DEVELOPMENT OF PUBLIC SPENDING STRUCTURES IN THE EU MEMBER STATES: SOCIAL INVESTMENT AND ITS IMPACT ON SOCIAL OUTCOMES
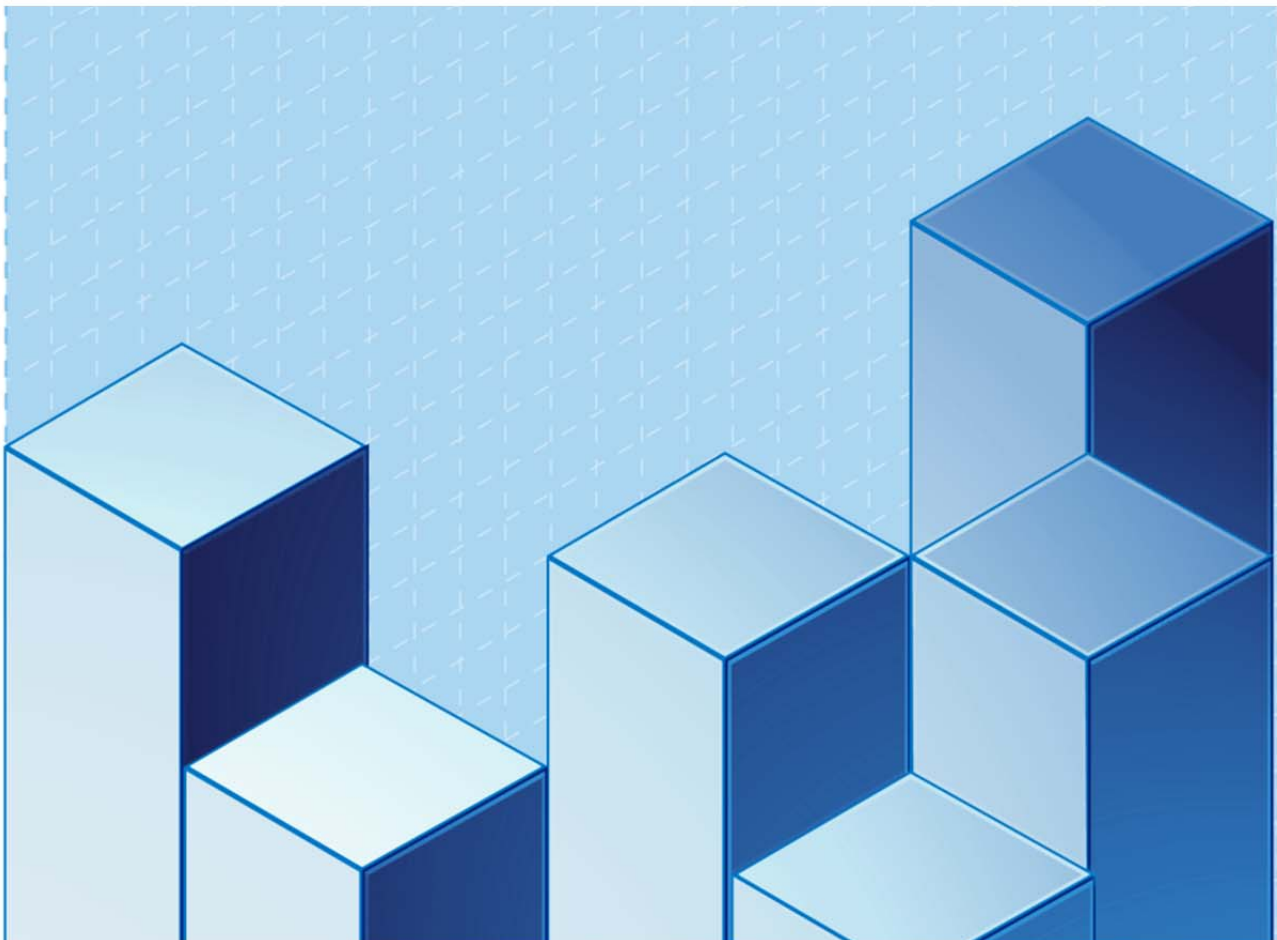
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DEVELOPMENT OF PUBLIC SPENDING STRUCTURES IN THE EU MEMBER STATES: SOCIAL INVESTMENT AND ITS IMPACT ON SOCIAL OUTCOMES

Sebastian Leitner
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Abstract

This paper analyses the changes in public spending structures in the EU Member States over the period 1995 to 2013 based on data on government expenditures by function (COFOG) with a focus on social expenditure categories health, education and social protection spending expressed in per capita terms in PPPs at constant prices. Expenditures increased in general in real terms, while large differences in spending levels are observed across countries. In EU countries which have been hit hard by the economic crisis cuts have been enacted. Furthermore the paper analyses the levels and changes of individual expenditures on health and education based on COICOP data (Classification of Individual Consumption by Purpose) across EU Member States. In an econometric analysis the effects of public and private expenditures on public health and other social outcomes are examined. Higher levels of public expenditures and lower levels of economic poverty are significantly correlated with superior population health and public welfare.

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1 Introduction

The role and magnitude of the government and the public sector is nowadays discussed mostly with respect to the size of the budget deficits and eventual austerity and tax measures as a response to the impacts of the economic crisis. However, the government or the public sector needs also to be seen as the provider of important goods and services to foster economic growth and raise overall levels of welfare, often enabling the economies to function more smoothly or to counteract arising social inequalities. Despite this important role of the public sector it is hard to pin down the overall impact of the public sector.

In this paper we analyse the development of the public sector in EU countries for the time period 1995 to 2013 and thereby concentrate on types of expenditure identified by the European Commission in its agenda 'Europe 2020' as important for social cohesion and growth in the EU. For the analysis of spending levels in the EU countries and particularly potential austerity driven cuts we use data on Government expenditures by function (COFOG). These data are then finally linked to dimensions of social outcomes and inequality with respect to health, education and crime.

In its communication 'Towards social investment for growth and cohesion' (2013a) the European Commission stressed the need for more and efficient expenditures in order to 'invest in human capital throughout life and ensure adequate livelihoods' (ebed., p.6) to attain the Europe 2020 target of a more inclusive European society. The commission highlights that the economic as well as social returns to social investments are expected to be positive (2013b). Thus one should expect higher expenditures in health, education and social protection to increase social welfare.

From the literature (for an overview see Singh, 2014) one would expect that across countries higher levels of public health spending are associated with improved population health, at least for some outcomes. However, the Commission (2013c) considers that health outcomes may not depend so much on spending levels but how efficiently the resources are used. Moreover, health spending increases almost uniformly with GDP (Jaminson, et al., 2013) due to swiftly growing costs in services. Thus it might be unclear if a rise in health outcomes, e.g. life expectancy is driven by higher income levels as such or by higher health expenditure if countries have similar GDP p.c. levels. Moreover, one might expect from the literature (WHO, 2010) that countries with higher public expenditure perform better concerning health outcomes compared to those where private spending accounts for a high share in total health expenditures. From the litera-

ture investigating the effects of education spending, one would expect that investment in additional years of schooling (and also in higher quality of schooling) results in lower dropout rates, higher income and employment levels and thus lower NEET rates (shares of youngsters not in employment, education or training) as analysed e.g. by de la Fuenta/Ciccone (2002). The European Commission highlights in its two most recent publications of its 'Education and Training Monitor' (EC, 2014, 2015) that austerity-driven cuts in spending on education might lead to reduced access to high quality education for all, hamper the aim of reducing social gradients in education and thus improving average outcomes. Based on considering the criminal act as a result of a cost-benefit decision as done in economic theory by e.g. Becker (1968) one could think of public expenditures on social protection as investments into crime prevention. First, it lowers the relative benefits from criminal behaviour, since it inhibits individuals from being economically and socially deprived and second it is an investment at the community level in social capital, fostering social norms. Empirical evidence on negative effects of welfare programmes on crime applying cross-country analysis is provided e.g. by Pratt/Godey (2002) and Savage, Bennet and Danner (2008).

Apart from spending levels in social expenditures various strains in the literature nowadays discuss the effects which economic inequalities might have on overall health and other social outcomes. More recently e.g. Marmot, et al. (2012) and the WHO (2013) have provided studies on the social gradients of health in Europe, showing the effects of individual economic position on individual health outcomes. Negative mortality effects of income inequality have been found in panel analysis e.g. by Torre and Myrskylä (2014) offering also an overview over the existing literature. A negative effect of economic inequalities on educational attainment might be found due to liquidity constraints of less well-off families (Cecchi, 2003) or lower effective returns from educational investments of individuals with less favourable family backgrounds (Aakvik, Salvanes and Vaage, 2005). The most prominent panel studies, observing a positive link between income inequality and crime were performed by Fajnzylber, Lederman and Norman (2002a, 2002b).

In the econometric analysis undertaken in this paper we thus consider both the effect of levels of social spending and the effect of economic inequality (or poverty) on average public health and social outcomes.

2   Government expenditures by function (COFOG)

A straightforward way to analyse the role of the government in the economy but also its potential effects on social developments is to look at government expenditures by function. The COFOG data provided by Eurostat shows the level of expenditures by function across European Member States. Thus the next subsection provides definitions, which is then followed by a descriptive assessment of government expenditure structures by function.

2.1   Definitions

The COFOG categories classify government expenditures by function of government.[1] At the most aggregate level ten different categories are identified (see Table 2.1.1). Items GF01 to GF06 mark "collective government expenditures". In ESA1995 these are defined as follows: *"Services for collective consumption („collective services") are provided simultaneously to all members of the community or all members of a particular section of the community, such as all households living in a particular region." (ESA95, para. 3.83).* The second category is government individual consumption and consists of GF07 Health, GF08 Recreation, culture and religion, GF09 Education, and GF10 Social protection. In ESA 1995 the definition is as follows: *"Furthermore, it must be recalled that government individual final consumption expenditure is one of the components of households' actual consumption expenditure (ESA95, para. 3.81-3.86)) and its calculation is very relevant to give a measure of the part of goods and services that households consume but do not pay for."* But also some sub-items of expenditures on individual final consumption (health, recreation, culture and religion, education and social protection) are considered as collective: GF07.5 (R&D Health) and GF07.6 (Health n.e.c.) and GF08.3 (Broadcasting and publishing services); GF08.4 (Religious and other community services), GF08.5 (R&D Recreation, culture and religion), and GF08.6 (Recreation, culture and religion n.e.c.); GF09.7 (R&D Education) and GF09.8 (Education n.e.c); GF10.8 (R&D Social protection) and GF10.9 (Social protection n.e.c.).

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[1] Classification of the functions of government (COFOG).

Table 2.1.1 – COFOG categories

TOTAL	Total	
*GF01	General public services	Collective
*GF02	Defence	Collective
*GF03	Public order and safety	Collective
*GF04	Economic affairs	Collective
*GF05	Environment protection	Collective
*GF06	Housing and community amenities	Collective
GF07	Health	Collective: 07.5, 07.6
GF08	Recreation, culture and religion	Collective: 08.3-08.6
GF09	Education	Collective: 09.7, 09.8
GF10	Social protection	Collective: 10.8, 10.9

Note: * marks collective services; remaining parts are "expenditure on individual final consumption"

The sub-items therefore remaining and being classified as government individual consumption therefore are those listed in Table 2.1.2.

Table 2.1.2 – COFOG 2nd level items comprising "government individual consumption"

Health	GF0701	Medical products, appliances and equipment
	GF0702	Outpatient services
	GF0703	Hospital services
	GF0704	Public health services
Recreation, culture and religion.	GF0801	Recreational and sporting services
	GF0802	Cultural services
Education	GF0901	Pre-primary and primary education
	GF0902	Secondary education
	GF0903	Post-secondary non-tertiary education
	GF0904	Tertiary education
	GF0905	Education not definable by level
	GF0906	Subsidiary services to education
Social protection	GF1001	Sickness and disability
	GF1002	Old age
	GF1003	Survivors
	GF1004	Family and children
	GF1005	Unemployment
	GF1006	Housing
	GF1007	Social exclusion n.e.c.

Furthermore, expenditures can be classified according to categories like compensation of employees (D1), subsidies (D3), gross capital formation (P5) etc. (as listed in Table 2.1.3) which are not investigated here.

Table 2.1.3 – Government expenditure categories

NA indicator	Description
TE	Total expenditure
*D1	Compensation of employees
**D29 + **D5 + **D8	Other taxes on production; current taxes on income, wealth, etc; adjustment for the change in net equity of households in pension funds reserves
**D3	Subsidies
**D4CO	Property income, consolidated
**D62 + *D6311 + *D63121 + *D63131	Social benefits other than social transfers in kind and social transfers in kind = expenditure on products supplied to households via market producers
**D7CO	Other current transfers, consolidated
***D9CO	Capital transfers, consolidated
***K2	Acquisitions less disposals of non-financial non-produced assets
*P2	Intermediate consumption
***P5	Gross capital formation

Note: * Final consumption (P.3) + adjustment; ** Remaining current expenditure; *** Capital expenditure;

Table 2.1.4 indicates how government expenditures are linked to household consumption, government individual consumption and government gross fixed capital formation according to national accounts conventions.

Table 2.1.4 - Relationship between expenditure components and final consumption

Eurostat expenditure items, *and other items*	Classification of the output and/or classification of the sale/transfer of the output by government		Sector consuming the output (either as final consumption or capital formation)
Social payments	Social benefits in cash (D.62)		Part of household consumption (P.3)
	Current transfers to NPISHs (D.75)		Part of NPISH final consumption (P.3)
	Social transfers in kind of goods and services produced by market producers (D.6311 + D.63121 + D.63131)		Government individual final consumption (P.31)
Government output = intermediate consumption + compensation of employees + taxes less subsidies + capital consumption + net operating surplus of market establishments	Other government non-market output (P.132) (net of payments for non-market output P.131)	Social transfers in kind of goods and services produced by non-market producers (D.63122 + D.63132)	
		Other transfers of individual non-market goods or services (D.632)	
		Transaction internal to government	Government collective final consumption (P.32)
	Sales (revenue item)	Payments for government non-market output (P.131)	Any sector: either final consumption or capital formation
		Government market output (P.11)	
		Government output for own final use (P.12)	Government gross fixed capital formation (P.51)

The table shows what would be recorded in national accounts if, for example, government employed construction workers, and bought some cement, to build a road. These costs would be recorded as government expenditure on the compensation of employees and intermediate consumption in the first column; as output for own final use in the second column; and as government fixed capital formation in the third column.

Source: Eurostat COFOG manual

From this table one can see that government expenditures are broadly divided into social payments and government output. Concerning social payments a part of these is also accounted as household consumption and NPISH consumption (P.3) and government individual final consumption. Government output is again either consumed as government individual or collective final consumption, or final consumption and gross fixed capital formation. Thus, in the supply-use or IO framework above it is not easy to clearly identify the role of government in final consumption. The exact procedure, how the final absorption part would have to be incorporated is to be seen in Figure 2.1.1. However, officially available data do not allows one to incorporate that exactly, thus the indicators provided above and in the following need to be seen as first proxies.

Figure 2.1.1 – Government expenditures in the SUT framework

Source: Eurostat IO manual.

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2.2 COFOG expenditure structures

In this section an overview of expenditure structures over time and across countries is provided based on the just described COFOG data. Government expenditures vary considerably as a share of GDP across EU Member States. In 2013 it amounts to almost 50% of GDP for the EU-28 and range from close to 60% in Denmark, Finland, France and Greece to only 35% in Romania.

A special focus is given the social expenditures, i.e. health (GF07), Education (GF09) and Social Protection (GF10). Table 2.2.1 shows the structure of expenditures for some selected years. On average, these three categories account for more than 65% of total government expenditures; other important spending items are General public services (14.1%) and Economic affairs (8.8%). Furthermore, the latter two expenditure items declined in importance over the period considered in favour of the above mentioned social spending.

Table 2.2.1 – COFOG expenditure structures in EU-27[1]

		1995[2]	2000	2005	2013
TOTAL	Total	100.0	100.0	100.0	100.0
GF01	General public services	15.6	15.6	13.6	14.1
GF02	Defence	3.7	3.7	3.3	2.9
GF03	Public order and safety	3.1	3.6	3.9	3.7
GF04	Economic affairs	13.7	7.3	9.0	8.8
GF05	Environment protection	1.4	1.6	1.7	1.7
GF06	Housing and community amenities	2.3	1.9	2.0	1.4
GF07	Health	11.6	13.5	14.6	14.8
GF08	Recreation, culture and religion	1.8	2.4	2.5	2.2
GF09	Education	9.6	10.9	11.1	10.3
GF10	Social protection	37.2	39.5	38.3	40.3

Source: Eurostat COFOG data; wiiw calculations.
Notes: 1) HR excluded due to missing data. 2) excluding BG, PL, SI.

For this research however we do not consider the overall structure of government expenditures, but look more closely at the expenditures in per capita terms. Furthermore, to make them comparable across countries government expenditures are expressed in PPPs at 2010 prices (see Appendix 1 for details). Thus our cross-country comparisons of expenditure levels (and also of country developments over time) diverge from analysis based on spending levels in terms of shares in GDP. The latter approach observes quite often increases of expenditure levels in times in the economic crisis years (mostly due to a decrease in GDP). Moreover, using per-capita expenditures levels in PPP terms entails relatively higher spending levels in real terms in the New EU Member States e.g. due to low wage levels in the health sector in those countries.

Figure 2.2.1 presents the relevant figures for 25 EU member states for which data are available. First, there are vast differences of these expenditures per capita across countries. Not considering Luxembourg, the expenditures per capita range between about 18.000€ in Denmark and 13.000€ in the UK. These are followed by some of the EU-CEE countries together with Greece, Spain and Portugal for which expenditures per capita range between 12.400€ (in Slovenia) to less than 5.000 €in Bulgaria. Over time, these expenditures per capita have increased (though in some cases with a dip in 2000) in general. However, since the year 2007 the expenditures per capita have decreased slightly in Italy, Greece, Bulgaria, and remained more or less constant in Hungary and Spain. Thus, it seems that countries which have been hit particularly hard by the crisis have reacted by a reduction of government expenditures per capita due to austerity measures.

Figure 2.2.1 – Total COFOG expenditures per capita in PPP at constant prices 2010, in ths
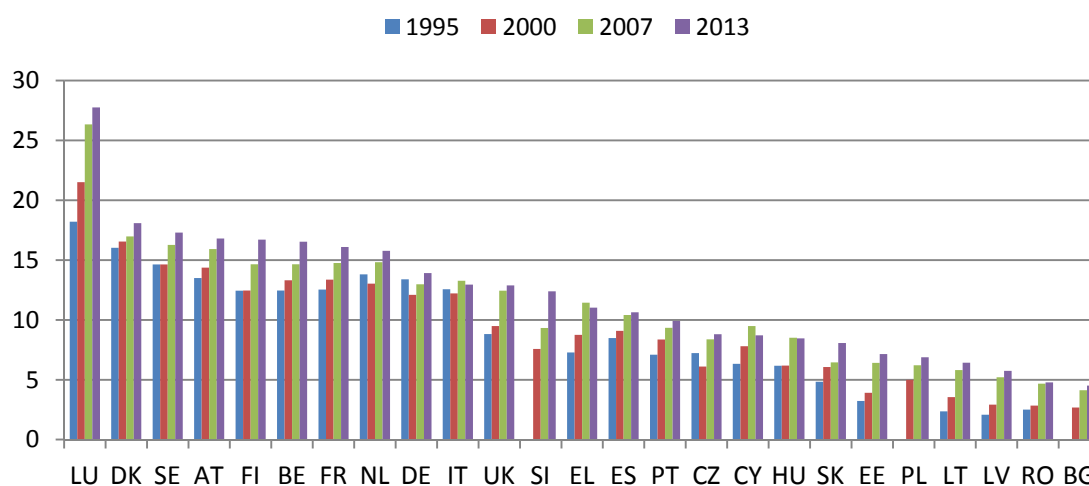
Note: Data for Poland for 2000 from 2002. Countries ranked according to value in 2013.
Source: COFOG; wiiw calculations.

These overall structures however differ when considering individual COFOG categories. Figure 2.2.2 presents the expenditure per capita on health, again expressed in PPPs at 2010 prices[2]. The expenditures range in the more advanced EU countries between 2.500€in the Netherlands and

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[2] As mentioned above expenditure levels per capita in the New EU Member States (e.g. in Slovakia) increase in comparison to other EU countries quite strongly, when expressed in PPP terms e.g. due to low wage levels in the health sector. Thus, the country ranking diverges in part considerably from those presented e.g. by the OECD (2015) based on health expenditure in relation to GDP.

about 1.700€in Sweden. For the remaining countries these are in between 1.500€and only 600€ in Cyprus. In most of the advanced member states these have increased considerable (by more than 30% in real terms in the period from 1995 to 2013 on average), while Finland and Sweden are an exception in this respect.. General increases are also observed for the EU-CEE countries though these are lower in general (a particular exception is the Czech Republic where these expenditure item has been strongly declining over the whole period). Over the crisis period these expenditures per capita have again been increasing for most countries – though these changes have been somewhat smaller in general. Only in some countries health expenditures declined, notably so in Italy, Sweden, Spain, Portugal, Latvia, Cyprus and Greece (for which a stronger increase is observed from 2000 to 2007).

Figure 2.2.2 - COFOG expenditures on health per capita in PPP at constant prices 2010, in ths

Note: Data for Poland for 2000 from 2002, for CY for 2013 from 2012. Countries ranked according to last figure available.
Source: COFOG; wiiw calculations.

The next category considered are expenditures on education per capita which are presented in Figure 2.2.3.

Figure 2.2.3 - COFOG expenditures on education per capita in PPP at constant prices 2010, in ths

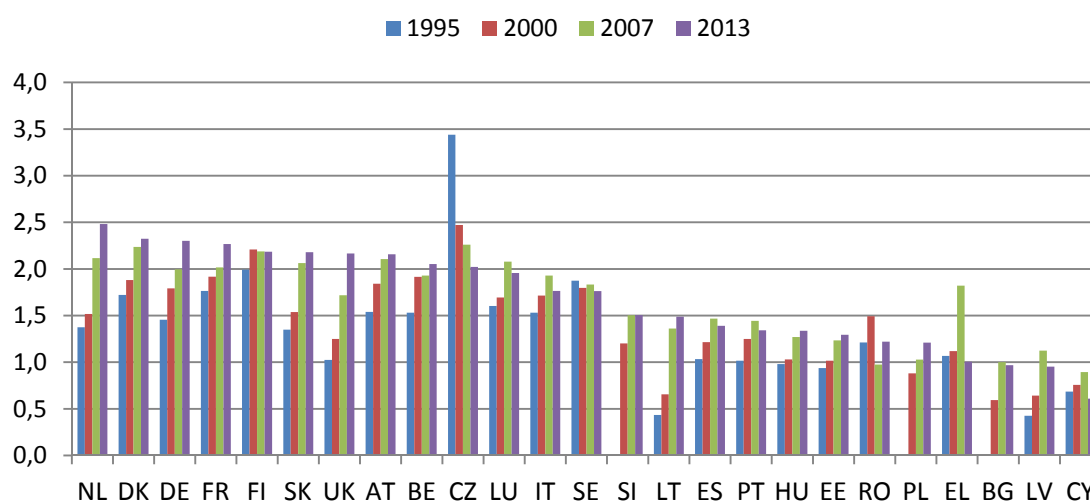*Note*: Data for Poland for 2000 from 2002. Countries ranked according to last figure available.
Source: COFOG; wiiw calculations

Expenditures per capita are highest in Luxembourg with more than 2.200€ to levels around 1.500€ in a wide range of countries. A few countries – Italy, Greece, Spain, Bulgaria, and Romania – show only values at or even below 1.000€ In many New Member States (the Baltic countries, Hungary and Slovakia) and the UK the increases had been stronger over time, while only modest in Luxembourg, Belgium, Portugal, the Czech Republic and Austria, but also Greece and Spain.

A few countries show longer-term trends like France and Germany, where the education expenditures per capita declined over the whole period. However, over the crisis years there are declines observed in most countries with a few exceptions. These declines have been particularly strong in Bulgaria and Romania, but also in Finland, Estonia, Italy, Spain and the UK.

Figure 2.2.5 - COFOG expenditures on social protection per capita in PPP at constant prices 2010, in ths

■ 1995 ■ 2000 ■ 2007 ■ 2013

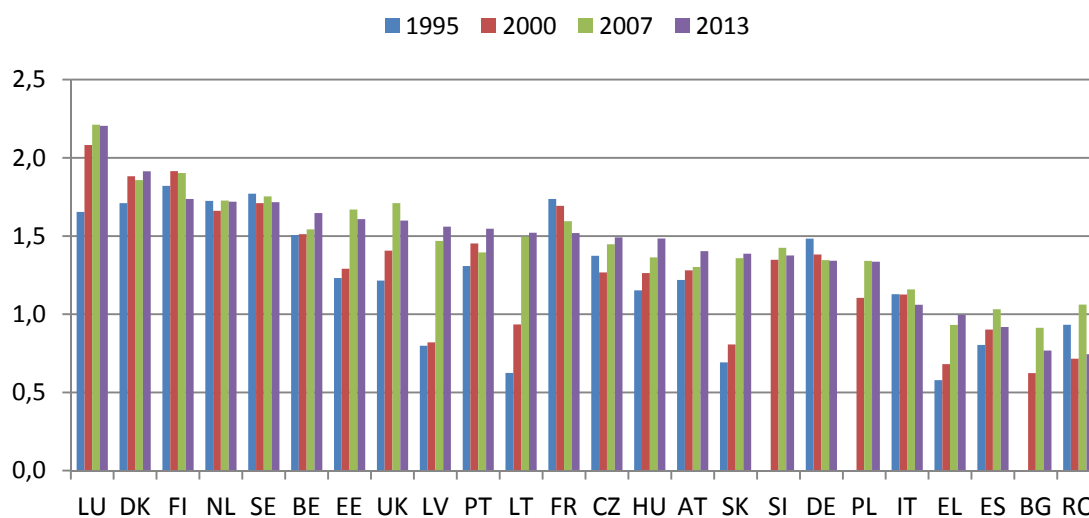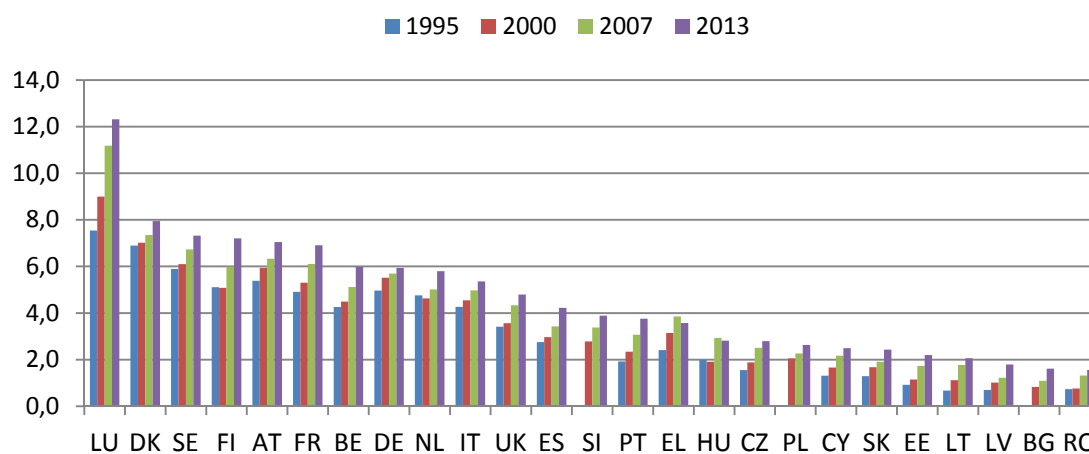*Note*: Data for Poland for 2000 from 2002. Countries ranked according to last figure available.
Source: COFOG; wiiw calculations

The final category looked at are expenditures on social protection. Figure 2.2.4 present the expenditures per capita in PPPs. For this category there is a remarkably wide range from 8.000€ per capita in Denmark (and even more than 12.000€ per capita in Luxembourg) to less than 2.000€ per capita observed in Latvia, Bulgaria and Romania. General, expenditures on social protection per capita are particularly low in EU-South and EU-CEE countries. Over time, these have increased considerably, inter alia due to a rising share of pensioners in the population but also due to higher unemployment levels in the years after 2007; here, only Greece and Hungary are exceptions as the per capita expenditures have decreased since the onset of the crisis.

2.3 COICOP expenditure structures

Corresponding items for individual expenditures on health and education exist from the COICOP data (Classification of Individual Consumption by Purpose – COICOP). Analogously to the COFOG data these are again expressed in per-capita terms and converted by PPPs.

Figure 2.3.1 - COICOP expenditures on health per capita in PPP at constant prices 2010, in ths
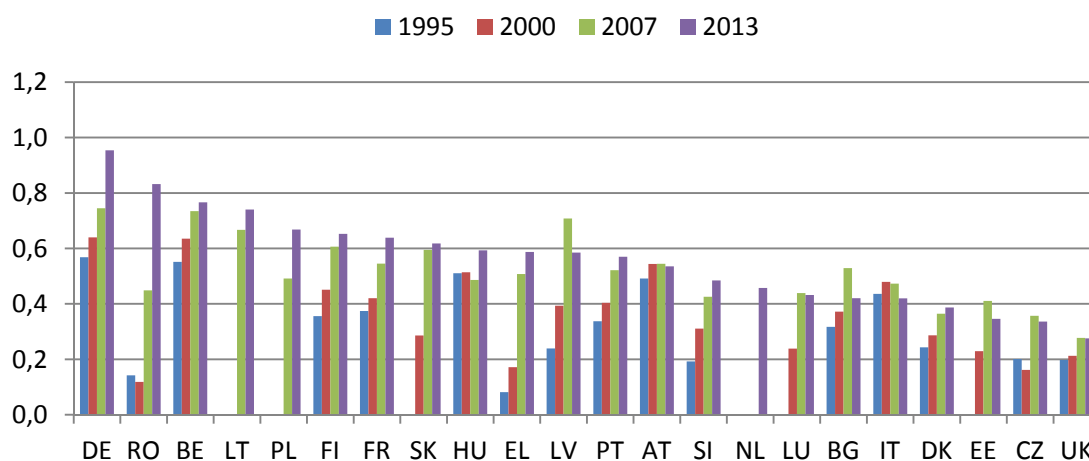
1995 2000 2007 2013

Note: Data for UK and PT are from 2011; for BG from 2012. Countries ranked according to last figure available.
Source: COFOG; wiiw calculations

Figure 2.3.2 - COICOP expenditures on education per capita in PPP at constant prices 2010, in ths
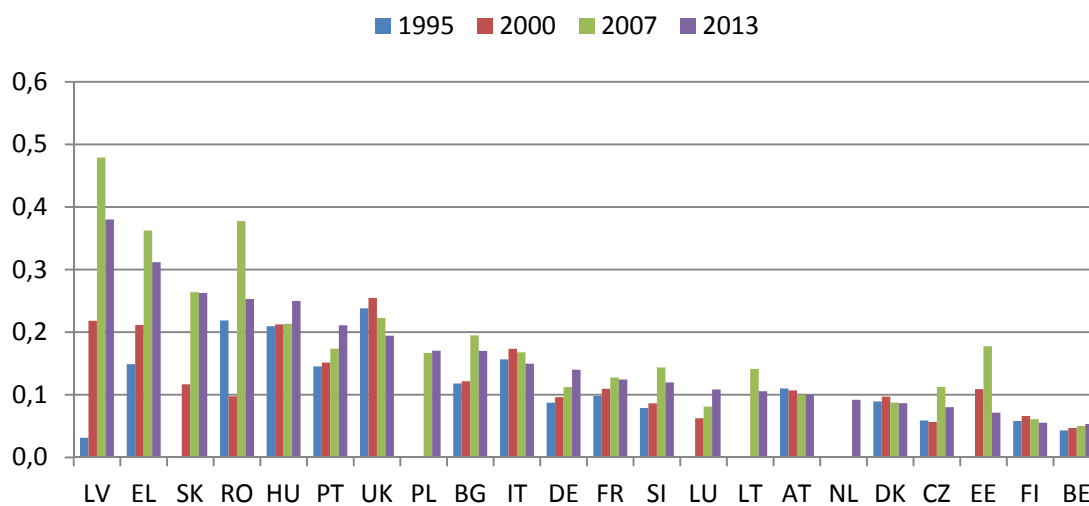
1995 2000 2007 2013

Note: Data for UK and PT are from 2011; for BG from 2012. Countries ranked according to last figure available.
Source: COFOG; wiiw calculations

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2.4 COFOG and COICOP: Substitutes or complements

A first question which arises is whether COICOP based expenditure, i.e. individual expenditures on education or health care are substitutes or complements to government expenditures taken from COFOG data. Figure 3.4.1 presents the expenditures per capita of COFOG and COICOP for education and health expenditures.

Figure 2.4.1 – Relationship between COICOP and COFOG expenditures in PPP at constant prices 2010

Education (2013)
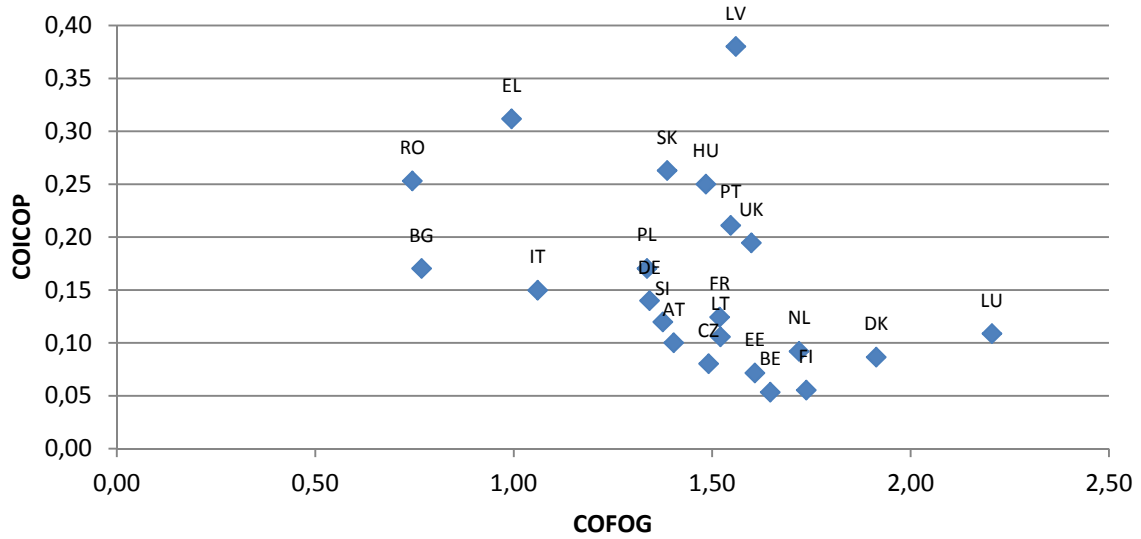
Health (2013)
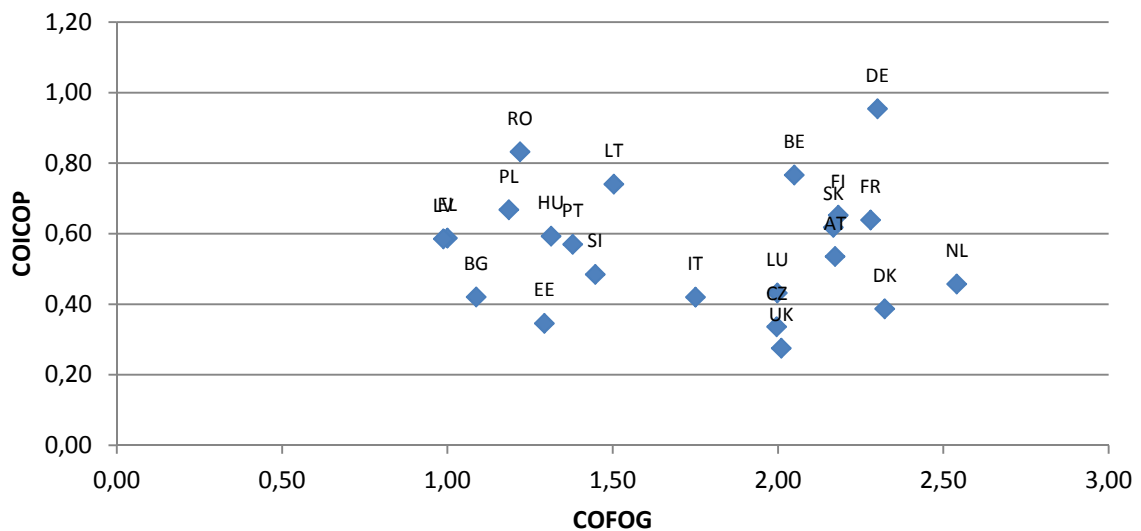
Source: COFOG and COICOP; wiiw calculations

For expenditures on education there seems to be a substitution effect prevailing, i.e. those countries with lower government expenditures per capita tend to have higher individual expenditures per capita on education. This is particularly true for Romania, Bulgaria and Greece. Further, for some of the New Member States the individual expenditures (COICOP) are higher. For health expenditures one cannot see such a relationship. These are rather clustered in two groups: the New Member States have lower government expenditures per capita on health, whereas the remaining countries are higher on average (Italy is in between). However, there is no clear pattern concerning the private health expenditures per capita in relation to public ones.

3   Public expenditures and social outcomes

In this section we are interested in the effects that public expenditures might have on social phenomena like public health, the participation of the young generation in education and the labour market and the effect on crime rates. In general, we expect public expenditures to further inclusion of citizens, thereby lifting the overall level of social welfare. Specific categories of public expenditures are health (COFOG 7), education (COFOG 9) and social protection (COFOG 10) which are tested in applying below regression analyses on appropriate social outcome variables.

3.1   Health expenditures

In the case of health expenditures our outcome variables of interest are life expectancy below the age of one, standardised mortality rates (age structure adjusted) for all causes of death and for diseases of the circulatory system (including particularly heart attack) and the infant mortality rate (number of deaths of children below 1 year of age per thousand live births in the same year).

Apart from public health expenditure per capita, we use as further explanatory variables private health expenditures p.c. and GDP p.c. (at prices and purchasing power parities of 2010), the Gini index and the poverty rate (both calculated on the basis of equivalised disposable household income).

One expects that countries with higher income levels feature higher life expectancy, resulting from more sophisticated methods of treatment, healthier lifestyles and many other factors. Moreover, higher public expenditures per capita (either for prevention, medical treatment or care) should allow enhancing the health status of the population and thus overall life expectancy. The literature on inequality suggests that higher income dispersion and poverty might result in lower income groups lacking of resources needed for attaining the same treatment as population groups with higher income. Moreover higher inequality may lead to dispersion in live styles, etc., which may result in lower increases of average life expectancy over time in societies with rising income inequality. A higher share of private expenditures in total health expenditures may also result in diverging health outcomes differentiated by income or education levels within the population. Analogous reasons apply for the other three public health indicators.

In order to control for time invariant country characteristics we make use of the panel structure of our data and apply a fixed effects regression. This captures more or less time-invariant omitted variables like e.g. differences in nutrition and lifestyle variables. In addition we apply time dummies where appropriate, which capture effects of shocks like the economic crisis, but also a

general trend towards an increase in life expectancy in all countries observed due to improvements in better medication and treatment, irrespective of the explanatory variables (e.g. public health expenditure) included in the model.

Table 3.1.1 – Regression results for population health 1

Explanatory variables	Dependent variable: Life expectancy (in logs), 1995-2013					
	(1)	(2)	(3)	(4)	(5)	(6)
Total Health expenditures (in logs) per capita in real terms and PPP	0.074*** (0.017)	0.011 (0.017)				
Total Health expenditures (in logs) share in GDP			0.056*** (0.015)			
Gross domestic product (in logs) per capita in real terms and PPP		0.088*** (0.011)	0.072*** (0.015)	0.076*** (0.016)	0.016 (0.019)	0.140 (0.118)
Gross domestic product (in logs)^2 per capita in real terms and PPP						-0.007 (0.006)
Public Health expenditures (in logs) share in GDP				0.043*** (0.010)	-0.008 (0.008)	0.414*** (0.105)
Public Health expenditures (in logs)^2 share in GDP						-0.025*** (0.006)
Private Health expenditures (in logs) share in GDP				0.006 (0.009)	-0.008 (0.009)	0.060 (0.065)
Private Health expenditures (in logs)^2 share in GDP						-0.005 (0.005)
Year					0.003*** (0.000)	0.004*** (0.000)
Constant	11.203*** (0.011)	10.338*** (0.110)	10.396*** (0.154)	10.057*** (0.172)	4.519*** (0.513)	1.057 (1.250)
Observations	431	431	434	434	434	434
Number of countries	24	24	24	24	24	24
R2_within	0.406	0.617	0.668	0.668	0.908	0.917
R2_between	0.456	0.728	0.804	0.788	0.359	0.010
R2_overall	0.421	0.701	0.775	0.761	0.356	0.153
R2_adjusted	0.404	0.615	0.667	0.666	0.904	0.912
Country fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	no	no	no	no	yes	yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1*
Source: COFOG, COICOP, Eurostat database, wiiw calculations.

The results of this econometric analysis to explain public health outcomes are presented in Table 3.1.1. Our dependent variable is in this case the log of life expectancy. The panel data is available for 24 EU countries (Croatia, Cyprus, Malta and Ireland had to be excluded due to missing data) for the years 1995 to 2013.

In the first specification we simply test if the level of health expenditure (per capita, in real terms at purchasing power parities) is correlated positively with life expectancy, which is the case. However, if we include as additional explanatory variable (see specification 2) GDP per capita (at purchasing power parities at price levels 2010) we see that countries with higher income levels show - as expected - higher average levels of life expectancy, while health expenditures in real terms become insignificant. Since the correlation coefficient of the explanatory variables GDP and health expenditure is with 0.72 relatively high, multicollinearity might be a problem. Thus specification 3 is more appropriate, which includes health expenditures as a share of GDP apart from GDP p.c. levels. In this case life expectancy is not only correlated with income but rises also if more income of a country is devoted to health expenses. Since we have data on public and private health expenditure, respectively, we disentangle both in specification 4. Only the share of public health expenditures remains significant, while private expenditures seem to have a very low effect on life expectancy, which is moreover not significant.

However, we should also include time fixed effects, if year specific characteristics exist. Applying a Wald test actually indicates the need to include year dummies in the case of our regression, which we thus apply from specification 5 onwards. In addition we include a year variable, which captures the time trend over the whole period, without changing the regression results. From that we can see that life expectancy shows an increasing secular trend: life expectancy increases every year by 0.3 percent when controlled for other factors, while the coefficients of all other explanatory become insignificant. However we would expect that the relationship between public health and expenditures is not linear. An increase of the expenses might be correlated with rising life expectancy but most probably an additional increment may lower the effect since elasticities are changing. Thus we include the squares of all explanatory variables in order to allow for non-linearity. The result is a strong plausible relationship between the share of public health expenditures and life expectancy.

Table 3.1.2 – Regression results for population health 2

	Dependent variables								
	Life expectancy in logs, 2004-2013			Mortality: total in logs, 2004-2012		Mortality: heart in logs, 2004-2012		Infant mortality in logs, 2004-2013	
Explanatory variables	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
GDP (in logs)	0.050	0.100	0.081	-0.102	-0.012	0.193	-0.044	4.153	4.584
p.c., real terms, PPP	(0.257)	(0.256)	(0.224)	(0.934)	(0.925)	(1.738)	(1.673)	(6.683)	(6.428)
GDP (in logs)^2	-0.002	-0.004	-0.004	0.009	0.005	0.005	0.016	-0.240	-0.262
p.c., real terms, PPP	(0.013)	(0.013)	(0.011)	(0.047)	(0.047)	(0.090)	(0.087)	(0.339)	(0.326)
Public Health (in logs)	**0.479****	**0.469****	**0.498*****	**-1.430***	**-1.545***	-0.035	0.018	-5.150	-5.717
share in GDP	(0.184)	(0.171)	(0.171)	(0.826)	(0.843)	(1.107)	(1.144)	(3.541)	(3.600)
Public Health (in logs)^2	**-0.028****	**-0.028****	**-0.03*****	**0.083***	**0.090***	-0.002	-0.005	0.297	0.332
share in GDP	(0.011)	(0.010)	(0.010)	(0.048)	(0.049)	(0.066)	(0.069)	(0.208)	(0.211)
Private Health (in logs)	-0.105	-0.107	-0.114	-0.581	-0.548	**-1.416****	**-1.411****	1.129	1.253
share in GDP	(0.117)	(0.115)	(0.103)	(0.488)	(0.439)	(0.562)	(0.544)	(1.482)	(1.470)
Private Health (in	0.006	0.006	0.007	0.041	0.039	**0.095****	**0.095****	-0.072	-0.080
share in GDP	(0.007)	(0.007)	(0.006)	(0.031)	(0.028)	(0.037)	(0.036)	(0.093)	(0.092)
Gini index (disposable		-0.010		0.057		-0.042		0.212	
househ. inc. - in logs)		(0.009)		(0.036)		(0.069)		(0.142)	
Poverty rate (disposable			-0.013*		**0.056****		0.006		**0.248****
househ. inc. - in logs)			(0.007)		(0.024)		(0.055)		(0.116)
Year	**0.003*****	**0.004*****	**0.004*****	**-0.019*****	**-0.019*****	**-0.034*****	**-0.034*****	**-0.03*****	**-0.03*****
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.003)	(0.003)	(0.006)	(0.007)
Constant	2.336	2.180	2.045	59.278***	59.915***	85.606***	86.384***	66.194	68.546*
	(1.403)	(1.472)	(1.384)	(4.760)	(4.836)	(11.470)	(11.939)	(38.790)	(38.007)
Observations	240	240	240	216	216	216	216	240	240
Number of country	24	24	24	24	24	24	24	24	24
R2_within	0.862	0.864	0.869	0.880	0.883	0.879	0.879	0.531	0.541
R2_between	0.356	0.342	0.308	0.619	0.565	0.572	0.567	0.500	0.504
R2_overall	0.279	0.263	0.274	0.043	0.027	0.219	0.223	0.499	0.501
R2_adjusted	0.853	0.854	0.860	0.871	0.875	0.870	0.870	0.498	0.508
Country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: COFOG, COICOP, Eurostat database, wiiw calculations.

In Table 3.1.2 we move on with our analysis. Specification 7 is a replication of specification 6 in Table 3.1.1, however only data of the time period 2004 to 2013 is used, since this allows us to include more explanatory variables which are available only for this reduced time span. The results reported in specification 7 nevertheless look quite similar as the ones in specification 6 for the years 1995 to 2013 concerning the significant coefficients of public health expenditure and the time trend. In specification 8 and 9 we are interested in the effect of dispersion in household income within countries on the level of life expectancy. As we can see from the results overall income inequality (measured by the Gini coefficient) does not correlate significantly with public health, while higher poverty rates correlate negatively with life expectancy.

Apart from life expectancy we analyse further indicators of public health, i.e. total mortality rates, rates of mortality due to diseases of the circulatory system (particularly heart attack) and infant mortality rates. We expect the relationships between mortality rates by individual causes of death and total public and private health expenditures to be less robust. In the regression specifications 10 to 15 we can see a secular decline of mortality rates over time. Public health expenditures have a significant effect only on total mortality rates, while in the case of mortality due to diseases of the circulatory system (particularly heart attack) private expenditures are correlated significantly; however, in the first case only at the 10% level, in the latter at the 5% level. Higher poverty rates are positively correlated with higher total and infant mortality rates.

In general, the analysis shows that levels of public health expenditures matter for life expectancy and overall mortality (the latter result being less significant) in the EU countries. Higher levels of poverty are correlated with lower life expectancy and higher mortality rates.

3.2   Education expenditures

Investments in the skills of the population should have a wide range of effects, particularly a rise in productivity and thus income levels. In the analysis here, we are interested in the inclusion effect of expenditures in education particularly for young people (aged 15-24 years). Thus we analyse if higher levels of public and private expenditures in GDP might lead to higher participation rates of youngsters in education or employment.

Table 3.1.3 shows the regression results for the rates of young people not in employment, education or training aged 15-24 (NEET rates) on GDP per capita, public and private expenditure levels in education (as share in GDP) and two indicators describing income inequality in the EU countries. The time period analysed first is 2004 to 2013 (specification 1 and 2) since for earlier years no comparable NEET rates are provided by Eurostat. In general, countries with higher income levels show lower levels of youngsters not attached to the labour market or education. However, contrary to our expectation higher public or private expenditures for education do not show a significant conditional correlation with lower NEET rates. Yet, the picture changes if we split the panel into two periods: the phase before the crisis (2004-2008) and the protracted crisis (2009-2013). In the first period (see specifications 3 and 4) NEET rates fell particularly in those countries with above-average levels which were not only those with the lowest GDP levels, most New EU Member States, but also those in Southern Europe. This period of economic cohesion resulted in "all boats being lifted" and higher income countries, which spend more in education, featured even higher NEET rates. This changed dramatically in the phase after the

collapse of aggregate demand and thus also labour demand in the EU (see specifications 5 and 6). While youth employment rates fell in almost all countries, in those with higher income and in addition higher public spending levels in education the young population is better off.

Table 3.1.3 – Regression results for young people not in employment, education or training

| | Dependent variable: NEET rate, 15-24 (in logs) | | | | | |
| | 2004-2013 | | 2004-2008 | | 2009-2013 | |
Explanatory variables	(1)	(2)	(3)	(4)	(5)	(6)
Gross domestic product (in logs)	-1.180***	-1.177***	-1.366***	-1.390***	-1.283***	-1.272***
per capita in real terms and PPP	(0.231)	(0.227)	(0.335)	(0.325)	(0.426)	(0.374)
Public Education (in logs)	-0.010	0.020	0.433	0.398	-0.410***	-0.446***
share in GDP	(0.193)	(0.197)	(0.300)	(0.301)	(0.144)	(0.134)
Private Education (in logs)	-0.135	-0.138	-0.043	-0.028	0.082	0.069
share in GDP	(0.103)	(0.099)	(0.282)	(0.262)	(0.085)	(0.072)
Gini index (in logs)	-0.084		-0.046		0.334	
disposable household income	(0.205)		(0.167)		(0.272)	
Poverty rate (in logs)		-0.161		0.113		0.381**
disposable household income		(0.170)		(0.143)		(0.136)
Year	0.018***	0.018***				
	(0.005)	(0.005)				
Constant	-12.027	-13.172	20.364***	19.257***	22.189***	22.214***
	(10.650)	(10.461)	(5.535)	(6.084)	(6.302)	(5.255)
Observations	240	240	120	120	120	120
Number of country	24	24	24	24	24	24
R2_within	0.419	0.425	0.481	0.484	0.349	0.389
R2_between	0.356	0.309	0.291	0.324	0.558	0.595
R2_overall	0.353	0.311	0.290	0.320	0.547	0.584
R2_adjusted	0.385	0.392	0.463	0.466	0.326	0.368
Country fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	no	no	no	no

Robust standard errors in parentheses
*** *p<0.01, ** p<0.05, * p<0.1*
Source: COFOG, COICOP, Eurostat database, wiiw calculations.

The coefficients for income inequality and the poverty rate also fit to this story. In the period 2004-2008 dispersion of income has not correlated with participation rates of youngsters. However, in the crisis period the relationship between these two social phenomena erupts as expected.

3.3 Social protection expenditures

In this part of the paper we analyse the effect of public social protection expenditures on both property and violent crime indicators. We might interpret social protection expenditures as a

cushion against individual risks for citizens and moreover as an instrument to equalise not only the income, but more general, the welfare situation of households within a society. Thus we would expect higher social protection expenditures to lower the propensity of individuals to commit crime within a society (i.e. the rate of offenders). Crime rates show a falling trend within the countries of the EU in almost all subcategories. One of the reasons for that is that most property and violent crime is committed by individuals of the age group 10 to 65 years. In an aging society the share of people (65 plus), i.e. the age group with a lower propensity to commit crime is increasing. In order to control for this effect, we divided the number of annual crime incidents not by the total population but by the number of those in the age group 10 to 65 years. Since we are interested in the effect social protection expenditures have on potential offenders (being defined as the age group 10-65) we exclude from public social expenditures old age and widow pensions. The choice of crime indicators is driven by the availability of data for the whole time period 2004 to 2012 for the 24 EU countries in the sample.

Table 3.2.1 - Regression results for property crime

Explanatory variables	Dependent variables (age structure adjusted rates, in logs), 2004-2012					
	Domestic burglery		Robbery		Vehicle theft	
	(1)	(2)	(3)	(4)	(5)	(6)
GDP (in logs)	**-1.687***	**-1.717***	**-1.841***	**-1.932***	**-1.644**	**-1.661***
p.c., real terms, PPP	(0.466)	(0.442)	(0.155)	(0.153)	(0.596)	(0.575)
Social protection (in logs, share in GDP)	**-0.128***	-0.130	0.015	-0.001	**-0.274***	**-0.277***
excl. pensions	(0.073)	(0.079)	(0.073)	(0.078)	(0.059)	(0.064)
Gini index (in logs)	**0.577****		**0.949****		0.132	
based on disposable househ. inc.	(0.248)		(0.453)		(0.671)	
Poverty rate (in logs)		**0.413****		**0.709***		0.130
based on disposable househ. inc.		(0.172)		(0.217)		(0.402)
Year	**0.025***	**0.023***				
	(0.013)	(0.012)				
Constant	-24.203	-18.549	24.889***	28.909***	29.969**	30.274***
	(22.367)	(21.716)	(4.608)	(1.846)	(11.263)	(7.939)
Observations	216	216	216	216	216	216
Number of countries	24	24	24	24	24	24
R2_within	0.312	0.319	0.383	0.402	0.277	0.278
R2_between	0.239	0.234	0.018	0.020	0.425	0.427
R2_overall	0.208	0.204	0.014	0.016	0.348	0.350
R2_adjusted	0.275	0.282	0.374	0.393	0.267	0.267
Country fixed effects	yes	yes	yes	yes	yes	yes
Time fixed effects	yes	yes	no	no	no	no

Robust standard errors in parentheses
*** *p<0.01, ** p<0.05, * p<0.1*
Source: COFOG, Eurostat database, wiiw calculations.

In Table 3.2.1 we show the regression results for property crime. Wald tests indicated the appropriateness of time dummies in the case of domestic burglary but not robbery and theft of vehicles. In general rates are lower in economically more developed EU countries. Higher shares of social protection expenditures in GDP correlate significantly with lower crime rates in the case of vehicle theft; in the case of domestic burglary the coefficients are not robust. Both for burglary and robbery rates higher income inequality measured by the Gini coefficient and monetary poverty are correlated positively with higher crime rates. The included trend variable shows rising age adjusted rates of domestic burglary within the EU countries in the period 2004 to 2012.

Table 3.2.2 - Regression results for violent crime

| | Dependent variables (age structure adjusted rates, in logs), 2004-2012 | | | |
| | Homicide | | Mortality: assault | |
Explanatory variables	(7)	(8)	(9)	(10)
GDP (in logs)	**-0.841*****	**-0.849*****	0.320	0.305
p.c., real terms, PPP	(0.193)	(0.184)	(0.576)	(0.547)
Social protection (in logs, share in GDP)	**-0.088***	**-0.090***	**-0.297****	**-0.302****
excl. pensions and unemployment	(0.048)	(0.049)	(0.131)	(0.134)
Gini index (in logs)	0.175		0.121	
based on disposable househ. inc.	(0.254)		(0.387)	
Poverty rate (in logs)		0.069		**0.567***
based on disposable househ. inc.		(0.122)		(0.331)
Year			**-0.062*****	**-0.065*****
			(0.016)	(0.015)
Constant	15.308***	16.530***	129.778***	132.581***
	(3.845)	(2.364)	(25.764)	(24.462)
Observations	216	216	216	216
Number of countries	24	24	24	24
R2_within	0.123	0.122	0.245	0.260
R2_between	0.280	0.274	0.111	0.015
R2_overall	0.267	0.261	0.002	0.059
R2_adjusted	0.111	0.110	0.205	0.220
Country fixed effects	yes	yes	yes	yes
Time fixed effects	no	no	yes	yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: COFOG, Eurostat database, wiiw calculations.

For violent crime comparable data for the whole period 2004 to 2013 is only available for homicide, while the second rate is for mortality due to assault, which thus covers a wider range of incidents (i.e. those where the death of the victim was not intended). For both indicators we observe a significant declining trend. In the case of the homicide rate (specifications 7 and 8)

this is captured by the GDP variable, in the case of the mortality rate due to assault this trend is to be found in the year variable (time dummies were according to the Wald test appropriate for specifications 9 and 10). Higher social protection expenditures are correlated with lower violent crime rates. In the case of homicide the coefficient is significant only at the 10% level, in the case of assault at the 5% level. Income inequality and poverty are positively correlated with both homicide and assault, however only in the case of assault the poverty rate shows a significant result at the 10% level.

In general, the analysis indicates that higher levels social protection expenditures might help to lower both property and violent crime. The correlations are most robust in the case of vehicle theft, less so for homicide, assault and domestic burglary. Income inequality and poverty is conditionally strongly correlated with higher rates of domestic burglary and robbery; in the case of mortality due to assault the correlation with poverty rates is significant only at the 10% level.

4   Summary and conclusions

This paper has considered the role of government and public sectors based on COFOG data (Government expenditures by function) allowing for a comparison across EU Member States over the period 1995 to 2013. We particularly focus our analysis on public social expenditures (health, education and social protection) identified by the European Commission in its agenda 'Europe 2020' as important for social cohesion and growth in the EU and how these are related to social outcomes. Using COFOG data one finds large differences in levels of government expenditures per capita across countries. Over time, these expenditures per capita have increased in real terms in general. However, since the year 2007 the expenditures per capita have decreased in Italy, Greece, Spain, Bulgaria, and remained more or less constant in Hungary. Thus, it seems that countries which have been hit particularly hard by the crisis have implemented austerity measures, thus reducing government expenditures per capita. This is also generally the case when considering more detailed functions like health, education or social protection.

A question arises whether government expenditures for health and education are substituted or complemented by individual (private household) expenditures in these categories taken from COICOP. For expenditures on education there seems to be a substitution effect prevailing, i.e. those countries with lower government expenditures per capita tend to have higher individual expenditures per capita on education. This is particularly true for Romania, Bulgaria and Greece. Further, for some of the New Member States the individual expenditures (COICOP) are higher per capita. For health expenditures one cannot see such a relationship. These are rather clustered in two groups: the New Member States have lower levels of government expenditures per capita on health, whereas the remaining countries have higher shares on average (Italy is in between). However, no clear pattern concerning the private health expenditures per capita in relation to public ones arises.

Finally, the question whether government expenditures impact on social outcomes is addressed. Considering public health expenditures first, one finds that these indeed affect life expectancy positively and overall mortality negatively (the latter result being less significant) in the EU countries. Concerning the effects of education expenditures on the NEET rate one finds that public expenditures on education have been particularly important in the crisis: While youth employment rates fell in almost all countries, in those with higher income and in addition higher public spending levels in education the young population is better off. Concerning social protection (excluding payments for pensions) we find that higher government spending is correlated

with lower rates of property crime (both for domestic burglary and vehicle theft) but also lower rates of violent crime (homicide rates and mortality rates due to assault). In the vast majority of regressions on various aspects of welfare, the incidence of higher levels of income inequality (described by the poverty rate) worsens social outcomes in the field of health, education and crime, respectively.

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Appendix 1 - Description of data

Government expenditure data by function (COFOG):

The data according to the Classification of Functions of Government (COFOG) is provided by Eurostat for various detailed subcategories according to different dimensions. For the analysis in part 3 and part 4 of this paper we used total expenditure data in millions of national currency and as shares of GDP for the functions Health (GF07), Education (GF09) and Social Protection (GF10). In part 4.2 of the paper we constructed an additional data series Social Protection without pensions, excluding from GF10 the subcategories Old age pensions (GF1002) and Survivors pensions (GF1003). Since data series were not for all countries according to ESA2010 available for the whole analysed time period (1995 to 2013) we used growth rates of ESA95 time series to extend the ESA2010 data series backwards (in the case of BG, EE, EL, LT, LU, PL, SI, UK). In order to obtain data on expenditures per capita in PPP, we used annual population figures and PPP conversion rates from Eurostat for the year 2010, which are provided for detailed products in accordance with the final expenditure classification of ESA2010. In order to construct data series in real terms at 2010 prices, it would be most appropriate to use implicit deflators for output of the sectors that produce the respective services. Since these data were not available, we used implicit deflators of gross value added data for the sectors Education (NACE Rev. 2: P) and Human health services (NACE Rev. 2: Q86) and for government expenditures on Social Protection the implicit deflator of total gross value added. In cases were deflators were not available for the whole time period 1995 to 2013 we extended the data series backward using ESA95 NACE Rev.2 data and in some cases even ESA95 NACE Rev.1.1 data.

Household consumption expenditure by purpose (COICOP):

For private expenditures on health and education (see analysis in part 3 and part 4 of this paper) we used data according to the Classification of Individual Consumption by Purpose (COICOP) provided by Eurostat. In order to obtain data on expenditures per capita in PPP, we used annual population figures and PPP conversion rates from Eurostat for the year 2010, which are provided for detailed products in accordance with the final expenditure classification of ESA2010. In order to construct data series in real terms at 2010 prices we used data from the Harmonised indices of consumer prices for the COICOP categories health and education.

Dependent Variables used for analysis in part 4 of the paper

Population health indicators:

We used life expectancy at birth, infant mortality rate (Number of deaths of children <1 year of age per thousand live births in the same year) and standardised death rates (age structure adjusted): assault and diseases of the circulatory system (particularly heart attack) all provided by Eurostat.

Crime indicators:

We used homicide rates and robbery rates for violent crime and rates of domestic burglary and theft of motor vehicles for property crime all provided by Eurostat. In order to standardize the rates for diverging age structures in the EU countries, the data for was divided by the resident population aged 11 to 65 years of age instead of the total resident population.

Non-participation of young persons in employment and education:

Eurostat provides the share of young persons aged 15-24 not in employment, education or training in the population of the same age (NEET rates).

Appendix 2- Tables

Appendix Table – COFOG categories

TOTAL	Total
*GF01	General public services
*GF0101	Executive and legislative organs, financial and fiscal affairs, external affairs
*GF0102	Foreign economic aid
*GF0103	General services
*GF0104	Basic research
*GF0105	R&D General public services
*GF0106	General public services n.e.c.
*GF0107	Public debt transactions
*GF0108	Transfers of a general character between different levels of government
*GF02	Defence
*GF0201	Military defence
*GF0202	Civil defence
*GF0203	Foreign military aid
*GF0204	R&D Defence
*GF0205	Defence n.e.c.
*GF03	Public order and safety
*GF0301	Police services
*GF0302	Fire-protection services
*GF0303	Law courts
*GF0304	Prisons
*GF0305	R&D Public order and safety
*GF0306	Public order and safety n.e.c.
*GF04	Economic affairs
*GF0401	General economic, commercial and labour affairs
*GF0402	Agriculture, forestry, fishing and hunting
*GF0403	Fuel and energy
*GF0404	Mining, manufacturing and construction
*GF0405	Transport
*GF0406	Communication
*GF0407	Other industries
*GF0408	R&D Economic affairs
*GF0409	Economic affairs n.e.c.
*GF05	Environment protection
*GF0501	Waste management
*GF0502	Waste water management
*GF0503	Pollution abatement
*GF0504	Protection of biodiversity and landscape
*GF0505	R&D Environmental protection
*GF0506	Environmental protection n.e.c.
*GF06	Housing and community amenities
*GF0601	Housing development
*GF0602	Community development
*GF0603	Water supply
*GF0604	Street lighting
*GF0605	R&D Housing and community amenities
*GF0606	Housing and community amenities n.e.c.
GF07	Health
GF0701	Medical products, appliances and equipment
GF0702	Outpatient services
GF0703	Hospital services
GF0704	Public health services
*GF0705	R&D Health
*GF0706	Health n.e.c.

GF08	Recreation, culture and religion
GF0801	Recreational and sporting services
GF0802	Cultural services
*GF0803	Broadcasting and publishing services
*GF0804	Religious and other community services
*GF0805	R&D Recreation, culture and religion
*GF0806	Recreation, culture and religion n.e.c.
GF09	Education
GF0901	Pre-primary and primary education
GF0902	Secondary education
GF0903	Post-secondary non-tertiary education
GF0904	Tertiary education
GF0905	Education not definable by level
GF0906	Subsidiary services to education
*GF0907	R&D Education
*GF0908	Education n.e.c.
GF10	Social protection
GF1001	Sickness and disability
GF1002	Old age
GF1003	Survivors
GF1004	Family and children
GF1005	Unemployment
GF1006	Housing
GF1007	Social exclusion n.e.c.
*GF1008	R&D Social protection
*GF1009	Social protection n.e.c.

Note: * marks collective services.