

# Identifying the effects of income inequality on population health and social outcomes in the (CEE) EU Member States

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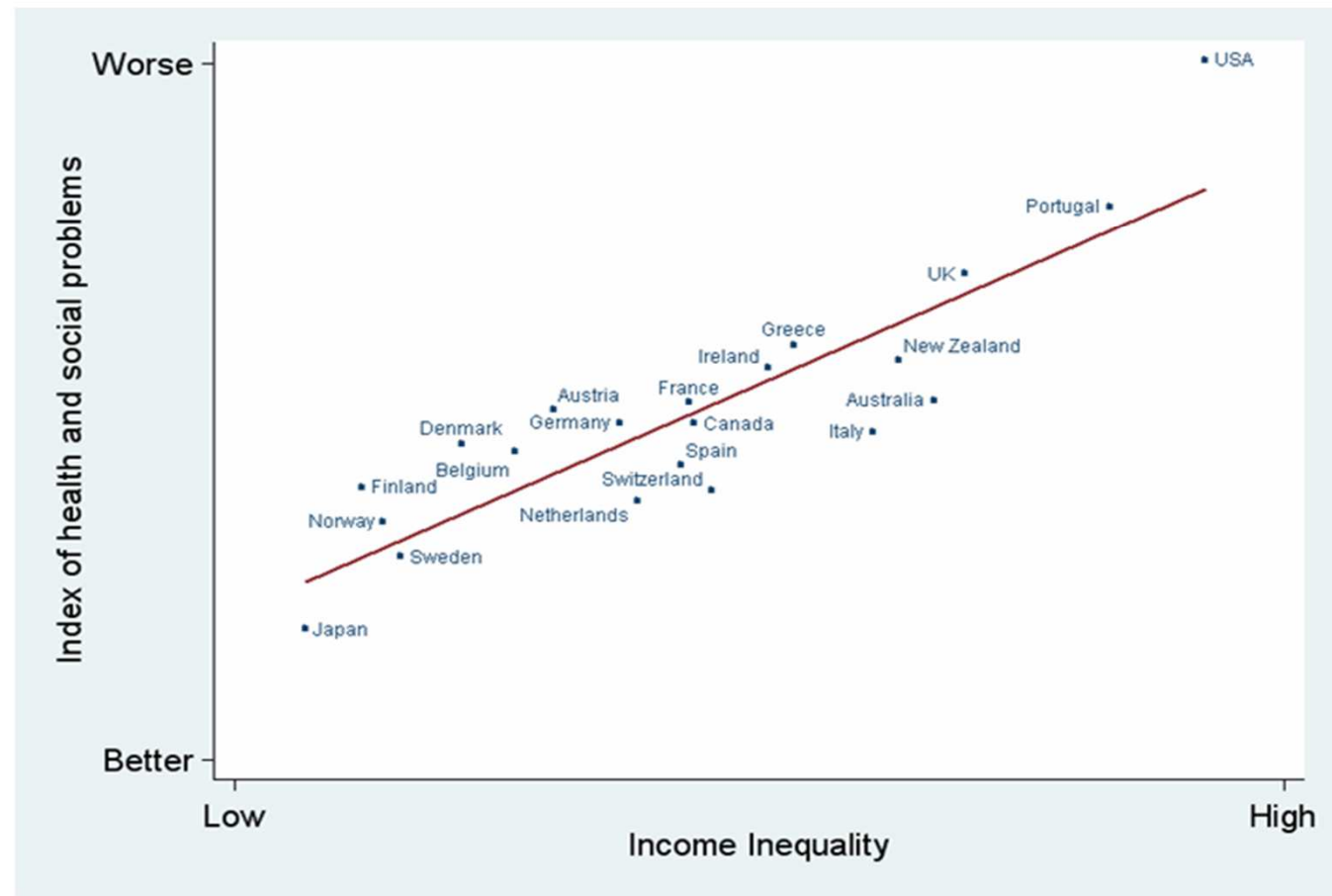
GRINCOH conference – Ljubljana 25-26 September

# Motivation

## Health and Social Problems are Worse in More Unequal Countries

**Index of:**

- Life expectancy
- Math & Literacy
- Infant mortality
- Homicides
- Imprisonment
- Teenage births
- Trust
- Obesity
- Mental illness – incl. drug & alcohol addiction
- Social mobility



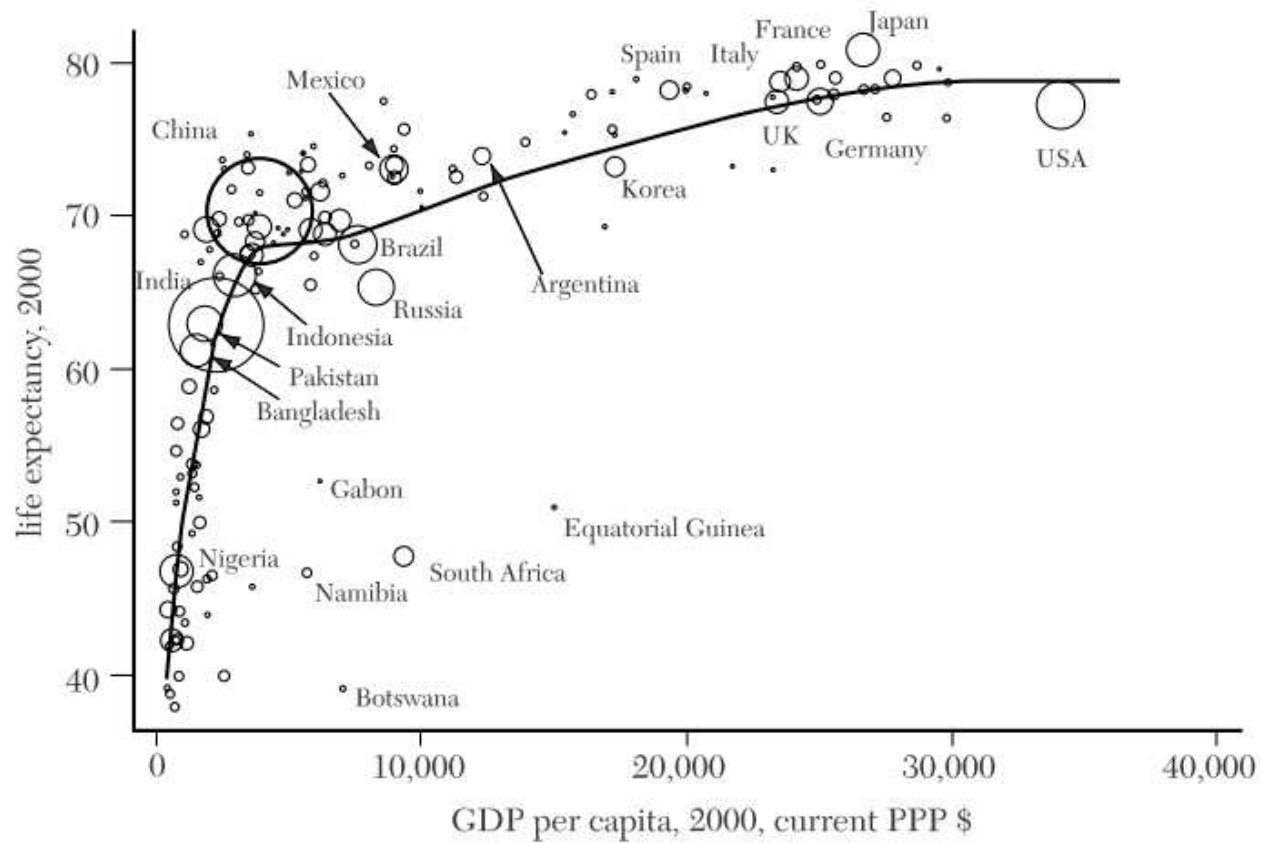


## Main questions of the analysis

- Are economic inequality and relative poverty drivers of population health / social outcomes in the EU at the regional (NUTS2) level?
- Are the relationships different for lower income countries – the CEE New EU Member States?



# Motivation



Source: Deaton, 2003.



## Possible mechanisms between inequality and social outcomes

- Population health:
  - Individual / Absolute income interpretation
  - Psychosocial / Relative income hypothesis
  - Neo-material interpretation
- Crime:
  - Act as a result of cost benefit analysis (Becker)
  - Social interactions effected by inequality through levels of trust, community cohesion and respect – inhibitions to commit crime lowered
- Participation in education:
  - Low income groups do not find financial markets to borrow resources for investment in education
  - Effective returns to education may strongly depend upon factors of family background

## Data

- NUTS 2 level data: Austria, Czech Republic, Denmark, Finland, France, Italy, Slovak Republic, Slovenia, Spain, Sweden and United Kingdom (1 region: CY, EE, LV, LT, LU, MT).
- NUTS 1 level data: Belgium, Germany, Greece, Hungary, Poland, the Netherlands, Bulgaria and Romania (1 region: Ireland).
- Data on population health: life expectancy, child mortality rates < 1 year, standardised (age structure adjusted) mortality rates: total, assault, drug use, heart attack, mental disease
- Data on crime: violent crime: homicide, robbery; property crime: domestic burglary, theft of motor vehicles
- Data on activity / non-participation of youngsters in education: NEET rates (age 15-24), rates of early leavers from education (age 18-24)

## Data

Explanatory variables:

- Indices of income inequality:
  - Gini coefficient (sensitive to inequ. in middle part of the income distribut.)
  - At risk of poverty rate (persons below 60% of median income)
  - Quintile share ratio (S80/S20 – dispersion between low and high inc.)  
available only for one year (2010 / 2009-11)  
➡ no panel data analysis possible
- GDP per capita at purchasing power parities
- No further explanatories available at the NUTS 2/1 level  
except for medical doctors per thousand inhabitants (insignificant)
- Sources: Eurostat DB, OECD regional well-being dataset, EU SILC microdata



## Methodology

- Pooled OLS

$$y_i = \alpha + \beta x_{j[i]} + \varepsilon_i; \quad \varepsilon_i \sim N(0, \sigma_y^2)$$

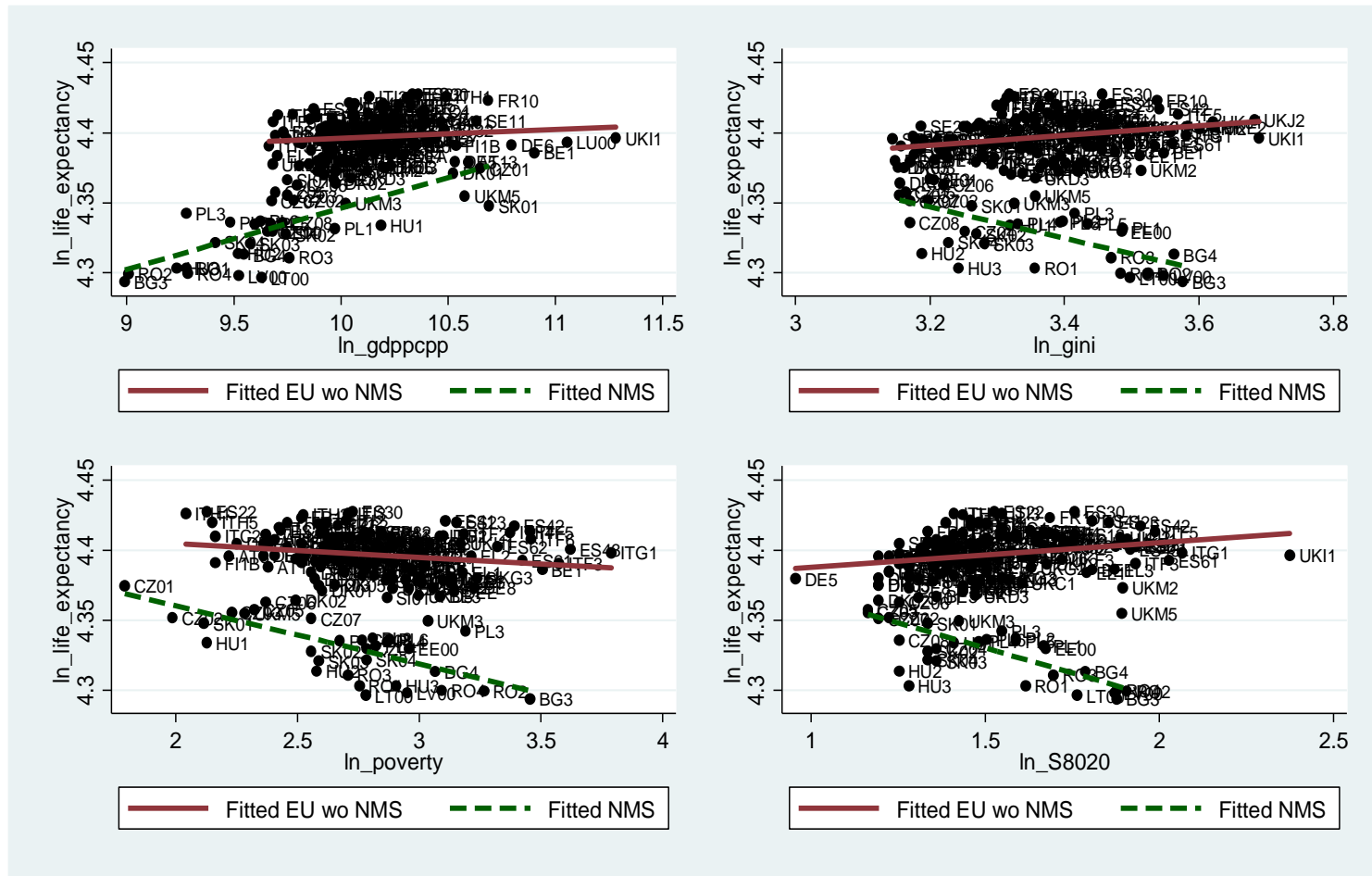
- One stage fixed effects model

$$y_i = \alpha_{j[i]} + \beta x_i + \varepsilon_i; \quad \alpha_j \sim N(\mu_\alpha, \infty); \quad \varepsilon_i \sim N(0, \sigma_y^2)$$

- One stage random effects model

$$y_i = \alpha_{j[i]} + \beta x_i + \varepsilon_i; \quad \alpha_j \sim N(\mu_\alpha, \sigma_\alpha^2); \quad \varepsilon_i \sim N(0, \sigma_y^2)$$

## Scatter plots: Life expectancy versus GDP per capita at PPP and inequality indicators (in logs)



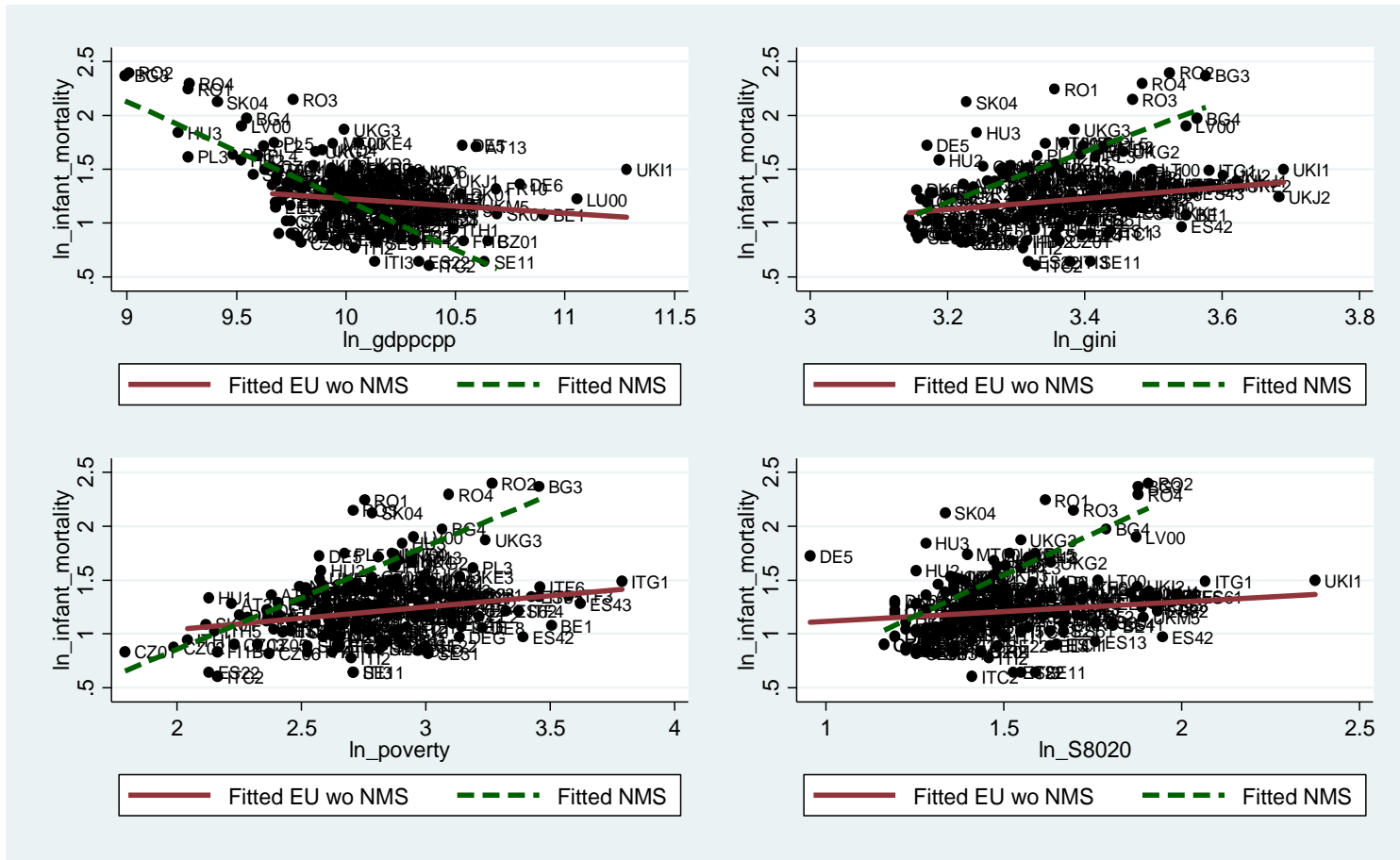
## Regression results for life expectancy (in logs)

VARIABLES	EU regions			EU regions excluding CEE NMS			CEE NMS regions		
ln_gdppcpp	0.017*** (0.003)	0.010*** (0.004)	0.019*** (0.003)	0.0144*** (0.00401)	0.00646 (0.00429)	0.0162*** (0.00401)	0.0291*** (0.00506)	0.00788 (0.00728)	0.0272*** (0.00466)
ln_gini	0.008 (0.010)			0.0102 (0.0103)			-0.0609** (0.0262)		
ln_poverty		-0.011*** (0.003)			-0.010*** (0.00351)			-0.0245** (0.00913)	
ln_S8020			-0.005 (0.005)			-0.00357 (0.00574)			-0.044*** (0.0154)
Constant	4.188*** (0.039)	4.313*** (0.044)	4.206*** (0.032)	4.217*** (0.0453)	4.357*** (0.0496)	4.238*** (0.0391)	4.251*** (0.0893)	4.321*** (0.0914)	4.133*** (0.0490)
Observations	181	181	180	149	149	148	32	32	32
Nr of countries	26	26	25	16	16	15	10	10	10
R2 within	0.173	0.228	0.175	0.117	0.163	0.113	0.524	0.657	0.566
R2 between	0.584	0.415	0.580	0.00598	0.0489	0.0493	0.658	0.329	0.656
R2 overall	0.338	0.141	0.301	0.0332	0.0361	0.00392	0.607	0.427	0.626
model	fixed	fixed	fixed	fixed	random	fixed	random	fixed	random

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Scatter plots: Infant mortality versus GDP per capita at PPP and inequality indicators (in logs)



## Regression results for infant mortality (< 1 year) (in logs)

VARIABLES	EU regions		EU regions excluding CEE NMS			CEE NMS regions			
ln_gdppcpp	-0.291*** (0.0542)	-0.00171 (0.0669)	-0.280*** (0.0541)	-0.129** (0.0640)	0.0821 (0.0705)	-0.124* (0.0645)	-0.505*** (0.115)	-0.208 (0.171)	-0.490*** (0.102)
ln_gini	0.631*** (0.159)			0.454*** (0.163)			0.877 (0.738)		
ln_poverty		0.277*** (0.0581)			0.262*** (0.0574)			0.365 (0.215)	
ln_S8020			0.353*** (0.0907)			0.227** (0.0928)			0.781* (0.435)
Constant	2.126*** (0.683)	0.511 (0.778)	3.602*** (0.537)	0.985 (0.751)	-0.374 (0.816)	2.119*** (0.643)	3.471 (2.207)	2.545 (2.150)	5.100*** (1.036)
Observations	183	183	182	151	151	150	32	32	32
Nr of countries	26	26	25	16	16	15	10	10	10
R-2 within	0.113	0.182	0.115	0.0633	0.150	0.0572	0.499	0.531	0.538
R-2 between	0.486	0.159	0.473	0.0463	0.000839	0.0123	0.657	0.572	0.649
R-2 overall	0.320	0.114	0.288	0.0915	0.0714	0.0521	0.684	0.563	0.727
model	random	fixed	random	random	random	random	fixed	fixed	fixed

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Regression results for homicide rates (in logs)

VARIABLES	EU regions			EU regions excluding CEE NMS			CEE NMS regions		
ln_gdppcpp	-0.248** (0.114)	0.155 (0.144)	-0.161 (0.112)	-0.301* (0.160)	0.170 (0.191)	-0.241 (0.158)	0.014 (0.116)	0.475*** (0.184)	0.096 (0.100)
ln_gini	1.295*** (0.366)			0.805* (0.422)			2.546*** (0.652)		
ln_poverty		0.446*** (0.119)			0.499*** (0.134)			0.452** (0.230)	
ln_S8020			0.882*** (0.214)			0.592** (0.247)			1.632*** (0.376)
Constant	0.768 (1.571)	-0.148 (1.672)	2.934** (1.190)	2.776 (2.028)	-0.749 (2.203)	3.981** (1.688)	-5.773*** (2.128)	-2.839 (2.342)	-0.489 (1.056)
Observations	139	139	138	107	107	106	32	32	32
Nr of countries	23	23	22	13	13	12	10	10	10
R2 within	0.0742	0.132	0.108	0.0957	0.149	0.118	0.322	0.241	0.418
R2 between	0.317	0.00173	0.307	0.0575	0.0960	0.0966	0.567	0.0223	0.540
R2 overall	0.0772	0.0167	0.0481	0.000764	0.0786	1.15e-05	0.452	0.0412	0.454
model	random	random	random	random	random	random	random	random	random

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Regression results for robbery rates (in logs)

VARIABLES	EU regions			EU regions excluding CEE NMS			CEE NMS regions		
ln_gdppcpp	0.811*** (0.180)	1.632*** (0.221)	0.997*** (0.179)	0.781*** (0.269)	2.085*** (0.325)	1.065*** (0.262)	0.693*** (0.167)	1.080*** (0.272)	0.752*** (0.154)
ln_gini	3.068*** (0.578)			3.396*** (0.709)			2.077*** (0.793)		
ln_poverty	1.081*** (0.191)			1.282*** (0.225)			0.438 (0.335)		
ln_S8020	1.988*** (0.340)			2.219*** (0.409)			1.275** (0.504)		
Constant	-12.18*** (2.546)	-13.12*** (2.568)	-6.719*** (1.912)	-12.90*** (3.382)	-18.49*** (3.740)	-7.676*** (2.791)	-7.820*** (2.857)	-5.730* (3.425)	-3.342** (1.624)
Observations	143	143	142	111	111	110	32	32	32
Nr of countries	24	24	23	14	14	13	10	10	10
R2 within	0.300	0.329	0.318	0.289	0.335	0.308	0.570	0.554	0.598
R2 between	0.0910	0.143	0.166	0.0112	0.0551	0.0528	0.431	0.0135	0.259
R2 overall	0.210	0.237	0.219	0.132	0.141	0.157	0.267	0.231	0.174
model	random	random	random	random	random	random	random	random	random

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Regression results for rates of domestic burglary (in logs)

VARIABLES	EU regions			EU regions excluding CEE NMS			CEE NMS regions		
In_gdppcpp	0.749*** (0.145)	1.137*** (0.183)	0.824*** (0.146)	0.695*** (0.210)	1.228*** (0.263)	0.812*** (0.210)	0.635*** (0.136)	0.600** (0.239)	0.698*** (0.127)
In_gini	1.606*** (0.464)			1.586*** (0.553)			1.828** (0.751)		
In_poverty		0.472*** (0.156)			0.507*** (0.182)			-0.213 (0.296)	
In_S8020			0.869*** (0.278)			0.834** (0.329)			1.122** (0.460)
Constant	-5.345*** (2.021)	-5.156** (2.124)	-2.036 (1.554)	-4.559* (2.634)	-6.141** (3.036)	-1.708 (2.245)	-5.224** (2.472)	1.894 (3.018)	-1.394 (1.338)
Observations	143	143	142	111	111	110	32	32	32
Nr of countries	24	24	23	14	14	13	10	10	10
R2 within	0.228	0.206	0.218	0.183	0.176	0.170	0.637	0.640	0.654
R2 between	0.337	0.277	0.249	0.0876	0.104	0.0562	0.270	0.177	0.157
R2 overall	0.215	0.222	0.197	0.0722	0.0777	0.0612	0.237	0.0201	0.189
model	random	random	random	random	random	random	random	random	random

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



## Regression results for NEET rates – age 15-24 (in logs)

VARIABLES	EU regions			EU regions excluding CEE NMS			CEE NMS regions		
ln_gdppcpp	-0.541*** (0.063)	-0.150** (0.062)	-0.558*** (0.056)	-0.494*** (0.0743)	-0.0728 (0.0672)	-0.507*** (0.0726)	-0.721*** (0.110)	-0.527*** (0.179)	-0.693*** (0.112)
ln_gini	0.577*** (0.182)			0.598*** (0.186)			0.849*** (0.307)		
ln_poverty		0.493*** (0.054)			0.516*** (0.0529)			0.316 (0.195)	
ln_S8020			0.489*** (0.094)			0.422*** (0.103)			0.486** (0.191)
Constant	5.940*** (0.747)	2.578*** (0.720)	7.206*** (0.559)	5.434*** (0.836)	1.738** (0.771)	6.942*** (0.709)	6.552*** (1.686)	6.675*** (2.177)	8.397*** (1.210)
Observations	182	182	181	150	150	149	32	32	32
Nr of countries	26	26	25	16	16	15	10	10	10
R2 within	0.324	0.536	0.347	0.259	0.536	0.291	0.575	0.613	0.576
R2 between	0.460	0.532	0.596	0.448	0.502	0.594	0.842	0.772	0.823
R2 overall	0.352	0.422	0.430	0.437	0.366	0.511	0.703	0.663	0.698
model	fixed	fixed	random	fixed	fixed	fixed	random	random	random

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Regression results for rate of early leavers from education - age 18-24 (in logs)

VARIABLES	EU regions		EU regions excluding CEE NMS			CEE NMS regions			
ln_gdppcpp	-0.316*** (0.076)	-0.113 (0.089)	-0.302*** (0.076)	-0.257*** (0.0827)	-0.0529 (0.0937)	-0.240*** (0.0834)	-0.655*** (0.188)	-0.141 (0.317)	-0.594*** (0.186)
ln_gini	0.489** (0.218)			0.512** (0.207)			1.411** (0.643)		
ln_poverty		0.229*** (0.077)			0.214*** (0.0737)			0.462 (0.397)	
ln_S8020			0.226* (0.124)			0.209* (0.119)			1.015*** (0.376)
Constant	4.031*** (0.896)	2.992*** (1.030)	5.192*** (0.736)	3.491*** (0.930)	2.547** (1.075)	4.726*** (0.815)	3.615 (2.958)	2.071 (3.980)	6.225*** (2.005)
Observations	182	182	181	150	150	149	32	32	32
Nr of countries	26	26	25	16	16	15	10	10	10
R2 within	0.108	0.129	0.0978	0.0863	0.102	0.0658	0.174	0.260	0.196
R2 between	0.0598	0.168	0.0539	0.540	0.431	0.572	0.650	0.542	0.665
R2 overall	0.0690	0.121	0.0669	0.335	0.149	0.348	0.479	0.389	0.526
model	fixed	fixed	fixed	fixed	fixed	fixed	random	fixed	random

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



## Summary of conditional correlations between social outcomes and income inequality

	EU regions			EU regions excluding CEE NMS			CEE NMS regions		
	Gini	Poverty	S80/S20	Gini	Poverty	S80/S20	Gini	Poverty	S80/S20
<b>Population health</b>									
Life expectancy		-			-				
Infant mortality	+	+	+	+	+	+			
Standardised mortality rates									
total		+			+			+	
assault	+	+	+		+	+		+	+
drug use			+		+	+			
heart attack		+			+	+		+	
mental disease	+		+	+	+	+			
<b>Crime</b>									
Homicide	+	+	+	+	+	+			
Robbery	+	+	+	+	+	+	+		+
Domestic burglary	+	+	+	+	+	+	+		+
Theft of motor vehicles	+	+	+	+	+	+		-	
<b>Education/non-activity</b>									
NEET rates									
early leavers from education									

## Conclusions

- Higher income inequality tends to lead to lower levels of population health and increased social harm in various fields on the regional level of the EU
- The relationships are mostly more robust and stronger for the CEE EU NMS compared to other countries of the EU.
- However, income inequality is to be seen as one of many factors influencing social outcomes (e.g. via life styles)
- More redistributive policies are expected to lead to better social outcomes; particularly in the NMS regions
- This effect might be accentuated by lower levels of public expenditures in the health and education sector.