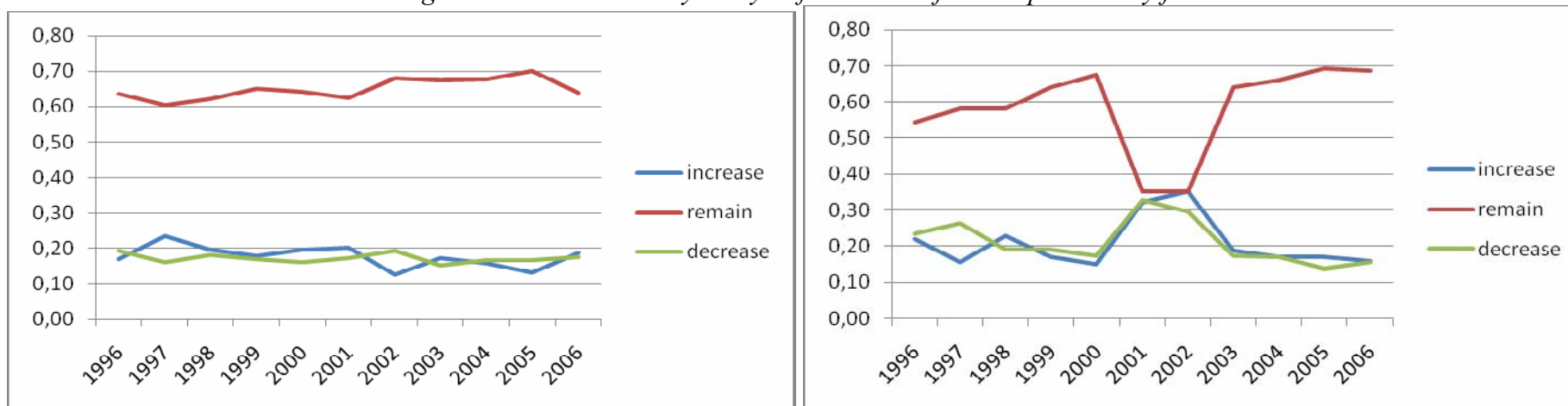


Table 8. Average change in technical efficiencies for dairy farms depending on their tercile movement

	BE	EST	FR	GER	HU	IT	NL	SW
Farms remaining each year								
tercile 1	0.244	0.161	0.090	0.205	0.140	0.221	0.239	0.213
tercile 2	0.179	0.127	0.060	0.159	0.104	0.157	0.178	0.160
tercile 3	0.240	0.172	0.105	0.225	0.201	0.200	0.236	0.209
Farms increasing each year								
tercile 2-1	0.072	0.109	0.086	0.086	0.140	0.096	0.074	0.079
tercile 3-1	0.015	0.071	0.027	0.025	0.050	0.028	0.015	0.030
tercile 3-2	0.077	0.105	0.094	0.090	0.073	0.084	0.078	0.096
Farms decreasing each year								
tercile 1-2	0.077	0.090	0.086	0.092	0.161	0.095	0.081	0.082
tercile 1-3	0.012	0.060	0.026	0.027	0.029	0.033	0.015	0.032
tercile 2-3	0.085	0.105	0.092	0.092	0.102	0.086	0.084	0.099

Source: authors' calculations

The mean of yearly mobility indexes, M1 and M2 (see equations 14 and 15), for the Old Member States are presented in table 9. For both indices a higher value indicates greater mobility, whilst a value close to zero indicates perfect immobility.

Table 9. Means of M1 and M2 mobility indices for field crop and dairy farms

	Field Crop		Dairy	
	M1	M2	M1	M2
Belgium	0.59	0.82	0.50	0.79
Estonia	0.81	0.99	0.81	0.98
France	0.59	0.86	0.61	0.89
Germany	0.58	0.85	0.62	0.89
Hungary	0.78	0.97	0.83	0.97
Italy	0.62	0.88	0.63	0.89
Netherlands	0.63	0.86	0.52	0.80
Sweden	0.52	0.81	0.63	0.87

Source: authors' calculations

Index means are remarkably similar across countries in this research. It is important to notice, that the M2 index ranks countries in the same way as M1 does, implying consistency of results. M1 ranges from 0.52 to 0.63 (0.50 to 0.63) for field crop (dairy) farms, and M2 from 0.81 to 0.88 (0.79 to 0.89) for field crop (dairy) farms indicating a similar degree of mobility for the Old Member States represented here. M1 and M2 indices are significantly higher for New Member States (Estonia and Hungary). M2 reaches 0.97 and 0.99 for both sectors in Hungary and Estonia, suggesting higher mobility of SFA scores throughout the entire distribution. For field crop farming, the lowest mobility scores are recorded for Sweden, whilst for dairy farms in Belgium and Netherlands.

IV.4. Total Factor Productivity Analysis

Detailed results computed with non-parametric methods of Total Factor Productivity Change, and its driving components, Technical Change (TC), Technical Efficiency Change (TEC), Scale Efficiency Change (SEC) and Allocative Efficiency Change (AEC) are available upon request. To get a picture about the volatility of indicators, tables 10 and 11 present the coefficient of variation for TFPC and its components for the field crop and dairy farms.

Table 10. Coefficient of variation for Total Factor Productivity Changes and its components for field crop farms

	TFPC	TC	TEC	SEC	AEC
Belgium	0.593	0.236	0.152	0.093	0.132
France	0.054	0.130	0.104	0.084	0.294
Germany	0.053	0.181	0.216	0.154	0.454
Italy	0.044	0.267	0.260	0.226	0.180
Netherlands	0.150	0.376	0.196	0.086	0.298
Sweden	0.228	0.102	0.125	0.083	0.174
Pooled	0.228	0.102	0.125	0.083	0.174

Source: authors' calculations

Table 11. Coefficient of variation for Total Factor Productivity Changes and its components for dairy farms

	TFPC	TC	TEC	SEC	AEC
Belgium	0.044	0.064	0.046	0.034	0.149
France	0.026	0.068	0.056	0.037	0.478
Germany	0.043	0.181	0.175	0.122	0.221
Italy	0.025	0.078	0.080	0.045	0.141
Netherlands	0.126	0.079	0.063	0.042	0.583
Sweden	0.077	0.051	0.083	0.064	0.131
Pooled	0.093	0.101	0.094	0.064	0.361

Source: authors' calculations

There is no obvious common trend. The highest volatility is recorded for Belgium field crop farms' TFPC, lowest for French dairy farms' TFPC. Field crop farm indicators generally present a significantly higher volatility than dairy farms. Notable exception is the AEC variable that (a) has much higher volatility in the case of dairy farms, (b) has the highest volatility of all indicators within dairy farms.

As indicated in the methodology section, panel unit root tests may provide information about whether TFPC and its components have the tendency to converge, or contrary, to diverge between countries. Table 12 and 13 present the panel unit root analysis results for field crop and dairy farms respectively.

Table 12. Panel unit root analysis for field crop farms

Exogenous variables: Individual effects					
Levin, Lin & Chu t	TFPC	TC	TEC	SEC	AEC
Im, Pesaran and Shin	1.00	0.00	0.00	0.00	0.00
W-stat					
ADF - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00
PP - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00	0.00
Exogenous variables: Individual effects, individual linear trends					
Levin, Lin & Chu t	1.00	0.00	0.00	0.00	0.00
Im, Pesaran and Shin	0.00	0.00	0.00	0.00	0.00
W-stat					
ADF - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00
PP - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00

Source: authors' calculations

Table 13. Panel unit root analysis for dairy farms

Exogenous variables: Individual effects					
	TFPC	TC	TEC	SEC	AEC
Levin, Lin & Chu t	0.00	0.00	0.00	0.00	0.00
Im, Pesaran and Shin	0.00	0.00	0.00	0.00	0.00
W-stat					
ADF - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00
PP - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00
Exogenous variables: Individual effects, individual linear trends					
Levin, Lin & Chu t	0.00	0.00	0.00	0.00	0.00
Im, Pesaran and Shin	0.00	0.00	0.00	0.00	0.00
W-stat					
ADF - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00
PP - Fisher Chi-square	0.00	0.00	0.00	0.00	0.00

Source: authors' calculations

All unit root tests applied here have non-stationarity (i.e. unit root) as their null hypothesis. With the exception of the Levin, Lin & Chu t-test for TFPC variable for field crop farms, the panel unit root hypothesis is strongly rejected by all tests for all variables, concluding stationary processes. It follows, that country estimates of TFPC and its components do not diverge over time.

To evaluate more formally the possible factors influencing TFPC we apply panel model estimations for Old EU Member States. We need to exclude Estonia and Hungary from the sample due to short time span. We regress TFPC on its components: TC, TEC, SEC, AEC (model 1). In addition, we employ two other

variables: time trend (model 2), and a reform dummy which equal to one in 1992 and 2000, otherwise zero (model 3). We applied both random and fixed effects models, but the Hausman test always favours the fixed effect models at 5 per cent.

Our results are not really straightforward for field crop farms (table 14). Except for technical change, all other variables are insignificant. In line with our a priori expectations, technical change positively influences the total productivity changes. Interestingly, the CAP reform dummy variable is not significant.

Table 14. Panel estimations for total productivity changes for field crop farms

	(1)	(2)	(3)
TC	0.509**	0.626***	0.657***
TEC	0.203	0.518	0.643
SEC	0.260	0.002	-0.130
AEC	-0.112	-0.073	-0.077
Time	-	0.007	-
CAP Reform	-	-	-0.007
Constant	0.103	-0.186	-0.137
N	90	90	90
R ²	0.0735	0.0785	0.0681
Hausman test (p value)	0.000	0.000	0.000

Sources: own calculations

Estimations show promising results for the milk farms (Table 15). Technical change, technical efficiency change and allocative efficiency change have positive impact on the total productivity change. Similarly to crop farms, additional variables as time trend and CAP reform are insignificant.

Table 15. Panel estimations for total productivity changes for milk farms

	(1)	(2)	(3)
TC	0.678***	0.683***	0.648***
TEC	0.984***	0.967***	0.950***
SEC	-0.269	-0.246	-0.271
AEC	0.044***	0.043***	0.039**
Time	-	0.001	-
CAP Reform	-	-	0.022
constant	-0.489*	-0.509*	-0.420
N	90	90	90
R ²	0.0508	0.0522	
Hausman test (p value)	0.0927	0.0063	0.0049

Sources: own calculations

V. Conclusions

In this paper we present and analyse various efficiency indicators for countries included in an FP7 (FACEPA) project, Belgium, Estonia, France, Germany, Hungary, Italy, The Netherlands and Sweden. The availability of long period datasets between 1990 and 2006, allows us to concentrate on the long time trends in technical efficiency especially in Old Member States. This study is the first which may provide a comprehensive overview on the development in farm level efficiency across eight European countries. We apply both DEA and SFA methodological approaches to measure efficiency, focusing on the field crops and dairy sectors. Our main results are following. Generally, all countries have relatively high levels of mean efficiency ranging from 0.72 to 0.92 for both field crops and dairy farms. Interestingly majority of countries have better performance in dairy sectors in terms of higher levels of mean efficiency than in field crop production. This suggests that larger heterogeneity in terms of agricultural practices apply in crop farming than in dairy farming. This is contrary to the intuition that livestock farming, which requires more human input than crop farming, would present a larger heterogeneity of human practices (this assumption was for example put forward by Curtiss 2000). However, an explanation may be that crop farming is more affected by land quality and climate conditions than livestock farming. Latruffe et al. (2009) have for example provided evidence of the role of climate conditions on farms' technical efficiency. Input quality is not taken into account within our analysis, as it is impossible to find equivalent proxy across all countries. Therefore, lower efficiency in field crop sector than in dairy sector may in fact be due to different land quality, which may affect farms' performance more than labour quality for example. A slightly decreasing trend of efficiency may be observed for all countries. Technical Efficiency estimates are largely in line with those obtained by previous studies.

We investigate the issue of how relative performance of farms fluctuates in terms of technical efficiency over time. We may hypothesise that many poorly performed farms remaining inefficient and some farmers are performing always very efficiently. We can identify farms which are usually at the bottom or top of the efficiency ranking. However, the FADN data has an inherent problem for long time period analysis arising from its rotated panel nature, namely that not all the farms are observed for the whole period. So we need to calculate transition matrices in each consecutive year. Surprisingly stability analysis revealed that in average 60% of farms maintain their efficiency ranking in two consecutive years, whilst 20% improve and 20% worsen their positions for all countries. However, these ratios slightly fluctuate around these values for one year to next year. Mobility analysis ranks countries according to the mobility of SFA scores within the distribution. Farms in New Member States are more mobile than those in EU15. This may be due to the unstable economic conditions of farms in these countries, where e.g. inputs access is not always secured or is costly.

The DEA estimation shows a similar declining trend on the development of technical efficiency over time except Swedish dairy sector increasing efficiency trend. We investigate the total productivity changes in two steps. First, we do not

find a definite trend in total factor productivity changes. Second, we address the question whether total factor productivity changes converge or diverge over time. Using panel unit root tests our estimations reveals a convergence of productivity across old EU member countries during analysed period. Panel unit root tests also reject the divergent technical change, technical efficiency change, scale efficiency change and allocative efficiency change null hypothesis across countries.

Finally, we decompose the total factor productivity changes into its main elements. Total Factor Productivity Change analysis, is first done graphically, showing rather different behaviour of TFPC and its components across countries and sectors. Indicators are represented by high volatility, a trend analysis does not however produce conclusive results except for Italy. In addition, field crop farm indicators generally present a significantly higher volatility than dairy farms. Random effect panel regression of Total Factor Productivity Change on its components shows Technological Change as being the significant positive driver for crop farms, whilst technical efficiency change followed by technological change are the most important for dairy farms. In addition we do not find significant impacts on CAP reform in 1992 and 2000 on total productivity changes.

This deliverable has highlighted the usefulness of FADN data in conducting a comparative analysis of farms' performance across EU Member States. The FADN database enables to use homogenous variables and indicators across countries and over time. A few shortcomings of the database can also be underlined. Firstly, the rotating nature of the panel makes it difficult to perform a long term investigation. The samples' changes imply that balanced panels over several years are too small to produce robust results. Therefore, we had to resort to balanced panels over two consecutive years only, limiting the possibility to follow the performance of the same farms over a long period and assess truly the effect of shocks such as CAP reforms. Secondly, the FADN database is too poor in terms of input prices. Regarding rentals, the variable includes both rentals for land and rentals for other assets (buildings, livestock), and therefore land price is difficult to assess. As for variable inputs, the absence of prices in the FADN database forces to use yearly price indices that are similar for all farms in each country, which reduces the information available in the calculations.

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Annex 1

Quintile distribution of sample farms according to area in hectares				
Quintiles	Crop farms (TF 1)		Dairy farms (TF 41)	
	Mean		Mean	
	Start of the period	End of the period	Start of the period	End of the period
BELGIUM				
Q1	1.899	3.744	1.069	0.000
Q2	13.667	22.842	37.092	33.901
Q3	23.944	40.060	70.630	73.382
Q4	37.691	59.971	109.312	125.362
Q5	66.505	106.533	261.660	315.325
ESTONIA				
Q1	25.843	27.179	0.000	0.000
Q2	64.823	67.462	5.878	5.456
Q3	113.643	118.739	18.311	18.814
Q4	206.577	217.458	41.585	46.273
Q5	613.707	708.010	262.883	330.392
FRANCE				
Q1	11.406	11.795	0.000	0.000
Q2	29.383	42.563	7.581	-
Q3	44.282	73.860	31.580	35.892
Q4	65.494	114.953	56.888	87.519
Q5	125.835	211.322	145.942	253.414
GERMANY				
Q1	10.428	9.935	1.287	0.000
Q2	23.457	34.784	25.671	21.674
Q3	32.965	58.442	46.320	59.221
Q4	44.875	96.461	68.903	121.962
Q5	74.178	604.002	134.795	448.259
HUNGARY				
Q1	22.478	24.320	10.668	12.810
Q2	56.547	59.738	29.418	35.153
Q3	101.165	105.905	69.776	62.133
Q4	188.587	198.948	221.116	175.177
Q5	911.343	815.989	842.472	847.454
ITALY				
Q1	2.376	2.273	0	0
Q2	5.553	6.522	-	-
Q3	9.074	13.281	2.785	-
Q4	15.295	27.954	10.640	11.450
Q5	50.263	122.099	52.827	188.44
THE NETHERLANDS				
Q1	1.166	1.179	0.000	0.000
Q2	8.101	5.876	-	-
Q3	19.906	19.490	33.844	45.546
Q4	35.269	41.034	101.211	135.334
Q5	74.570	98.826	312.098	687.946
SWEDEN				
Q1	19.675	22.634	0.183	0.629
Q2	33.703	47.414	15.995	24.556
Q3	45.010	70.443	32.743	48.595
Q4	60.592	105.279	49.634	87.945
Q5	112.837	245.062	97.629	261.339

Source: FADN database

Annex 2

Descriptive statistics of variables used – first and last years of sample

Crop farms (TF 1)

Countries	First year of sample				Last year of sample			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
BELGIUM								
Total Output deflated (TO)	118,172	67,802	20,894	337,157	114,646	95,258	14,477	527,785
Utilised Agricultural Area (UAA)	54.00	29.39	5.18	169.37	73.87	42.29	17.35	223.96
Total Labour (TL)	1.47	0.64	0.46	4.96	1.40	0.59	0.40	3.91
Intermediate consumption deflated (IC)	53,664	30,294	8,570	170,436	55,047	43,568	7,653	229,866
Fixed Assets deflated (FA)	205,672	156,483	19,107	745,961	314,747	288,662	2,268	1,605,155
Land price deflated (PL)	155	40	65	300	180	89	45	494
Labour price deflated (PL)	11,422	3,327	2,942	25,681	16,199	2,953	5,899	31,578
Intermediate consumption price index (PIC)	100	0	100	100	112	0	112	112
Capital price index (PC)	100	0	100	100	157	0	157	157
ESTONIA								
Total Output deflated (TO)	69,556	71,093	4,329	369,571	68,604	75,946	2,238	419,243
Utilised Agricultural Area (UAA)	230.11	213.95	9.10	984.95	240.27	235.24	8.20	1,247.55
Total Labour (TL)	2.40	1.89	0.27	12.66	2.37	1.90	0.55	12.54
Intermediate consumption deflated (IC)	52,106	53,263	3,775	250,006	56,194	63,625	2,008	342,887
Fixed Assets deflated (FA)	159,346	190,892	188	1,204,610	156,800	167,492	1,061	879,786
Land price deflated (PL)	8	22	0	271	9	9	0	67
Labour price deflated (PL)	3,173	1,348	714	7,645	3,498	1,290	996	8,181
Intermediate consumption price index (PIC)	100	0	100	100	109	0	109	109
Capital price index (PC)	100	0	100	100	106	0	106	106
FRANCE								
Total Output deflated (TO)	109,611	76,576	8,667	765,489	114,639	95,250	2,064	1,235,507
Utilised Agricultural Area (UAA)	80.89	53.77	1.40	435.00	135.88	84.87	2.17	705.63
Total Labour (TL)	1.52	0.82	0.76	12.55	1.84	1.35	0.76	21.81
Intermediate consumption deflated (IC)	53,410	35,812	5,518	345,301	73,920	51,121	3,707	484,101
Fixed Assets deflated (FA)	136,700	106,646	432	1,538,609	150,089	134,145	19	1,449,649
Land price deflated (PL)	110	68	0	1,104	107	96	0	2,942

Labour price deflated (PL)	14,346	5,713	1,058	53,540	14,154	5,159	569	96,520
Intermediate consumption price index (PIC)	100	0	100	100	124	0	124	124
Capital price index (PC)	100	0	100	100	135	0	135	135
GERMANY								
Total Output deflated (TO)	91,084.40	67,661.11	11,366.00	475,584.00	229,618.10	429,410.25	3,327.00	6,610,749.00
Utilised Agricultural Area (UAA)	47.11	32.04	3.53	267.59	252.02	470.17	3.37	5,196.70
Total Labour (TL)	1.49	0.70	0.17	6.52	3.37	6.33	1.00	95.50
Intermediate consumption deflated (IC)	50,295.05	36,500.36	7,750.00	239,026.00	155,091.19	297,504.53	7,289.00	4,416,859.00
Fixed Assets deflated (FA)	300,327.56	282,800.77	2,239.00	3,094,287.00	690,661.40	719,602.79	368.00	9,250,715.00
Land price deflated (PL)	254.40	155.14	14.22	1,898.87	205.58	406.67	1.46	14,274.86
Labour price deflated (PL)	12,221.86	5,923.79	1,699.33	47,793.15	14,067.40	6,374.18	2,071.15	47,380.12
Intermediate consumption price index (PIC)	100.00	0.00	100.00	100.00	127.10	0.00	127.10	127.10
Capital price index (PC)	100.00	0.00	100.00	100.00	131.30	0.00	131.30	131.30
HUNGARY								
Total Output deflated (TO)	189,179	454,328	2,198	5,426,983	141,741	276,075	492	2,217,689
Utilised Agricultural Area (UAA)	255.45	500.9	5.07	5,078.00	240.05	426.50	3.68	3,681.00
Total Labour (TL)	4.34	10.18	0.01	97.4	4.05	9	0.01	100.09
Intermediate consumption deflated (IC)	122,299	280,757	2,685	3,276,464	100,238	199,847	2,080	1,657,006
Fixed Assets deflated (FA)	232,577	406,143	397	5,692,597	203,281	299,100	225	2,973,876
Land price deflated (PL)	49	41	0	503	53	39	0	257
Labour price deflated (PL)	4,848	2,322	0	18,919	4,718	1,829	0	15,284
Intermediate consumption price index (PIC)	100	0	100	100	105	0	105	105
Capital price index (PC)	100	0	100	100	111	0	111	111
ITALY								
Total Output deflated (TO)	35,444	44,944	263	570,335	48,070	117,616	325	2,467,585
Utilised Agricultural Area (UAA)	19.61	24.48	0.24	378.00	50.96	101.26	0.50	1,846.87
Total Labour (TL)	1.66	1.00	0.04	11.58	1.74	2.60	0.06	45.76
Intermediate consumption deflated (IC)	13,992	18,733	417	211,490	23,549	62,006	244	1,225,770
Fixed Assets deflated (FA)	197,325	247,516	53	3,086,357	440,172	1,462,303	12	35,561,353
Land price deflated (PL)	216	163	0	3,942	163	138	0	3,078
Labour price deflated (PL)	12,063	1,932	2,634	25,032	10,255	1,883	1,206	26,348
Intermediate consumption price index (PIC)	100	0	100	100	140	0	140	140
Capital price index (PC)	100	0	100	100	168	0	168	168
THE NETHERLANDS								

Total Output deflated (TO)	182,102	122,456	22,930	639,138	238,599	202,012	10,989	1,124,646
Utilised Agricultural Area (UAA)	62.34	38.23	13.37	222.97	82.81	56.68	11.20	302.45
Total Labour (TL)	1.78	0.96	0.10	7.93	1.95	1.50	0.05	12.18
Intermediate consumption deflated (IC)	79,091	48,424	15,656	260,114	110,104	83,121	7,732	493,261
Fixed Assets deflated (FA)	598,801	542,053	8,452	3,443,725	1,330,608	1,079,767	30,458	5,728,201
Land price deflated (PL)	399	224	68	2,324	632	667	0	5,145
Labour price deflated (PL)	18,155	5,961	2,402	34,625	19,775	10,029	1,127	87,489
Intermediate consumption price index (PIC)	100	0	100	100	131	0	131	131
Capital price index (PC)	100	0	100	100	136	0	136	136
SWEDEN								
Total Output deflated (TO)	64,946	50,936	3,055	307,021	98,799	126,077	5,781	694,016
Utilised Agricultural Area (UAA)	83.61	46.55	14.00	275.60	120.19	124.52	16.97	890.50
Total Labour (TL)	1.01	0.52	0.09	2.51	1.16	0.89	0.11	5.53
Intermediate consumption deflated (IC)	43,485	27,375	5,547	213,335	73,111	83,018	8,322	523,867
Fixed Assets deflated (FA)	277,539	219,414	13,536	1,249,065	576,479	560,391	2,389	3,568,796
Land price deflated (PL)	133	128	12	1541	166	113	7	941
Labour price deflated (PL)	25,839	3,651	2,099	37,961	22,312	4,180	1,552	38,312
Intermediate consumption price index (PIC)	100	0	100	100	128	0	128	128
Capital price index (PC)	100	0	100	100	132	0	132	132

Source: authors' calculations

Annex 3

Descriptive statistics of variables used – first and last years of sample

Dairy farms (TF4 1)

Countries	First year of sample				Last year of sample			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
BELGIUM								
Total Output deflated (TO)	98,966	52,406	21,241	297,678	95,979	43,768	18,352	246,730
Utilised Agricultural Area (UAA)	33.97	17.61	6.20	107.16	50.95	25.66	10.38	158.46
Total Labour (TL)	1.66	0.47	0.80	3.78	1.62	0.52	1.00	3.98
Intermediate consumption deflated (IC)	45,953	27,422	10,025	146,875	49,269	24,011	7,047	142,025
Fixed Assets deflated (FA)	215,187	128,066	23,337	642,098	354,465	196,105	50,327	1,066,675
Land price deflated (PL)	127	51	32	306	157	96	26	590
Labour price deflated (PL)	11,649	2,230	3,074	23,594	16,645	2,702	6,304	37,132
Intermediate consumption price index (PIC)	100	0	100	100	112	0	112	112
Capital price index (PC)	100	0	100	100	157	0	157	157
ESTONIA								
Total Output deflated (TO)	105,273	182,927	9,368	1,455,085	124,488	203,379	6,868	1,353,182
Utilised Agricultural Area (UAA)	204.22	271.27	15.25	1,949.06	211.89	277.85	17.47	1,840.70
Total Labour (TL)	5.03	7.52	1.00	51.86	5.74	8.58	1.00	52.00
Intermediate consumption deflated (IC)	66,748	98,512	5,463	629,469	90,266	144,108	5,469	909,802
Fixed Assets deflated (FA)	169,473	366,737	9,051	2,873,491	215,198	363,710	1,164	2,955,239
Land price deflated (PL)	5	8	0	67	7	7	0	45
Labour price deflated (PL)	3,414	1,364	776	6,635	4,092	1,507	992	7,842
Intermediate consumption price index (PIC)	100	0	100	100	109	0	109	109
Capital price index (PC)	100	0	100	100	106	0	106	106
FRANCE								
Total Output deflated (TO)	79,205	42,959	3,397	313,545	93,200	54,619	7,647	407,519
Utilised Agricultural Area (UAA)	46.86	23.54	9.00	190.00	81.43	42.25	8.15	322.98
Total Labour (TL)	1.62	0.54	0.9	4.64	1.83	0.87	1.0	8.18
Intermediate consumption deflated (IC)	43,307	24,898	4,731	181,621	61,061	34,789	9,104	239,970
Fixed Assets deflated (FA)	129,114	67,838	8,647	716,539	182,706	110,699	19,955	821,970
Land price deflated (PL)	151	1,752	0	65,789	89	47	0	564

Labour price deflated (PL)	10,552	5,215	640	34,532	11,123	4,699	1,789	33,769
Intermediate consumption price index (PIC)	100	0	100	100	124	0	124	124
Capital price index (PC)	100	0	100	100	135	0	135	135
GERMANY								
Total Output deflated (TO)	86,592	44,248	7,440	297,251	187,568	395,986	9,769	5,113,708
Utilised Agricultural Area (UAA)	38.72	18.85	5.46	177.66	113.90	244.68	11.38	3,011.62
Total Labour (TL)	1.64	0.55	0.32	5.01	3.08	7.36	1.00	102.00
Intermediate consumption deflated (IC)	47,387	24,750	6,651	205,401	123,123	271,364	7,494	3,557,392
Fixed Assets deflated (FA)	268,619	146,617	23,783	1,374,886	523,228	490,516	10,730	5,230,291
Land price deflated (PL)	217	195	14	3 647	200	190	2	2 851
Labour price deflated (PL)	10,731	5,679	1,535	44,463	14,258	6,794	1,775	47,374
Intermediate consumption price index (PIC)	100	0	100	100	127	0	127	127
Capital price index (PC)	100	0	100	100	131	0	131	131
HUNGARY								
Total Output deflated (TO)	399,165	610,083	3,571	2,582,967	381,994	631,126	4,115	3,045,291
Utilised Agricultural Area (UAA)	239.25	402.78	0.00	2,138.49	270.66	515.61	0.00	3,059.36
Total Labour (TL)	11.34	17.51	0.10	76.30	11.34	19.74	0.32	112.17
Intermediate consumption deflated (IC)	331,305	521,984	3,197	2,028,763	280,582	494,461	2,442	2,151,636
Fixed Assets deflated (FA)	488,580	711,646	6,951	3,429,804	432,007	614,096	5,105	3,125,486
Land price deflated (PL)	59	97	0	684	306	2,309	0	21,081
Labour price deflated (PL)	4,777	1,944	2,282	9,100	4,794	1,802	2,649	10,628
Intermediate consumption price index (PIC)	100	0	100	100	105	0	105	105
Capital price index (PC)	100	0	100	100	111	0	111	111
ITALY								
Total Output deflated (TO)	77,154	87,420	1,970	1,018,518	139,789	189,013	4,627	1,659,249
Utilised Agricultural Area (UAA)	20.45	36.33	0.10	588.00	43.66	54.16	0.59	490.31
Total Labour (TL)	2.09	0.93	0.39	9.62	2.54	1.87	0.44	21.33
Intermediate consumption deflated (IC)	38,581.36	45,991	1,975	591,180	75,832	114,350	1,666	1,384,779
Fixed Assets deflated (FA)	235,991.37	217,445	5,924	2,332,024	462,126	687,046	5,628	7,711,387
Land price deflated (PL)	154.16	114	0	1,544	169	183	0	2,717
Labour price deflated (PL)	10,864	1,928	2,395	37,908	10,618	1,814	1,649	23,529
Intermediate consumption price index (PIC)	100	0	100	100	140	0	140	140
Capital price index (PC)	100	0	100	100	168	0	168	168
THE NETHERLANDS								

Total Output deflated (TO)	159,590	90,748	28,814	615,757	166,326	107,554	1,902	802,786
Utilised Agricultural Area (UAA)	32.92	17.98	4.93	132.50	51.55	30.04	6.21	221.04
Total Labour (TL)	1.69	0.57	0.60	4.11	1.72	0.65	0.66	4.54
Intermediate consumption deflated (IC)	74,418	43,438	10,706	293,802	90,430	53,675	11,090	427,527
Fixed Assets deflated (FA)	616,962	362,534	40,049	2,332,102	1,554,447	978,106	69,400	6,774,708
Land price deflated (PL)	364	690	14	15,105	525	604	15	6,570
Labour price deflated (PL)	18,009	6,403	2,611	66,046	19,465	8,989	1,400	90,505
Intermediate consumption price index (PIC)	100	0	100	100	131	0	131	131
Capital price index (PC)	100	0	100	100	136	0	136	136
SWEDEN								
Total Output deflated (TO)	70,759	39,469	3,875	257,642	131,843	129,835	12,274	797,823
Utilised Agricultural Area (UAA)	40.62	21.46	9.50	144.79	84.06	80.85	9.53	756.70
Total Labour (TL)	1.49	0.49	0.38	3.27	1.91	1.06	0.50	9.22
Intermediate consumption deflated (IC)	45,897	23,759	8,097	146,268	105,422	101,116	7,971	860,600
Fixed Assets deflated (FA)	231,170	133,405	12,862	786,807	362,104	377,782	38,610	3,459,396
Land price deflated (PL)	78	94	1	1,293	88	127	0	1,426
Labour price deflated (PL)	26,063	3,491	11,553	58,856	24,624	4,172	4,469	45,860
Intermediate consumption price index (PIC)	100	0	100	100	128	0	128	128
Capital price index (PC)	100	0	100	100	132	0	132	132

Source: authors' calculations

Annex 4

Yearly technical efficiency estimates								
Crop farms (TF 1)								
Years	SFA				DEA			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
BELGIUM								
1990	-	-	-	-	0.802	0.139	0.488	1.000
1991	0.909	0.025	0.805	0.948	0.793	0.122	0.491	1.000
1992	0.906	0.029	0.790	0.946	0.736	0.145	0.362	1.000
1993	0.898	0.047	0.627	0.953	0.791	0.147	0.456	1.000
1994	0.907	0.039	0.769	0.951	0.741	0.171	0.405	1.000
1995	0.910	0.038	0.742	0.963	0.707	0.174	0.179	1.000
1996	0.890	0.082	0.362	0.957	0.775	0.153	0.301	1.000
1997	0.884	0.073	0.508	0.948	0.731	0.167	0.307	1.000
1998	0.896	0.052	0.554	0.951	0.621	0.220	0.190	1.000
1999					0.741	0.160	0.245	1.000
2000	0.877	0.066	0.506	0.968	0.643	0.174	0.211	1.000
2001	0.883	0.068	0.468	0.964	0.732	0.177	0.202	1.000
2002	0.875	0.081	0.422	0.967	0.656	0.185	0.203	1.000
2003	0.866	0.079	0.446	0.967	0.697	0.170	0.240	1.000
2004	0.896	0.057	0.531	0.971	0.730	0.169	0.358	1.000
2005	0.870	0.064	0.587	0.971	0.679	0.159	0.368	1.000
2006	0.855	0.064	0.607	0.944	0.678	0.172	0.381	1.000
Whole period	0.887	0.061	0.362	0.971	0.720	0.173	0.179	1.000
ESTONIA								
2004	0.826	0.070	0.451	0.948	0.630	0.208	0.112	1.000
2005	0.844	0.051	0.686	0.931	0.642	0.199	0.128	1.000
2006	0.811	0.068	0.492	0.936	0.588	0.198	0.228	1.000
Whole period	0.826	0.064	0.450	0.947	0.620	0.203	0.112	1.000
FRANCE								
1990	0.859	0.059	0.441	0.955	0.562	0.154	0.127	1.000
1991	0.869	0.049	0.461	0.965	0.555	0.167	0.080	1.000
1992	0.850	0.064	0.389	0.957	0.568	0.155	0.095	1.000
1993	0.824	0.070	0.247	0.952	0.537	0.160	0.062	1.000
1994	0.822	0.073	0.210	0.956	0.431	0.145	0.034	1.000
1995	0.813	0.072	0.339	0.953	0.508	0.148	0.072	1.000
1996	0.816	0.066	0.404	0.957	0.479	0.152	0.083	1.000
1997	0.813	0.071	0.425	0.946	0.533	0.151	0.102	1.000
1998	0.809	0.067	0.382	0.951	0.558	0.144	0.143	1.000
1999	0.796	0.077	0.215	0.955	0.505	0.152	0.046	1.000
2000	0.795	0.073	0.337	0.927	0.534	0.144	0.106	1.000
2001	0.776	0.085	0.225	0.950	0.495	0.161	0.043	1.000
2002	0.784	0.076	0.312	0.948	0.500	0.143	0.105	1.000
2003	0.783	0.086	0.267	0.957	0.565	0.144	0.143	1.000
2004	0.781	0.081	0.304	0.959	0.524	0.151	0.071	1.000
2005	0.763	0.086	0.308	0.967	0.531	0.164	0.048	1.000
2006	0.786	0.086	0.149	0.965	0.424	0.141	0.023	1.000
Whole period	0.807	0.079	0.148	0.967	0.518	0.157	0.023	1.000
GERMANY								
1990	0.815	0.073	0.365	0.942	0.649	0.167	0.166	1.000
1991	0.825	0.072	0.416	0.951	0.554	0.162	0.133	1.000
1992	0.819	0.083	0.367	0.956	0.592	0.170	0.167	1.000
1993	0.799	0.093	0.106	0.949	0.559	0.175	0.034	1.000
1994	0.793	0.091	0.291	0.958	0.501	0.180	0.092	1.000
1995	0.779	0.094	0.160	0.934	0.530	0.156	0.068	1.000

1996	0.786	0.082	0.418	0.959	0.422	0.137	0.109	1.000
1997	0.783	0.095	0.071	0.958	0.433	0.148	0.010	1.000
1998	0.770	0.103	0.072	0.946	0.443	0.147	0.011	1.000
1999	0.781	0.091	0.333	0.968	0.327	0.146	0.062	1.000
2000	0.775	0.087	0.353	0.953	0.534	0.165	0.122	1.000
2001	0.781	0.089	0.221	0.941	0.476	0.145	0.092	1.000
2002	0.741	0.110	0.049	0.955	0.391	0.151	0.066	1.000
2003	0.754	0.112	0.073	0.967	0.392	0.178	0.008	1.000
2004	0.774	0.093	0.245	0.967	0.500	0.171	0.087	1.000
2005	0.761	0.089	0.315	0.946	0.488	0.163	0.105	1.000
2006	0.774	0.092	0.151	0.963	0.414	0.163	0.022	1.000
Whole period	0.779	0.094	0.048	0.968	0.472	0.177	0.008	1.000
HUNGARY								
2004	0.803	0.075	0.335	0.952	0.369	0.163	0.089	1.000
2005	0.773	0.082	0.152	0.937	0.466	0.169	0.022	1.000
2006	0.783	0.094	0.177	0.968	0.446	0.178	0.024	1.000
Whole period	0.786	0.084	0.151	0.968	0.425	0.175	0.022	1.000
ITALY								
1990	0.763	0.082	0.128	0.931	0.318	0.149	0.010	1.000
1991	0.779	0.064	0.467	0.930	0.312	0.148	0.056	1.000
1992	0.763	0.073	0.241	0.917	0.334	0.162	0.027	1.000
1993	0.763	0.075	0.216	0.939	0.298	0.160	0.024	1.000
1994	0.754	0.080	0.215	0.921	0.320	0.159	0.019	1.000
1995	0.746	0.088	0.178	0.938	0.225	0.160	0.008	1.000
1996	0.736	0.089	0.056	0.953	0.263	0.168	0.002	1.000
1997	0.732	0.090	0.108	0.927	0.239	0.153	0.003	1.000
1998	0.733	0.089	0.126	0.920	0.241	0.155	0.003	1.000
1999	0.737	0.089	0.226	0.926	0.296	0.166	0.024	1.000
2000	0.733	0.096	0.096	0.938	0.231	0.149	0.003	1.000
2001	0.741	0.090	0.164	0.943	0.203	0.110	0.012	1.000
2002	0.739	0.098	0.061	0.954	0.239	0.153	0.001	1.000
2003	0.724	0.105	0.154	0.941	0.183	0.138	0.007	1.000
2004	0.723	0.102	0.218	0.966	0.203	0.142	0.023	1.000
2005	0.739	0.100	0.145	0.969	0.142	0.134	0.003	1.000
2006	0.741	0.095	0.184	0.934	0.208	0.141	0.008	1.000
Whole period	0.744	0.089	0.055	0.968	0.255	0.160	0.001	1.000
THE NETHERLANDS								
1990	0.921	0.001	0.803	0.957	0.658	0.161	0.282	1.000
1991	0.911	0.001	0.744	0.950	0.696	0.165	0.344	1.000
1992	0.895	0.002	0.488	0.954	0.646	0.173	0.200	1.000
1993	0.906	0.002	0.749	0.953	0.673	0.170	0.335	1.000
1994	0.923	0.001	0.792	0.959	0.639	0.201	0.281	1.000
1995	0.911	0.002	0.660	0.961	0.688	0.180	0.224	1.000
1996	0.902	0.002	0.752	0.954	0.715	0.168	0.249	1.000
1997	0.915	0.001	0.815	0.960	0.558	0.189	0.212	1.000
1998	0.917	0.002	0.737	0.955	0.666	0.183	0.229	1.000
1999	0.889	0.003	0.561	0.953	0.683	0.190	0.179	1.000
2000	0.888	0.003	0.521	0.951	0.681	0.186	0.180	1.000
2001	0.906	0.003	0.623	0.969	0.387	0.179	0.105	1.000
2002	0.890	0.003	0.658	0.964	0.555	0.198	0.192	1.000
2003	0.901	0.003	0.560	0.957	0.579	0.207	0.229	1.000
2004	0.876	0.004	0.507	0.946	0.603	0.177	0.161	1.000
2005	0.893	0.003	0.726	0.949	0.574	0.166	0.236	1.000
2006	0.898	0.004	0.597	0.955	0.578	0.212	0.196	1.000
Whole period	0.904	0.039	0.488	1.000	0.630	0.196	0.105	1.000
SWEDEN								
1995	0.803	0.010	0.114	0.941	0.556	0.220	0.044	1.000

1996	0.831	0.008	0.342	0.942	0.669	0.206	0.164	1.000
1997	0.809	0.008	0.405	0.941	0.549	0.200	0.149	1.000
1998	0.748	0.012	0.152	0.938	0.553	0.221	0.095	1.000
1999	0.753	0.012	0.211	0.945	0.523	0.219	0.091	1.000
2000	0.754	0.010	0.087	0.931	0.556	0.224	0.037	1.000
2001	0.750	0.010	0.061	0.938	0.544	0.231	0.026	1.000
2002	0.769	0.009	0.178	0.936	0.562	0.216	0.072	1.000
2003	0.774	0.009	0.270	0.937	0.549	0.211	0.132	1.000
2004	0.753	0.009	0.158	0.929	0.561	0.205	0.075	1.000
2005	0.764	0.008	0.286	0.930	0.591	0.208	0.158	1.000
2006	0.757	0.009	0.204	0.928	0.572	0.214	0.096	1.000
Whole period	0.769	0.141	0.061	1.000	0.563	0.217	0.026	1.000
ALL COUNTRIES								
1990	0.788	0.081	0.107	0.948	0.384	0.173	0.009	1.000
1991	0.800	0.066	0.423	0.947	0.366	0.177	0.055	1.000
1992	0.784	0.077	0.216	0.936	0.393	0.175	0.026	1.000
1993	0.778	0.079	0.133	0.952	0.361	0.179	0.024	1.000
1994	0.772	0.083	0.189	0.938	0.351	0.156	0.019	1.000
1995	0.762	0.089	0.154	0.953	0.308	0.181	0.008	1.000
1996	0.757	0.087	0.044	0.965	0.324	0.166	0.002	1.000
1997	0.753	0.092	0.089	0.944	0.312	0.169	0.003	1.000
1998	0.749	0.093	0.088	0.940	0.298	0.145	0.008	1.000
1999	0.749	0.092	0.200	0.944	0.283	0.144	0.021	1.000
2000	0.746	0.095	0.078	0.955	0.298	0.166	0.003	1.000
2001	0.749	0.094	0.130	0.957	0.206	0.099	0.012	1.000
2002	0.744	0.098	0.047	0.966	0.280	0.150	0.001	1.000
2003	0.738	0.104	0.096	0.955	0.242	0.143	0.007	1.000
2004	0.738	0.096	0.197	0.975	0.207	0.108	0.023	1.000
2005	0.737	0.096	0.124	0.978	0.172	0.118	0.003	1.000
2006	0.745	0.096	0.152	0.951	0.223	0.133	0.008	1.000
Whole period	0.757	0.091	0.044	0.977	0.293	0.166	0.001	1.000

Source: authors' calculations

Annex 5

Yearly technical efficiency estimates								
Dairy farms (TF 41)								
Years	SFA				DEA			
	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max
BELGIUM								
1990	-	-	-	-	0.714	0.136	0.336	1.000
1991	0.904	0.044	0.638	0.964	0.703	0.145	0.226	1.000
1992	0.889	0.062	0.352	0.966	0.720	0.139	0.367	1.000
1993	0.906	0.048	0.601	0.971	0.763	0.143	0.395	1.000
1994	0.909	0.049	0.660	0.965	0.755	0.130	0.314	1.000
1995	0.903	0.050	0.464	0.961	0.754	0.148	0.019	1.000
1996	0.876	0.088	0.029	0.958	0.766	0.135	0.434	1.000
1997	0.871	0.066	0.584	0.954	0.760	0.138	0.298	1.000
1998	0.892	0.063	0.534	0.963	0.764	0.137	0.422	1.000
1999					0.724	0.139	0.316	1.000
2000	0.894	0.064	0.514	0.967	0.755	0.144	0.337	1.000
2001	0.897	0.061	0.530	0.962	0.749	0.161	0.289	1.000
2002	0.889	0.079	0.368	0.964	0.746	0.154	0.295	1.000
2003	0.874	0.085	0.424	0.965	0.751	0.140	0.325	1.000
2004	0.888	0.062	0.515	0.965	0.730	0.147	0.264	1.000
2005	0.864	0.080	0.321	0.963	0.695	0.156	0.233	1.000
2006	0.854	0.074	0.410	0.973	0.763	0.139	0.394	1.000
Whole period	0.884	0.073	0.029	0.973	0.742	0.145	0.019	1.000

ESTONIA								
2004	0.826	0.070	0.451	0.948	0.672	0.152	0.326	1.000
2005	0.844	0.051	0.686	0.931	0.747	0.148	0.335	1.000
2006	0.811	0.068	0.492	0.936	0.693	0.161	0.291	1.000
Whole period	0.915	0.040	0.646	0.971	0.704	0.157	0.291	1.000
FRANCE								
1990	0.912	0.053	0.220	0.975	0.667	0.120	0.142	1.000
1991	0.903	0.058	0.233	0.975	0.683	0.124	0.144	1.000
1992	0.910	0.063	0.258	0.979	0.667	0.131	0.147	1.000
1993	0.913	0.055	0.340	0.978	0.680	0.131	0.176	1.000
1994	0.915	0.049	0.462	0.980	0.705	0.118	0.299	1.000
1995	0.909	0.054	0.217	0.975	0.651	0.116	0.121	1.000
1996	0.895	0.065	0.260	0.972	0.684	0.121	0.166	1.000
1997	0.894	0.064	0.375	0.975	0.661	0.118	0.205	1.000
1998	0.904	0.055	0.431	0.977	0.618	0.120	0.235	1.000
1999	0.899	0.063	0.284	0.974	0.643	0.125	0.156	1.000
2000	0.899	0.068	0.112	0.971	0.711	0.126	0.075	1.000
2001	0.891	0.064	0.405	0.975	0.686	0.123	0.252	1.000
2002	0.889	0.074	0.030	0.976	0.643	0.126	0.016	1.000
2003	0.878	0.072	0.247	0.970	0.595	0.140	0.143	1.000
2004	0.869	0.083	0.381	0.974	0.719	0.132	0.260	1.000
2005	0.870	0.081	0.210	0.970	0.681	0.133	0.146	1.000
2006	0.848	0.096	0.276	0.974	0.635	0.131	0.162	1.000
Whole period	0.895	0.067	0.030	0.980	0.667	0.129	0.016	1.000
GERMANY								
1990	0.870	0.060	0.336	0.962	0.682	0.127	0.130	1.000
1991	0.860	0.063	0.356	0.977	0.503	0.142	0.100	1.000
1992	0.874	0.055	0.532	0.970	0.644	0.126	0.234	1.000
1993	0.860	0.064	0.463	0.966	0.657	0.131	0.205	1.000
1994	0.850	0.068	0.354	0.981	0.529	0.130	0.129	1.000
1995	0.842	0.073	0.399	0.965	0.573	0.121	0.173	1.000
1996	0.824	0.068	0.493	0.979	0.407	0.127	0.141	1.000
1997	0.840	0.069	0.398	0.967	0.591	0.131	0.189	1.000
1998	0.854	0.073	0.152	0.975	0.532	0.135	0.082	1.000
1999	0.858	0.067	0.334	0.976	0.532	0.143	0.089	1.000
2000	0.866	0.060	0.471	0.974	0.547	0.132	0.191	1.000
2001	0.851	0.071	0.375	0.963	0.607	0.129	0.156	1.000
2002	0.829	0.079	0.340	0.974	0.491	0.134	0.105	1.000
2003	0.817	0.081	0.402	0.980	0.512	0.155	0.122	1.000
2004	0.824	0.079	0.279	0.965	0.581	0.124	0.109	1.000
2005	0.815	0.072	0.345	0.972	0.572	0.146	0.114	1.000
2006	0.820	0.078	0.312	0.965	0.560	0.132	0.121	1.000
Whole period	0.843	0.072	0.152	0.981	0.558	0.148	0.082	1.000
HUNGARY								
2004	0.842	0.065	0.544	0.940	0.717	0.189	0.230	1.000
2005	0.847	0.062	0.566	0.944	0.703	0.185	0.248	1.000
2006	0.865	0.042	0.723	0.953	0.720	0.189	0.362	1.000
Whole period	0.851	0.057	0.544	0.953	0.714	0.187	0.230	1.000
ITALY								
1990	0.920	0.029	0.144	0.962	0.502	0.150	0.026	1.000
1991	0.919	0.021	0.683	0.967	0.480	0.170	0.094	1.000
1992	0.917	0.023	0.666	0.965	0.494	0.167	0.144	1.000
1993	0.919	0.024	0.462	0.966	0.464	0.157	0.085	1.000
1994	0.917	0.038	0.092	0.963	0.444	0.164	0.015	1.000
1995	0.918	0.030	0.067	0.961	0.466	0.155	0.013	1.000
1996	0.916	0.027	0.513	0.967	0.439	0.175	0.105	1.000
1997	0.914	0.029	0.477	0.966	0.387	0.169	0.078	1.000
1998	0.913	0.028	0.530	0.966	0.412	0.166	0.084	1.000

1999	0.914	0.028	0.568	0.963	0.419	0.161	0.088	1.000
2000	0.914	0.028	0.476	0.961	0.416	0.148	0.091	1.000
2001	0.918	0.024	0.658	0.962	0.432	0.159	0.145	1.000
2002	0.918	0.023	0.555	0.975	0.334	0.145	0.051	1.000
2003	0.908	0.038	0.359	0.967	0.429	0.181	0.058	1.000
2004	0.915	0.026	0.669	0.972	0.413	0.175	0.111	1.000
2005	0.916	0.025	0.688	0.963	0.440	0.172	0.114	1.000
2006	0.916	0.027	0.713	0.969	0.438	0.201	0.090	1.000
Whole period	0.916	0.027	0.067	0.974	0.438	0.169	0.013	1.000
THE NETHERLANDS								
1990	0.925	0.002	0.632	0.966	0.770	0.119	0.388	1.000
1991	0.924	0.001	0.698	0.966	0.770	0.116	0.392	1.000
1992	0.929	0.001	0.722	0.970	0.767	0.110	0.399	1.000
1993	0.927	0.001	0.731	0.971	0.767	0.114	0.419	1.000
1994	0.923	0.002	0.768	0.970	0.729	0.114	0.424	1.000
1995	0.906	0.002	0.686	0.970	0.728	0.122	0.386	1.000
1996	0.882	0.003	0.496	0.957	0.733	0.121	0.332	1.000
1997	0.908	0.002	0.345	0.968	0.738	0.126	0.208	1.000
1998	0.900	0.003	0.560	0.975	0.695	0.134	0.309	1.000
1999	0.899	0.003	0.539	0.967	0.731	0.132	0.350	1.000
2000	0.903	0.003	0.585	0.968	0.751	0.126	0.359	1.000
2001	0.894	0.003	0.565	0.970	0.749	0.131	0.346	1.000
2002	0.871	0.004	0.566	0.972	0.663	0.139	0.372	1.000
2003	0.874	0.004	0.452	0.969	0.678	0.127	0.309	1.000
2004	0.862	0.004	0.510	0.965	0.745	0.125	0.460	1.000
2005	0.858	0.005	0.219	0.967	0.652	0.145	0.224	1.000
2006	0.848	0.005	0.078	0.959	0.708	0.143	0.081	1.000
Whole period	0.899	0.060	0.078	1.000	0.732	0.130	0.081	1.000
SWEDEN								
1995	0.878	0.006	0.193	0.975	0.623	0.169	0.092	1.000
1996	0.866	0.006	0.285	0.977	0.683	0.177	0.188	1.000
1997	0.853	0.006	0.137	0.971	0.613	0.158	0.094	1.000
1998	0.851	0.006	0.285	0.963	0.653	0.150	0.179	1.000
1999	0.832	0.007	0.198	0.960	0.658	0.168	0.127	1.000
2000	0.852	0.006	0.270	0.956	0.682	0.166	0.162	1.000
2001	0.834	0.006	0.315	0.963	0.681	0.165	0.162	1.000
2002	0.833	0.006	0.180	0.954	0.687	0.169	0.117	1.000
2003	0.839	0.005	0.294	0.957	0.682	0.154	0.180	1.000
2004	0.813	0.006	0.342	0.961	0.635	0.164	0.212	1.000
2005	0.811	0.006	0.259	0.947	0.693	0.157	0.192	1.000
2006	0.792	0.006	0.495	0.947	0.679	0.149	0.360	1.000
Whole period	0.837	0.113	0.137	1.000	0.665	0.164	0.092	1.000