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Productivity and efficiency in Czech agriculture: Does farm size matter?

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Electronic supplementary material

Supplementary Tables S1–S4
Supplementary Figure S1

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Table S1. Descriptive statistics of samples

	yC (EUR)	*yAOC* (EUR)	*yAOO* (EUR)	*xL* (ha)	*xW* (AWU)	*xK* (EUR)	*xM* (EUR)
Cereals							
Mean	285 947	310 450	519 335	885	22	171 382	874 276
SD	344 137	367 507	758 453	860	26	202 700	1 042 406
Min.	1 316	29	9	7	1	385	4 237
Max.	2 835 793	2 764 805	5 940 594	4 641	156	1 397 347	6 986 736
Milk							
Mean	616 477	220 562	915 375	1 164	37	246 762	1 386 139
SD	500 654	257 980	919 111	859	29	225 343	1 195 591
Min.	3 381	465	1 229	11	1	162	6 046
Max.	3 302 821	2 869 419	6 725 201	4 558	156	1 397 347	6 986 736
Beef							
Mean	138 786	333 923	392 303	703	20	123 654	698 674
SD	145 668	388 567	485 709	675	21	143 084	769 662
Min.	1 060	22	1 229	11	1	162	6 046
Max.	900 430	1 797 123	2 252 942	2 921	87	732 300	3 549 412

yC – main output (cereals, milk, beef, respectively); *yAOC* – output of other crops in cereals production and other livestock in milk production; *yAOO* – other farm output; *xL* – land; *xW* – labour; *xK* – capital; *xM* – materials; AWU – annual working unit

Source: FADN (2021)

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Table S2. Input distance function (IDF) estimates – Cereals

ln_*xM*	Coefficient	SE	*P* > |*t*|
ln_*yC*	–0.375	0.045	0.000
ln_*yAOC*	–0.260	0.038	0.000
ln_*yAOO*	–0.293	0.025	0.000
ln_*xL*	0.161	0.097	0.096
ln_*xW*	0.154	0.061	0.012
ln_*xK*	0.122	0.033	0.000
ln_*yC*_2	–0.244	0.079	0.002
ln_*yAOC*_2	–0.084	0.038	0.028
ln_*yAOO*_2	–0.059	0.012	0.000
ln_*yCyAOC*	0.116	0.041	0.005
ln_*yCyAOO*	0.075	0.021	0.001
ln_*yAOCyAOO*	0.003	0.025	0.892
ln_*xL*_2	–0.558	0.296	0.060
ln_*xW*_2	0.091	0.195	0.641
ln_*xK*_2	0.102	0.123	0.406
ln_*xLxW*	0.025	0.183	0.892
ln_*xLxK*	0.119	0.141	0.396
ln_*xWxK*	–0.095	0.096	0.325
t	0.017	0.006	0.002
*t*_2	–0.051	0.007	0.000
ln_*yCt*	–0.009	0.014	0.524
ln_*yAOCt*	0.009	0.014	0.529
ln_*yAOOt*	0.003	0.005	0.561
ln_*xLt*	0.027	0.026	0.313
ln_*xWt*	–0.020	0.011	0.063
ln_*xKt*	–0.004	0.010	0.662
ln_*yCxL*	0.098	0.119	0.411
ln_*yAOCxL*	–0.126	0.117	0.283
ln_*yAOOxL*	0.056	0.057	0.325
ln_*yCxW*	–0.063	0.114	0.580
ln_*yAOCxW*	0.034	0.101	0.737
ln_*yAOOxW*	–0.029	0.043	0.506
ln_*yCxK*	–0.016	0.075	0.827
ln_*yAOCxK*	–0.040	0.049	0.413
ln_*yAOOxK*	0.070	0.045	0.121
D farm contractor	0.148	0.089	0.099
Constant	0.010	0.092	0.910
F-test	710.31	*F*[36, 437]	*P*-value: 0.000
AR(2)	–0.01	–	*P*-value: 0.993
Hansen test	153.76	χ^2[135]	*P*-value: 0.129
Significance of technological change	9.62	*F*[8, 437]	*P*-value: 0.000
Log-likelihood test: sigma_η = 0 for PTE	0.50	–	*P*-value: 0.300
Number of instruments		172	
Number of groups		438	

yC – main output (cereals, milk, beef, respectively); *yAOC* – output of other crops in cereals production and other livestock in milk production; *yAOO* – other farm output; *xL* – land; *xW* – labour; *xK* – capital; *xM* – materials; *t* – time trend; PTE – persistent technical efficiency

Source: Authors' own calculation based on FADN (2021)

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Table S3. Input distance function (IDF) estimates – Milk

ln_*xM*	Coefficient	SE	*P* > |*t*|
ln_*yC*	–0.282	0.025	0.000
ln_*yAOC*	–0.154	0.016	0.000
ln_*yAOO*	–0.513	0.021	0.000
ln_*xL*	0.113	0.052	0.032
ln_*xW*	0.141	0.037	0.000
ln_*xK*	0.093	0.034	0.006
ln_*yC*_2	–0.127	0.095	0.185
ln_*yAOC*_2	–0.074	0.038	0.052
ln_*yAOO*_2	–0.047	0.043	0.276
ln_*yCyAOC*	0.123	0.048	0.011
ln_*yCyAOO*	0.010	0.062	0.876
ln_*yAOCyAOO*	–0.001	0.036	0.987
ln_*xL*_2	–0.459	0.287	0.111
ln_*xW*_2	0.003	0.141	0.983
ln_*xK*_2	0.013	0.041	0.759
ln_*xLxW*	0.165	0.221	0.457
ln_*xLxK*	0.116	0.115	0.316
ln_*xWxK*	–0.080	0.080	0.317
t	0.035	0.004	0.000
*t*_2	–0.052	0.007	0.000
ln_*yCt*	–0.016	0.008	0.043
ln_*yAOCt*	0.007	0.006	0.268
ln_*yAOOt*	0.012	0.006	0.050
ln_*xLt*	0.006	0.014	0.667
ln_*xWt*	0.003	0.010	0.783
ln_*xKt*	0.005	0.010	0.627
ln_*yCxL*	–0.028	0.143	0.847
ln_*yAOCxL*	–0.027	0.089	0.763
ln_*yAOOxL*	–0.010	0.084	0.905
ln_*yCxW*	–0.155	0.075	0.041
ln_*yAOCxW*	0.065	0.067	0.337
ln_*yAOOxW*	0.090	0.072	0.208
ln_*yCxK*	0.089	0.061	0.145
ln_*yAOCxK*	–0.023	0.047	0.622
ln_*yAOOxK*	–0.043	0.035	0.215
D LFA	–0.223	0.041	0.000
D 2016	0.037	0.007	0.000
Constant	0.256	0.039	0.000
F-test	1 242.00	*F*[37, 272]	*P*-value: 0.000
AR(2)	0.45	–	*P*-value: 0.653
Hansen test	204.37	χ^2[203]	*P*-value: 0.460
Significance of technological change	13.02	*F*[8, 272]	*P*-value: 0.000
Log–likelihood test: sigma_η = 0 for PTE	–0.001	–	*P*-value: 1.000
Number of instruments		241	
Number of groups		273	

yC – main output (cereals, milk, beef, respectively); *yAOC* – output of other crops in cereals production and other livestock in milk production; *yAOO* – other farm output; *xL* – land; *xW* – labour; *xK* – capital; *xM* – materials; *t* – time trend; *D* – dummy variable; LFA – less-favoured area; PTE – persistent technical efficiency

Source: Authors' own calculation based on FADN (2021)

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Table S4. Input distance function (IDF) estimates – Beef

ln_*xM*	Coefficient	SE	*P* > |*t*|
ln_*yC*	–0.375	0.063	0.000
ln_*yAOC*	–0.131	0.038	0.001
ln_*yAOO*	–0.393	0.051	0.000
ln_*xL*	0.139	0.077	0.076
ln_*xW*	0.232	0.057	0.000
ln_*xK*	0.088	0.048	0.071
ln_*yC*_2	–0.192	0.090	0.035
ln_*yAOC*_2	–0.035	0.010	0.001
ln_*yAOO*_2	–0.143	0.111	0.202
ln_*yCyAOC*	0.008	0.030	0.799
ln_*yCyAOO*	0.101	0.102	0.325
ln_*yAOCyAOO*	0.030	0.021	0.161
ln_*xL*_2	0.014	0.350	0.968
ln_*xW*_2	–0.050	0.272	0.854
ln_*xK*_2	0.000	0.058	0.995
ln_*xLxW*	–0.177	0.265	0.507
ln_*xLxK*	0.212	0.107	0.050
ln_*xWxK*	–0.149	0.103	0.150
t	0.021	0.009	0.022
*t*_2	–0.020	0.011	0.078
ln_*yCt*	–0.010	0.022	0.654
ln_*yAOCt*	–0.004	0.008	0.565
ln_*yAOOt*	0.016	0.018	0.354
ln_*xLt*	–0.038	0.031	0.215
ln_*xWt*	0.029	0.024	0.235
ln_*xKt*	0.010	0.016	0.556
ln_*yCxL*	0.090	0.141	0.524
ln_*yAOCxL*	0.060	0.063	0.341
ln_*yAOOxL*	–0.067	0.102	0.510
ln_*yCxW*	–0.173	0.198	0.382
ln_*yAOCxW*	0.003	0.048	0.952
ln_*yAOOxW*	0.014	0.113	0.904
ln_*yCxK*	0.067	0.091	0.460
ln_*yAOCxK*	–0.068	0.024	0.005
ln_*yAOOxK*	0.011	0.059	0.859
*D*_kredit	–0.167	0.094	0.077
Constant	0.299	0.122	0.016
F-test	1 023.57	*F*[36, 127]	*P*-value: 0.000
AR(2)	0.03	–	*P*-value: 0.974
Hansen test	93.81	χ^2[205]	*P*-value: 1.000
Significance of technological change	2.19	*F*[8, 127]	*P*-value: 0.000
Log–likelihood test: sigma_η = 0 for PTE	6.38	–	*P*-value: 0.010
Number of instruments		242	
Number of groups		128	

yC – main output (cereals, milk, beef, respectively); *yAOC* – output of other crops in cereals production and other livestock in milk production; *yAOO* – other farm output; *xL* – land; *xW* – labour; *xK* – capital; *xM* – materials; *t* – time trend; *D* – dummy variable; PTE – persistent technical efficiency

Source: Authors' own calculation based on FADN (2021)

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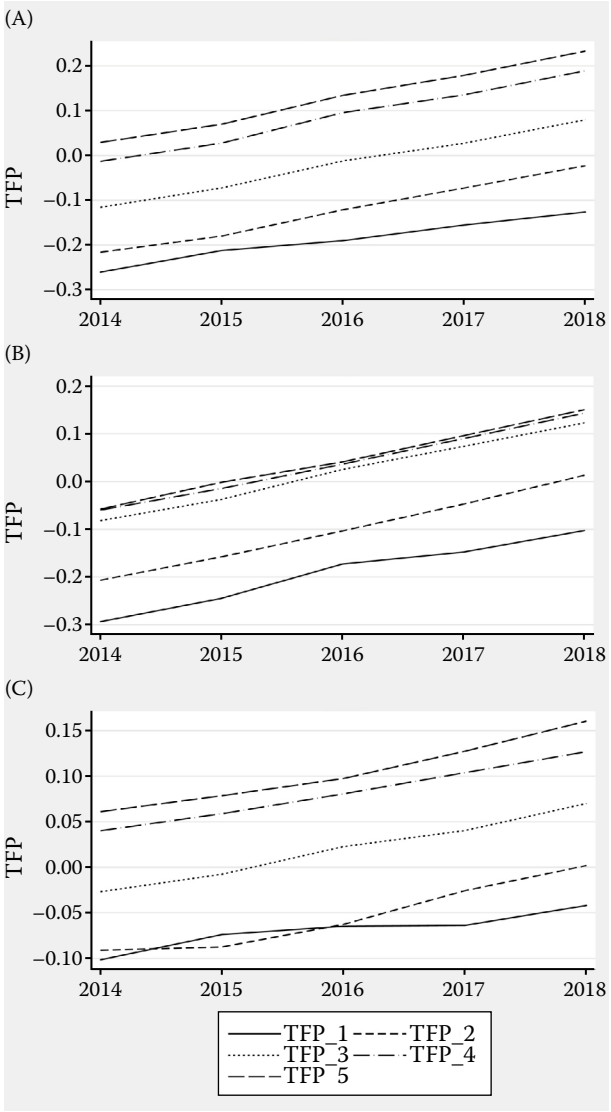

Figure S1. Total factor productivity (TFP) development: (A) cereals, (B) milk, and (C) beef

TFP_1 – size class < 20 ha; TFP_2 – size class 20–99 ha; TFP_3 – size class 100–499 ha; TFP_4 – size class 500–1 499 ha; TFP_5 – size class ≥ 1 500 ha

Source: Authors' own calculation based on FADN (2021)