MODELLING THE IMPACT OF EU ACCESSION ON AGRICULTURE

Dissertation thesis

in 9.1.9 Applied Mathematics

Mgr. DÁŠA BARTOŠOVÁ

Supervisor: Prof. Dr. Ing. Jarko Fidrmuc

Comenius University Bratislava

Faculty of Mathematics, Physics and Informatics

COMENIUS UNIVERSITY
BRATISLAVA

Motivation

★ The CEECs – before accession – bilateral agreements, limited liberalization

★ Access into the common market – competition, trade creation, trade diversion

¿¿¿ Are agriculture products competitive enough to gain from liberalization ???

Methods:

★ CGEM

★ Gravity panel data models

★ Dynamics of trade

¿¿¿ Are dynamic panel data models appropriate tools for modeling this ???

COMENIUS UNIVERSITY
BRATISLAVA

Goals

★ To analyze:

- the impact of EU accession on agriculture trade (if and how much)

- the influence of dynamics on agriculture trade

★ To formulate special dynamic gravity panel data model for import and export with agriculture commodities for accession countries

- includes dynamics of trade and positives of gravity panel data models with detailed structure of CGEM

- avoid the common mistakes in gravity models (Baldwin's gold, silver and bronze medal mistakes)

★ To compare several methods with each other and with bootsrap estimation

- Fixed Effects, Hausman-Taylor (bootstraping)

- Generalized Method of Movements - long-run effects

Material – data

★ Unique database (TRADEAG project) – import, export

★ <u>Panel dimension:</u> 7 reporting countries and 10 partner regions => Slovakia, Czech Republic, Slovenia, Latvia, Lithuania, Bulgaria, Romania with each other, Poland, Hungary, Estonia, EU15, CIS, USA and OC – rest of the world (small cross-sectional dimension)

★ <u>Time dimension:</u> 1996Q1-2005Q4 => Quarterly between 1996 and 2005 (relatively long time-series)

★ Commodities: Meat (bovine, poultry, swine, total), Milk (cream, cheese and curd, total), Cereals, Oilseeds, Sugar, Total (m, x)

★ *GDP*

★ *CPI*

★ *EU* dummy variable

★ *B* - border and *D* - distance dummy variables used in the Hausman-Taylor estimation

★ *seas**

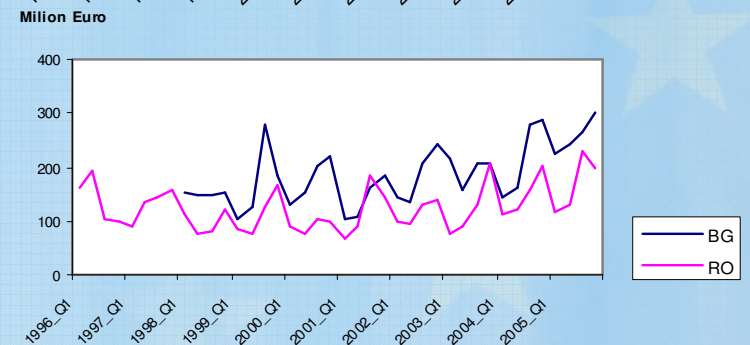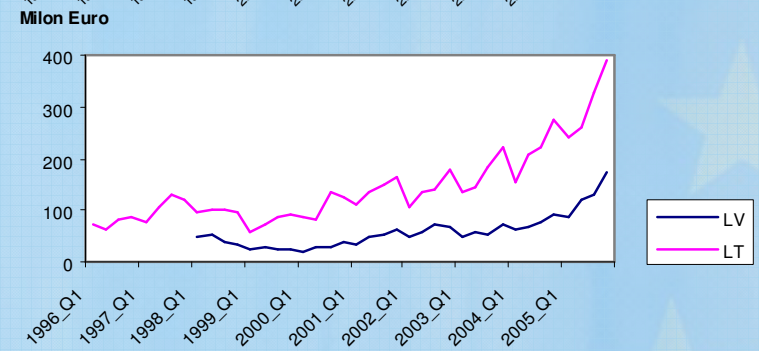# Total agri-food trade

IMPORT

EXPORT
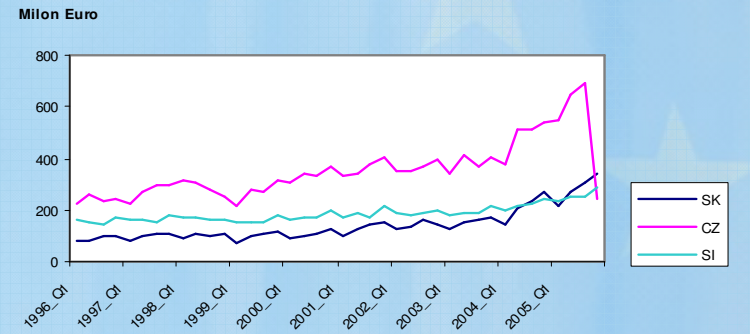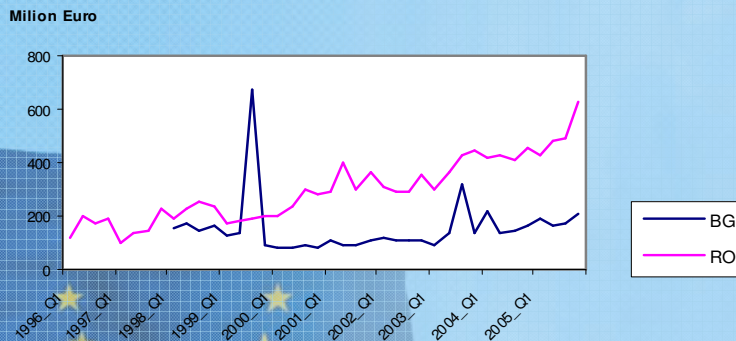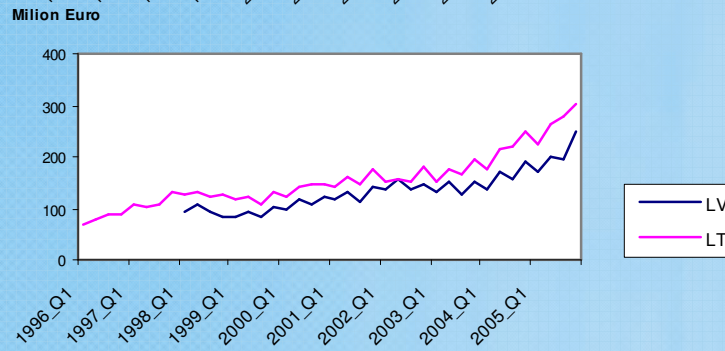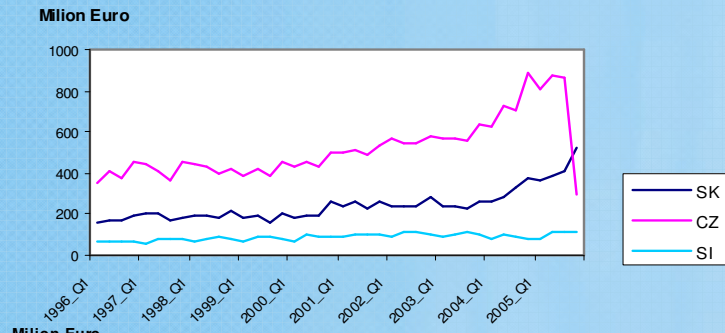
September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Methods

★ **CGEM** (Computable General Equilibrium Model)
  - includes detailed sectoral information
  - calibrated parameters

★ **Gravity models**
  - detailed geographic structure
  - partial model

★ **Dynamics of trade**

★ <u>Estimation method:</u>

★ Log-linear form
★ Fixed effects and Hausman-Taylor
★ Bootstraping (FE and HT)
★ Generalized Method of Movement (long-run)

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

CGEM
Computable General Equilibrium Model

★ Trade flows are related to trend of income and price on export and import market

★ Defined complex model's structure

★ Includes detailed sectoral information

★ Calibrated parameters

★ Use results of gravity models as inputs

(e.g. Keuschnigg and Kohler (1997, 2000, 2002) use gravity models to calibrate the impact of trade liberalization on trade cost such that the resulting trade increase are consistent with available estimates of trade potential from gravity models)

Gravity models

★ Estimate trade flows for several countries in specific period as a function of S and D in partner countries, transport and transaction costs and integration effect

★ Trade flow is aggregated

★ Detailed geographic structure (doesn't allow complex analysis for individual sectors of economy)

★ Partial model (Anderson and Van Wincoop (2001) derive gravity equation from general equilibrium model)

★ Estimates use reduced form (parameters of initial model are overall estimated, e.g. as fixed or time effects)

COMENIUS UNIVERSITY
BRATISLAVA

Random Effects vs. Fixed Effects vs. Hausman-Taylor

★ **Random Effects (RE)**

- estimates are efficient (maybe better)

- enable to estimate parameters invariant in time (distance)

- country RE are uncorrelated with other parameters (not satisfied in general – Hausman test)

★ **Fixed Effects (FE)**

- enable to estimate parameters variant across the entities, not over time

- can be used for >2 time observations for each entity (biased for high cross-sectional dimension and low time dimension (according to Baltaggi(2001)))

★ **Hausman-Taylor (HT)**

- use combination of FE and RE (also correlated parameters)

Fixed Effects (FE) Model Specification

★ Dynamic models for import and export

$$m_{it} = \alpha_i + \theta_t + \rho m_{it-1} + \beta_1 y_t^{home} - \beta_2 (e_t p_{it}^m - cpi_t^{home}) + \gamma EU + \varepsilon_{it}^m$$

$$x_{it} = \alpha_i + \theta_t + \rho x_{it-1} + \beta_1 y_{it} - \beta_2 (p_{it}^x - cpi_{it}) + \gamma EU + \varepsilon_{it}^x$$

★ α_i denotes fixed effects

★ Domestic S – covered by θ_t, standard demand function – relative price effects

★ y_t - GDP, e_t - exchange rate, p_t - price, EU - integration effect

★ Bias – autocorrelation of dependent variable (because of lags), but limited (small cross-sectional and long time dimension)

★ Within estimator

★ Fixed effect model (appropriate if $T > 15$)

COMENIUS UNIVERSITY
BRATISLAVA

Results for panel
Fixed Effect Model
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import	Total agrarian import HS01-14	Total agrarian import HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
m_{it-1}	0.427***	0.611***	0.505***	0.527***	0.444***	0.307***	0.406***	0.008	0.274***	0.228***	0.281***	0.231***	0.348***
	(11.08)	(18.91)	(18.13)	(22.00)	(12.11)	(10.86)	(15.39)	(0.16)	(8.85)	(5.85)	(16.66)	(12.85)	(18.64)
p_t	-0.569***	-0.206*	-0.135	-0.155**	-0.700***	-0.094	-0.398***	-0.727***	-0.340***	-1.411***	-0.674***	-0.712***	-0.561***
	(-3.79)	(-1.65)	(-1.61)	(-2.20)	(-5.76)	(-0.91)	(-5.77)	(-3.73)	(-3.48)	(-6.80)	(-17.50)	(-13.36)	(-13.10)
y_t	0.613*	1.028***	0.732***	0.853***	0.019	1.161***	0.452***	-0.288	0.302	-0.266	0.179**	0.148	0.288***
	(1.80)	(4.25)	(3.97)	(5.74)	(0.06)	(7.00)	(3.02)	(-0.66)	(1.57)	(-0.61)	(2.56)	(1.48)	(3.72)
EU	0.085	0.045	0.242**	0.085	0.001	0.363***	0.306***	0.617*	0.616***	2.532***	0.112**	0.266***	0.008
	(0.38)	(0.30)	(3.97)	(0.90)	(0.01)	(3.21)	(3.06)	(1.69)	(4.05)	(7.97)	(2.40)	(3.76)	(0.15)
R^2	0.45	0.64	0.60	0.68	0.61	0.43	0.71	0.37	0.55	0.53	0.82	0.79	0.83
N	536	651	829	1073	536	705	975	300	807	388	1781	1273	1835

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

COMENIUS UNIVERSITY
BRATISLAVA

Results for panel
Fixed Effect Model
EXPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian export	Total agrarian export HS01-14	Total agrarian export HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
x_{it-1}	0.348***	0.577***	0.542***	0.549***	0.393***	0.470***	0.502***	0.462***	0.294***	0.391***	0.400***	0.293***	0.467***
	(7.59)	(13.81)	(13.70)	(18.09)	(13.33)	(20.07)	(23.38)	(5.47)	(8.03)	(8.74)	(21.24)	(14.18)	(26.42)
p_t	-0.401*	0.113	-0.512***	-0.092	-0.310**	0.335***	-0.149**	-0.518	-0.733***	-0.775***	-0.533***	-0.647***	-0.660***
	(-1.91)	(0.68)	(-4.05)	(-0.92)	(-2.51)	(3.17)	(-2.05)	(-1.47)	(-4.67)	(-3.78)	(-12.71)	(-11.06)	(-15.12)
y_t	-0.511	-0.172	-0.028	-0.071	-0.539	0.767***	0.213	1.632	0.334	2.294***	0.296***	0.141	0.281***
	(-1.32)	(-0.60)	(-0.12)	(-0.39)	(-2.52)	(5.43)	(1.64)	(1.63)	(1.20)	(4.65)	(3.98)	(1.24)	(3.75)
EU	0.850***	0.208	0.629***	0.657***	0.764***	0.255**	0.425***	-0.003	0.376	1.334***	0.232***	0.247***	0.166***
	(3.36)	(1.00)	(3.74)	(4.66)	(4.32)	(2.16)	(4.14)	(-0.01)	(1.57)	(3.69)	(4.40)	(3.03)	(3.17)
R^2	0.25	0.41	0.44	0.39	0.22	0.45	0.38	0.37	0.25	0.54	0.41	0.29	0.49
N	315	380	468	730	917	845	1295	144	594	357	1771	1330	1968

★ t-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Hausman-Taylor (HT) Model Specification

★ Dynamic models for import and export

$$m_{it} = \alpha_i + \theta_t + \rho m_{it-1} + \beta_1 y_t^{home} - \beta_2(e_t p_{it}^m - cpi_t^{home}) + \gamma EU + \varphi B + \phi D + \varepsilon_{it}^m$$

$$x_{it} = \alpha_i + \theta_t + \rho x_{it-1} + \beta_1 y_{it} - \beta_2(p_{it}^x - cpi_{it}) + \gamma EU + \varphi B + \phi D + \varepsilon_{it}^x$$

★ Exogenous variables
   D – distance dummy (time invariant)
   *seas** - seasonal dummy (time variant)

★ Endogenous variables
   B – border dummy (time variant)

★ Used by e.g. Serlenga and Shin (2004)
   - in heterogeneous panels with common time-specific factors (Intra-EU trade)

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Results for panel
Hausman-Taylor Model
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import	Total agrarian import HS01-14	Total agrarian import HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
m_{it-1}	0.434***	0.620***	0.513***	0.534***	0.498***	0.333***	0.469***	0.021	0.312***	0.242***	0.283***	0.231***	0.352***
	(10.51)	(18.86)	(17.14)	(21.10)	(13.48)	(10.52)	(18.03)	(0.39)	(8.70)	(5.54)	(16.02)	(12.34)	(18.33)
p_t	-0.580***	-0.216*	-0.124	-0.137*	-0.612***	-0.055	-0.404***	-0.686***	-0.375***	-1.518***	-0.665***	-0.710***	-0.544***
	(-3.78)	(-1.66)	(-1.36)	(-1.81)	(-5.29)	(-0.52)	(-6.08)	(-3.21)	(-3.21)	(-5.88)	(-16.42)	(-12.66)	(-12.11)
y_t	0.388	0.906***	0.765***	0.926***	0.065	1.295***	0.500***	0.437	0.253	-0.320	0.218***	0.213*	0.346***
	(1.12)	(3.40)	(3.66)	(5.48)	(0.24)	(6.95)	(3.41)	(0.93)	(1.00)	(-0.59)	(2.81)	(1.85)	(4.13)
EU	0.180	0.093	0.216*	0.043	-0.026	0.267**	0.220**	0.306	0.588***	2.518***	0.096*	0.239***	-0.015
	(0.82)	(0.59)	(1.82)	(0.42)	(-0.15)	(2.33)	(2.38)	(0.83)	(3.31)	(7.03)	(1.94)	(3.16)	(-0.29)
dist	0.326	0.231	0.877**	0.313	0.609	0.591	-0.016	0.986	1.423	2.093	1.381	1.562	0.384
	(0.70)	(0.25)	(2.00)	(0.55)	(0.57)	(2.00)	(-0.00)	(1.25)	(1.06)	(1.19)	(0.69)	(0.24)	(0.48)
bord	1.659	0.449	2.958**	1.671	1.808	3.620	1.073	1.470	4.548	13.096	8.768	9.240	3.222
	(0.70)	(0.14)	(2.11)	(0.89)	(0.46)	(1.42)	(0.09)	(0.40)	(0.67)	(1.15)	(0.79)	(0.27)	(0.87)
N	474	583	688	910	484	592	837	248	610	312	1649	1102	1701

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Results for panel
Hausman-Taylor Model
EXPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian export	Total agrarian export HS01-14	Total agrarian export HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
x_{it-1}	0.355***	0.585***	0.546***	0.555***	0.393***	0.470***	0.503***	0.461***	0.294***	0.392***	0.400***	0.292***	0.468***
	(7.98)	(13.78)	(14.08)	(18.59)	(13.70)	(20.51)	(23.79)	(5.57)	(8.15)	(9.29)	(21.47)	(14.46)	(26.73)
p_t	-0.355*	0.134	-0.499***	-0.059	-0.309**	0.335***	-0.146**	-0.517	-0.739***	-0.789***	-0.535***	-0.644***	-0.666***
	(-1.77)	(0.80)	(-4.03)	(-0.61)	(-2.57)	(3.24)	(-2.05)	(-1.49)	(-4.88)	(-4.09)	(-12.89)	(-11.22)	(-15.40)
y_t	-0.328	-0.014	0.024	0.114	-0.536***	0.767***	0.225*	1.655*	0.308	2.201***	0.284***	0.150	0.243***
	(-0.96)	(-0.05)	(0.11)	(0.72)	(-2.58)	(5.55)	(1.76)	(1.70)	(1.32)	(4.84)	(3.93)	(1.35)	(3.35)
EU	0.760***	0.148	0.605***	0.590***	0.763***	0.255**	0.421***	-0.007	0.383*	1.356***	0.236***	0.243***	0.177***
	(3.22)	(0.70)	(3.68)	(4.35)	(4.44)	(2.21)	(4.17)	(-0.01)	(1.65)	(3.99)	(4.51)	(3.04)	(3.43)
dist	1.133	0.964	1.159	-0.281	2.908	-0.023	0.708	0.292	0.556	-0.196	0.414	0.692	-0.033
	(0.77)	(0.065)	(0.83)	(-0.46)	(0.63)	(-0.03)	(1.28)	(0.14)	(0.48)	(-0.10)	(1.20)	(1.16)	(-0.10)
bord	2.577	3.965	4.810	1.501	13.570	1.239	3.409*	-2.235	2.032	3.513	2.923*	5.259*	0.594
	(1.11)	(1.15)	(1.58)	(1.06)	(0.83)	(0.51)	(1.79)	(-0.27)	(0.64)	(0.38)	(1.76)	(1.77)	(0.38)
N	315	380	468	730	917	845	1295	144	594	357	1771	1330	1968

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Results for panel
Short comparison FE vs. HT

IMPORT

	m_{it-1}		Pt		Yt		EU	
	FE	HT	FE	HT	FE	HT	FE	HT
Meat total	0.527***	0.534***	-0.155**	-0.137*	0.853***	0.926***	0.085	0.043
	(22.00)	(21.10)	(-2.20)	(-1.81)	(5.74)	(5.48)	(0.90)	(0.42)
Milk and dairy total	0.406***	0.469***	-0.398***	-0.404***	0.452***	0.500***	0.306***	0.220**
	(15.39)	(18.03)	(-5.77)	(-6.08)	(3.02)	(3.41)	(3.06)	(2.38)
Cereals without rice	0.008	0.021	-0.727***	-0.686***	-0.288	0.437	0.617*	0.306
	(0.16)	(0.39)	(-3.73)	(-3.21)	(-0.66)	(0.93)	(1.69)	(0.83)
Oilseeds	0.274***	0.312***	-0.340***	-0.375***	0.302	0.253	0.616***	0.588***
	(8.85)	(8.70)	(-3.48)	(-3.21)	(1.57)	(1.00)	(4.05)	(3.31)
Sugar	0.228***	0.242***	-1.411***	-1.518***	-0.266	-0.320	2.532***	2.518***
	(5.85)	(5.54)	(-6.80)	(-5.88)	(-0.61)	(-0.59)	(7.97)	(7.03)
Total agrarian import	0.281***	0.283***	-0.674***	-0.665***	0.179**	0.218***	0.112**	0.096*
	(16.66)	(16.02)	(-17.50)	(-16.42)	(2.56)	(2.81)	(2.40)	(1.94)

EXPORT

	x_{it-1}		Pt		Yt		EU	
	FE	HT	FE	HT	FE	HT	FE	HT
Meat total	0.549***	0.555***	-0.092	-0.059	-0.071	0.114	0.657***	0.590***
	(18.09)	(18.59)	(-0.92)	(-0.61)	(-0.39)	(0.72)	(4.66)	(4.35)
Milk and dairy total	0.502***	0.503***	-0.149**	-0.146**	0.213	0.225*	0.425***	0.421***
	(23.38)	(23.79)	(-2.05)	(-2.05)	(1.64)	(1.76)	(4.14)	(4.17)
Cereals without rice	0.462***	0.461***	-0.518	-0.517	1.632	1.655*	-0.003	-0.007
	(5.47)	(5.57)	(-1.47)	(-1.49)	(1.63)	(1.70)	(-0.01)	(-0.01)
Oilseeds	0.294***	0.294***	-0.733***	-0.739***	0.334	0.308	0.376	0.383*
	(8.03)	(8.15)	(-4.67)	(-4.88)	(1.20)	(1.32)	(1.57)	(1.65)
Sugar	0.391***	0.392***	-0.775***	-0.789***	2.294***	2.201***	1.334***	1.356***
	(8.74)	(9.29)	(-3.78)	(-4.09)	(4.65)	(4.84)	(3.69)	(3.99)
Total agrarian export	0.400***	0.400***	-0.533***	-0.535***	0.296***	0.284***	0.232***	0.236***
	(21.24)	(21.47)	(-12.71)	(-12.89)	(3.98)	(3.93)	(4.40)	(4.51)

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Bootstraping

★ If the distribution is likely to be different from standard asymptotic distribution

★ Simple regression in vector form

$$y = \alpha \iota_{NT} + X\beta + u = Z\delta + u$$

★ $M \leq N$ random observations of (y, Z) to derive an estimate $\hat{\delta}_1$

★ Many replications (say R) generate a sequence of bootstrap estimators

$$(\hat{\delta}_1, \hat{\delta}_2, ..., \hat{\delta}_R)$$

★ Sample mean

$$E[\delta] = \hat{\delta} = \frac{\hat{\delta}_1 + \hat{\delta}_2 + ... + \hat{\delta}_R}{R}$$

Sample variance

$$Var[\delta] = \frac{\sum_{r=1}^{R} (\hat{\delta}_r - \hat{\delta})(\hat{\delta}_r - \hat{\delta})'}{R}$$

★ FE and HT

★ 50 and 250 replications

COMENIUS UNIVERSITY
BRATISLAVA

Bootstraping results for panel
Short comparison FE vs. HT
IMPORT

	m$_{it-1}$ FE	m$_{it-1}$ HT	P$_t$ FE	P$_t$ HT	y$_t$ FE	y$_t$ HT	EU FE	EU HT
Meat total	0.527*** (22.00)	0.534*** (21.10)	-0.155** (-2.20)	-0.137* (-1.81)	0.853*** (5.74)	0.926*** (5.48)	0.085 (0.90)	0.043 (0.42)
Milk and dairy total	0.406*** (15.39)	0.469*** (18.03)	-0.398*** (-5.77)	-0.404*** (-6.08)	0.452*** (3.02)	0.500*** (3.41)	0.306*** (3.06)	0.220** (2.38)
Cereals without rice	0.008 (0.16)	0.021 (0.39)	-0.727*** (-3.73)	-0.686*** (-3.21)	-0.288 (-0.66)	0.437 (0.93)	0.617* (1.69)	0.306 (0.83)
Oilseeds	0.274*** (8.85)	0.312*** (8.70)	-0.340*** (-3.48)	-0.375*** (-3.21)	0.302 (1.57)	0.253 (1.00)	0.616*** (4.05)	0.588*** (3.31)
Sugar	0.228*** (5.85)	0.242*** (5.54)	-1.411*** (-6.80)	-1.518*** (-5.88)	-0.266 (-0.61)	-0.320 (-0.59)	2.532*** (7.97)	2.518*** (7.05)
Total agrarian import	0.281*** (16.66)	0.283*** (16.02)	-0.674*** (-17.50)	-0.665*** (-16.42)	0.179** (2.56)	0.218*** (2.81)	0.112** (2.40)	0.096* (1.94)

Variable	Meat total 0201-0210 FE 250 strata	Meat total HT 250 strata	Cheese and curd 0406 FE 250 strata	Cheese and curd HT 250 strata	Milk and dairy total 0401-0406 FE 250 strata	Milk and dairy total HT 250 strata	Cereals without rice 1001-1005, 1007-1008 FE 250 strata	Cereals without rice HT 250 strata	Oilseeds 1201-1207 FE 250 strata	Oilseeds HT 250 strata	Sugar 1701-1702 FE 250 strata	Sugar HT 250 strata	Agricult. Imports 01-24 FE 250 strata	Agricult. Imports HT 250 strata
m$_{it-1}$	0.527*** (11.73) 0.04492	0.534*** (10.93) 0.04888	0.307*** (4.41) 0.06966	0.334*** (3.63) 0.09177	0.406*** (6.86) 0.05920	0.469*** (8.34) 0.05632	0.008 (0.15) 0.04860	0.021 (0.42) 0.05041	0.274*** (5.31) 0.05153	0.313*** (5.25) 0.06135	0.228*** (4.28) 0.05337	0.242*** (4.01) 0.06040	0.281*** (6.03) 0.04666	0.283*** (5.94) 0.04767
p$_t$	-0.155* (-1.76) 0.08817	-0.137 (-1.36) 0.10081	-0.094 (-0.69) 0.13584	-0.055 (-0.39) 0.14003	-0.398*** (-4.47) 0.08914	-0.404*** (-5.30) 0.07611	-0.727*** (-2.90) 0.25091	-0.686** (-2.18) 0.31387	-0.340*** (-2.77) 0.12303	-0.375** (-2.53) 0.14806	-1.411*** (-5.06) 0.27872	-1.518*** (-4.44) 0.34224	-0.674*** (-12.14) 0.05548	-0.665*** (-12.12) 0.05486
y$_t$	0.853*** (5.96) 0.14325	0.926*** (5.37) 0.17242	1.161*** (5.80) 0.20011	1.295*** (4.69) 0.27647	0.452** (2.29) 0.19775	0.500*** (2.81) 0.17795	-0.288 (-0.55) 0.52748	0.437 (0.85) 0.51299	0.302 (1.56) 0.19331	0.253 (0.93) 0.27240	-0.266 (-0.48) 0.54944	-0.320 (-0.45) 0.71677	0.179** (2.24) 0.07997	0.218*** (2.53) 0.08613
EU	0.085 (0.94) 0.09037	0.043 (0.50) 0.08610	0.363*** (3.09) 0.11754	0.267** (2.11) 0.12628	0.306*** (3.15) 0.09712	0.220** (2.81) 0.08889	0.617* (1.70) 0.36253	0.306 (0.90) 0.33903	0.616*** (3.71) 0.16588	0.588*** (2.95) 0.19944	2.532*** (6.13) 0.41285	2.518*** (5.92) 0.42505	0.113*** (2.48) 0.04236	0.096** (2.10) 0.04591
dist		0.313 (0.79) 0.39764		0.591 (0.51) 1.16287		-0.016 (-0.01) 2.44062		0.986* (1.89) 0.52164		1.423 (0.80) 1.78757		2.093 (1.31) 1.59641		1.381 (1.26) 1.09369
bord		1.671 (0.96) 1.74248		3.620 (1.27) 2.85103		1.073 (0.14) 7.90824		1.470 (0.47) 3.14571		4.548 (0.49) 9.27980		13.096 (0.88) 14.89228		8.768 (1.22) 7.21220

★ the first value = bootstrap mean, the third value = bootstrap standard error
★ *t*-statistics are in parentheses
★ the bootstrap standard error
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Bootstraping results for panel
Short comparison FE vs. HT
EXPORT

	X_{it-1} FE	X_{it-1} HT	P_t FE	P_t HT	Y_t FE	Y_t HT	EU FE	EU HT
Meat total	0.549***	0.555***	-0.092	-0.059	-0.071	0.114	0.657***	0.590***
	(18.09)	(18.59)	(-0.92)	(-0.61)	(-0.39)	(0.72)	(4.66)	(4.35)
Milk and dairy total	0.502***	0.503***	-0.149**	-0.146**	0.213	0.225*	0.425***	0.421***
	(23.38)	(23.79)	(-2.05)	(-2.05)	(1.64)	(1.76)	(4.14)	(4.17)
Cereals without rice	0.462***	0.461***	-0.518	-0.517	1.632	1.655*	-0.003	-0.007
	(5.47)	(5.57)	(-1.47)	(-1.49)	(1.63)	(1.70)	(-0.01)	(-0.01)
Oilseeds	0.294***	0.294***	-0.733***	-0.739***	0.334	0.308	0.376	0.383*
	(8.03)	(8.15)	(-4.67)	(-4.88)	(1.20)	(1.32)	(1.57)	(1.65)
Sugar	0.391***	0.392***	-0.775***	-0.789***	2.294***	2.201***	1.334***	1.356***
	(8.74)	(9.29)	(-3.78)	(-4.09)	(4.65)	(4.84)	(3.69)	(3.99)
Total agrarian export	0.400***	0.400***	-0.533***	-0.535***	0.296***	0.284***	0.232***	0.236***
	(21.24)	(21.47)	(-12.71)	(-12.89)	(3.98)	(3.93)	(4.40)	(4.51)

Variable	Meat total FE 250 strata	Meat total HT 250 strata	Cheese and curd FE 250 strata	Cheese and curd HT 250 strata	Milk and dairy total FE 250 strata	Milk and dairy total HT 250 strata	Cereals without rice FE 250 strata	Cereals without rice HT 250 strata	Oilseeds FE 250 strata	Oilseeds HT 250 strata	Sugar FE 250 strata	Sugar HT 250 strata	Agrucult. Exports FE 250 strata	Agrucult. Exports HT 250 strata
HS code	0201-0210		0406		0401-0406		1001-1005, 1007-1008		1201-1207		1701-1702		01-24	
x_{it-1}	0.549***	0.555***	0.470***	0.470***	0.502***	0.503***	0.462***	0.461***	0.294***	0.294***	0.391***	0.392***	0.400***	0.400***
	(10.95)	(12.11)	(7.86)	(8.46)	(11.40)	(11.88)	(3.67)	(3.45)	(3.79)	(3.78)	(6.05)	(5.93)	(11.61)	(10.96)
	0.05013	0.04584	0.05987	0.05561	0.04405	0.04234	0.12587	0.13358	0.07744	0.07771	0.06461	0.66092	0.03440	0.03651
p_t	-0.092	-0.059	0.335***	0.335***	-0.149*	-0.146*	-0.518	-0.517	-0.733***	-0.739***	-0.775***	-0.789***	-0.533***	-0.535***
	(-0.77)	(-0.51)	(2.73)	(2.71)	(-1.89)	(-1.93)	(-1.59)	(-1.55)	(-3.85)	(-4.08)	(-2.96)	(-3.27)	(-8.46)	(-8.66)
	0.11883	0.11605	0.12270	0.12375	0.07875	0.07568	0.32609	0.33228	0.19049	0.18102	0.26146	0.24139	0.06297	0.06172
y_t	-0.071	0.114	0.767***	0.767***	0.213	0.225	1.632	1.655	0.334	0.308	2.294***	2.201***	0.296***	0.284***
	(-0.29)	(0.44)	(3.88)	(4.30)	(1.64)	(1.63)	(1.35)	(1.41)	(1.06)	(0.97)	(3.77)	(3.75)	(3.40)	(3.47)
	0.24701	0.26194	0.19791	0.17849	0.12999	0.13751	1.20795	1.17042	0.31513	0.31675	0.60916	0.58688	0.08706	0.08177
EU	0.657***	0.590***	0.255**	0.255**	0.425***	0.421***	-0.003	-0.007	0.376	0.383*	1.334***	1.356***	0.232***	0.236***
	(4.70)	(4.23)	(2.07)	(2.06)	(4.56)	(4.74)	(-0.00)	(-0.01)	(1.58)	(1.68)	(3.04)	(3.52)	(4.42)	(4.86)
	0.13959	0.13935	0.12283	0.12406	0.09319	0.08876	0.66037	0.64054	0.23779	0.22708	0.43837	0.38545	0.05255	0.04845
dist		-0.281		-0.023		0.708**		0.292		0.556		-0.196		0.414
		(-0.29)		(-0.08)		(2.00)		(0.18)		(0.64)		(-0.19)		(0.95)
		0.95208		02.9561		0.35399		1.58899		0.86550		1.01843		0.43711
bord		1.501		1.239		3.409**		-2.235		2.032		3.513		2.923
		(0.77)		(0.95)		(2.06)		(-0.43)		(0.71)		(0.40)		(1.37)
		1.94254		1.30861		1.65117		5.14993		2.87452		8.71986		2.1363

★ the first value = bootstrap mean, the third value = bootstrap standard error
★ *t*-statistics are in parentheses
★ the bootstrap standard error
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Generalized Method of Movements (GMM) Specification

★ Dynamic models for import and export

$$\Delta m_{it} = \rho \Delta m_{it-1} + \beta_1 \Delta y_t^{home} - \beta_2 (\Delta p_{it}^m - \Delta cpi_t^{home}) + \gamma EU + \Delta \varepsilon_{it}^m$$

$$\Delta x_{it} = \rho \Delta x_{it-1} + \beta_1 \Delta y_{it} - \beta_2 (\Delta p_{it}^x - \Delta cpi_{it}) + \gamma EU + \Delta \varepsilon_{it}^x$$

★ Elimination of fixed effects

★ Autocorrelation of transformed errors => lagged dependent and independent variables are used as IV (Arellano and Bond (1991))

★ Less applicable because of small cross-sectional dimension => just for analyzing the stability of the results

★ Long-run effects

COMENIUS UNIVERSITY
BRATISLAVA

Results for panel
Dynamic Arellano-Bond Models
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import	Total agrarian import HS01-14	Total agrarian import HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
$LD.m_{it-1}$	0.172***	0.120	0.136**	0.180***	-0.012	0.121**	0.109	-0.106**	-0.021	-0.069	-0.067	0.028	0.005
	(2.80)	(1.52)	(2.56)	(5.07)	(-0.23)	(1.99)	(1.43)	(-2.24)	(-0.35)	(-0.84)	(-1.58)	(0.62)	(0.09)
Dp_t	-1.321**	-0.259	-0.489**	-0.061	-1.246***	0.161	-0.535*	-0.592**	-0.142	-1.080*	-0.928***	-0.833***	-0.941***
	(-2.30)	(-0.77)	(-2.06)	(-0.22)	(-4.31)	(0.57)	(-1.90)	(-2.13)	(-0.47)	(-1.92)	(-11.03)	(-5.67)	(-10.86)
Dy_t	-0.410	0.190	0.171	0.644	0.922	0.738	0.947*	1.597	1.892**	2.741*	0.105	-0.017	-0.051
	(-0.32)	(0.27)	(0.33)	(1.06)	(1.02)	(1.07)	(1.65)	(0.96)	(2.52)	(1.69)	(0.55)	(-0.04)	(-0.21)
EU	0.083	0.141**	0.064	0.016	0.062	0.00	0.025	-0.080	-0.055	-0.037	0.033	0.045	0.029
	(0.83)	(2.29)	(1.13)	(0.35)	(0.74)	(0.07)	(0.54)	(-0.20)	(-0.67)	(-0.25)	(1.35)	(1.38)	(1.20)
N	440	566	747	972	432	607	858	149	635	266	1524	956	1619
ARM1	-2.27**	-3.47***	-3.09***	-3.40***	-2.57**	-3.26***	-2.77***	-2.21**	-3.51***	-1.64	-2.62***	-2.80***	-3.57***
ARM2	-1.49	-0.54	-0.06	-1.58	-0.36	-1.10	-0.94	-1.36	-0.72	-1.26	-2.42**	-1.38	-0.49

★ *t*-statistics are in parentheses
★ ARM1 and ARM2 denote the Arrelano-Bond test that the average autocovariance in residuals of order 1 and 2 is 0 with H_0 of no autocorrelation
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Results for panel
Dynamic Arellano-Bond Models
EXPORT

	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian export	Total agrarian export HS01-14	Total agrarian export HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
$LD.x_{it-1}$	-0.067	0.228**	0.063***	0.280***	0.131	0.185**	0.190	0.189	0.123*	0.023	0.088	0.041	0.255***
	(-0.69)	(2.04)	(0.73)	(3.48)	(1.54)	(2.44)	(1.47)	(1.19)	(1.82)	(0.26)	(1.21)	(0.72)	(2.91)
Dp_t	0.124	-1.152*	-1.313	-0.769**	-0.407	0.103	-0.397*	0.459	-0.915***	-1.223*	-0.936***	-0.892***	-0.977***
	(0.24)	(-1.96)	(-4.31)	(-2.14)	(-1.05)	(0.63)	(-1.84)	(0.49)	(-2.78)	(-1.76)	(-8.18)	(-7.03)	(-7.43)
Dy_t	-0.701	1.705***	0.470	1.028***	0.246	1.399***	0.843*	5.288	-0.270	3.333***	-0.510	0.461	-0.210
	(-0.48)	(3.27)	(0.59)	(2.72)	(0.46)	(2.72)	(1.91)	(1.27)	(-0.47)	(7.58)	(-1.23)	(1.83)	(-0.78)
EU	0.244**	0.156	0.104	0.122**	0.138*	0.070	0.085	-1.356*	0.015	-0.186	0.029	0.044*	0.002
	(2.21)	(1.40)	(1.13)	(2.00)	(1.66)	(1.29)	(1.23)	(-1.85)	(0.14)	(-1.25)	(1.02)	(1.05)	(0.06)
N	213	288	381	579	757	718	1124	60	414	205	1486	1001	1707
ARM1	-2.10**	-2.75***	-2.01**	-2.60***	-2.92***	-3.50***	-2.88***	-0.91	-2.72***	-0.81	-3.64***	-3.03***	-3.55***
ARM2	1.03	0.27	-2.41**	-1.69*	-1.99**	-0.36	0.21	-0.75	-1.31	-0.56	-1.88*	-2.78***	-0.63

★ *t*-statistics are in parentheses
★ ARM1 and ARM2 denote the Arrelano-Bond test that the average autocovariance in residuals of order 1 and 2 is 0 with H_0 of no autocorrelation
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009   COMENIUS UNIVERSITY
                                          BRATISLAVA

General Results

★ The lagged exports and imports have a large influence on trade flows of agri-food commodities

★ The income elasticities:

imports – significant for all meat and milk commodities

exports – significant only for cheese and sugar => saturated market

★ The price elasticities are relatively high. Thus, price effects due to trade changes may have large effects on trade flows

★ Bootstrap confirmed our estimations

★ The results are largely confirmed by the GMM estimations

COMENIUS UNIVERSITY
BRATISLAVA

Results on the EU enlargement Effects

★ We found positive and significant EU enlargement effects on both imports and exports, which vary strongly between agricultural commodities

★ The highest EU elasticities are found for sugar both for the imports (2.56) and exports (1.34)

★ The import effects of the EU dominate only for sugar, oilseeds, cheese and milk

★ The export effects of the EU are significant for all commodities except for meat of swine, cereals and oilseeds

★ The net effects (x - m) – positive for all except sugar, cheese, cereals and oilseeds

Conclusions

★ Panel dynamic model is appropriate for the explanation of the agri-food trade during the period of pre-accession and post-accession to the EU

★ We found important differences between individual commodities

★ The lagged exports and imports have a large influence on trade flows of agri-food commodities

★ Accession to the EU increased the new member states' exports, has less impact on their import

★ The new member states have gained significantly from liberalized access

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Possible Effects on Third Countries

★ In our sample, which includes mainly the reporting countries of the new member states of the EU, we cannot estimate directly possible trade diversion effects

★ The EU effects cover both trade creation effects and trade diversion effects

★ Nevertheless, the addition of Bulgaria and Romania did not change the results

★ Since the EU effects dominate for the export, trade creation is expected to be more important

COMENIUS UNIVERSITY
BRATISLAVA

Thank you for your attention

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Questions 1

★ **It is theoretically correct to use gravity model for homogeneous products and under what conditions?**

- countries are specialized in special products (Feenstra and Deardorff (1998))

- gravity models for homogeneous products (cereals, oilseeds,…) don't go well with literature

- commodity groups - considered as differentiated goods (cheese and milk products) – can be used gravity models under new theory of international trade (increasing returns to scale in production)

★ **What is the reason of negative income elasticity especially for imports?**

- the negative elasticity is not significant

- could it be caused because of Engel's law (the higher income the lower share of spending for foodstuff)

★ **The EU dummy variable is always positive for imports and mostly positive for exports (except for cereals). Significant estimates of EU dummy are for exports of meat, milk, sugar and total agrarian trade. What is the main reason for this?**

- it could be explained by relatively high protectionist rates prior to EU accession as those products are viewed as sensitive products in agricultural trade and characterized by high trade barriers

- this is the main economic gain of thesis

COMENIUS UNIVERSITY
BRATISLAVA

Questions 2

★ **What is the explanation for different income elasticity and negative income elasticity in import equation?**

- see Questions 1

★ **What is the explanation for positive distance elasticity in import equation?**

- the positive elasticity is not significant

- because of data, we have fixed effects – (don't know exactly what all they include)

- significant for Meat of poultry - could it be caused because peripheral countries are concentrated on agriculture (the centre of EU on industry)

★ **Combination of CGEM and gravity model**

- **CGEM**   - include complicated detailed structure of (agriculture) sector

                          - the parameters are calibrated (could be calibrated by gravity model)

- **gravity model**   - known as partial models

                          - trade is aggregated

                          - Anderson and Van Wincoop derive gravity equation from CGEM (many initial parameters are estimated in aggregated form – as part of fixed or time effects - reduced estimation)

September 21, 2009   COMENIUS UNIVERSITY
BRATISLAVA

International trade theories

Classical theories

★ Adam Smith - absolute advantage theory

- 2 countries, 2 commodities, one-factor theory

★ David Ricardo - the theory of comparative advantage

- bilateral trade is profitable for both of countries, also for country without absolute advantage, absolute price, one-factor theory

Neoclassical theories

★ Bertil Ohlin - Heckscher-Ohlin theorem

- 2 countries, 2 commodities, two-factor theory, constant economies of scale, country exports commodity, which is produced by using more abundant factor

★ Paul Samuelson - Stolper-Samuelson theorem

- price balancing (with assumption H-O theorem, element of dynamics)

★ Paul Krugman

- economies of scale and consumers' preferences

COMENIUS UNIVERSITY
BRATISLAVA

Comparison of results for panel and Slovakia
Fixed Effect Model
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import	Total agrarian import HS01-14	Total agrarian import HS15-24
m_{it-1}	0.427***	0.611***	0.505***	0.527***	0.444***	0.307***	0.406***	0.008	0.274***	0.228***	0.281***	0.231***	0.348***
	(11.08)	(18.91)	(18.13)	(22.00)	(12.11)	(10.86)	(15.39)	(0.16)	(8.85)	(5.85)	(16.66)	(12.85)	(18.64)
p_t	-0.569***	-0.206*	-0.135	-0.155**	-0.700***	-0.094	-0.398***	-0.727***	-0.340***	-1.411***	-0.674***	-0.712***	-0.561***
	(-3.79)	(-1.65)	(-1.61)	(-2.20)	(-5.76)	(-0.91)	(-5.77)	(-3.73)	(-3.48)	(-6.80)	(-17.50)	(-13.36)	(-13.10)
y_t	0.613*	1.028***	0.732***	0.853***	0.019	1.161***	0.452***	-0.288	0.302	-0.266	0.179**	0.148	0.288***
	(1.80)	(4.25)	(3.97)	(5.74)	(0.06)	(7.00)	(3.02)	(-0.66)	(1.57)	(-0.61)	(2.56)	(1.48)	(3.72)
EU	0.085	0.045	0.242**	0.085	0.001	0.363***	0.306***	0.617*	0.616***	2.532***	0.112**	0.266***	0.008
	(0.38)	(0.30)	(3.97)	(0.90)	(0.01)	(3.21)	(3.06)	(1.69)	(4.05)	(7.97)	(2.40)	(3.76)	(0.15)
m_{it-1}	0.310***	0.509***	0.374***	0.532***	0.438***	0.062	0.297***	-0.025	0.057	0.206*	0.075**	0.104***	0.158***
	(2.85)	(5.34)	(5.34)	(8.52)	(4.34)	(1.05)	(5.99)	(-0.31)	(0.65)	(1.73)	(2.11)	(2.62)	(4.41)
p_t	-0.892**	0.273	-1.074***	-0.698***	-0.047	1.051***	-0.243*	-0.578	-0.377	0.990	-0.804***	-0.840***	-0.778***
	(-2.31)	(0.06)	(-4.40)	(-3.00)	(-0.14)	(4.60)	(-1.72)	(-1.57)	(-1.34)	(1.17)	(-6.71)	(-6.11)	(-7.64)
y_t	-1.224*	-0.239	0.577	0.106	2.645***	1.362***	0.610**	-0.420	-0.197	5.926***	0.854***	-0.170	0.654***
	(-1.87)	(-0.07)	(1.20)	(0.29)	(3.84)	(3.93)	(2.24)	(-0.55)	(-0.35)	(3.53)	(4.77)	(-0.73)	(4.05)
EU	0.187	0.185	0.626**	0.509**	-0.060	0.741***	0.653***	0.188	0.103	-0.415	-0.134	0.007	-0.188
	(0.37)	(0.44)	(2.13)	(2.22)	(-0.13)	(3.11)	(3.84)	(0.30)	(0.24)	(-0.35)	(-1.00)	(0.04)	(-1.62)

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

Comparison of results for panel and Slovakia
Fixed Effect Model
EXPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import	Total agrarian import HS01-14	Total agrarian import HS15-24
x_{it-1}	0.348***	0.577***	0.542***	0.549***	0.393***	0.470***	0.502***	0.462***	0.294***	0.391***	0.400***	0.293***	0.467***
	(7.59)	(13.81)	(13.70)	(18.09)	(13.33)	(20.07)	(23.38)	(5.47)	(8.03)	(8.74)	(21.24)	(14.18)	(26.42)
p_t	-0.401*	0.113	-0.512***	-0.092	-0.310**	0.335***	-0.149**	-0.518	-0.733***	-0.775***	-0.533***	-0.647***	-0.660***
	(-1.91)	(0.68)	(-4.05)	(-0.92)	(-2.51)	(3.17)	(-2.05)	(-1.47)	(-4.67)	(-3.78)	(-12.71)	(-11.06)	(-15.12)
y_t	-0.511	-0.172	-0.028	-0.071	-0.539	0.767***	0.213	1.632	0.334	2.294***	0.296***	0.141	0.281***
	(-1.32)	(-0.60)	(-0.12)	(-0.39)	(-2.52)	(5.43)	(1.64)	(1.63)	(1.20)	(4.65)	(3.98)	(1.24)	(3.75)
EU	0.850***	0.208	0.629***	0.657***	0.764***	0.255**	0.425***	-0.003	0.376	1.334***	0.232***	0.247***	0.166***
	(3.36)	(1.00)	(3.74)	(4.66)	(4.32)	(2.16)	(4.14)	(-0.01)	(1.57)	(3.69)	(4.40)	(3.03)	(3.17)
x_{it-1}	0.548***	0.074	0.480***	0.455***	0.407***	0.648***	0.408***	0.440***	0.361***	0.408***	0.353***	0.134***	0.397***
	(2.98)	(0.45)	(5.47)	(5.94)	(6.31)	(12.47)	(8.49)	(6.94)	(5.63)	(8.49)	(8.96)	(3.87)	(10.97)
p_t	-0.884	1.078***	-0.447**	-0.292**	-0.658***	-0.154	-0.622***	-1.040***	-0.676***	-1.456***	-0.500***	-0.934***	-0.626***
	(-1.10)	(3.49)	(-2.60)	(-2.04)	(-3.38)	(-0.69)	(-5.15)	(-5.79)	(-3.26)	(-7.99)	(-8.88)	(-11.69)	(-9.21)
y_t	-0.531	-0.831	-0.178	0.151	-0.155	0.2848	0.290	0.028	-0.407	0.455	0.739***	0.791***	0.562***
	(-0.41)	(-1.45)	(-0.36)	(0.33)	(-0.46)	(0.93)	(1.18)	(0.35)	(-1.04)	(1.06)	(5.84)	(4.14)	(3.87)
EU	0.645	1.390	1.502***	1.237***	1.158***	0.202	0.415**	0.901**	0.881***	1.168***	0.151	0.283	0.306**
	(0.70)	(1.29)	(3.37)	(3.10)	(3.52)	(0.85)	(2.07)	(2.21)	(2.76)	(3.38)	(1.42)	(1.58)	(2.56)

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

COMENIUS UNIVERSITY
BRATISLAVA

Comparison of results for panel and Czech republic
Fixed Effect Model
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import
m_{it-1}	0.427***	0.611***	0.505***	0.527***	0.444***	0.307***	0.406***	0.008	0.274***	0.228***	0.281***
	(11.08)	(18.91)	(18.13)	(22.00)	(12.11)	(10.86)	(15.39)	(0.16)	(8.85)	(5.85)	(16.66)
p_t	-0.569***	-0.206*	-0.135	-0.155**	-0.700***	-0.094	-0.398***	-0.727***	-0.340***	-1.411***	-0.674***
	(-3.79)	(-1.65)	(-1.61)	(-2.20)	(-5.76)	(-0.91)	(-5.77)	(-3.73)	(-3.48)	(-6.80)	(-17.50)
y_t	0.613*	1.028***	0.732***	0.853***	0.019	1.161***	0.452***	-0.288	0.302	-0.266	0.179**
	(1.80)	(4.25)	(3.97)	(5.74)	(0.06)	(7.00)	(3.02)	(-0.66)	(1.57)	(-0.61)	(2.56)
EU	0.085	0.045	0.242**	0.085	0.001	0.363***	0.306***	0.617*	0.616***	2.532***	0.112**
	(0.38)	(0.30)	(3.97)	(0.90)	(0.01)	(3.21)	(3.06)	(1.69)	(4.05)	(7.97)	(2.40)
m_{it-1}	0.377***	0.638***	0.329***	0.429***	0.148	0.231***	0.369***	0.889	0.404***	0.389***	0.332***
	(5.24)	(8.16)	(5.24)	(6.78)	(1.65)	(4.42)	(6.24)	(0.94)	(5.72)	(5.15)	(8.99)
p_t	-2.213***	-1.315***	-0.754***	-1.308***	-0.122	0.179	-0.705***	-1.047***	-1.064***	-1.984**	-0.817***
	(-5.99)	(-3.10)	(-2.74)	(-4.48)	(-0.33)	(0.90)	(-4.87)	(-3.02)	(-3.31)	(-2.54)	(-10.00)
y_t	0.999	1.677**	0.304	1.372***	3.057***	0.829***	0.959***	-0.375	1.315**	0.433	0.607***
	(1.36)	(2.35)	(0.76)	(3.11)	(3.39)	(3.27)	(3.59)	(-0.49)	(2.08)	(0.64)	(7.31)
EU	1.372***	0.437	1.016***	0.572**	0.691	0.332*	0.194	0.180	-1.051*	0.135**	0.099
	(3.16)	(1.29)	(3.91)	(2.10)	(1.63)	(1.84)	(1.11)	(0.35)	(-1.82)	(0.17)	(1.58)

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

COMENIUS UNIVERSITY
BRATISLAVA

Comparison of results for panel and Czech republic
Fixed Effect Model
EXPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import
x_{it-1}	0.348***	0.577***	0.542***	0.549***	0.393***	0.470***	0.502***	0.462***	0.294***	0.391***	0.400***
	(7.59)	(13.81)	(13.70)	(18.09)	(13.33)	(20.07)	(23.38)	(5.47)	(8.03)	(8.74)	(21.24)
p_t	-0.401*	0.113	-0.512***	-0.092	-0.310**	0.335***	-0.149**	-0.518	-0.733***	-0.775***	-0.533***
	(-1.91)	(0.68)	(-4.05)	(-0.92)	(-2.51)	(3.17)	(-2.05)	(-1.47)	(-4.67)	(-3.78)	(-12.71)
y_t	-0.511	-0.172	-0.028	-0.071	-0.539	0.767***	0.213	1.632	0.334	2.294***	0.296***
	(-1.32)	(-0.60)	(-0.12)	(-0.39)	(-2.52)	(5.43)	(1.64)	(1.63)	(1.20)	(4.65)	(3.98)
EU	0.850***	0.208	0.629***	0.657***	0.764***	0.255**	0.425***	-0.003	0.376	1.334***	0.232***
	(3.36)	(1.00)	(3.74)	(4.66)	(4.32)	(2.16)	(4.14)	(-0.01)	(1.57)	(3.69)	(4.40)
x_{it-1}	0.332***	0.394***	0.555***	0.505***	0.426***	0.402***	0.467***	0.549***	0.251***	0.350***	0.549***
	(4.96)	(6.09)	(6.59)	(8.44)	(9.15)	(10.21)	(12.40)	(13.95)	(5.19)	(8.30)	(16.39)
p_t	-1.244***	-0.234	0.073	-0.199	-0.521***	-0.018	-0.514***	-2.192***	-0.961***	-1.727***	-0.357***
	(-9.48)	(-1.21)	(0.74)	(-1.59)	(-3.39)	(-0.10)	(-5.69)	(-10.50)	(-6.81)	(-11.50)	(-8.72)
y_t	-1.563***	0.413	1.029***	0.318	-0.640*	0.731***	-0.115	0.161***	0.463	-0.451	0.184**
	(-3.74)	(0.91)	(2.76)	(0.85)	(-1.75)	(2.85)	(-0.53)	(2.96)	(1.60)	(-1.15)	(2.05)
EU	0.535**	0.334	0.426***	0.325	0.718**	-0.100	0.001	-0.382	0.153	1.512***	0.058
	(2.15)	(1.15)	(2.67)	(1.34)	(2.30)	(-0.53)	(0.01)	(-1.24)	(0.69)	(4.59)	(0.80)

★ t-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Comparison of results for panel and Latvia
Fixed Effect Model
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import
m_{it-1}	0.427***	0.611***	0.505***	0.527***	0.444***	0.307***	0.406***	0.008	0.274***	0.228***	0.281***
	(11.08)	(18.91)	(18.13)	(22.00)	(12.11)	(10.86)	(15.39)	(0.16)	(8.85)	(5.85)	(16.66)
p_t	-0.569***	-0.206*	-0.135	-0.155**	-0.700***	-0.094	-0.398***	-0.727***	-0.340***	-1.411***	-0.674***
	(-3.79)	(-1.65)	(-1.61)	(-2.20)	(-5.76)	(-0.91)	(-5.77)	(-3.73)	(-3.48)	(-6.80)	(-17.50)
y_t	0.613*	1.028***	0.732***	0.853***	0.019	1.161***	0.452***	-0.288	0.302	-0.266	0.179**
	(1.80)	(4.25)	(3.97)	(5.74)	(0.06)	(7.00)	(3.02)	(-0.66)	(1.57)	(-0.61)	(2.56)
EU	0.085	0.045	0.242**	0.085	0.001	0.363***	0.306***	0.617*	0.616***	2.532***	0.112**
	(0.38)	(0.30)	(3.97)	(0.90)	(0.01)	(3.21)	(3.06)	(1.69)	(4.05)	(7.97)	(2.40)
m_{it-1}	0.527***	0.603***	0.636***	0.720***	0.512***	0.571***	0.360***	0.089	0.367***	0.388***	0.234***
	(5.52)	(8.40)	(8.94)	(11.23)	(6.08)	(7.43)	(8.71)	(0.68)	(5.94)	(2.90)	(5.22)
p_t	0.366	0.033	-0.209	0.049	-1.299***	-0.131	-1.140***	-2.323**	-1.027***	-1.263**	-1.027***
	(1.09)	(0.10)	(-0.87)	(0.24)	(-3.39)	(-0.34)	(-6.82)	(-2.26)	(-3.60)	(-2.10)	(-10.25)
y_t	-0.081	0.598	0.818**	0.118	1.442**	1.189***	1.788***	5.609*	0.190	0.777	0.041
	(-0.17)	(1.22)	(2.54)	(0.49)	(2.20)	(3.08)	(7.37)	(1.97)	(0.41)	(0.96)	(0.31)
EU	0.051	0.263	-0.040	0.130	0.162	0.090	0.031	-0.848	0.697***	2.213***	0.320***
	(0.20)	(1.14)	(-0.26)	(1.11)	(0.57)	(0.56)	(0.29)	(-0.80)	(2.88)	(4.24)	(4.05)

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Comparison of results for panel and Latvia

Fixed Effect Model

EXPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import
x_{it-1}	0.348***	0.577***	0.542***	0.549***	0.393***	0.470***	0.502***	0.462***	0.294***	0.391***	0.400***
	(7.59)	(13.81)	(13.70)	(18.09)	(13.33)	(20.07)	(23.38)	(5.47)	(8.03)	(8.74)	(21.24)
P_t	-0.401*	0.113	-0.512***	-0.092	-0.310**	0.335***	-0.149**	-0.518	-0.733***	-0.775***	-0.533***
	(-1.91)	(0.68)	(-4.05)	(-0.92)	(-2.51)	(3.17)	(-2.05)	(-1.47)	(-4.67)	(-3.78)	(-12.71)
y_t	-0.511	-0.172	-0.028	-0.071	-0.539	0.767***	0.213	1.632	0.334	2.294***	0.296***
	(-1.32)	(-0.60)	(-0.12)	(-0.39)	(-2.52)	(5.43)	(1.64)	(1.63)	(1.20)	(4.65)	(3.98)
EU	0.850***	0.208	0.629***	0.657***	0.764***	0.255**	0.425***	-0.003	0.376	1.334***	0.232***
	(3.36)	(1.00)	(3.74)	(4.66)	(4.32)	(2.16)	(4.14)	(-0.01)	(1.57)	(3.69)	(4.40)
x_{it-1}	0.402***	0.328	0.354***	0.515***	0.503***	0.563***	0.503***	0.435***	0.221***	0.218***	0.376***
	(3.53)	(1.64)	(4.05)	(7.98)	(8.44)	(7.09)	(8.33)	(7.77)	(3.24)	(2.83)	(8.07)
P_t	-1.380**	-0.814*	-1.524***	-1.083***	-0.966***	-0.436	-0.581***	-3.325***	-2.433***	-2.273***	-0.668***
	(-2.08)	(-1.84)	(-6.51)	(-5.94)	(-4.37)	(-1.54)	(-5.74)	(-11.64)	(-10.44)	(-8.72)	(-8.79)
y_t	-0.182	2.164	-1.343**	-0.230	-1.292***	-0.105	-0.597***	0.096	-0.509	-1.545	0.360**
	(-0.16)	(1.50)	(-2.09)	(0.52)	(-2.80)	(-0.36)	(-2.70)	(1.58)	(-0.88)	(-1.53)	(2.23)
EU	2.219***	0.731	1.582***	1.211***	1.010***	0.379*	0.637***	0.032	0.529	2.056***	0.416***
	(3.01)	(1.23)	(3.57)	(3.83)	(2.87)	(1.69)	(3.51)	(0.09)	(1.31)	(3.86)	(3.78)

★ t-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

COMENIUS UNIVERSITY
BRATISLAVA

Comparison of results for panel and Lithuania
Fixed Effect Model
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import
m_{it-1}	0.427***	0.611***	0.505***	0.527***	0.444***	0.307***	0.406***	0.008	0.274***	0.228***	0.281***
	(11.08)	(18.91)	(18.13)	(22.00)	(12.11)	(10.86)	(15.39)	(0.16)	(8.85)	(5.85)	(16.66)
p_t	-0.569***	-0.206*	-0.135	-0.155**	-0.700***	-0.094	-0.398***	-0.727***	-0.340***	-1.411***	-0.674***
	(-3.79)	(-1.65)	(-1.61)	(-2.20)	(-5.76)	(-0.91)	(-5.77)	(-3.73)	(-3.48)	(-6.80)	(-17.50)
y_t	0.613*	1.028***	0.732***	0.853***	0.019	1.161***	0.452***	-0.288	0.302	-0.266	0.179**
	(1.80)	(4.25)	(3.97)	(5.74)	(0.06)	(7.00)	(3.02)	(-0.66)	(1.57)	(-0.61)	(2.56)
EU	0.085	0.045	0.242**	0.085	0.001	0.363***	0.306***	0.617*	0.616***	2.532***	0.112**
	(0.38)	(0.30)	(3.97)	(0.90)	(0.01)	(3.21)	(3.06)	(1.69)	(4.05)	(7.97)	(2.40)
m_{it-1}	0.169*	0.694***	0.507***	0.435***	0.463***	0.572***	0.534***	0.136	0.190**	0.122	0.323***
	(1.92)	(9.04)	(8.15)	(9.70)	(7.77)	(7.94)	(10.54)	(1.61)	(2.47)	(1.46)	(6.13)
p_t	-0.826*	-0.728**	-0.522**	-0.875***	-1.508***	-0.545	-0.774***	-2.023***	-0.034	-1.774***	-0.942***
	(-1.87)	(-2.19)	(-2.11)	(-3.79)	(-4.29)	(-3.09)	(-3.11)	(-2.30)	(-0.11)	(-3.08)	(-7.43)
y_t	0.006	0.455	0.480*	-0.014	-0.313	1.209***	-0.309	-0.121	1.458***	-0.448	-0.314
	(0.01)	(1.09)	(1.66)	(-0.05)	(-0.81)	(3.52)	(-1.17)	(-0.11)	(2.76)	(-0.40)	(-1.58)
EU	0.375	0.415*	0.348**	0.795***	-1.000***	0.244	0.505**	-0.356	0.806**	3.527***	0.440***
	(1.19)	(1.69)	(2.05)	(4.70)	(-3.28)	(1.33)	(2.21)	(-0.30)	(2.45)	(3.67)	(5.41)

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Comparison of results for panel and Lithuania
Fixed Effect Model
EXPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import
x_{it-1}	0.348***	0.577***	0.542***	0.549***	0.393***	0.470***	0.502***	0.462***	0.294***	0.391***	0.400***
	(7.59)	(13.81)	(13.70)	(18.09)	(13.33)	(20.07)	(23.38)	(5.47)	(8.03)	(8.74)	(21.24)
p_t	-0.401*	0.113	-0.512***	-0.092	-0.310**	0.335***	-0.149**	-0.518	-0.733***	-0.775***	-0.533***
	(-1.91)	(0.68)	(-4.05)	(-0.92)	(-2.51)	(3.17)	(-2.05)	(-1.47)	(-4.67)	(-3.78)	(-12.71)
y_t	-0.511	-0.172	-0.028	-0.071	-0.539	0.767***	0.213	1.632	0.334	2.294***	0.296***
	(-1.32)	(-0.60)	(-0.12)	(-0.39)	(-2.52)	(5.43)	(1.64)	(1.63)	(1.20)	(4.65)	(3.98)
EU	0.850***	0.208	0.629***	0.657***	0.764***	0.255**	0.425***	-0.003	0.376	1.334***	0.232***
	(3.36)	(1.00)	(3.74)	(4.66)	(4.32)	(2.16)	(4.14)	(-0.01)	(1.57)	(3.69)	(4.40)
x_{it-1}	0.554***	0.420***	0.734***	0.564***	0.505***	0.719***	0.489***	0.867***	0.263***	0.490***	0.501***
	(7.11)	(3.10)	(8.48)	(8.55)	(7.59)	(9.70)	(9.45)	(15.51)	(3.36)	(7.14)	(9.15)
p_t	0.728**	0.012	-0.426*	0.145	0.269**	0.165	0.060	0.030	-0.174	-0.264	-0.021
	(2.50)	(0.01)	(-1.87)	(0.67)	(2.48)	(1.09)	(0.70)	(0.09)	(-0.71)	(-1.63)	(-0.13)
y_t	-0.355	2.297**	1.863***	0.353	-0.453*	0.783**	0.170	0.020	1.246**	1.486***	1.215***
	(-0.08)	(2.11)	(5.40)	(0.83)	(-1.74)	(2.43)	(0.96)	(0.22)	(2.21)	(3.08)	(3.01)
EU	0.331	-0.325	-0.112	0.685**	0.480**	-0.062	0.273*	0.115	0.634	0.391	0.358**
	(1.14)	(-0.43)	(-0.41)	(2.31)	(2.27)	(-0.31)	(1.79)	(0.25)	(1.48)	(1.21)	(2.20)

★ t-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Baldwin's medal mistakes

★ **Gold**

- the work without multilateral resistance factor (only time-invariant variables, without cross-section)

★ **Silver**

- the work with logarithm of average of the sum of import and export $\log\left(\frac{m+x}{2}\right)$

instead of average of logarithm of import and export $\dfrac{\log(m) + \log(x)}{2}$

★ **Bronze**

- the use of real trade flows instead of nominal values => biases via spurious correlations, because of global trends in inflation rates

Results for Slovakia
Fixed Effect Model
IMPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian import	Total agrarian import HS01-14	Total agrarian import HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
m_{it-1}	0.310***	0.509***	0.374***	0.532***	0.438***	0.062	0.297***	-0.025	0.057	0.206*	0.075**	0.104***	0.158***
	(2.85)	(5.34)	(5.34)	(8.52)	(4.34)	(1.05)	(5.99)	(-0.31)	(0.65)	(1.73)	(2.11)	(2.62)	(4.41)
p_t	-0.892**	0.273	-1.074***	-0.698***	-0.047	1.051***	-0.243*	-0.578	-0.377	0.990	-0.804***	-0.840***	-0.778***
	(-2.31)	(0.06)	(-4.40)	(-3.00)	(-0.14)	(4.60)	(-1.72)	(-1.57)	(-1.34)	(1.17)	(-6.71)	(-6.11)	(-7.64)
y_t	-1.224*	-0.239	0.577	0.106	2.645***	1.362***	0.610**	-0.420	-0.197	5.926***	0.854***	-0.170	0.654***
	(-1.87)	(-0.07)	(1.20)	(0.29)	(3.84)	(3.93)	(2.24)	(-0.55)	(-0.35)	(3.53)	(4.77)	(-0.73)	(4.05)
EU	0.187	0.185	0.626**	0.509**	-0.060	0.741***	0.653***	0.188	0.103	-0.415	-0.134	0.007	-0.188
	(0.37)	(0.44)	(2.13)	(2.22)	(-0.13)	(3.11)	(3.84)	(0.30)	(0.24)	(-0.35)	(-1.00)	(0.04)	(-1.62)
R^2	0.33	0.40	0.61	0.66	0.49	0.38	0.54	0.47	0.08	0.41	0.41	0.29	0.48

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level
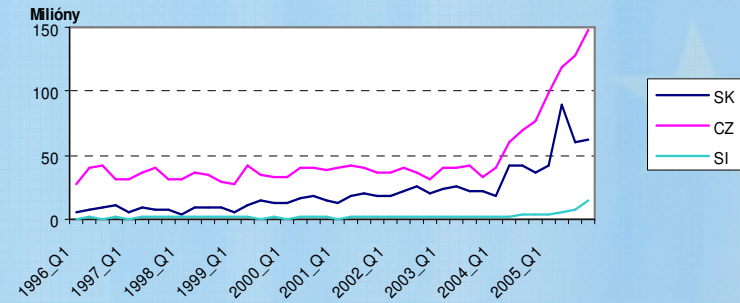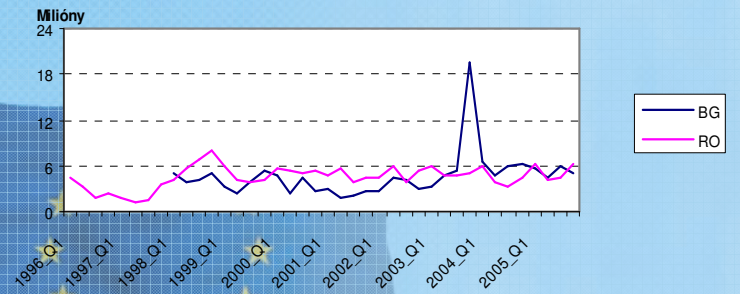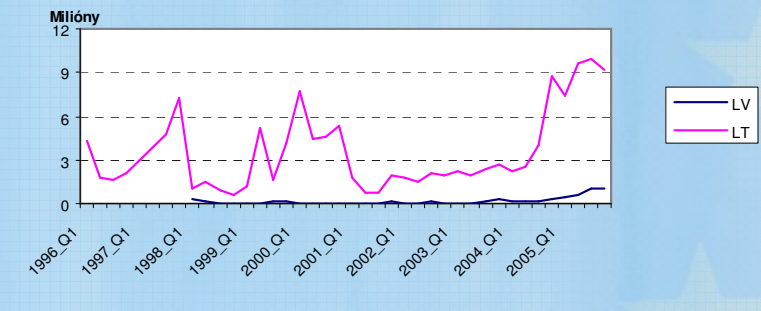
September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Results for Slovakia
Fixed Effect Model
EXPORT

Variable	Meat of bovine	Meat of swine	Meat of poultry	Meat total	Milk and cream	Cheese and curd	Milk and dairy total	Cereals without rice	Oilseeds	Sugar	Total agrarian export	Total agrarian export HS01-14	Total agrarian export HS15-24
HS code	0201-0202	0203	0207	0201-0210	0401-0402	0406	0401-0406	1001-1005, 1007-1008	1201-1207	1701-1702	01-24	01-14	15-24
x_{it-1}	0.548***	0.074	0.480***	0.455***	0.407***	0.648***	0.408***	0.440***	0.361***	0.408***	0.353***	0.134***	0.397***
	(2.98)	(0.45)	(5.47)	(5.94)	(6.31)	(12.47)	(8.49)	(6.94)	(5.63)	(8.49)	(8.96)	(3.87)	(10.97)
p_t	-0.884	1.078***	-0.447**	-0.292**	-0.658***	-0.154	-0.622***	-1.040***	-0.676***	-1.456***	-0.500***	-0.934***	-0.626***
	(-1.10)	(3.49)	(-2.60)	(-2.04)	(-3.38)	(-0.69)	(-5.15)	(-5.79)	(-3.26)	(-7.99)	(-8.88)	(-11.69)	(-9.21)
y_t	-0.531	-0.831	-0.178	0.151	-0.155	0.2848	0.290	0.028	-0.407	0.455	0.739***	0.791***	0.562***
	(-0.41)	(-1.45)	(-0.36)	(0.33)	(-0.46)	(0.93)	(1.18)	(0.35)	(-1.04)	(1.06)	(5.84)	(4.14)	(3.87)
EU	0.645	1.390	1.502***	1.237***	1.158***	0.202	0.415**	0.901**	0.881***	1.168***	0.151	0.283	0.306**
	(0.70)	(1.29)	(3.37)	(3.10)	(3.52)	(0.85)	(2.07)	(2.21)	(2.76)	(3.38)	(1.42)	(1.58)	(2.56)
R^2	0.31	0.58	0.47	0.40	0.46	0.51	0.43	0.46	0.35	0.58	0.49	0.40	0.53

★ *t*-statistics are in parentheses
★ *, **, *** denote significance at the 10, 5 and 1 per cent level
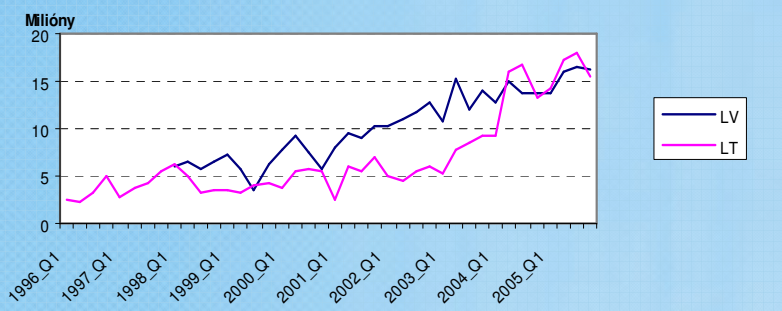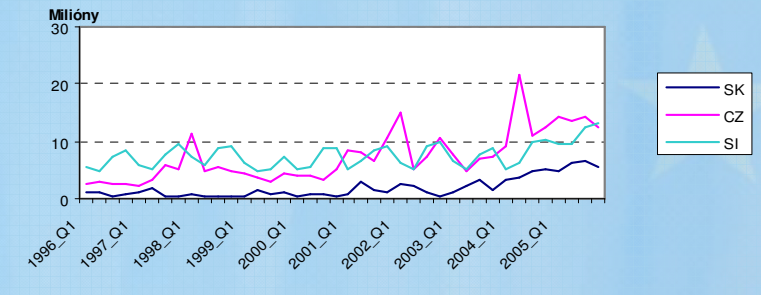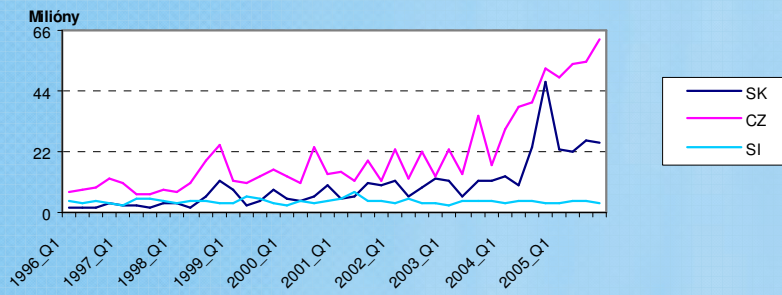
September 21, 2009

COMENIUS UNIVERSITY
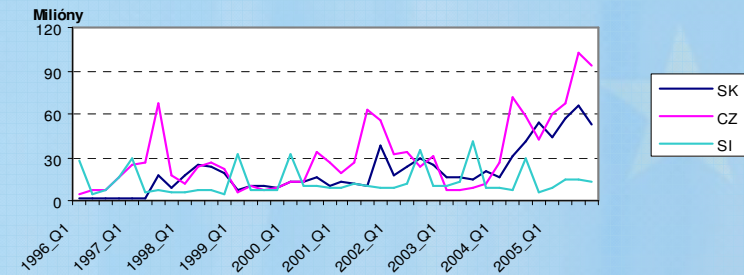BRATISLAVA
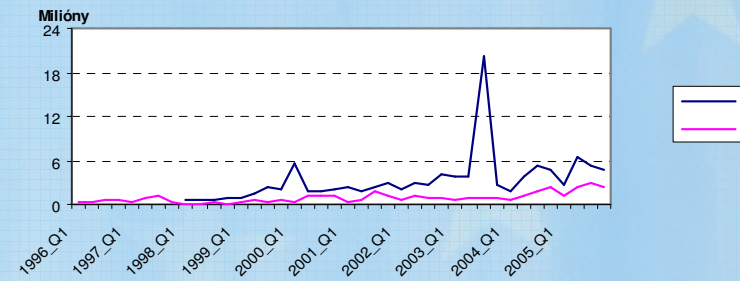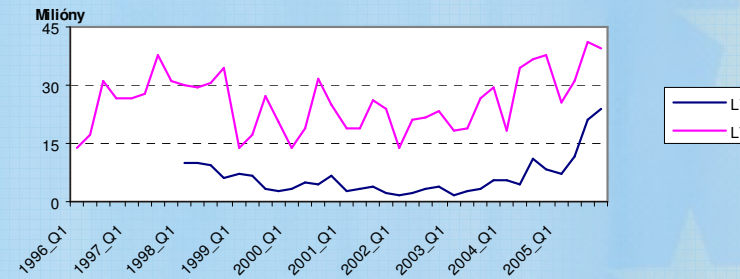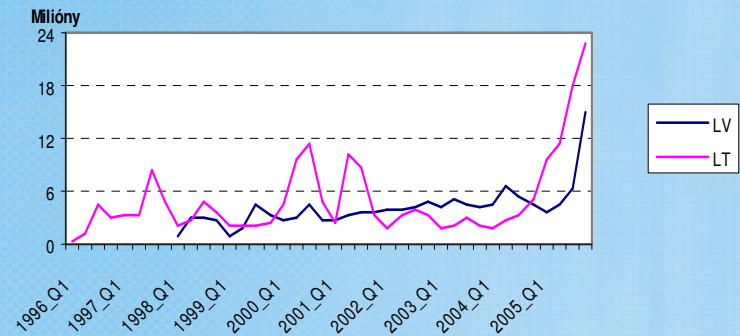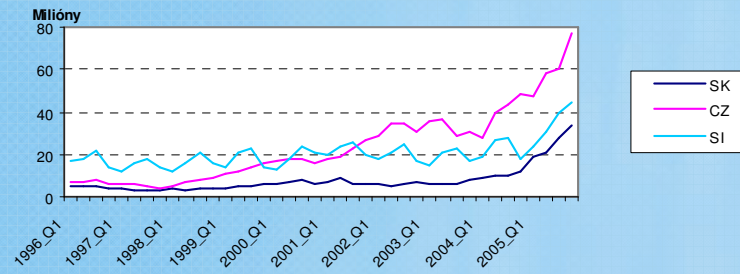
Total meat trade
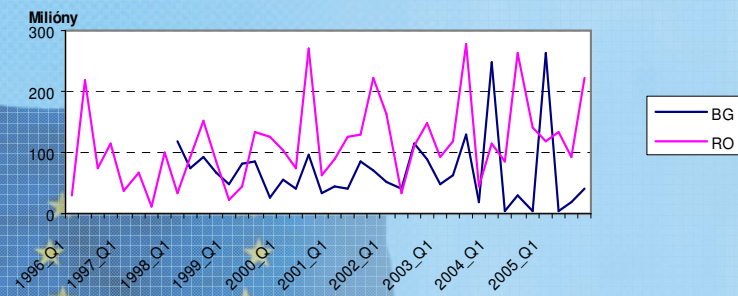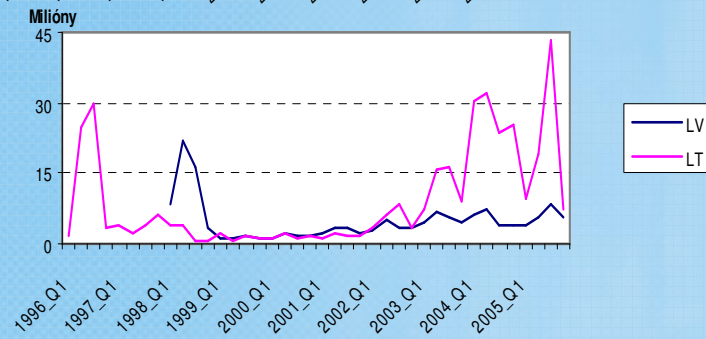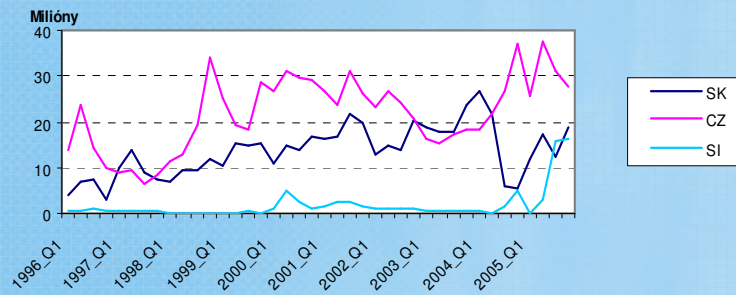
IMPORT

EXPORT
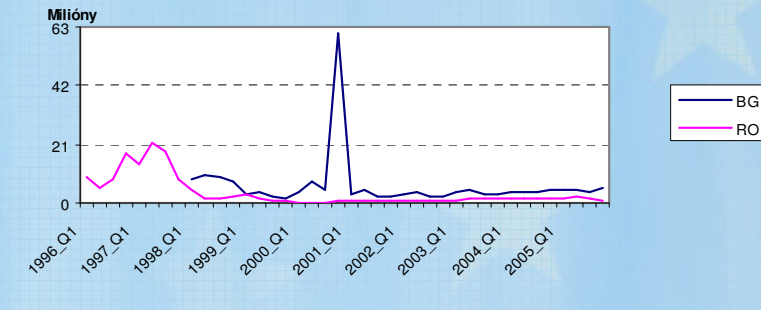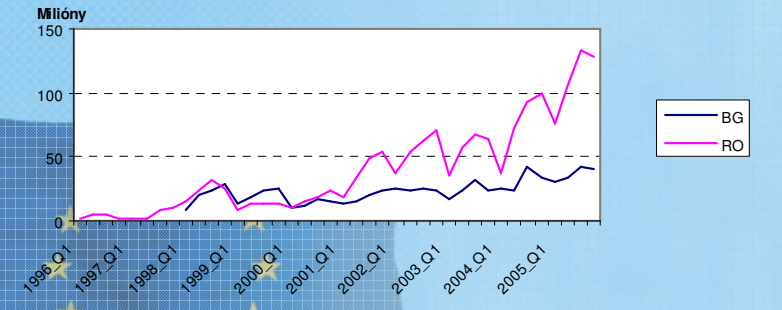
September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA

Total sugar trade

IMPORT

EXPORT

September 21, 2009

COMENIUS UNIVERSITY
BRATISLAVA