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In recent years youth unemployment rates across Europe soared, causing the European Commission to take actions through initiatives to counter this development. This article examines youth unemployment development in selected CEE countries and compares them to the EU 15. We use Okun's law and estimate age and country specific Okun coefficients for five different age cohorts. Our results show that young people display much higher Okun coefficients than their older peers, thus confirming that young people are more prone to macroeconomic shocks. This result might be a justification for additional governmental intervention and active labour market policies favouring young people.

JEL classification: E24, F50, C23

Keywords: Okun's law, labor market, youth unemployment

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In recent years youth unemployment rates across Europe soared, causing the European Commission to take actions through initiatives to counter this development. This article examines youth unemployment development in selected CEE countries and compares them to the EU 15. We use Okun's law and estimate age and country specific Okun coefficients for five different age cohorts. Our results show that young people display much higher Okun coefficients than their older peers, thus confirming that young people are more prone to macroeconomic shocks. This result might be a justification for additional governmental intervention and active labour market policies favouring young people.

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1 Introduction

Youth unemployment has been identified by the European Commission (EC) in 2009 as one of the most urgent problems to solve. As a consequence, the EC outlined a strategy to address major problems concerning labour market participation of young people, including education and training deficits as well as lower employment chances (European Commission, 2009). Recently, the European Commission (2012) proposed specific actions concerning the unemployment problem of young people. Each member state is supposed to guarantee young people an offer of employment or continued education (i.e. apprenticeship or traineeship) supported by financial means of the European Union. In light of this recent debate, the paper examines the unemployment development in selected central and eastern European countries (CEE countries) and the EU 15¹ countries as an aggregate. Using Okun's law (Okun, 1962) we estimate age-cohort specific Okun coefficients showing that young people are significantly more exposed to business-cycle fluctuations than older ones. The remainder of the paper is structured as follows: Section 2 provides a general description of the dataset used, as well as a descriptive statistic regarding youth versus total unemployment. Section 3 discusses the regression approach and results. Section 4 concludes.

2 Dataset and Descriptive Statistics

The dataset used to estimate Okun's law consists of annual GDP data published in the Annual Macro-Economic Database (AMECO) of the European Commission (2013) and the unemployment rate for various age cohorts provided by the Organisation for Economic Co-operation and Development (OECD, 2013). The joint dataset uses the earliest available entries for each country and ends in 2011.² The dataset contains two main variables for each country: Real GDP measured in prices of the year 2005 and the unemployment rate. The latter is based on International Labour Organisation (ILO) standards ensuring comparability among different countries.

¹EU 15 includes all countries which were members of the European Union before the eastern enlargement in May 2004. For a country specific analysis of major EU 15 countries see Hutengs and Stadtmann (2013).

²Selection of countries is determined by data availability. Countries used and dataset starting dates with number of observations per cohort in parenthesis: Czech Republic - 1994 (18), Estonia - 1994 (18), Hungary - 1993 (19), Poland - 1993 (19), Slovakia - 1995 (17) and EU15 - 1981 (31).

A first glance on the youth unemployment trends, i.e. people between the age of 15 and 24 years, among CEE countries reveals a rather diverse picture.

- According to Figure 1, youth unemployment rates in the Czech Republic and Hungary reached their recorded maximum (close to 20 %) in recent years, whereas Estonia shows a decreasing rate after surpassing its all time maximum value of over 30 % in 2010. In general, all CEE countries experience relatively high youth unemployment rates recently, whereas EU 15 youth unemployment is lower. Furthermore, all CEE countries show a huge fluctuation over the whole period.
- One distinctive pattern is the decrease in unemployment figures in most CEE countries after the accession to the EU in 2004. The decrease may not only be attributed to high GDP growth but also to high emigration from CEE countries. The United Kingdom and Ireland had opened up their respective national labour markets right from the start of the accession date, thus enabling workers from CEE countries to move and work there without major barriers. The recently observed increases in unemployment figures can clearly be attributed to the financial and economic crisis of 2007, slowing and partially reversing GDP growth tremendously.
- Poland and Slovakia stand out by having seemingly identical business cycles whereas the Hungarian cycle differs strongly from the Polish/Slovak one. Different business cycles among CEE countries could pose a serious problem when these countries would join the Eurozone, because the likelihood of the occurrence of asymmetric shocks is relatively high. Furceri and Zdzienicka (2011) show that the currently existing flexible exchange rate systems have helped to mitigate negative effects brought by the financial crisis in the short-run. Estonia has already begun digesting the macroeconomic shock of the financial crisis as indicated by their decreasing unemployment rate, while Poland's unemployment rate has not yet shown signs of reversal.

Insert Figure 1 about here

In Table 1 we characterize the difference between youth unemployment and total unemployment over time. In general, youth unemployment rates are higher than the total unemployment rate across all countries. This is to be expected,

as young people often show a lack of required skills and working experience, leading to fewer employment chances for this cohort (OECD, 2010). Moreover, labour market institutions directly influence the level and difference between both rates. The European Economic Advisory Group (2013, p. 86) argues, for example, that a minimum wage adversely affects young people by artificially lowering pay differences between younger and older workers, thus directly decreasing young people's employment chances during a recession.

CEE countries like Poland and Slovakia show a very large gap (over 14 percentage points) between both rates. In contrast to this, the Czech Republic, Estonia and Hungary tend to have lower gaps on average (below 10 percentage points), which are even lower than in the EU 15. Summary statistics show that these three countries' average unemployment figures resemble those of the EU 15. Poland and Slovakia substantially differ from the others because all the unemployment indicators show higher values. In contrast, the Czech Republic shows the lowest unemployment figures, having even lower values than the EU 15 across all indicators.

Insert Table 1 about here

All CEE countries with the exception of Hungary show a specific pattern regarding the size of this gap. The gap starts to increase in the late 1990s reaching its maximum in the first years of the 2000s and beginning to level off shortly before EU accession in May 2004. The gap stopped closing after the outbreak of the financial crisis in 2007, which led to a decrease in GDP growth rates. Since then, all CEE countries experienced increases in the total unemployment rate mirrored by even sharper rises in youth unemployment. Estonia was hit very hard by the crisis showing huge increases in both unemployment rates hitting all-time highs in the year 2010. The increase in Poland was much lower than observed elsewhere favoured by positive albeit low GDP growth in the crisis years. The big exception Hungary shows an adverse pattern, i.e. decreasing unemployment rates in the 1990s and increasing ones afterwards showing a decoupling of their growth trend from the other CEE countries' economies.

In general, the emerging pattern indicates that youth unemployment rates increase much faster than total unemployment rates in times of economic downturns. The weaker EU 15 response to the crisis compared to CEE countries is mainly due to its composition. On the one hand, there are countries like Spain

and Greece with similarly strong rises in unemployment figures. On the other hand, Germany and Austria show little change in unemployment figures during the recent crisis (Hutengs and Stadtmann, 2013).

3 Regression Analysis

There exist many different versions of Okun's law, the original ones proposed by Okun (1962), i.e. gap and difference version, and derivations developed over time, i.e. dynamic versions (see, for example, Knotek, 2007). This paper focuses on the well-known difference version which highlights the effect of the business cycle on the change in the unemployment rate. The difference version written as a linear regression model is given by

$$\Delta u_t = \alpha + \beta \widehat{GDP}_t + \varepsilon_t, \quad (1)$$

where Δu_t represents the change in unemployment rate, \widehat{GDP}_t symbolizes the discrete GDP growth rate and ε_t is an assumed white noise error term. The parameter β is called the Okun coefficient and is expected to show a negative sign.

Due to the transition from planned to market economies earliest reliable data start in the mid 1990s. Thus, there is only a limited number of observations available for single OLS estimates. A balanced panel for each country is constructed to circumvent these limitations. The panel includes the yearly changes in the unemployment rate and the GDP growth rate for five different age cohorts. Rather than estimating each beta coefficient for each age cohort and each country separately as suggested by equation (1), we estimate the following panel least squares dummy variable model (LSDV) for each country:

$$\Delta u_{i,t} = \alpha_1 + \sum_{i=2}^5 \alpha_i D_i + \sum_{i=1}^5 \beta_i D_i \widehat{GDP}_t + \varepsilon_{i,t}, \quad (2)$$

where $\Delta u_{i,t}$ represents the change in unemployment rate for cohort i at time t , D_i is a dummy variable accounting for the different age cohorts and $\varepsilon_{i,t}$ is an assumed white noise error term. Thus, β_i captures the different cohort specific Okun coefficients. Common to panel analysis are the presence of heteroscedasticity, serial correlation and cross-sectional dependencies. These effects may lead to inefficient estimates with biased standard errors and thus misleading results. Heteroscedasticity and cross-sectional dependencies are found in all

country panels. Serial correlation also exists in almost all countries with the exception of Estonia and Slovakia. Considering these econometric problems, all results³ show panel corrected standard errors allowing inference on statistical significance.

The regression results of Equation (2) are summarized in Table 2. The Okun coefficients are negative across all countries and cohorts. Therefore, the postulated negative correlation between GDP growth and change in unemployment rate can be confirmed: A negative GDP growth leads to an increase in unemployment rate for any cohort. The strength of the effect differs not only across countries but also across age cohorts. The former is to be expected as there are different labour market regimes and levels of economic development present in each country. All countries show their highest absolute Okun coefficients among their respective youth cohort, which are significantly larger than the ones for the 55-64 years cohort. This clearly indicates that young people are more exposed to fluctuations in GDP growth and suffer most in the crisis.

Insert Table 2 about here

Figure 2 plots the Okun coefficient for the different age cohorts for each country with 95 % confidence intervals. The coefficients clearly diminish with increasing age in all countries, suggesting that the accumulation of skills, experience and employment protection leads to a more secure employment environment with increasing age.

Insert Figure 2 about here

The strongest decline in the Okun coefficient is observed from the 15-24 years cohort to the subsequent cohort (25-34 years). After the initial decline the coefficient decreases much more slowly over the following age cohorts, indicating that young people are indeed most vulnerable during economic downturns. The change between the two youngest cohorts is most distinct in Poland and Slovakia indicating a huge vulnerability of the youngest cohort to business cycle fluctuations.

³Estimation results are obtained through linear regression with Prais-Winsten standard errors.

Tables 3 to 8 show Wald-Tests for equality of coefficients which confirm that the Okun coefficients for the youth cohort (15-24) differ significantly from those of all older cohorts. This holds for all countries. Some countries such as Czech Republic and EU 15 have Okun coefficients for the 25-34 years old cohort that differ significantly from the three oldest cohorts, whereas such a result cannot be confirmed for Slovakia. Tests for equality of coefficients usually do not provide significant results while comparing the Okun coefficients of the three oldest cohorts among themselves. This is to be expected due to similar size of coefficients. Furthermore, these cohorts are mostly well established on the labour market in terms of skills and experience, not to speak of additional protection through labour legislation.

Insert Table 3 to 8 about here

4 Conclusion

In this paper we have examined the unemployment development of several CEE countries and estimated age-cohort specific Okun coefficients. The main results can be summarized as follows:

1. The Okun coefficient in CEE countries for a subgroup consisting of 15-24 years old people is larger (in absolute values) than for a control group of older people, showing that young people are more dependent on good economic conditions to gain access to the labour market.
2. The Okun coefficient in CEE countries is decreasing (in absolute values) with progressing age across countries, whereas the fall is most distinctive when advancing from the youth group (15-24 years) to the second cohort (25-34 years old).

Youth unemployment is a serious problem in many CEE countries. The highest rates of youth unemployment are observed in Estonia which is facing severe economic problems due to the financial crisis. Nevertheless, Estonia as well as Slovakia show already signs of a decreasing unemployment rates recently. In contrast, Poland shows the highest average unemployment rates of all countries. Furthermore, the Polish labour market markets does not show a trend reversal in unemployment yet. In general, the youth cohort depends much

more on economic growth than others, thus while in the short run there is not much to gain, medium-run and long-run economic policies must include positive GDP growth and qualification provisions to let young people compete on the labour market (OECD, 2010, p. 147). Bell and Blanchflower (2011) argue that youth unemployment today will incur even higher social costs in the future, negatively impacting well-being and job satisfaction. Similarly, the European Economic Advisory Group (2013, p. 86) argues that prolonged unemployment leads to lower human capital accumulation in the long-term and thus lower lifetime earnings. In this context, the proposed youth guarantees of the European Commission may remind national governments that an active labour market policy for young people is necessary.

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Table 1. Summary Statistics

Country	(1) Avg. youth unempl.	(2) Avg. tot. unempl.	(3) Δ columns (1) and (2)	(4) Max. Δ youth & total	(5) Min. Δ youth & total
Czech Republic	14.11	6.43	7.67	12.09	3.30
Estonia	15.64	8.81	6.83	15.17	0.99
Hungary	18.15	8.42	9.73	16.47	5.53
Poland	30.42	13.53	16.89	23.95	10.17
Slovakia	29.09	14.52	14.57	19.76	9.09
EU 15	18.33	9.02	9.31	12.37	6.70

Notes: (1) Average unemployment rate of the youngest age cohort in %. (2) Average unemployment rate of the total population in %. (3) Difference between column (1) and (2) in percentage points. (4) Highest value of the difference between the young and the total unemployment rate within one country over time in percentage points. (5) Lowest value of the difference between the young and the total unemployment rate within one country over time in percentage points.

Table 2. Regression Results: Okun coefficients for different age cohorts and standard errors

Country	15-24	25-34	35-44	45-54	55-64	R^2	N
Czech Republic	-0.723*** (0.171)	-0.318*** (0.071)	-0.190*** (0.055)	-0.145* (0.061)	-0.105* (0.053)	0.47	90
Estonia	-0.605*** (0.143)	-0.364*** (0.052)	-0.283*** (0.075)	-0.331*** (0.056)	-0.233*** (0.080)	0.52	90
Hungary	-0.575*** (0.168)	-0.228** (0.073)	-0.189** (0.064)	-0.147** (0.048)	-0.179* (0.088)	0.35	95
Poland	-1.324*** (0.353)	-0.637** (0.201)	-0.442** (0.141)	-0.454** (0.164)	-0.308* (0.133)	0.38	95
Slovakia	-1.097*** (0.168)	-0.392*** (0.078)	-0.353*** (0.076)	-0.339** (0.082)	-0.339** (0.113)	0.63	85
EU 15	-0.697*** (0.080)	-0.380*** (0.053)	-0.232*** (0.044)	-0.203*** (0.037)	-0.199*** (0.057)	0.61	155

Notice: (N) number of observations, standard errors in parentheses, significance at *** 1 % level, ** 5 % level, * 10 % level

Table 3. Czech Republic: Wald-Test for Equality of Coefficients

	$\beta_{25 \text{ to } 34}$	$\beta_{35 \text{ to } 44}$	$\beta_{45 \text{ to } 54}$	$\beta_{55 \text{ to } 64}$
$\beta_{15 \text{ to } 24}$	10.75***	15.47***	20.05***	18.29***
$\beta_{25 \text{ to } 34}$		16.48***	17.49***	15.63***
$\beta_{35 \text{ to } 44}$			1.66	3.16*
$\beta_{45 \text{ to } 54}$				0.51

significance at *** 1 % level, ** 5 % level, * 10 % level

Table 4. Estonia: Wald-Test for Equality of Coefficients

	$\beta_{25 \text{ to } 34}$	$\beta_{35 \text{ to } 44}$	$\beta_{45 \text{ to } 54}$	$\beta_{55 \text{ to } 64}$
$\beta_{15 \text{ to } 24}$	5.35**	9.37***	7.85***	13.87***
$\beta_{25 \text{ to } 34}$		2.82*	0.76	5.13**
$\beta_{35 \text{ to } 44}$			0.69	0.60
$\beta_{45 \text{ to } 54}$				3.13*

significance at *** 1 % level, ** 5 % level, * 10 % level

Table 5. Hungary: Wald-Test for Equality of Coefficients

	$\beta_{25 \text{ to } 34}$	$\beta_{35 \text{ to } 44}$	$\beta_{45 \text{ to } 54}$	$\beta_{55 \text{ to } 64}$
$\beta_{15 \text{ to } 24}$	6.38**	7.62***	10.14***	7.64***
$\beta_{25 \text{ to } 34}$		0.80	2.71*	0.32
$\beta_{35 \text{ to } 44}$			1.07	0.02
$\beta_{45 \text{ to } 54}$				0.26

significance at *** 1 % level, ** 5 % level, * 10 % level

Table 6. Poland: Wald-Test for Equality of Coefficients

	$\beta_{25 \text{ to } 34}$	$\beta_{35 \text{ to } 44}$	$\beta_{45 \text{ to } 54}$	$\beta_{55 \text{ to } 64}$
$\beta_{15 \text{ to } 24}$	8.46***	10.02***	8.30***	12.17***
$\beta_{25 \text{ to } 34}$		1.92	3.27*	5.99**
$\beta_{35 \text{ to } 44}$			0.01	1.11
$\beta_{45 \text{ to } 54}$				1.59

significance at *** 1 % level, ** 5 % level, * 10 % level

Table 7. Slovakia: Wald-Test for Equality of Coefficients

	$\beta_{25 \text{ to } 34}$	$\beta_{35 \text{ to } 44}$	$\beta_{45 \text{ to } 54}$	$\beta_{55 \text{ to } 64}$
$\beta_{15 \text{ to } 24}$	27.32***	29.67***	25.92***	22.11***
$\beta_{25 \text{ to } 34}$	-	0.36	0.56	0.25
$\beta_{35 \text{ to } 44}$	-	-	0.09	0.03
$\beta_{45 \text{ to } 54}$	-	-	-	0.00

significance at *** 1 % level, ** 5 % level, * 10 % level

Table 8. EU 15: Wald-Test for Equality of Coefficients

	$\beta_{25 \text{ to } 34}$	$\beta_{35 \text{ to } 44}$	$\beta_{45 \text{ to } 54}$	$\beta_{55 \text{ to } 64}$
$\beta_{15 \text{ to } 24}$	34.75***	68.51***	68.48***	50.78***
$\beta_{25 \text{ to } 34}$		54.96***	47.31***	10.89***
$\beta_{35 \text{ to } 44}$			2.98*	0.49
$\beta_{45 \text{ to } 54}$				0.01

significance at *** 1 % level, ** 5 % level, * 10 % level

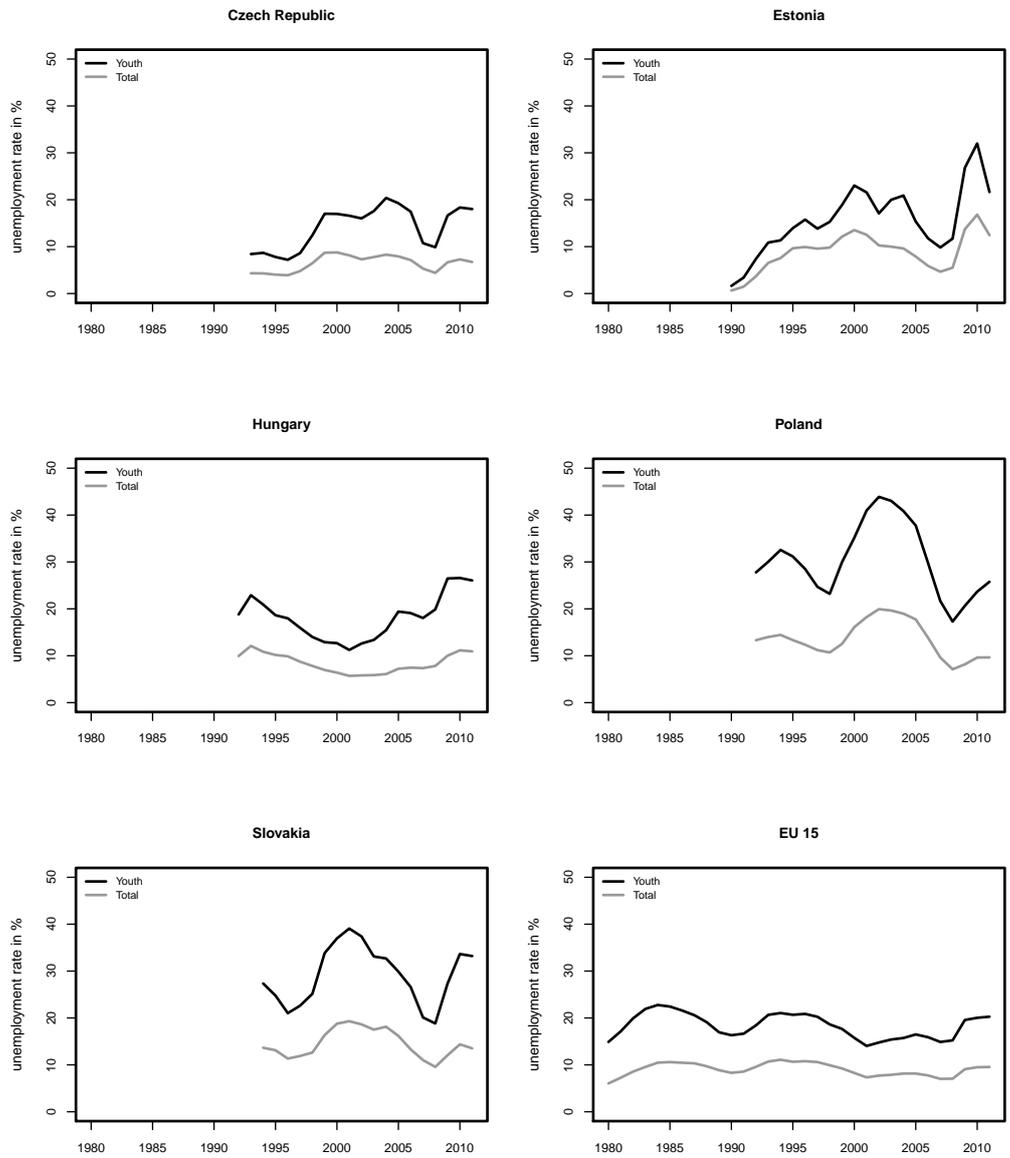


Figure 1. Youth and total unemployment rates for CEE countries

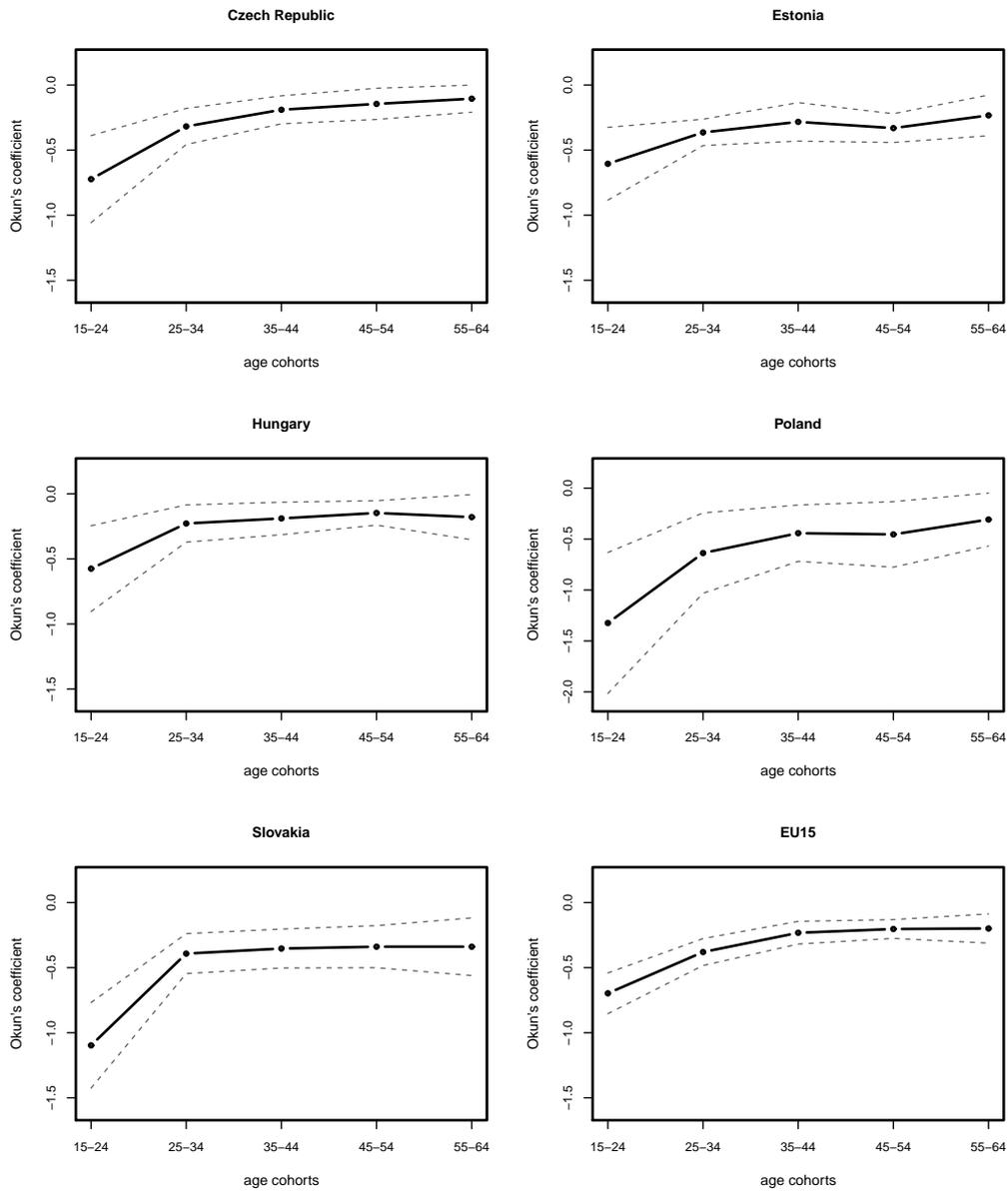


Figure 2. Okun Coefficients over age cohorts

Note: The scale on the vertical axis on the "Poland" graph differs from the other ones.