



Czech University of Life Sciences Prague

**Faculty of Economics
and Management**

Factors determining TFP changes in Czech agriculture

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE



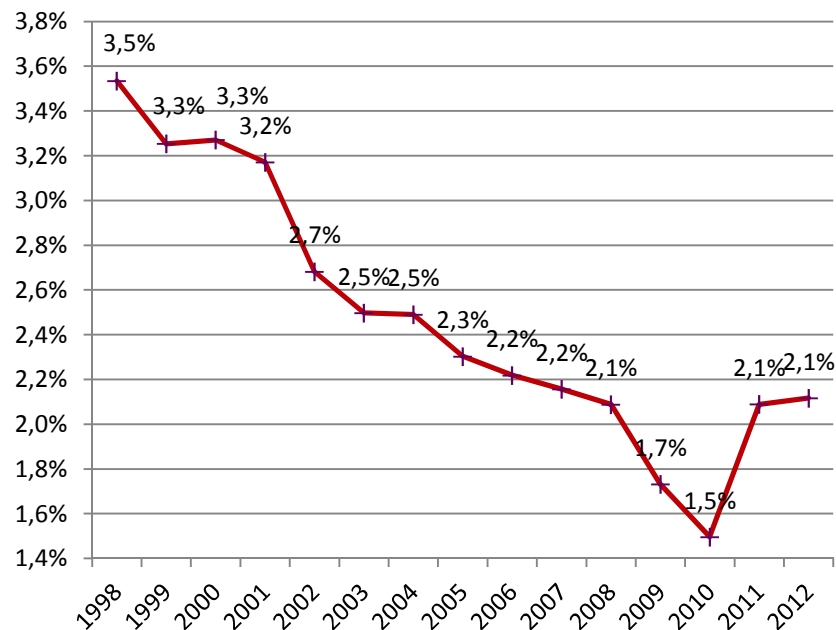
Introduction

- Czech agriculture experienced a couple of important institutional and structural changes in last two decades with different results in each individual agricultural sector.
- The study focuses on three important sectors of the Czech agriculture (cereals, dairy and pork) and identifies factors determining TFP development in these sectors in last decade.

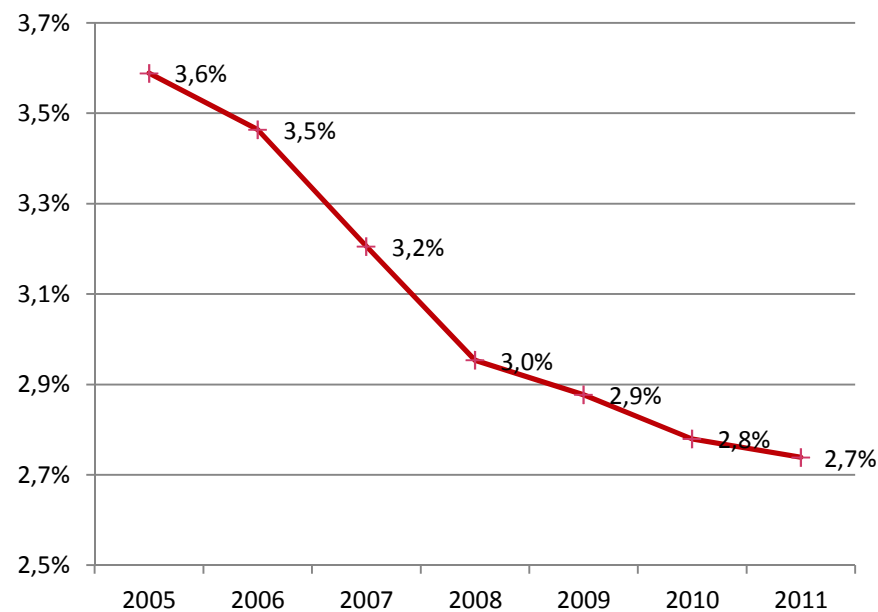


Position of Czech Agriculture

Share of agriculture, forestry and fishing on GDP
at purchaser prices (current prices, seasonally
adjusted) (%)



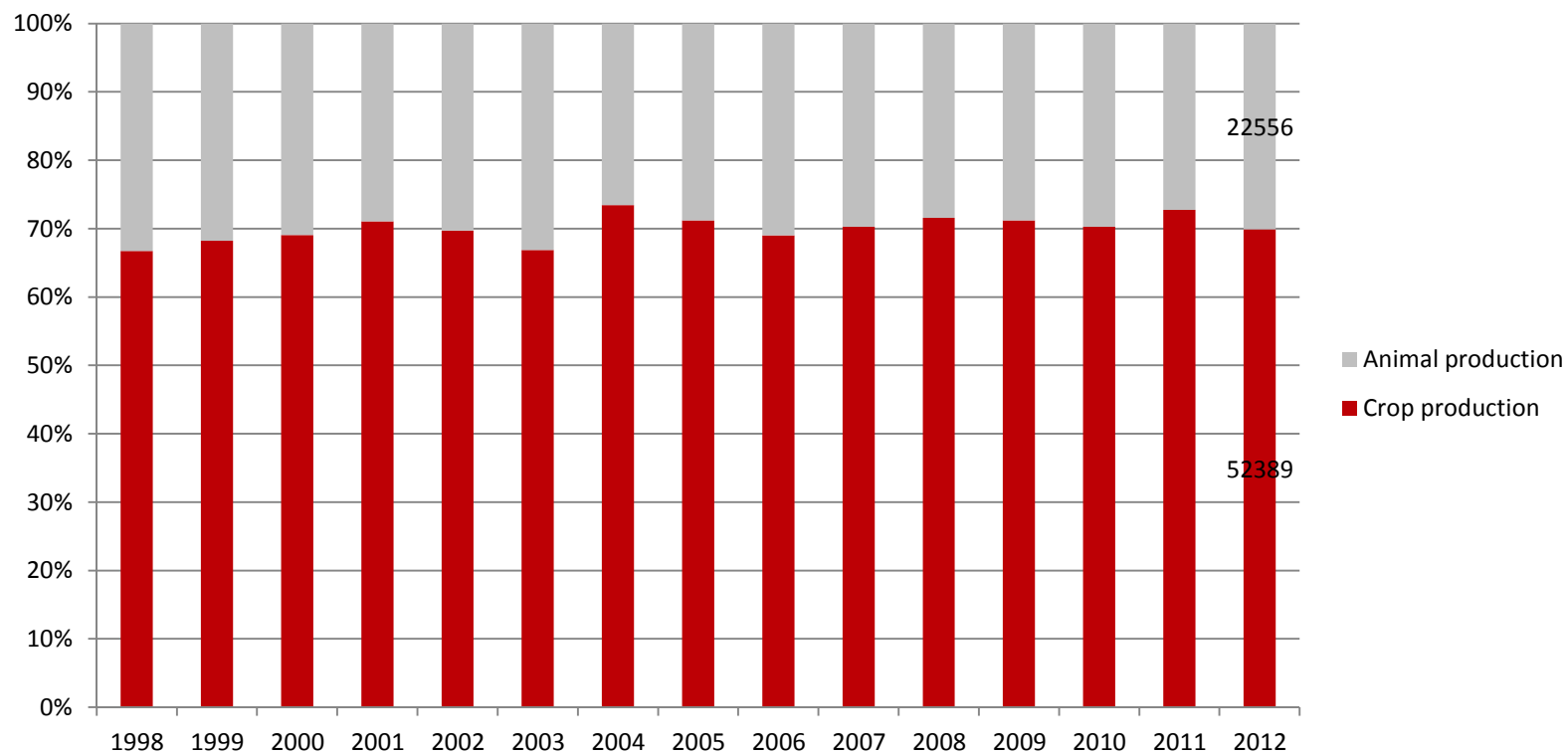
Share of agriculture, forestry and fishing on the
employment (%)





Structure of Czech Agriculture

Structure of production output in the CR - current prices 2000 (mil. CZK)

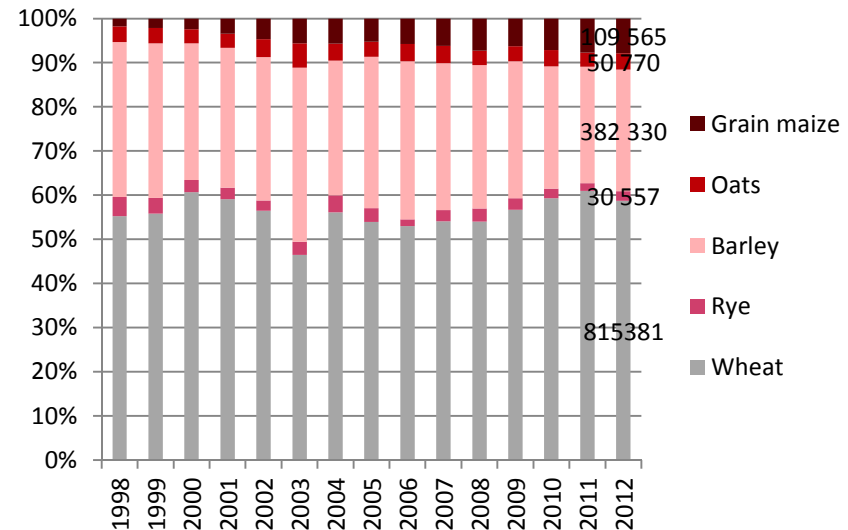




Cereals

- The area of agricultural land in the Czech Republic is around (4.2) mil. ha, where 2.48 mil. ha represents sowing area.
- Cereals are grown on the over half of it (57.7 %).
- Wheat represents one quarter of the arable land and barley 14.1 %.

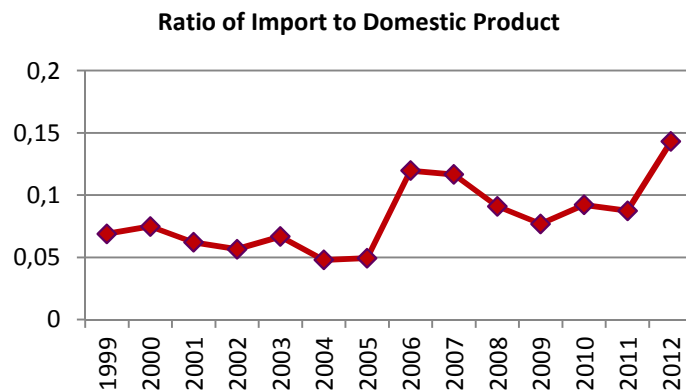
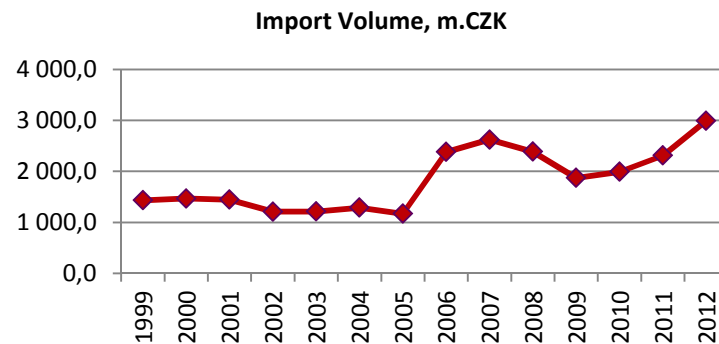
The development of the sowing structure of cereals between years 1998 - 2012



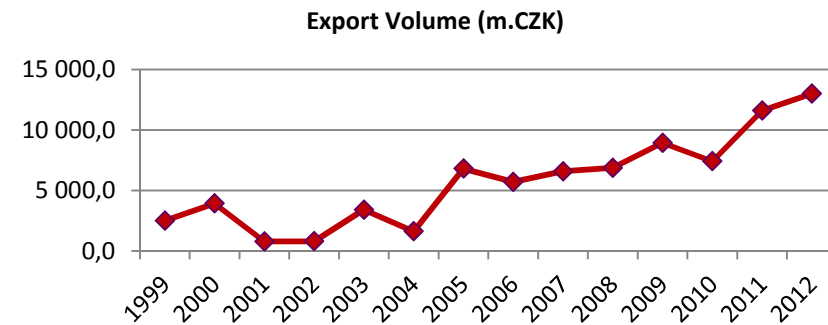


Cereals

Import



Export



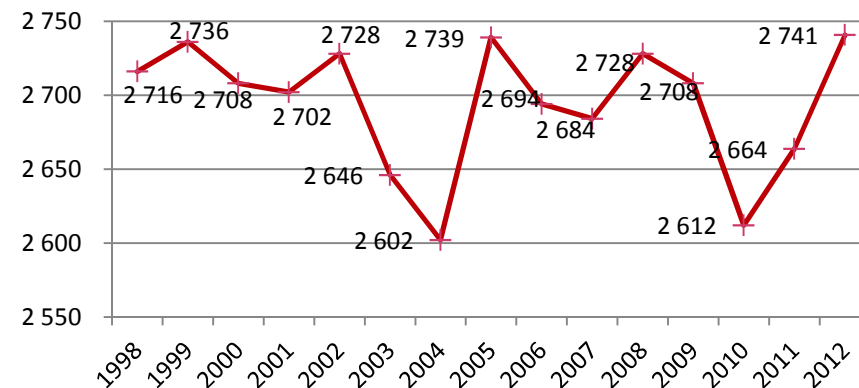
- Domestic production exhibits significant fluctuations with considerable growth in the year 2006 and 2012, which was involved by the lower domestic production and, respectively, higher import volume.
- Export Volume has positive trend during the period under consideration, increased more than 5 times over the years 1999-2012



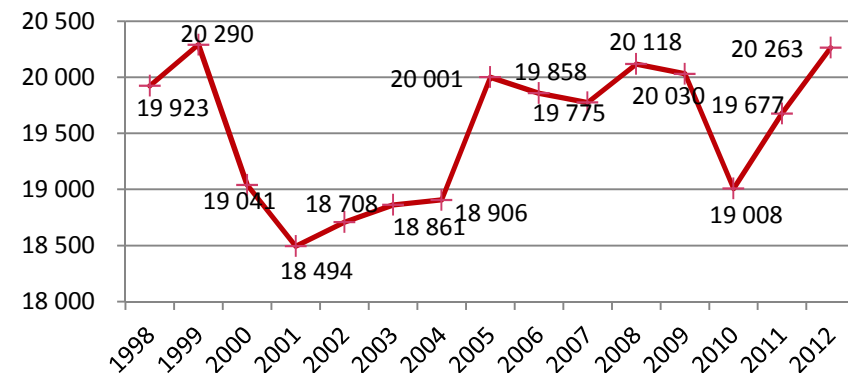
- Milk production fluctuates around 2700 mil. liters (the average in 1998-2012 was 2694 mil. l).
- It declined after the entrance of the CR to the EU in 2004 and again in 2010.
- Measured in constant prices, the decline was recorded in 2001 and 2010.

Dairy

Milk production (mil. l)



Milk production - constant prices 2000 (mil. CZK)

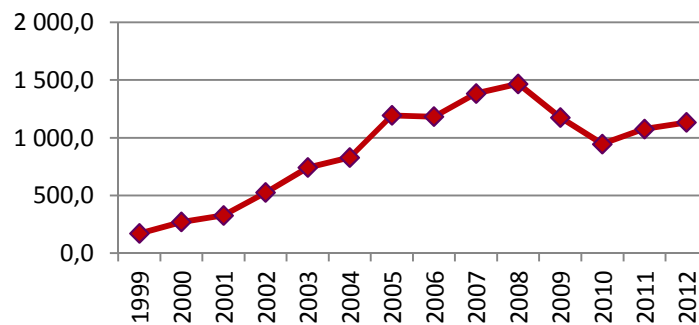




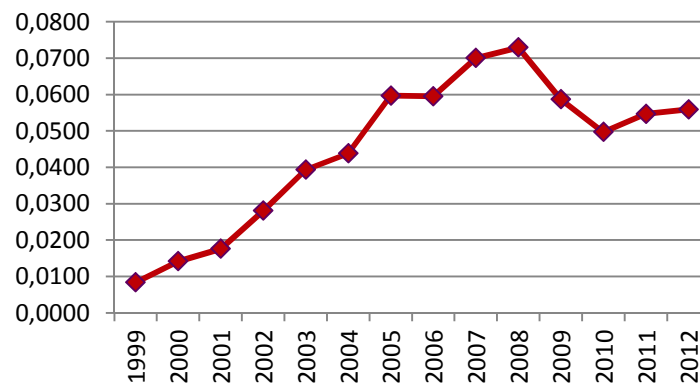
Dairy

Import

Import Volume (m.CZK)

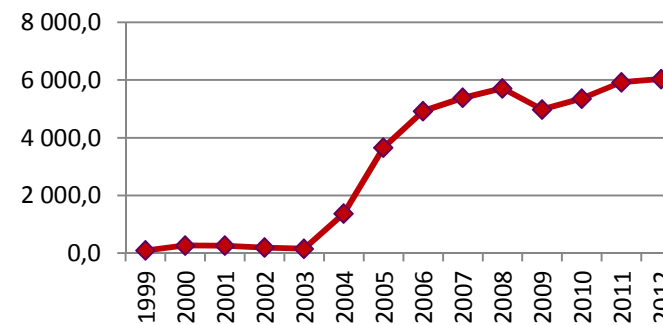


Ratio of Milk Import to Domestic Product



Export

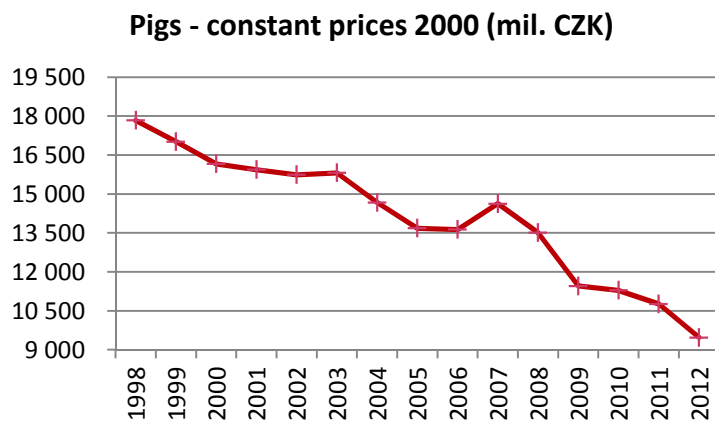
Deflated Export Volume of Milk (mln.CZK)



- Increase of milk Import was accompanied by decrease of domestic production, that lead to significant growth of Ratio of Import Volume indicator to Import Volume within the years 1999-2008. Following reduction of import volume lead to decline of indicator under consideration until the year 2010 with subsequent slight increase.
- Depicted graph shows considerable growth of export volume of milk between the years 2003-2008, after that the indicator exhibits quite stable trend with a fall in the year 2009.

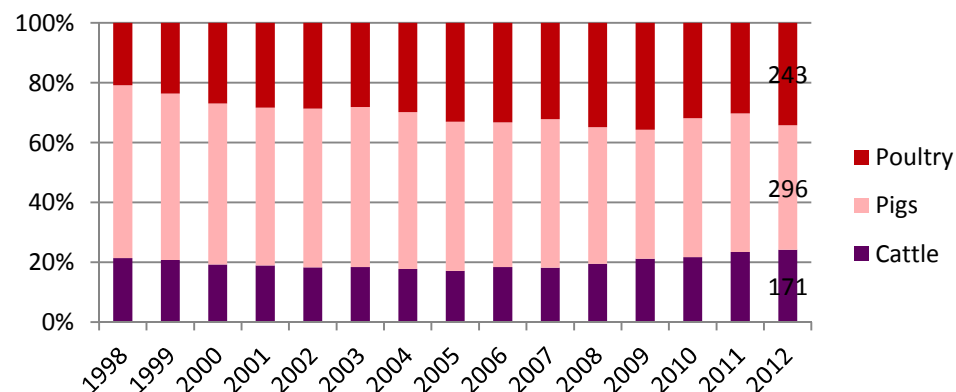


- Production of pigs for slaughter sharply decreased between 1998 – 2012.
- While the level was almost constant between 2000-2003, the decline speed up after 2004

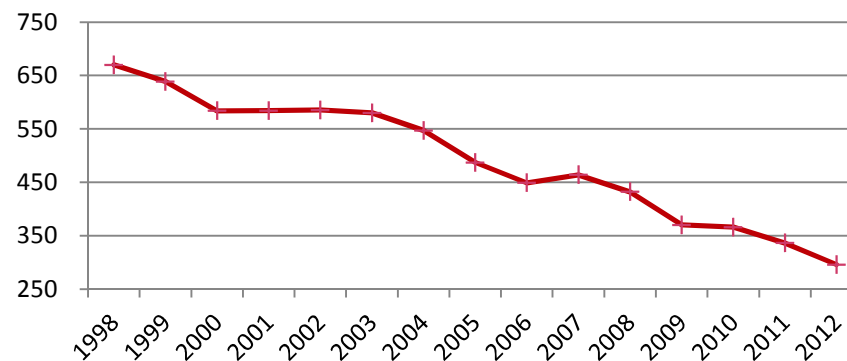


Pork

Production of livestock for slaughter (thous. t of live weight)



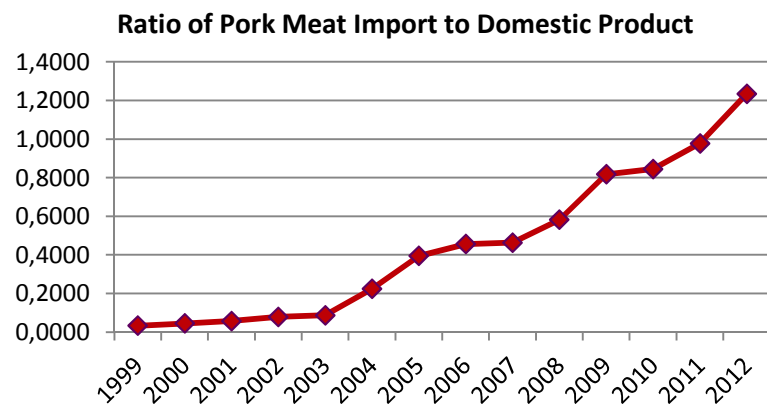
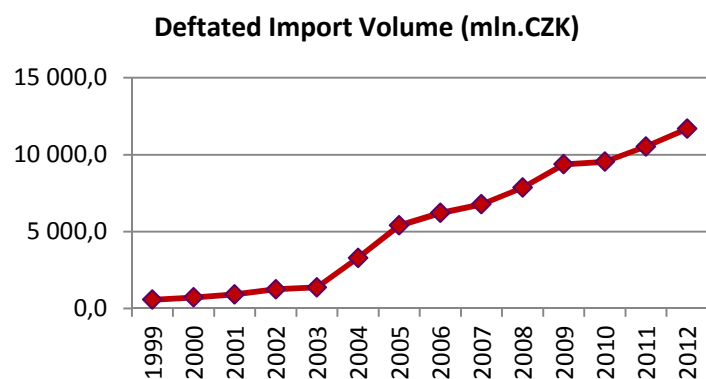
Pigs (thous. t of live weight)



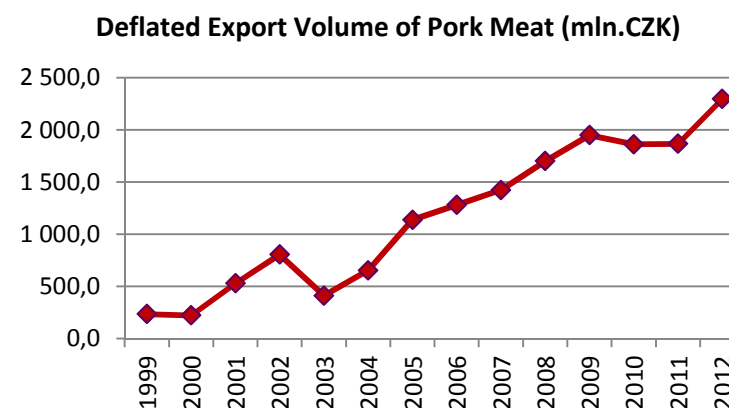


Pork

Import



Export



- The graph displays continuous growth of ratio of Pork Meat Import to Domestic Production, that is a result of permanent decline of domestic production and increase of import volume.
- Export Volume of pork meat has positive trend during the period under consideration with two decline points in the year 2003 and 2011.



Methodology

- Output distance function
- Translog form
- Sectors: cereals (3658 cases), dairy (3701 cases), pork (746).
- FADN data
- TFP and decomposition on SE, TCH, MAN, and TE

Variables	
Y1	CE (Cereals)
Y2	PP (Plant Production)
Y3	AP (Animal Production)
Y1	D (Dairy)
Y2	AP (Other Animal Production)
Y3	PP (Plant Production)
Y1	P (Pork)
Y2	AP (Other Animal Production)
Y3	PP (Plant Production)
X1	A (Labour)
X2	L (Land)
X3	C (Capital)
X4	SM (Specific material)
X5	OM (Other material)



Results

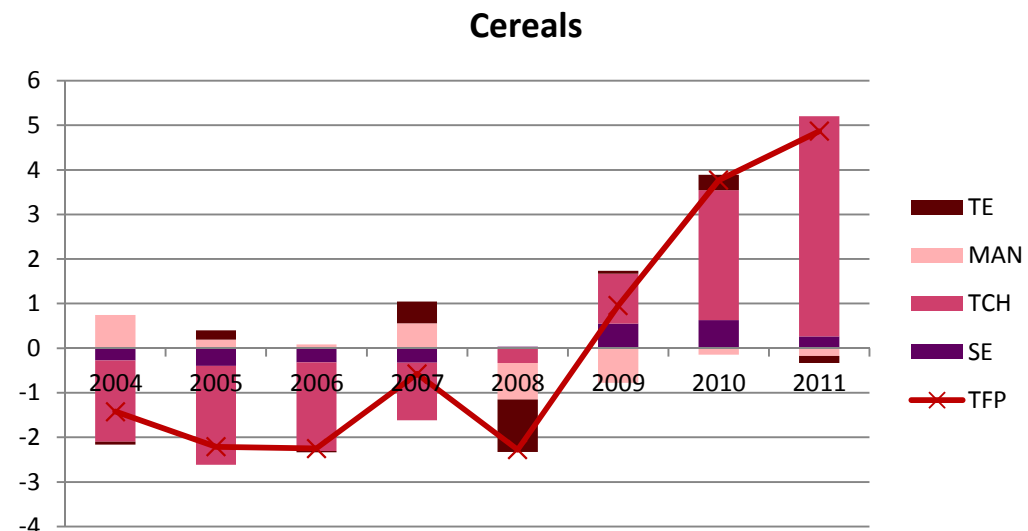
- Three models were estimated for:
 - cereals
 - dairy
 - pork

Means for random parameters				Coefficient on unobservable fixed management			
Variable	Coef.	SE	P [z >Z*]	Variable	Coef.	SE	P [z >Z*]
Const.	-0.27497	0.01526	0.0000	Alpha_m	-0.06208	0.00270	0.0000
Time	-0.00564	0.00134	0.0000	Time	-0.02746	0.00122	0.0000
X1	-0.12826	0.00666	0.0000	X1	0.03127	0.00634	0.0000
X2	-0.06892	0.00854	0.0000	X2	-0.12350	0.00632	0.0000
X3	-0.03267	0.00597	0.0000	X3	0.02210	0.00424	0.0000
X4	-0.25086	0.00433	0.0000	X4	-0.03227	0.00194	0.0000
X5	-0.53401	0.01006	0.0000	X5	0.07752	0.00860	0.0000
				Alpha_mm	0.26397	0.00483	0.0000
Variable	Coef.	SE	P [z >Z*]	Variable	Coef.	SE	P [z >Z*]
TT	-0.01195	0.00122	0.0000	X13	-0.05437	0.00994	0.0000
Y2	0.23696	0.00265	0.0000	X14	-0.03058	0.00957	0.0014
Y3	0.48171	0.00406	0.0000	X15	-0.08369	0.02106	0.0001
Y2T	-0.01034	0.00094	0.0000	X23	0.06947	0.01280	0.0000
Y3T	0.00217	0.00153	0.1562	X24	0.03476	0.00945	0.0002
Y22	0.05027	0.00111	0.0000	X25	-0.09837	0.02451	0.0001
Y33	0.09978	0.00348	0.0000	X34	-0.04981	0.00709	0.0000
Y23	-0.03966	0.00154	0.0000	X35	0.08858	0.01424	0.0000
X1T	0.00339	0.00287	0.2377	X45	0.14419	0.01188	0.0000
X2T	-0.01502	0.00328	0.0000	Y2X1	0.01178	0.00332	0.0004
X3T	-0.00676	0.00240	0.0048	Y2X2	0.02216	0.00398	0.0000
X4T	-0.01088	0.00190	0.0000	Y2X3	-0.01275	0.00261	0.0000
X5T	0.03173	0.00440	0.0000	Y2X4	-0.01535	0.00224	0.0000
X11	0.14594	0.01723	0.0000	Y2X5	0.01835	0.00521	0.0004
X22	0.00641	0.01515	0.6725	Y3X1	-0.03820	0.00731	0.0000
X33	-0.06147	0.00873	0.0000	Y3X2	0.01047	0.00701	0.1352
X44	-0.05325	0.00341	0.0000	Y3X3	-0.05168	0.00543	0.0000
X55	-0.11302	0.04050	0.0053	Y3X4	0.01727	0.00278	0.0000
X12	0.01132	0.01533	0.4602	Y3X5	0.07291	0.00940	0.0000
Sigma	0.13912	0.00676	0.0000	Pork – parameters estimate Source: Own calculation			
Lambda	0.70694	0.18458	0.0001				



Cereals - TFP development and its decomposition

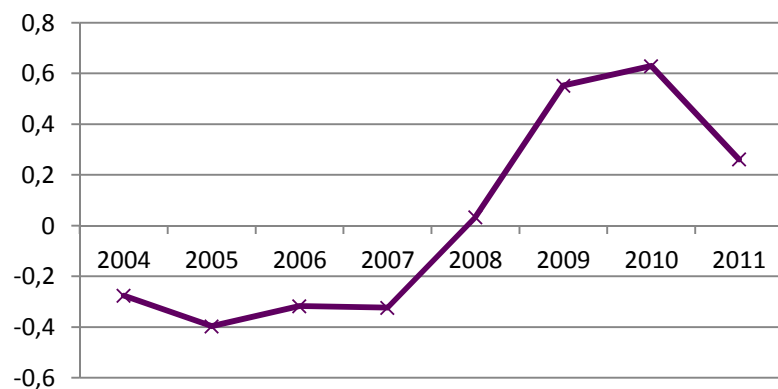
- Total Factor Productivity (TFP) was negative in years 2004-2008, then increased in 2009.
- The increase was influenced, to the greatest extent, by the Technological change (TCH) component.



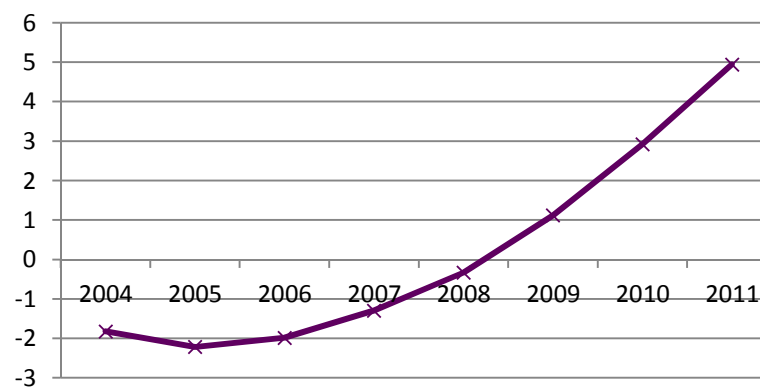


SE, TCH, MAN, and TE development

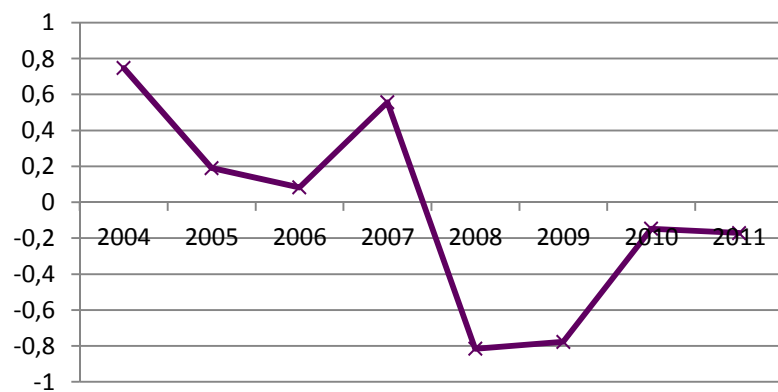
Cereals - scale efficiency



Cereals - technological change



Cereals - management



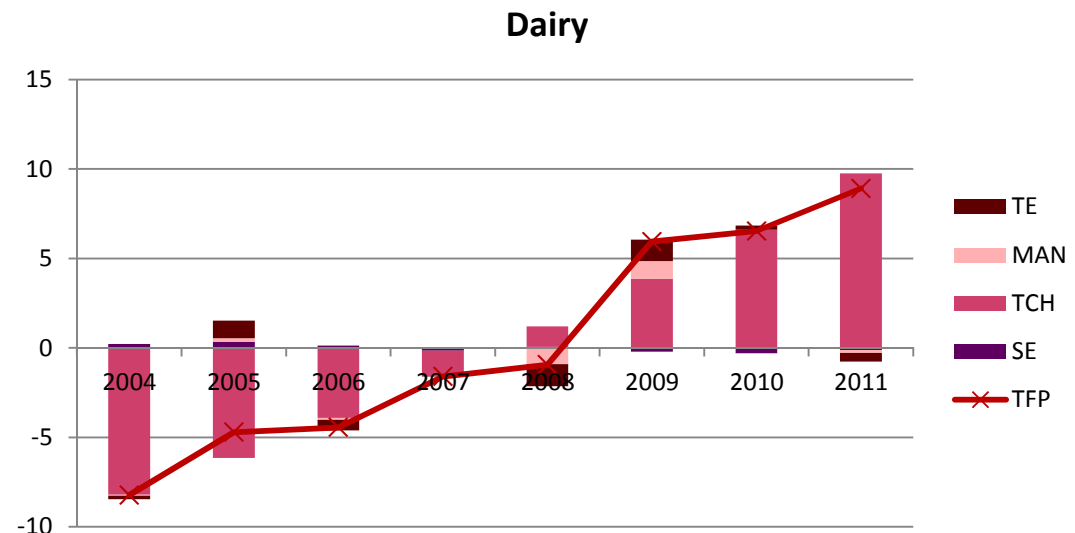
Cereals - technical efficiency





Dairy - TFP development and its decomposition

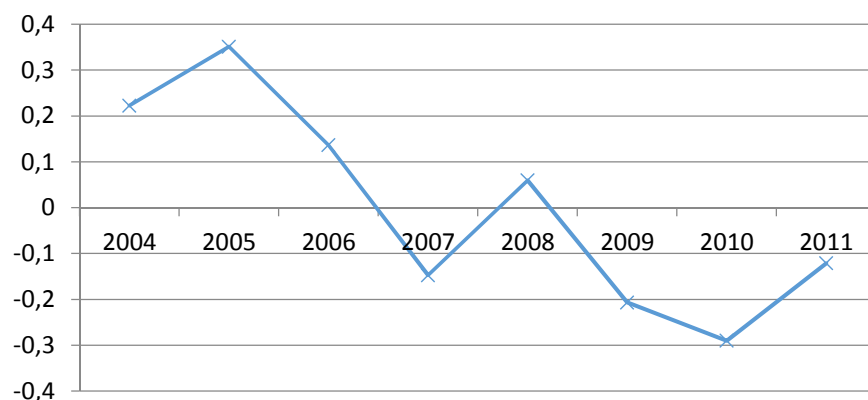
- TFP constantly increased in the period under consideration.
- The trend of TFP development was mostly influenced by the SE and MAN component.



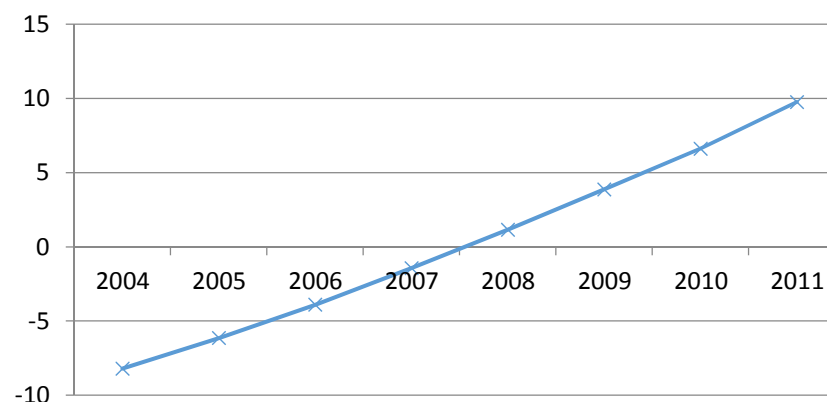


SE, TCH, MAN, and TE development

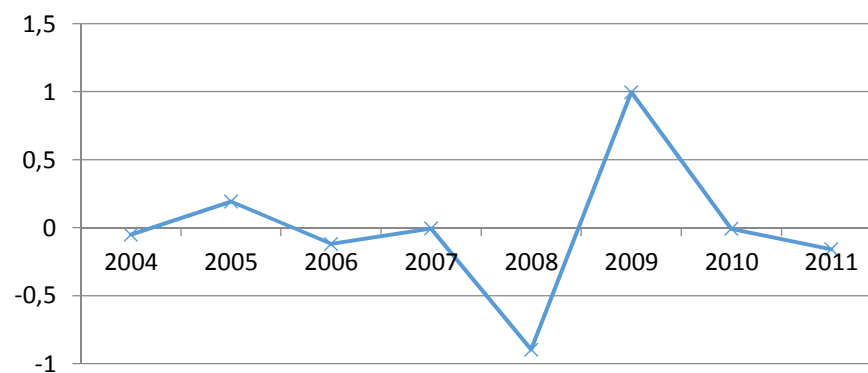
Dairy - scale efficiency



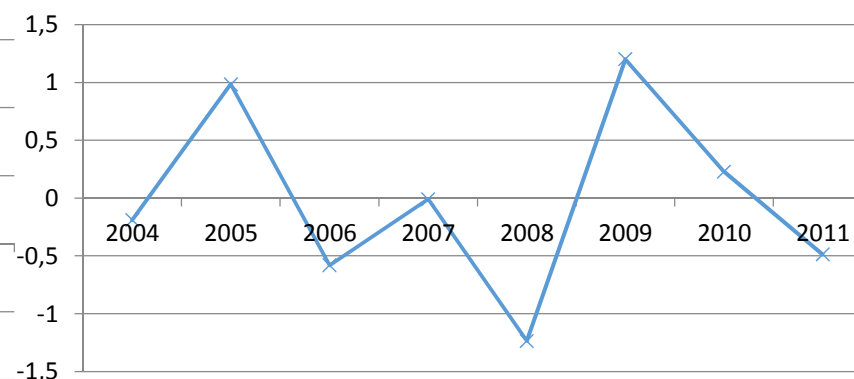
Dairy - technological change



Dairy - management



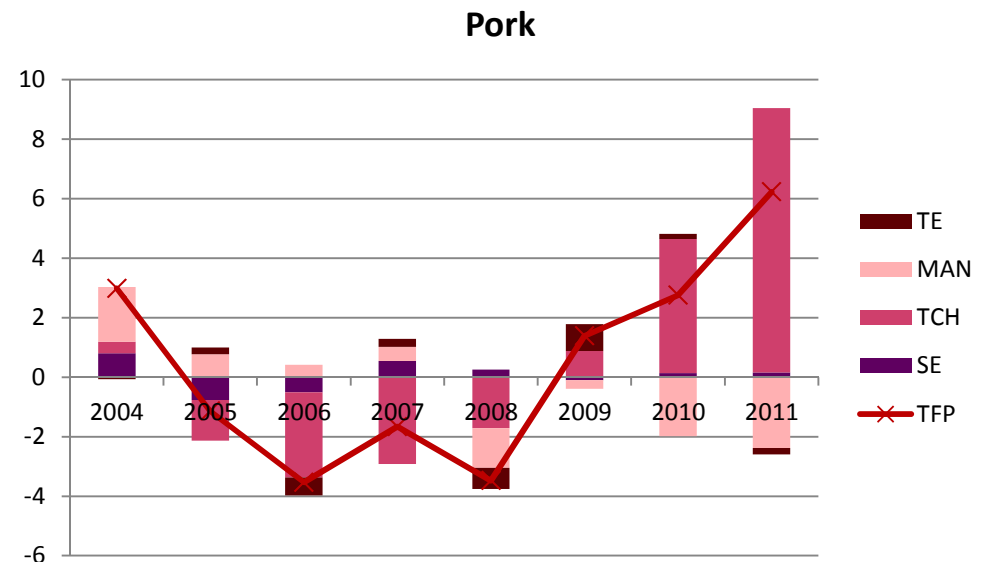
Dairy - technical efficiency





Pork - TFP development and its decomposition

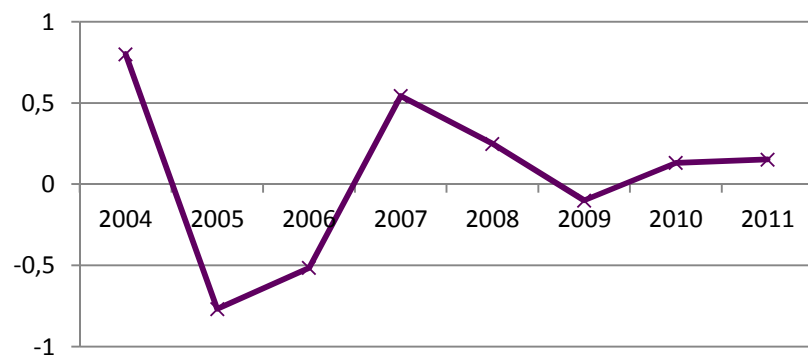
- TFP change over the period 2004-2011, reflecting the trend of TCH component.



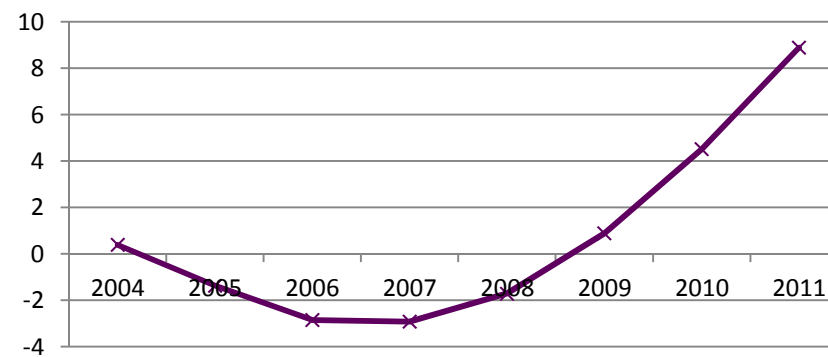


SE, TCH, MAN, and TE development

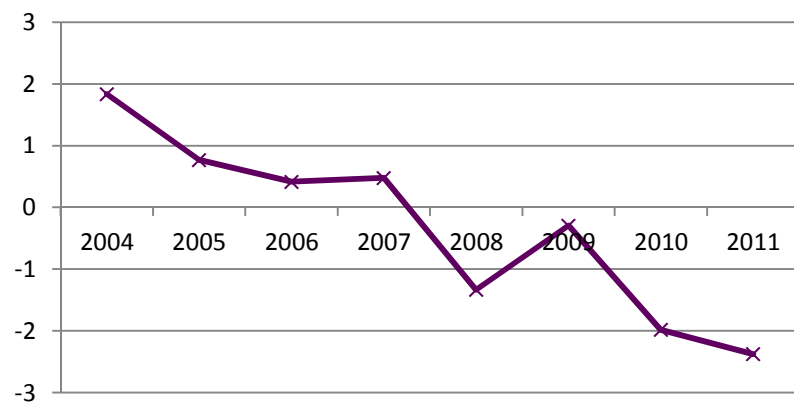
Pork - scale efficiency



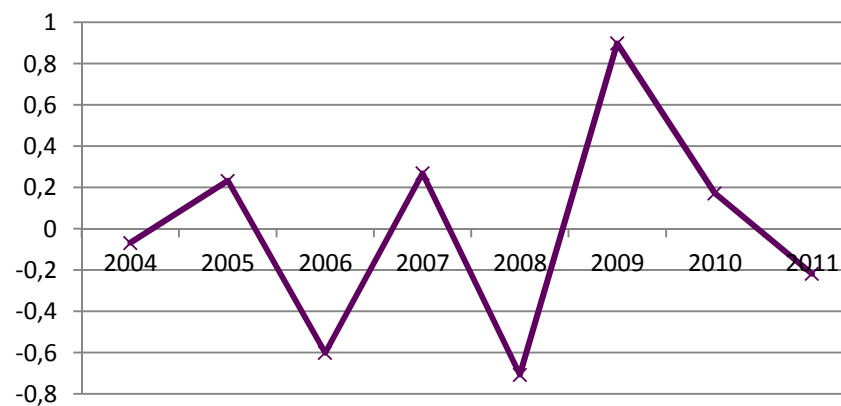
Pork - technological change



Pork - management

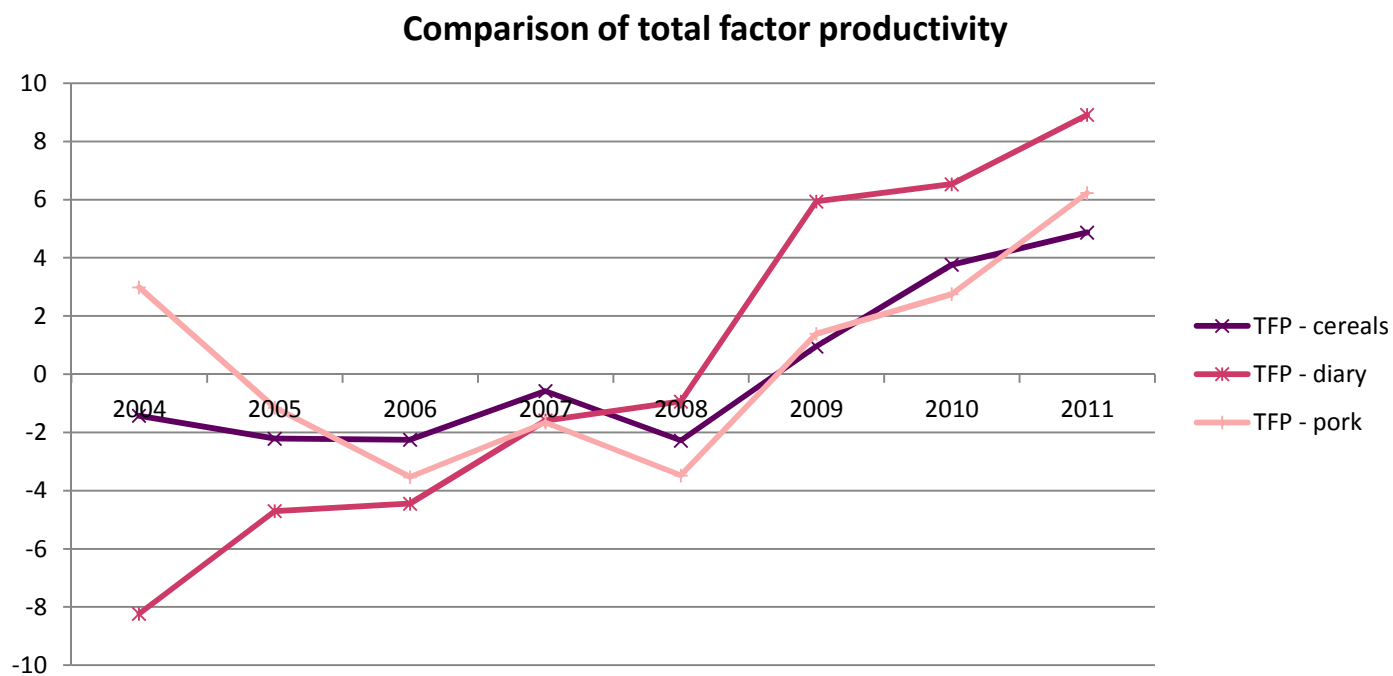


Pork - technical efficiency





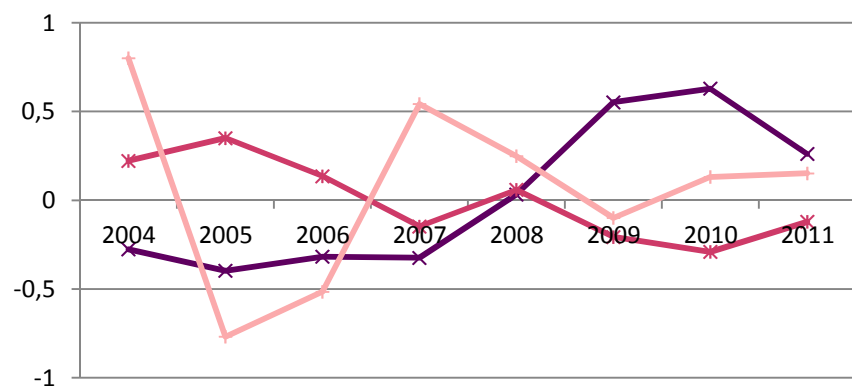
Comparison of sectors - TFP



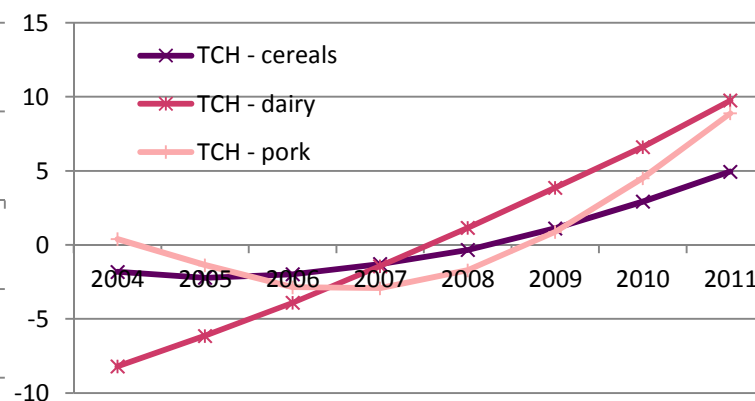


Comparison of sectors

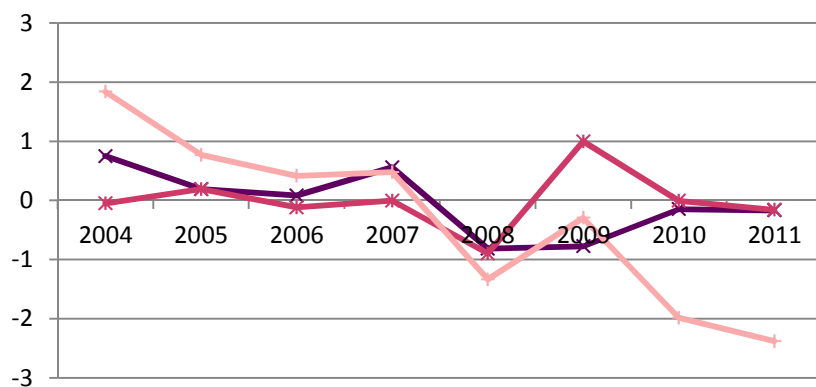
Comparison of scale efficiencies



Comparison of technological changes



Comparison management



Comparison of technical efficiencies





TE comparisson

Technical efficiency	Mean	Std. dev.	Minimum	Maximum
- cereals	0.9233	0.0180	0.8060	0.9696
- dairy	0.9211	0.0346	0.6647	0.9780
- pork	0.9256	0.0286	0.7178	0.9770



Discussion and conclusions

- TFP developments experienced similar patterns in analyzed sectors.
- TFP development was significantly determined by TCH in each sector.
- Whereas TCH and TE experienced similar patterns, SE and MAN have rather idiosyncratic development that is related to ongoing structural changes in cereal, dairy and pork sectors. These changes are significantly determined by the setting of subsidies.



Sources

- Czech Statistical Office (www.czso.cz)
- FADN



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Thank you for your attention.

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