

# What Drives the Non-Price Competitiveness of the EU New Member States?



Jaromír Baxa (Charles University, Prague, Czech Academy of Sciences)

Eva Michalíková (Brno University of Technology)

Michal Mejstřík, Ondřej Sláma (Charles University, Prague)

# Motivation

Countries can choose various strategies how to improve their competitiveness:

=> Real depreciation vs. improvements in quality.

The EU New Member States: Substantial real **appreciation** associated with **increasing** export market shares after the EU accession, which wouldn't have been possible without improvements in the non-price factors of their production.

Since the Great Recession, the convergence to the EU core slowed down markedly and the countries in the region seem to need to rethink their growth models and to restart their convergence (Damijan et al., PostComEcon, 2015, IMF Regional Econ Issues, 2016).

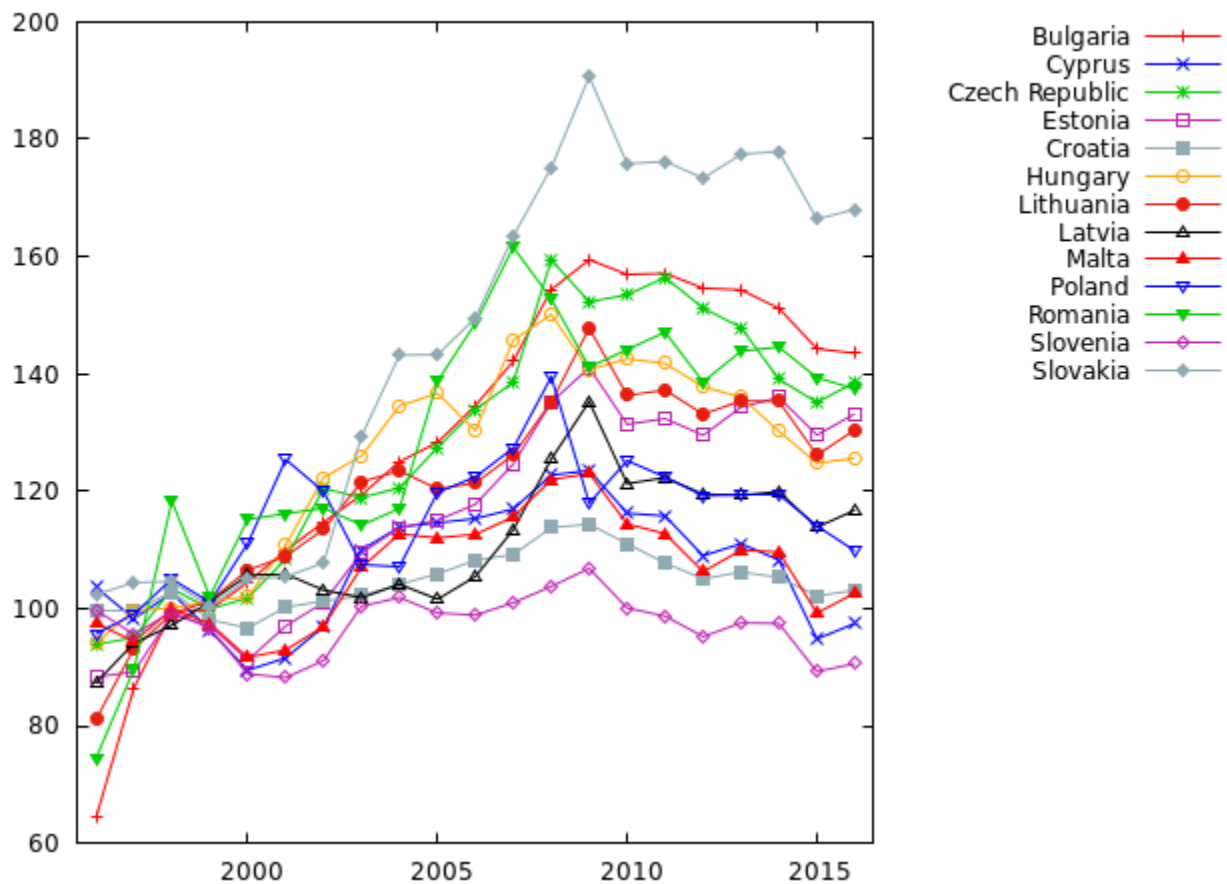
# Motivation (Cont.)

**Our paper:** Evaluates changes in non-price competitiveness among the EU New Member States by using the framework of relative export prices adjusted for changes in variety, taste and quality of their production.

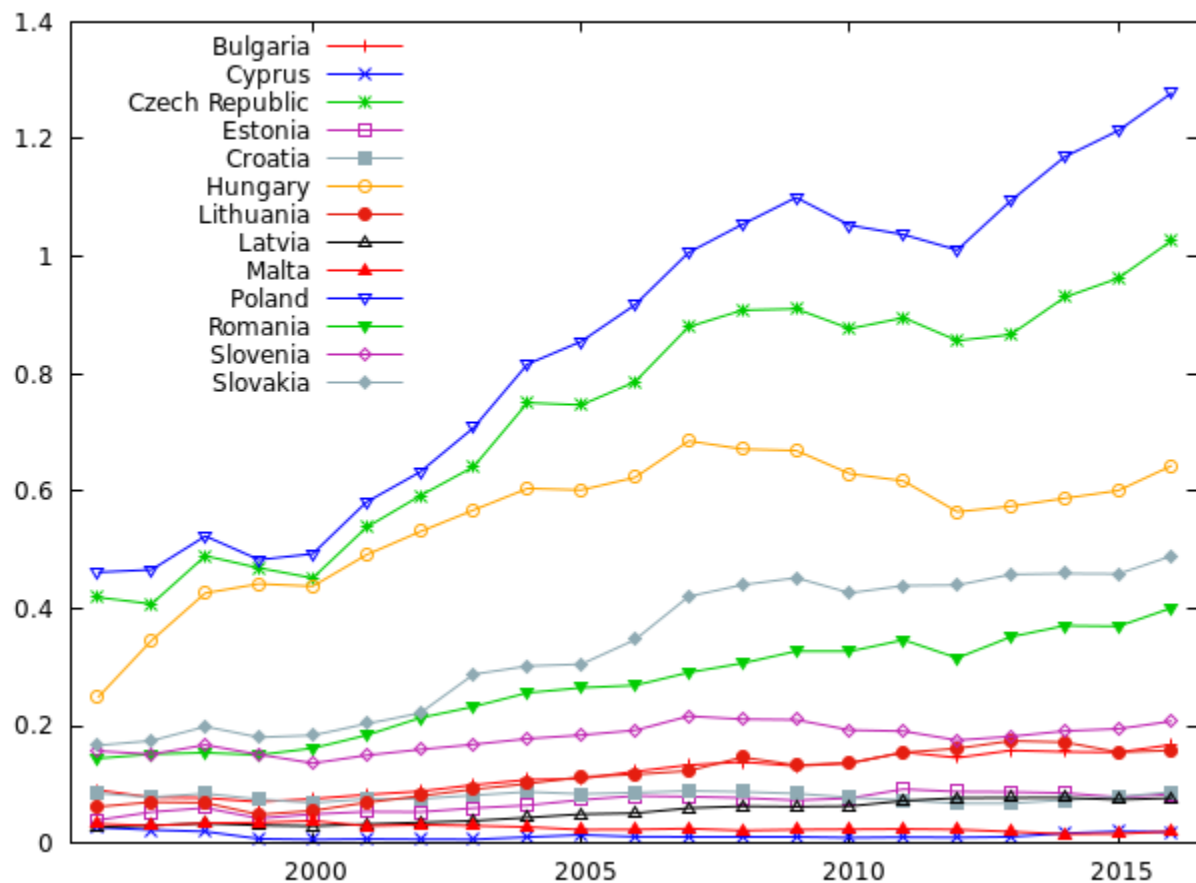
We follow the framework by Benkovskis and Rimgailaite (J of Economic Transition, 2011) or Benkovskis and Wörz (Focus On European Economic Integration, 2012), with some extensions: COMTRADE data up to 2016, introduction of an index of non-price competitiveness.

On top of that, we analyse the determinants of the non-price competitiveness using panel regressions and Bayesian Model Averaging to address issues with collinearity and model uncertainty.

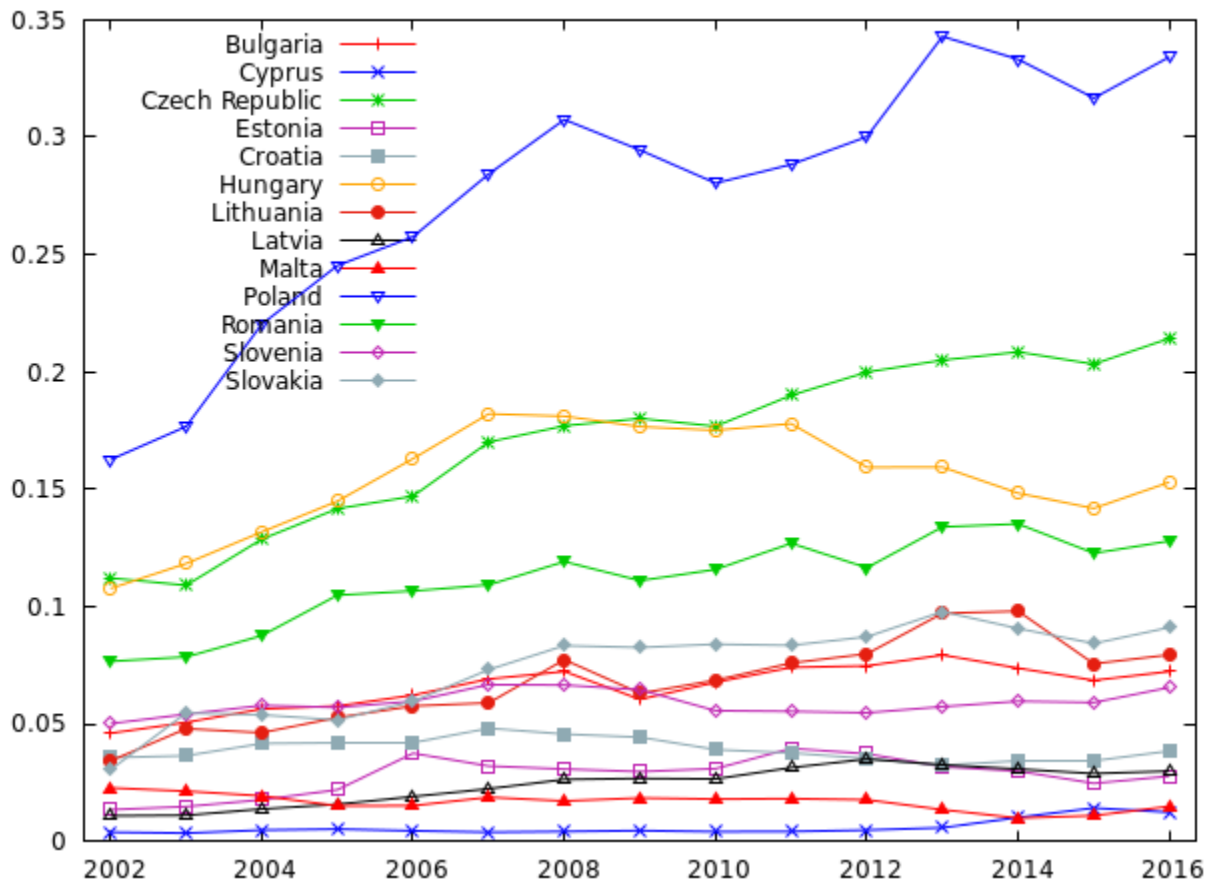
REER (CPI, 1999 = 100), EU New Member States



Export market shares including intra EU trade

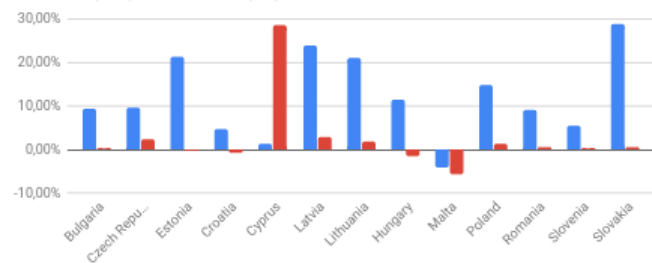


Export market shares excluding intra EU trade



Growth rates of market shares

2002-2008 (blue) and 2008-2017 (red)



# Methodology: Relative export prices

Benkovskis and Wörz (2016): Relative export price index (RXP) of country  $i$  - price level of exports relative to the price levels of other countries.

Advantages over REER: Direct focus on export prices, not a deflator over the economy as a whole.

Calculated from disaggregated data, in our case from the COMTRADE database (5132 products, 188 countries, annual frequency).

Limitation: Trade in services not covered.

$$RXP(i)_{gk,t} = \prod_{c \in C_g} \left( \frac{P_{gk,t}}{P_{gc,t}} \frac{P_{gc,t-1}}{P_{gk,t-1}} \right)^{(\sigma_g - 1)w_{g,t}(C_g)}$$

# Methodology: The Non-Price Competitiveness

Feenstra (1994): Adjustment for a ratio representing a share of new and declining exporters  $\lambda$  (more competitors => lower market power of existing exporters => higher weight of a price change in a particular market.

Benkovskis and Wörz (2016): Adjustment of relative quality and tastes  $d$ : If quality improves, it creates a price discount to the customer and the overall exports increase. Hence, the overall quality decreases the price index.

$$\ln \left( \frac{d_{gc,t}}{d_{gk,t}} \right) = \sigma_g \ln \left( \frac{p_{gc,t}}{p_{gk,t}} \right) + \ln \left( \frac{x_{gc,t}}{x_{gk,t}} \right)$$
$$RXP(i)_{gk,t}^Q = \prod_{c \in C_g} \left( \frac{p_{gk,t}}{p_{gc,t}} \frac{p_{gc,t-1}}{p_{gk,t-1}} \right)^{(\sigma_g - 1)w_{g,t}(C_g)} \left( \frac{\lambda_{g,t-1}}{\lambda_{g,t}} \right) \prod_{c \in C_g} \left( \frac{d_{gk,t}}{d_{gc,t}} \frac{d_{gc,t-1}}{d_{gk,t-1}} \right)^{w_{g,t}(C_g)}$$



# Methodology: The Non-Price Competitiveness (Cont.)

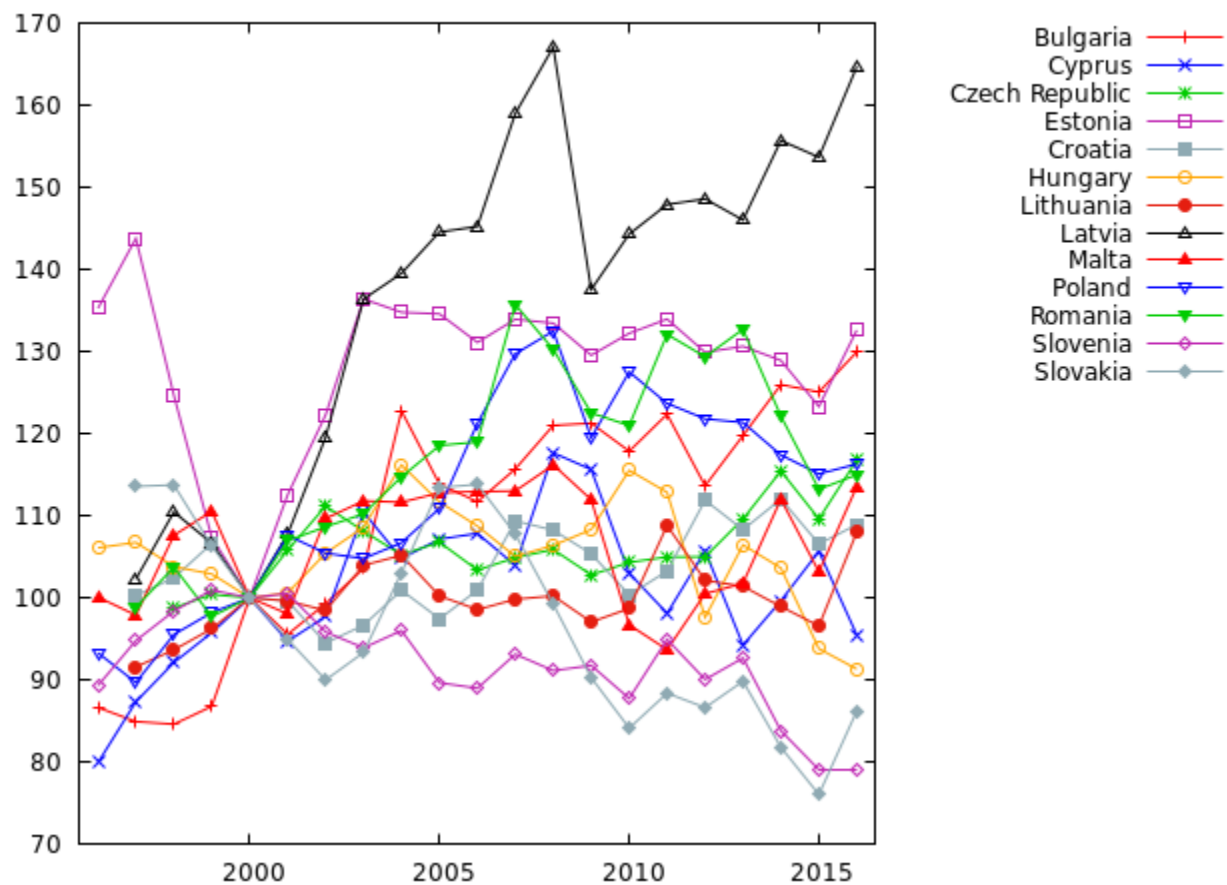
Both indices,  $RXP(i)$  and  $RXP^Q(i)$  are then aggregated over different goods.

Then, the non-price competitiveness is derived as a ratio between the two indices, and inverted so that an increase in index implies an increase of non-price competitiveness.

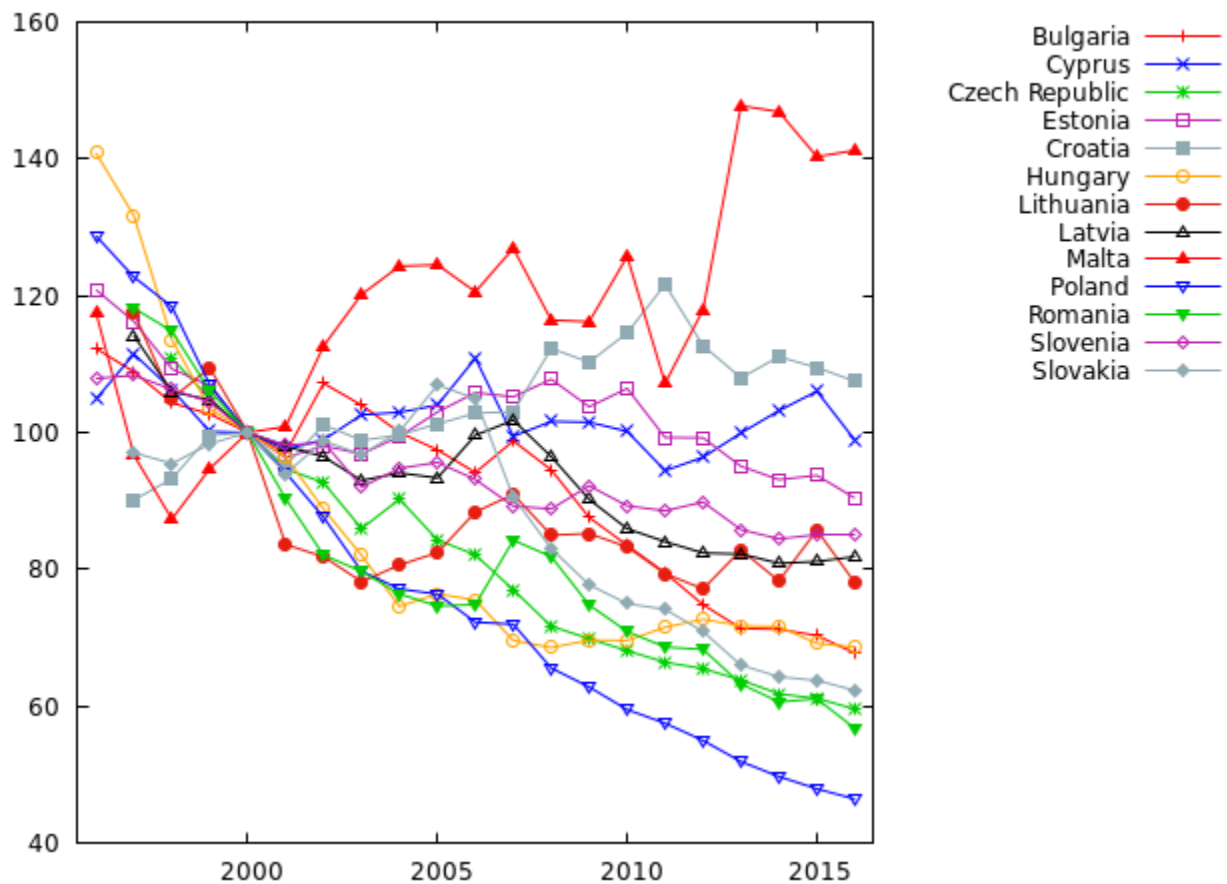
$$RXP_{k,t}^Q = \prod_{i \in I} \prod_{g \in G} \left( RXP(i)_{gk,t}^Q \right)^{W(i)_{g,t}}$$

$$NPC_{k,t} = \frac{100 \times RXP_{k,t}}{RXP_{k,t}^Q}$$

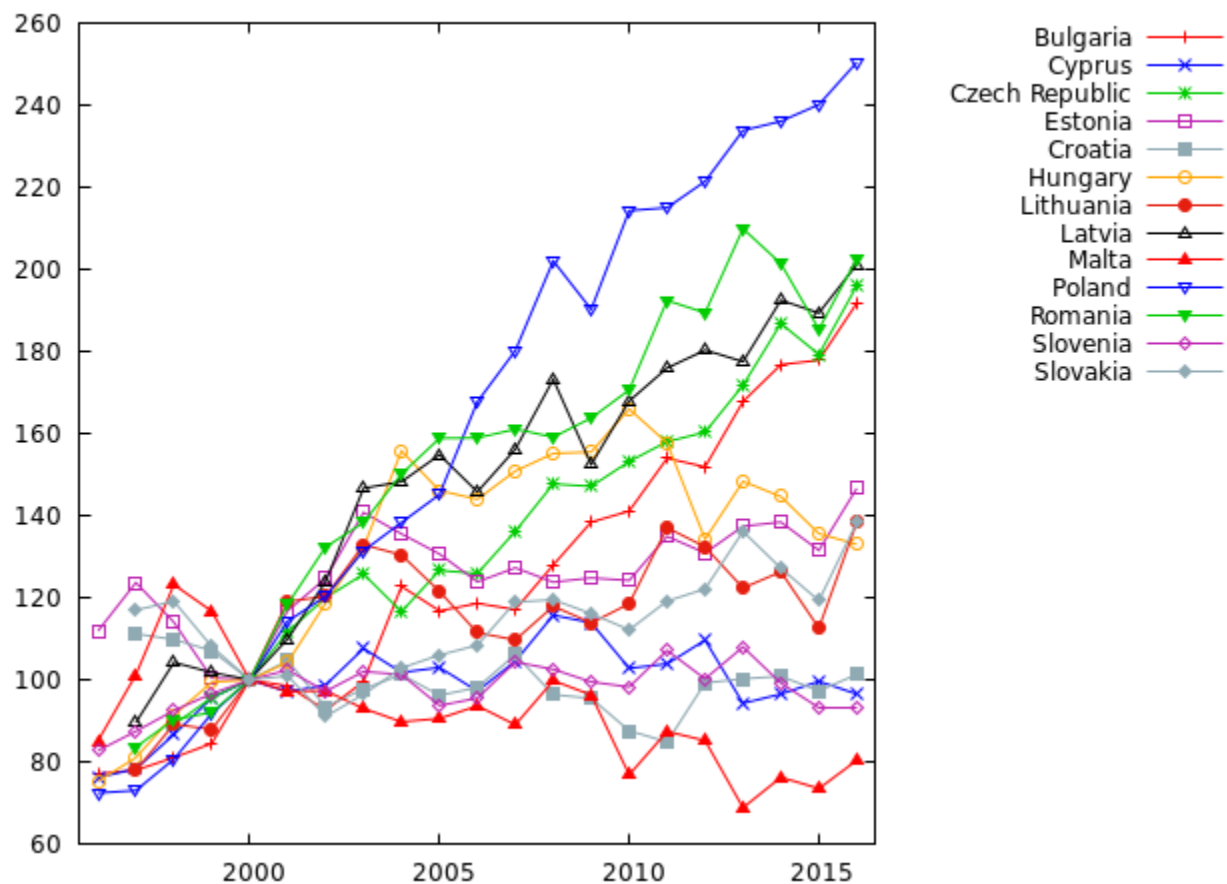
RXP, EU New Member States, 2000=100



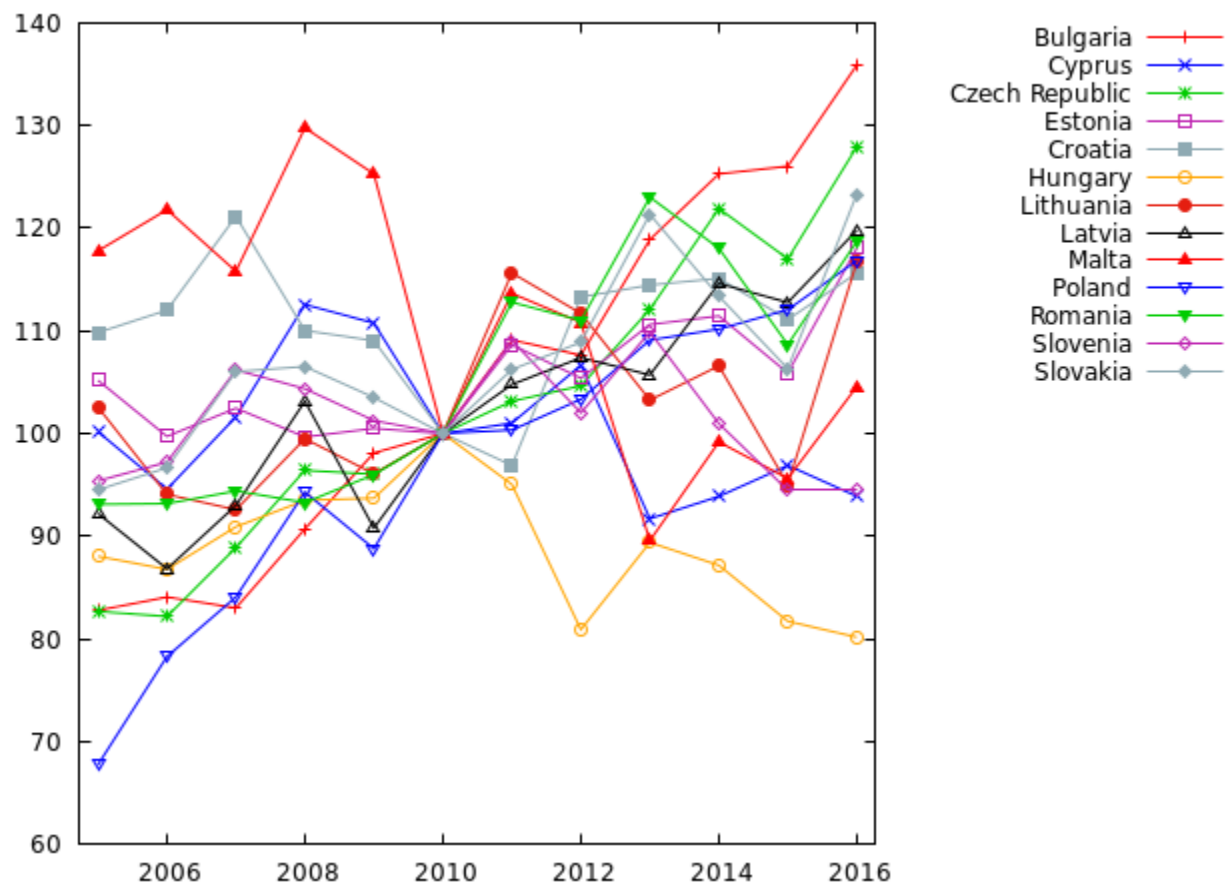
RXP quality adjusted (1999 = 100), EU New Member States



Non-price competitiveness, EU New Member States (2000=100)



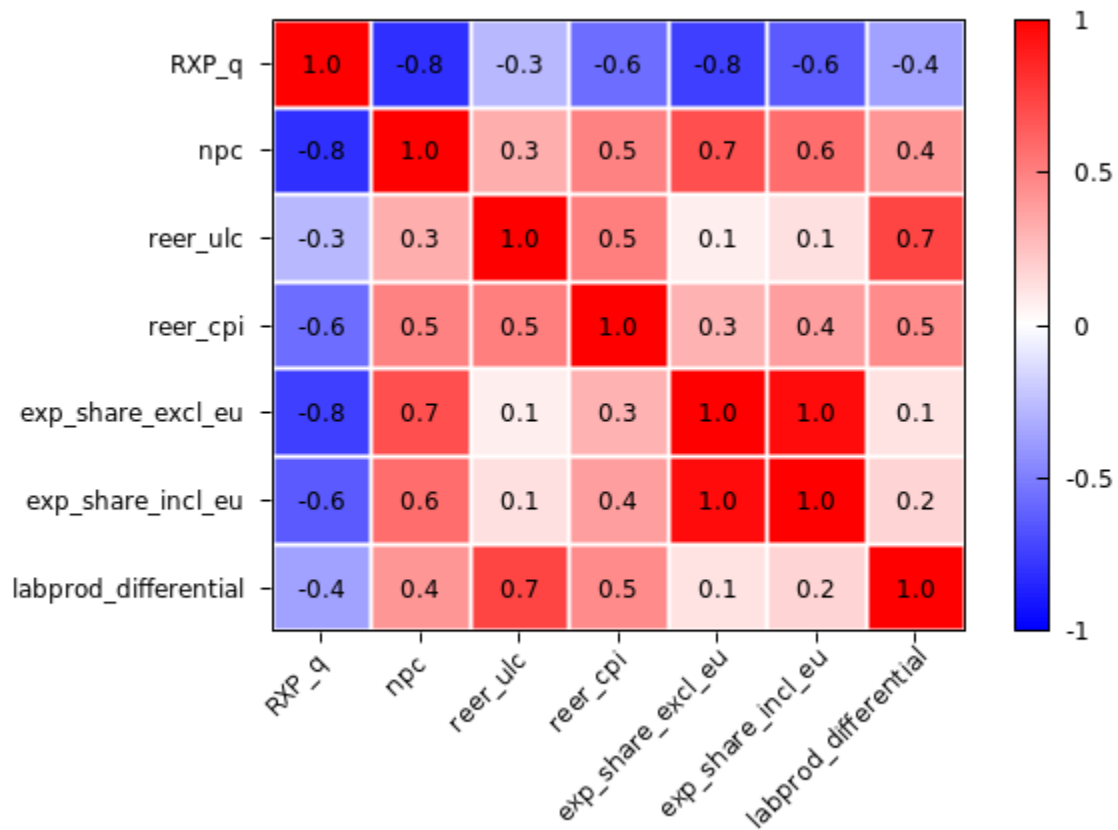
Non-price competitiveness index, 2010 = 100



## Growth rates of non-price competitiveness

	<b>1999-2008</b>	<b>2008-2016</b>	<b>1999-2016</b>	<b>Difference</b>
<b>Czech Republic</b>	4,83	3,53	4,78	-1,29
<b>Hungary</b>	4,94	-1,92	1,94	-6,87
<b>Poland</b>	8,76	2,68	6,69	-6,08
<b>Slovakia</b>	1,12	1,83	1,64	0,71
<b>Slovenia</b>	0,66	-1,23	-0,26	-1,89
<b>Estonia</b>	2,32	2,12	2,52	0,20
<b>Latvia</b>	5,91	1,87	4,54	-4,03
<b>Lithuania</b>	3,26	1,99	3,02	-1,26
<b>Cyprus</b>	2,12	-2,27	0,06	-4,39
<b>Malta</b>	-1,74	-2,70	-2,48	-0,96
<b>Bulgaria</b>	4,61	5,05	5,46	0,44
<b>Romania</b>	6,07	3,02	5,25	-3,05
<b>Croatia</b>	-1,17	0,62	-0,37	1,79

Correlation matrix



# What drives the evolution of the non-price competitiveness?

Motivation straightforward: We'd wish to know, what's behind. More precisely, which of the non-price factors of competitiveness that are frequently mentioned in the literature, i.e. education, institutions, innovations, infrastructure etc. are the most important for the non-price competitiveness in the EU New Member States.

... and we wanted to verify whether the NPC index is actually related to the non-price factors.

Methodology: Panel fixed effects model and Bayesian Model Averaging

Sample 2006-2016



# Data

Factors of non-price competitiveness: Global Competitiveness Report (World Economic Forum) - 160 variables under 12 pillars, with several subcategories.

Fixed-effects: 12 pillars / BMA: 28 subcategories.

The 12 pillars include: Institutions, Infrastructure, Macroeconomic Environment, Health and primary education, Higher education and training, Goods market efficiency, Labour market efficiency, Financial market development, Technological readiness, Market size, Business sophistication and Innovation.

Additionally, several macro variables to control for possible omitted variable bias: Real GDP, GDP growth, ULC, REER, FDI inflows/outflows, long-term currency misalignment in the spirit of Rodrik (2008).

# Results I.1: Fixed effects

## Non-price competitiveness

Fixed effects significantly  
different from the pooled  
model.

Also model with time-  
fixed effects used

Most robust finding across  
several alternative  
specification: primary role  
of institutions.

Dependent variable: **npc\_index**

	coefficient	std. error	t-ratio	p-value	
const	-127.850	81.7548	-1.564	0.1211	
Institutions	27.7373	9.38756	2.955	0.0039	***
Infrastructure	11.4340	6.28098	1.820	0.0717	*
HealthPrimaryEdu	7.06631	7.80942	0.9048	0.3677	
HigherEducation	-10.8219	12.3147	-0.8788	0.3816	
GoodsMarketEffic~	-28.8206	12.9587	-2.224	0.0284	**
LabourMarketEffi~	-26.9470	7.82281	-3.445	0.0008	***
FinMarketDevelop~	15.3638	5.76781	2.664	0.0090	***
Technology	9.53550	4.65057	2.050	0.0430	**
Market_size	12.3750	9.64019	1.284	0.2022	
Business_sophist~	13.3124	10.8605	1.226	0.2232	
budgetbalance_pct	-0.222193	0.544062	-0.4084	0.6839	
gross_savings_pct	1.19472	0.305247	3.914	0.0002	***
inflation_pct	0.426719	0.602415	0.7083	0.4804	
gov_debt	0.423112	0.151493	2.793	0.0063	***
GDPgrowth	0.919781	0.380956	2.414	0.0176	**
ULC_nominal	0.814268	0.219061	3.717	0.0003	***
ULC_real	-0.555242	0.333219	-1.666	0.0988	*
REER_ulc	0.0766919	0.166211	0.4614	0.6455	
REER_cpi	0.392464	0.242249	1.620	0.1084	
FDI_inward	0.0154128	0.0492053	0.3132	0.7548	
FDI_outward	0.0516742	0.0614805	0.8405	0.4027	
creditGDP	0.132914	0.102103	1.302	0.1960	
undervaluation	-8.91690	13.5357	-0.6588	0.5116	

# Results I.1b: Fixed effects

Non-price  
competitiveness and  
conventional  
determinants of REER  
(NFA, TNT, TOT)

Tnt = ratio between prices  
of tradables and  
nontradables, relative to  
the euro area; controls for  
Balassa-Samuelson effect.

The results are much  
better.

Dependent variable: **npc\_index**

	coefficient	std. error	t-ratio	p-value	
const	-33.8859	73.4646	-0.4613	0.6458	
Institutions	25.5675	9.95199	2.569	0.0119	**
Infrastructure	18.6903	5.38612	3.470	0.0008	***
HealthPrimaryEdu	-8.66638	7.74377	-1.119	0.2661	
HigherEducation	17.4911	14.1039	1.240	0.2182	
GoodsMarketEffic~	-28.6362	11.6583	-2.456	0.0160	**
LabourMarketEffi~	-21.7697	8.07202	-2.697	0.0084	***
FinMarketDevelop~	9.73769	5.74519	1.695	0.0936	*
Technology	21.2898	4.45664	4.777	7.06e-06	***
Market_size	3.40370	10.4777	0.3249	0.7461	
Business_sophist~	4.58668	12.8516	0.3569	0.7220	
Innovation	-19.7218	9.87390	-1.997	0.0489	**
budgetbalance_pct	0.238337	0.459962	0.5182	0.6056	
gross_savings_pct	0.851514	0.322967	2.637	0.0099	***
inflation_pct	0.711422	0.630523	1.128	0.2623	
gov_debt	0.125462	0.150450	0.8339	0.4066	
nfa_pct	0.0469801	0.0824406	0.5699	0.5702	
openness_pct	0.107713	0.112348	0.9588	0.3403	
tnt_ppi	-38.5664	20.6431	-1.868	0.0651	*
tot_relative	16.7359	46.2291	0.3620	0.7182	
ir_diff_ea_real	0.517766	0.562122	0.9211	0.3595	
FDI_inward	-0.0141834	0.0533027	-0.2661	0.7908	
FDI_outward	0.0572114	0.0619432	0.9236	0.3582	
creditGDP	0.193009	0.108639	1.777	0.0791	*
undervaluation	-34.0696	10.2844	-3.313	0.0013	***
GDPgrowth	0.913088	0.408124	2.237	0.0278	**

# Results 1.2: Fixed effects

## RXP index

Analogously, we can check whether the RXP\_qadj is really adjusted for the non-price factors.

By large, the non-price factors are insignificant, with the exception of labour market efficiency. Somewhat strangely, the coefficient is the opposite to our expectations.

Dependent variable: **RXP\_qadj**

	coefficient	std. error	t-ratio	p-value	
const	215.336	51.0237	4.220	5.42e-05	***
Institutions	-7.40369	6.09333	-1.215	0.2272	
Infrastructure	-2.64307	3.53711	-0.7472	0.4567	
HealthPrimaryEdu	-3.65454	4.86082	-0.7518	0.4539	
HigherEducation	0.367313	7.91271	0.04642	0.9631	
GoodsMarketEffic~	1.10864	7.98518	0.1388	0.8899	
LabourMarketEffi~	19.8631	4.94276	4.019	0.0001	***
FinMarketDevelop~	-7.14834	3.66646	-1.950	0.0540	*
Technology	1.71988	2.94966	0.5831	0.5612	
Market_size	-3.80493	6.07030	-0.6268	0.5322	
Business_sophist~	-6.62069	7.27396	-0.9102	0.3649	
Innovation	1.86181	6.38848	0.2914	0.7713	
budgetbalance_pct	0.498283	0.338359	1.473	0.1440	
gross_savings_pct	-0.578913	0.188901	-3.065	0.0028	***
inflation_pct	0.547275	0.378896	1.444	0.1518	
gov_debt	-0.240289	0.0946997	-2.537	0.0127	**
GDPgrowth	0.111206	0.238630	0.4660	0.6422	
ULC_nominal	-0.405070	0.134282	-3.017	0.0032	***
ULC_real	0.0970014	0.212926	0.4556	0.6497	
REER_ulc	0.0918473	0.100852	0.9107	0.3647	
REER_cpi	-0.448966	0.143321	-3.133	0.0023	***
FDI_inward	0.00369305	0.0306479	0.1205	0.9043	
FDI_outward	-0.0362656	0.0384085	-0.9442	0.3474	
creditGDP	-0.0343916	0.0629314	-0.5465	0.5860	

# Results 1.3: Fixed effects

## REER (CPI deflated)

Finally, we can check for the role of the non-price factors in REERs.

Unlike the RXP\_qadj, the nonprice factors are more often significant, i.e. Infrastructure, higher education, goods market efficiency, market size and business sophistication.

Dependent variable: **REER\_CPI**

	coefficient	std. error	t-ratio	p-value	
const	196.475	34.5944	5.679	1.26e-07	***
Institutions	-4.74350	5.67319	-0.8361	0.4050	
Infrastructure	6.18977	3.07749	2.011	0.0469	**
HealthPrimaryEdu	-1.36457	4.46908	-0.3053	0.7607	
HigherEducation	-12.4462	7.28225	-1.709	0.0904	*
GoodsMarketEffic~	-12.4865	6.68465	-1.868	0.0646	*
LabourMarketEffi~	6.73999	4.42676	1.523	0.1309	
FinMarketDevelop~	3.51472	3.31532	1.060	0.2916	
Technology	-2.14915	2.53718	-0.8471	0.3989	
Market_size	-13.7363	5.43372	-2.528	0.0130	**
Business_sophist~	25.5861	6.31547	4.051	9.89e-05	***
Innovation	-8.02688	5.81993	-1.379	0.1708	
budgetbalance_pct	-0.256298	0.272470	-0.9406	0.3491	
gross_savings_pct	-0.200190	0.174624	-1.146	0.2543	
inflation_pct	-0.407856	0.339419	-1.202	0.2323	
gov_debt	0.00431073	0.0788824	0.05465	0.9565	
GDPgrowth	-0.951320	0.173137	-5.495	2.85e-07	***
FDI_inward	-0.0356308	0.0285716	-1.247	0.2152	
FDI_outward	0.0408225	0.0358219	1.140	0.2571	
creditGDP	-0.0836686	0.0560862	-1.492	0.1388	

# Results 1.3b: Fixed effects

REER (CPI deflated) and  
conventional ER  
determinants

ependent variable: **REER\_CPI**

	coefficient	std. error	t-ratio	p-value	
const	216.811	35.6973	6.074	3.11e-08	***
Institutions	-0.969182	4.73885	-0.2045	0.8384	
Infrastructure	11.5593	2.54975	4.533	1.82e-05	***
HealthPrimaryEdu	-3.79329	3.67771	-1.031	0.3052	
HigherEducation	-7.17376	6.72862	-1.066	0.2893	
GoodsMarketEffic~	-15.2849	5.55541	-2.751	0.0072	***
LabourMarketEffi~	7.74796	3.87179	2.001	0.0485	**
FinMarketDevelop~	2.24794	2.80431	0.8016	0.4249	
Technology	-1.94970	2.09848	-0.9291	0.3554	
Market_size	-5.98436	4.96829	-1.205	0.2316	
Business_sophist~	12.2573	5.99406	2.045	0.0439	**
Innovation	-6.76990	4.76972	-1.419	0.1593	
budgetbalance_pct	0.0686165	0.221411	0.3099	0.7574	
gross_savings_pct	-0.267614	0.157494	-1.699	0.0928	*
inflation_pct	0.539673	0.260685	2.070	0.0414	**
gov_debt	-0.0393588	0.0719613	-0.5469	0.5858	
tot_relative	52.8172	22.5314	2.344	0.0213	**
tnt_ppi	10.4479	9.82084	1.064	0.2903	
openness_pct	-0.114763	0.0531142	-2.161	0.0334	**
nfa_pct	-0.0348280	0.0391967	-0.8885	0.3767	
ir_diff_ea_real	0.212055	0.225110	0.9420	0.3488	
FDI_inward	-0.0106355	0.0251649	-0.4226	0.6736	
FDI_outward	0.000698689	0.0293473	0.02381	0.9811	
creditGDP	-0.129918	0.0516257	-2.517	0.0137	**
RXP_qadj	-0.426692	0.0820003	-5.204	1.26e-06	***
undervaluation	-39.2107	4.70055	-8.342	9.26e-13	***

# Results II: Growth regressions

Is the NPC index significant in growth regressions?

Yes, if we control for other macro variables.

However, it's significance disappears when REER included in the regression

Inclusion of additional variables from the GCR - similar results as baseline.

Dependent variable: GDPgrowth

	coefficient	std. error	t-ratio	p-value	
const	14.0529	9.63119	1.459	0.1472	
GDPreal_perhead_1	-0.00199416	0.000378808	-5.264	6.47e-07	***
npc_index	0.0785223	0.0318170	2.468	0.0150	**
creditGDP	-0.136900	0.0255570	-5.357	4.30e-07	***
undervaluation	5.63852	2.81132	2.006	0.0472	**
RXP_qadj	0.182481	0.0563779	3.237	0.0016	***

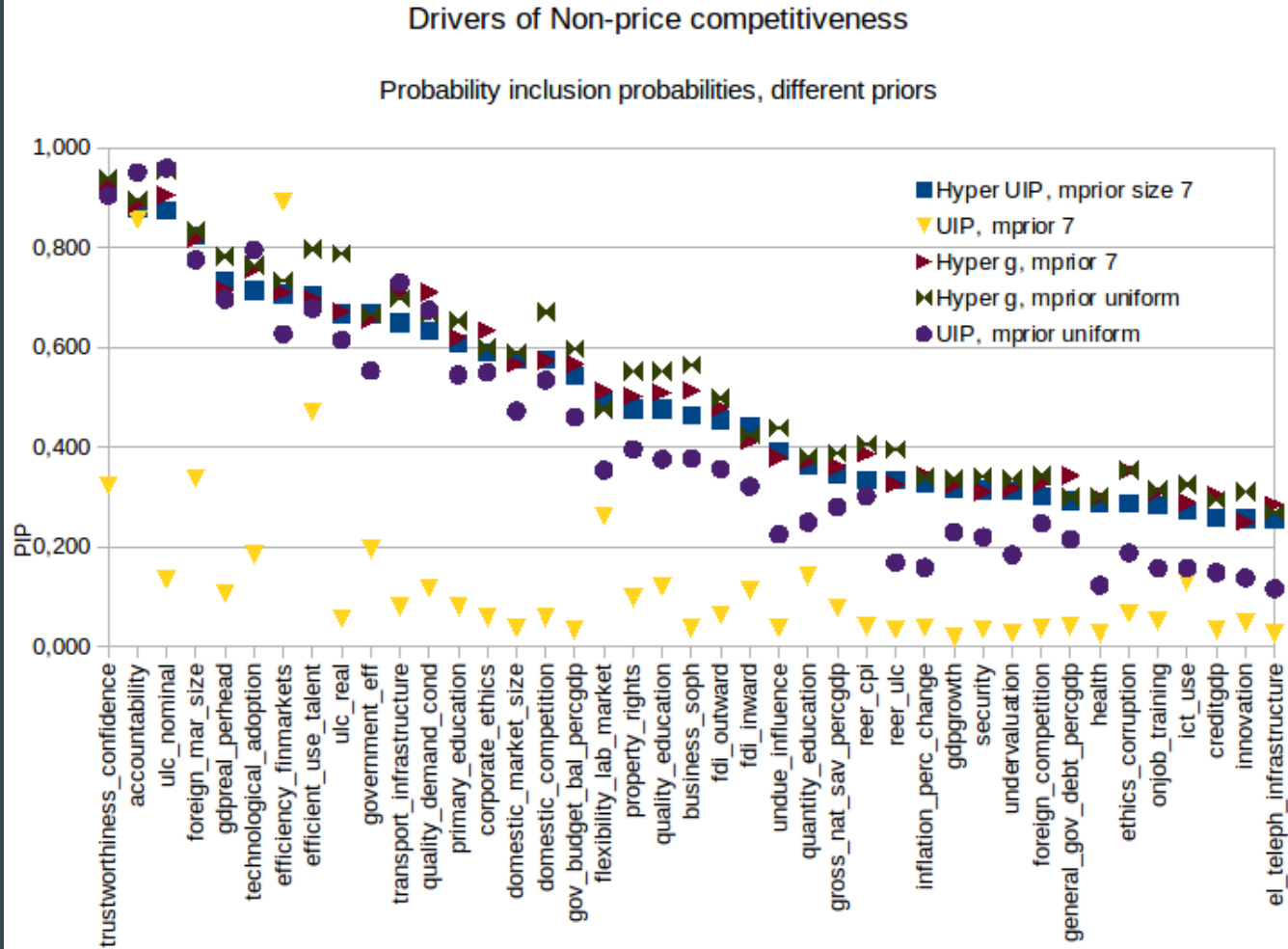
# Results III: BMA

BMA allows us to handle more variables than traditional regression; to see which parts of pillars from the GVC are the most important ones.

Key outcome: PIP (Posterior inclusion probability that a particular variable shall be included in a regression).

Several combinations of model and parameter priors.

BMS package in R was used.





# Results III: BMA (Cont.)

## Variables with highest PIP

Trustworthiness and confidence (Financial markets)

Accountability (Institutions - private)

ULC nominal

Foreign market size (Market size)

Technological adoption (Technological Readiness) (-)

Efficiency of financial markets (Fin markets) (-)

Efficient use of talent (Labour market efficiency) (-)

## Variables with lowest PIP (selection)

Credit/GDP ratio,

Innovations,

On the job training,

ICT use,

Ethics/corruption,

Health.

# Summary and conclusions

The REERs do not provide complete picture about evolution of competitiveness of the EU New Member States, in some cases different indicators based on relative export prices lead to much different result (more consistent with emerging CA surpluses and rising export shares); RXP\_qadj and the non-price component are much more consistent with the developments in the EU NMS.

The improvements in non-price competitiveness (relatively to trading partners!) as a convergence strategy slowed down after 2008 - in most countries.

The non-price competitiveness component in relative prices is driven mainly by improvements in institutions, financial markets, to some extent in infrastructure. On the other hand, goods and labour market efficiency are negatively correlated with the non-price competitiveness index.

Importantly, the non-price factors are almost irrelevant in explanation of the RXP\_qadj, so this index eliminates the non-price factors quite well. The REER is driven by both, price and non-price factors.

# Summary and conclusions

The impact of undervaluation twofold: It has positive effect on growth, but negative on the non-price competitiveness. At the same time, growth is positively affected by non-price competitiveness as well. Hence, there seems to be some trade-off for the countries in our sample, whether to opt for the price or non-price competitiveness as a strategy to boost economic growth.

Similar results are obtained using BMA: Highest PIPs of Trustworthiness and confidence (fin markets) and accountability, along with the ULC's. On the other hand, variables representing education and innovations are rarely included in the regression or are significant rarely: Educational variables and innovations, suggesting limited contribution of those factors to exports.