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TRANSITION AND MORTALITY IMPACT IN POST-COMMUNIST ROMANIA

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ABSTRACT. ***The impact of economic conditions on mortality in a large transition economy is analysed using county level data (NUTS III) from post-communist Romania 1997-2014 and a fixed-effects model. Overall mortality, circulatory diseases mortality, neoplasms mortality and external cause mortality move counter-cyclically relative to economic growth. The long and severe transition impoverished a large share of the population and worsened public health. In the future, health will be even more sensitive to changes in economic conditions. Unemployment has little impact on mortality except for digestive diseases mortality. Health care availability, gender, education level, rural concentration and sector of employment significantly impact mortality rates. Policy measures should focus on the counter-cyclical nature of mortality and specific population subgroups in Romania.***

KEYWORDS: mortality, economic growth, Romania.

JEL classification: I15, I18, O5.

Introduction

The link between health and economic development has a long history in the literature. Health at the microeconomic level can influence labour market participation, labour supply, labour productivity, earnings and early retirement. Moreover, diseases can also discourage capital accumulation with negative long-term effects on the capital stock. We focus on the macroeconomic and health nexus across regions of Romania. In the literature periods of economic growth have been shown to negatively (e.g. Khemka, Roberts, 2015; Currie *et al*., 2015) or positively (e.g. Lindo, 2015) affect the health status of the population. Such mixed findings have a long history in the literature (e.g. Eyer, 1977; Brenner, 1973; 1979; 1982; 1983) and continue recently as well (Arroyave *et al*., 2015; Lindo, 2015; Ruhm, 2015; Thuilliez, 2016).

Since variations exist across countries (Ariizumi, Schirle, 2012; Buchmueller *et al*., 2007; Tapia Granados, 2005b) and time periods (Ruhm, 2015) extending the literature with transition countries can shed additional light on these relationships. Investigating the influence of economic performance on health status in Romania is of special interest not only due to the relative lack of studies of Eastern Europe, but also to the particularities of Romania. In Romania, the macroeconomic impact of mortality during the post-communist transition process was muted by the high long-term unemployment, the high number of social insurance pensioners and the high rural population share (Incaltarau *et al*., 2015). But how did the economic transition influence health at the under studied subnational level? We use a fixed-effects model 1997-2014 at the county level (NUTS III) to answer this question for transition Romania. The paper is structured as follows: The first section reviews the recent cross-

country literature. The second section provides a statistical description of the Romanian post-communist transition. Section three outlines the method and section four discusses the results. The final section concludes.

1. Literature Review

Conventional wisdom has been that good health is a consequence of favourable economic status (Suhrcke *et al*., 2007) and vice versa poor economic development generally leads to poor health (Sala-i-Martin, 2005). This health-wealth 'gradient' (Deaton, 2002; Marmot, 2004) assumes that there is a gradual relationship between improving health and wealth as health improves with income throughout the income distribution. The higher a given group's income is the lower the chances that the group will be exposed to a wide array of risk factors for poor health outcomes. Therefore the impact of income inequality on health reflects a lack of resources, lower standard of living and consequently higher health risks (Lynch *et al*., 2000). For example, Rose and Marmot (1981) noticed a higher predisposition to illness for individuals having a lower socioeconomic status. The poorest socioeconomic groups reported the highest overall and cardiovascular in particular mortality rates. However, this by some called "neo-materialist" view could not explain why even though there is a strong relationship between mortality and income inequalities (Wilkinson, 1992); there is little relationship between average income (gross domestic product per capita) and life expectancy in rich countries (Marmot, Wilkinson, 2001). In response, a "psychosocial" interpretation is that in rich countries wellbeing is more closely related to relative income than absolute income; therefore, income inequalities influence health in the sense of induced relative deprivation (Marmot, Wilkinson, 2001). Moreover, income inequalities may increase the feeling of relative deprivation through social networks increasing the risk of mortality (Kawachi *et al*., 1997).

The two interpretations are complementary emphasizing both absolute and relative material deprivation. Therefore, economic growth is necessary but not sufficient for reducing mortality. The literature gives more details. During economic expansions work can reduce exercise and healthy diets (Ruhm, 2005a; 2005b), long hours can negatively impact leisure time (Sokejima, Kagamimori, 1998; Sparks, Cooper, 1997), and additional income can increase detrimental drinking and smoking behaviour (Brown *et al*., 2005). Finally, the additional stress alone can negatively impact health (Chandola *et al*., 2008).

The mixed evidence between improved health and the business cycle is found in many countries. A significant counter-cyclical relationship between mortality and the business cycle was found among men but not women in Sweden suggesting the need to control for gender (Gerdtham, Johannesson, 2005). Higher mortality during expansions is also evident in South Korea (Khang *et al*., 2005), 13 EU countries (Economou *et al*., 2008) and Australia (Khemka, Roberts, 2015). However, in the U.S. a pro-cyclical relationship is repeatedly found (Ruhm, 2015), (Laporte, 2004), (Tapia Granados, 2005a), (Stevens *et al*., 2011) and (Ionides *et al*., 2013). The pro-cyclical relationship is also found in Germany (Neumayer, 2004), Spain (Tapia Granados, 2005b), Sweden (Tapia Granados, Ionides, 2011), France (Buchmueller *et al*., 2007) and Mexico (Gonzalez, Quast, 2010). Aggregating data for 23 OECD countries, Gerdtham and Ruhm (2006) also found a pro-cyclical relation especially with countries having weak social insurance systems. Finally, a few studies argued against any cyclical relationship at all (Catalano *et al*., 2011; Stuckler *et al*., 2009). Very recently, research has suggested there may be a switch from pro to counter-cyclical health status over time in the

U.S. (Ruhm, 2015) and France (Thuilliez, 2016) with another study arguing against for the U.S (Lindo, 2015).

When using unemployment rates to measure economic cycles, recent studies have differentiated transitory from permanent effects showing that while the transitory effect of increasing unemployment rates is to decrease mortality, the permanent effect of increasing unemployment rates is to increase mortality suggesting a lag effect (Bender, Theodossiou, 2015). Using different levels of education, Edwards (2008) found that in the U.S. working males with a higher level of education experienced pro-cyclical mortality while those with less education experienced counter-cyclical mortality. Stevens *et al*. (2011) argues that as deaths during expansions come from an increase in mortality among the elderly and not among those active in the labour market, cyclical movements in the quality of health care should be the focus rather than changes in work hours or employment status. Similarly, Arroyave *et al*. (2015) found that the relationship between business cycles and mortality in Colombia was sensitive to the time period and ages considered. An examination of Romania therefore adds to a wide variety of research findings across many different case studies.

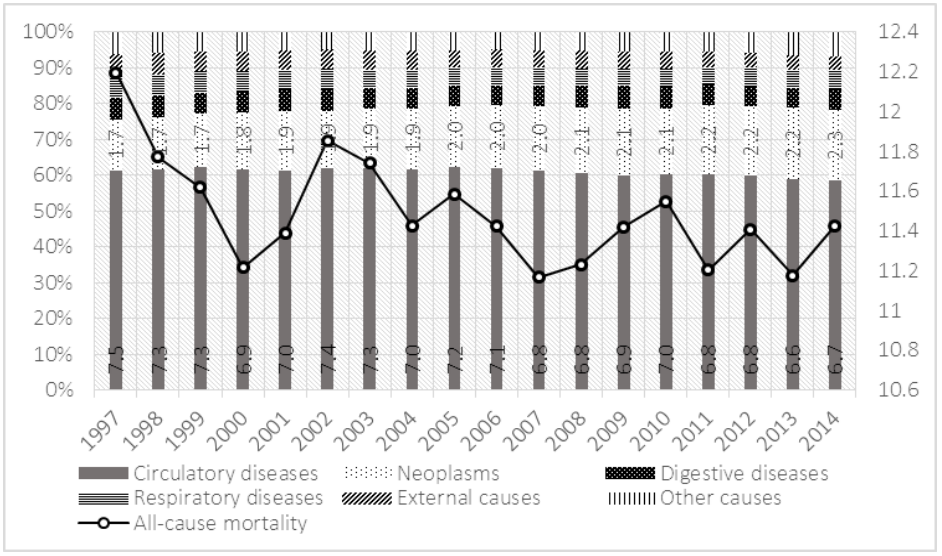
2. Statistical Profile of Health and Economic Transition in Romania

Romania had a unique transition in Eastern Europe as unlike the Czech Republic, Poland, and Hungary which adopted a 'shock therapy' strategy, the Romanian transition was more gradual like China. While shock therapy helped other countries experience rapid economic growth that facilitated an improvement in life expectancy (Dolea *et al*., 2002), Romania's gradualist approach influenced by low political will (Gallagher, 2004) caused mortality to fall more slowly. Despite a gradualist approach, the Romanian transition path was long and hard. The 1990s had substantial economic volatility with high unemployment and hyperinflation dragging the population into poverty. However, since the beginning of the century Romania has greater macroeconomic stability (Ahrens, Zweynert, 2012). The second set of reforms in the late 1990s and the decision of the European Council to start negotiations for accession of Romania to the EU were crucial for progress during the 2000s until the global Great Recession in 2008.

While the experience of some countries (e.g. Khang *et al*., 2005) is the impact of an economic crisis on mortality mainly depends on the length and depth of a crisis plus a buffering capacity, Eastern Europe (EE) was particularly ill suited to whether a long transition. Suhrcke, Stuckler (2012) argue that the greatest adverse effects of economic crises on health are generated when economic changes are rapid, social protection and cohesion are weak, and drugs and alcohol are widely available. Post-communist EE countries are characterized by all of these features and suffered a surge in mortality (Brainerd, Cutler, 2005; Cockerham *et al*., 2006; Ginter, 1996) with cardiovascular mortality in particular a problem (Britton, McKee, 2000; Jood *et al*., 2009; McKee, Britton, 1998; Neufeld, Rehm, 2013; Pająk, Kozela, 2012).

In Romania, the continuous decline in life expectancy after the fall of communism was attributable to increasing adult mortality. The mortality rate grew from 11.4 deaths per 1000 inhabitants in 1992 to 12.5 in 1996 (National Institute of Statistics, n.d.). However, thanks to poor health policies in the 1980s, child mortality also increased in the 1990s with an epidemic of pediatric AIDS unique to Romania (Dolea *et al*., 2002). While infant mortality grew during 1991-1994, the trend by 1997 was reversed thanks to the decline of circulatory diseases

mortality rates (from 7.5 in 1997 to 6.7 in 2014 – see *Figure 1*) along with respiratory diseases and external causes mortality (*Figure 2*).

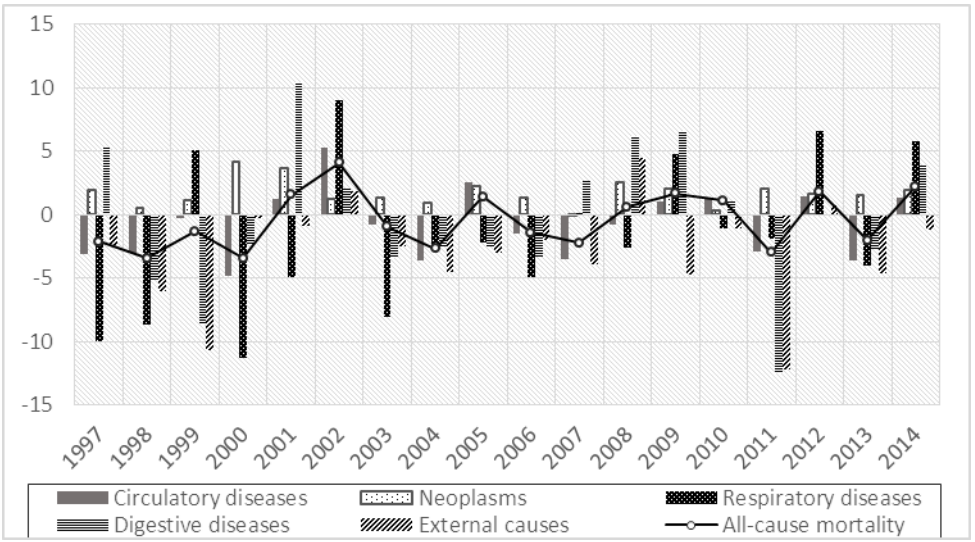


Notes: all-cause mortality rate is displayed according to the right axis.

Source: own representation using data from the Romanian National Institute of Statistics.

Figure 1. **The Evolution of the Main Causes Mortality Rates and their Share in all-cause Mortality in Romania, 1997-2014**

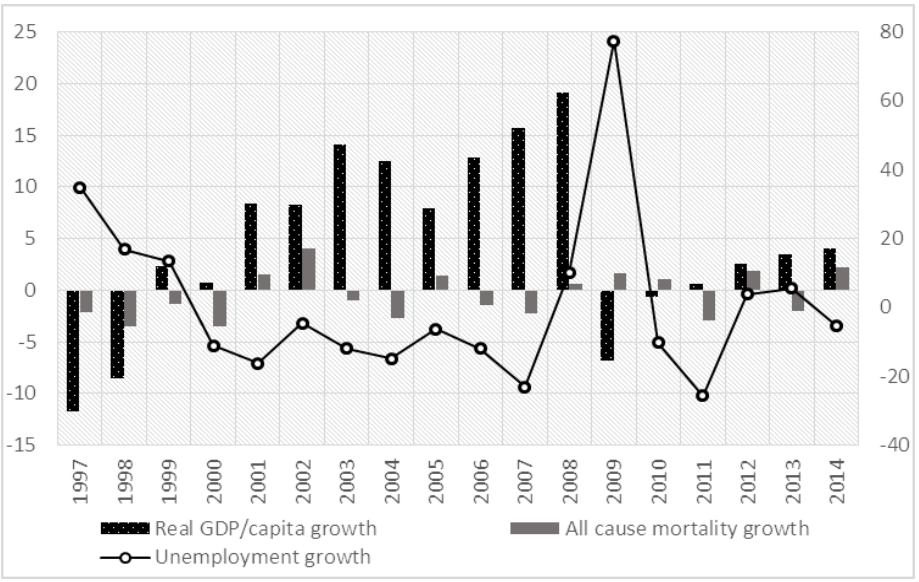
Still, in terms of shares, circulatory diseases continued to remain by far the main (60% – *Figure 1*) mortality cause during the entire post-communist period. Neoplasms, respiratory diseases and digestive diseases were the other main mortality causes. While the share of mortality caused by neoplasms rose considerably from 14% in 1997 to more than 19% in 2014, the shares accounted for by circulatory diseases and respiratory disease have slowly decreased from 61.5% and 6.3% in 1997 to 60% and 5.2 in 2014 (*Figure 1*).



Source: own representation using data from the Romanian National Institute of Statistics.

Figure 2. **Growth of Mortality Rates (per 1000 inhabitants) by Main Causes, 1997-2014**

The business cycle and mortality rate cycle move in opposite directions 1997-2014 with the business cycle measured using real per capita GDP (pcGDP) and the unemployment rate (*Figure 3*). The economic boom 2002-2008 is associated with lower mortality rates while rates rose during the Great Recession and then have a mixed performance during the current recovery. Therefore the mortality rate behaves in the same counter-cyclical way the unemployment rate does in a standard business cycle.

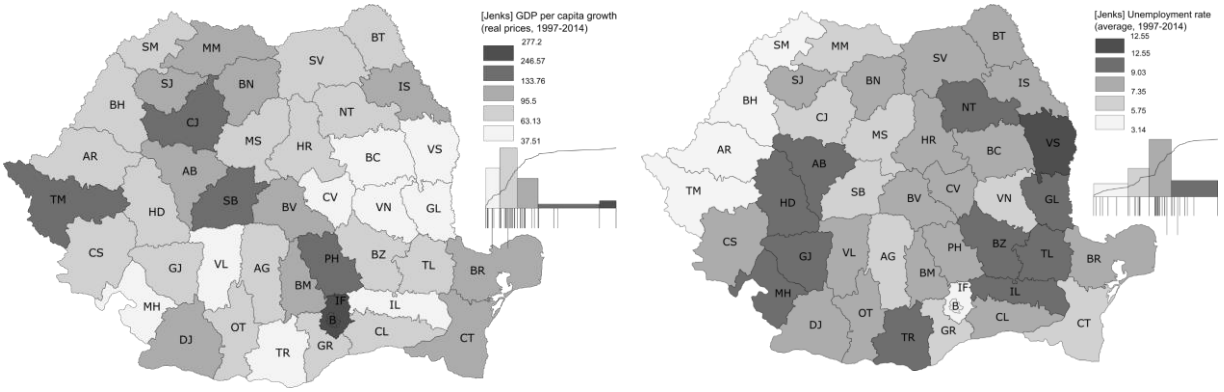


Notes: unemployment rate growth is displayed according to the left axis.

Source: own representation using data from the Romanian National Institute of Statistics.

Figure 3. **Mortality and Economic Fluctuations in Romania, 1997-2014**

At the regional level, a countercyclical mortality pattern is evident as well. Bucuresti and Ilfov experienced the largest cumulated growth during the 1997-2014 period (pcGDP grew 250%) followed by Cluj, Prahova, Timis and Sibiu growing over 130% during the same period (*Figure 4.a*).

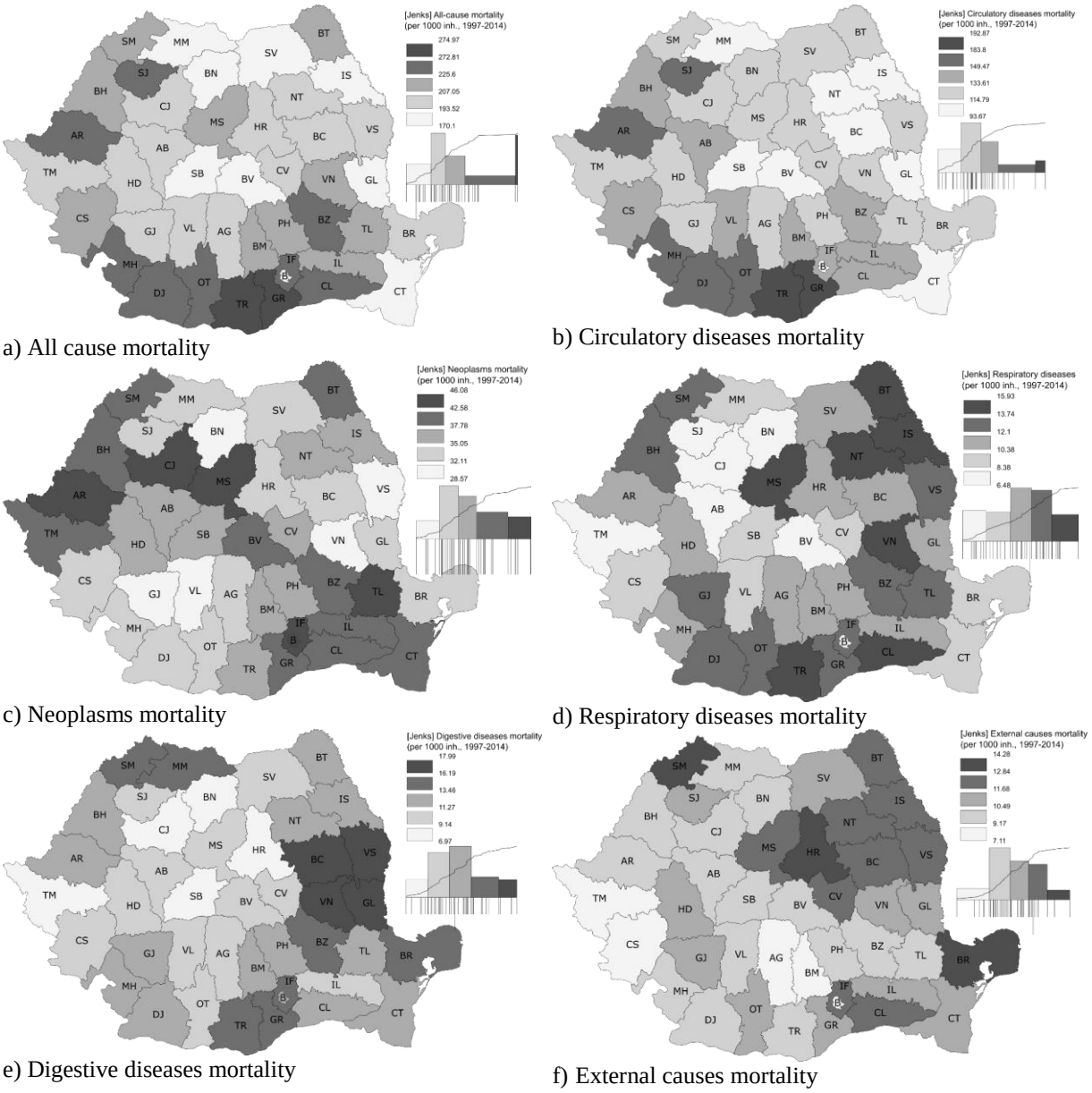


a) Real GDP per capita growth b) Unemployment rate

Source: own representation using data from the Romanian National Institute of Statistics.

Figure 4. **Real GDP *per cap*, Growth and Unemployment Rate, by NUTS III level, 1997-2014**

Counties with the highest economic growth rates have the lowest mortality rates. Comparing *Figures 4.a and Figure 5.a*, the ten highest growth regions have the 10 lowest mortality rates with the exception of Ilfov region that has the second highest growth and 8th highest mortality. *Figure 5.c*. and *Figure 5.d*. reveal the specific mortality problem is high neoplasms and digestive disease mortality.



a) All cause mortality

b) Circulatory diseases mortality

c) Neoplasms mortality

d) Respiratory diseases mortality

e) Digestive diseases mortality

f) External causes mortality

Source: own representation using data from the Romanian National Institute of Statistics. Made with Philcarto.

Figure 5. **Mortality *per* 1000 Inhabitants, by NUTS III level: all-cause Mortality, Circulatory Diseases Mortality, Neoplasms Mortality, Respiratory Diseases Mortality, Digestive Diseases Mortality, and External Causes Mortality, 1997-2014**

With regional unemployment rates (*Figure 4.b*), a countercyclical pattern is not as pronounced as at the national level. Of the top ten regions in terms of unemployment, 3 of them (Mehedinti, Teleorman and Buzau) also have high mortality rates (*Figure 5.a*).

Types of mortality are detailed geographically in figures 5.b.-5.f. Circulatory disease mortality (*Figure 5.b*) follows the overall counter-cyclical pattern as it accounts for about half of all mortality. Neoplasms mortality (*Figure 5.c*) impacts both high and low growth regions equally (e.g. compare high growth Bucuresti, Ilfov, Cluj and Timis with low growth Calarasi and Mures). Digestive disease mortality (*Figure 5.e*) appears to be associated with the low economic growth of regions such as Bacau, Vrancea, Vaslui, Galati, and Teleorman. Neamt, Teleorman, Vaslui, and Buzau regions have high mortality caused by respiratory diseases (*Figure 5.d*) and a high unemployment rate (*Figure 4.b*), while Harghita, Tulcea and Satu Mare have the highest mortality due to external causes (*Figure 5.f*).

In conclusion, the literature analysing the impact of economic growth cycles on mortality shows mixed results. The business cycle may both lower and raise the mortality rate (Gerdtham, Johannesson, 2005; Neumayer, 2005). In the case of Romania, mortality has followed a counter-cyclical path in the transition era. We expect the trend to continue with lower incomes and continued poverty raising mortality rates over time. We now turn to regression analysis for evidence that our main hypothesis of growth negatively impacting mortality is correct and consequently also expect morality to have a positive association with the unemployment rate.

3. Data and Methods

To test whether mortality followed a countercyclical pattern in post-communist Romania, we fit 1997-2014 regional (NUTS III) data to a linear model found in Ruhm (2005a). Variations of the model can be found in Ariizumi, Schirle (2012), Arroyave *et al*. (2015), Economou *et al*. (2008), Granados (2005), Khemka, Roberts (2015), Lin (2009), Lindo (2015) and Neumayer (2004). The mortality rate is expressed as the yearly number of deaths per 1,000 inhabitants. Further, for causes of death we here used the International Classification of Diseases - Tenth Revision of WHO (2010), namely circulatory diseases, neoplasms, respiratory, digestive and external causes mortality (see *Table 1*). All-cause mortality and specific cause mortality are regressed on to per capita Gross Regional Product (GRP), the unemployment rate and some control variables (e.g. healthcare availability, education level, and gender) using the literature. Definitions and descriptive data on the variables are in *Table 1* and *Table 1A* in Appendix.

The basic specification of the fixed effects model we have used for estimating the effect of economic growth on health condition of population is:

$$\text{mortality}_{c,t} = \beta_0 + \beta_1 \text{GDP}_{c,t} + \beta_2 X_{c,t} + \gamma_c + \delta_t + \varepsilon_{c,t} \quad (1)$$

where $mortality_{c,t}$ is the natural logarithm of the mortality rate in each of 42 counties c and over 18 years t, $GDP_{c,t}$ refers to the real GDP per capita in logarithmic form, $X_{c,t}$ includes a set of control variables, γ_c represents the unobserved county-specific fixed effects which account for differences across counties that are time-invariant, δ_t are the year-specific effects which control for factors that vary uniformly across counties and $\varepsilon_{c,t}$, is a stochastic error term. A variation using the unemployment rate as a proxy for economic conditions is also examined:

$$\text{mortality}_{c,t} = \beta_0 + \beta_1 U_{c,t} + \beta_2 X_{c,t} + \gamma_c + \delta_t + \varepsilon_{c,t} \quad (2)$$

Table 1. Variables description

Variable	Description
GDP per capita	Natural logarithm of real GDP per capita. GDP is expressed in Romanian lei (RON)* and deflated using the consumer prices indices
unemployment	unemployment rate
all-cause mortality	all-cause mortality rate per 1000 inhabitants
circulatory diseases mortality	natural logarithm of mortality caused by diseases of the circulatory system (per 1000 inhabitants);
neoplasms mortality	natural logarithm of mortality caused by neoplasms (per 1000 inhabitants)
respiratory diseases mortality	natural logarithm of mortality caused by diseases of the respiratory system (per 1000 inhabitants)
digestive diseases mortality	natural logarithm of mortality caused by diseases of the digestive system (per 1000 inhabitants)
external causes mortality	natural logarithm of mortality caused by injury, poisoning and other consequences of external causes (per 1000 inhabitants)
Doctors	number of doctors (excluding dentists) per 1000 inhabitants
secondary education share	people enrolled in secondary education (% of population aged 15-18 years)
male share	share of masculine population (% of total population)
old share	population over 65 years old (% of total population of the county)
rural share	rural population (% of total population of the county)
industry share	share of employment in industry (% of total employment)

Notes: *1 EUR= 4,4450 RON (National Bank of Romania); ** causes of death correspond to the International Classification of Diseases - Tenth Revision of WHO (2010).

Source: National Institute of Statistics, n.d..

The second model uses exactly the same variables as the first one except for the $U_{c,t}$ which replaces the $GDP_{c,t}$ as a proxy for economic conditions. In Romania, the unemployment cycling is much more muted than a developed economy due to factors such as a large informal economy and emigration though such factors declined in importance after 2004 with greater stability.

An F-test indicated that including county specific effects is preferable to a simple OLS regression. In order to check if time fixed effects are also required along with the county fixed effects, a Wald test was performed that rejected the hypothesis that dummies for all years are jointly null. A Breusch-Pagan Lagrange multiplier (LM) test revealed significant differences across counties so random effects were preferable to a pooled OLS estimation. However, given that we use the entire population of regions and with support from a Hausman test, fixed effects are used instead of random effects. Considering the regional approach, the fixed effects estimates are the preferred option in most studies dealing with the health impact of economic conditions (e.g. Ariizumi, Schirle, 2012; Arroyave *et al.*, 2015; Economou *et al.*, 2008; Khemka, Roberts, 2015; Lindo, 2015; Neumayer, 2004). A modified Wald statistic for group-wise heteroscedasticity in the residuals rejected the hypothesis of homoscedastic residuals (Greene 2000, p.598) and no serial correlation (*Table 2A* in Appendix). Therefore we used the Driscoll and Kraay (1998) standard errors to address these problems.

4. Results and Discussions

The results (*Table 2*) show that overall economic growth had a negative net impact on mortality at the regional level during the sample period (Model 1) though additional

explanatory variables makes the result statistically insignificant (Model 3a). Results are robust to the inclusion of time and region fixed effects (Model 3b). Unlike GDP per capita, unemployment did not show a significant impact on mortality as the null hypothesis of a null coefficient could not be rejected in either of models 2, 4a and 4b. The controls for healthcare availability, education level, gender, old age, rural concentration and sector of employment behave as expected. For example, there is a negative relation between the number of doctors (healthcare availability) and mortality. The education level is also inversely associated with mortality in support of an extensive literature (see Davis *et al*., 2014; Stringhini *et al*., 2011; Winkleby *et al*., 1992). More rural regions have higher mortality. Finally, the results indicate an inverse relation between male and industry shares relative to mortality.

Table 2. Regression results for fixed-effects models relating all-cause mortality rates to economic conditions in Romania at NUTS III level

	(1) ln(mortality)	(2) ln(mortality)	(3a) ln(mortality)	(4a) ln(mortality)	(3b) ln(mortality)	(4b) ln(mortality)
ln(GDPpc)	-0.0587***		-0.0142		-0.0289**	
	(0.0158)		(0.0223)		(0.0106)	
unemployment		-0.00121**		0.000729		-0.000133
		(0.000458)		(0.00200)		(0.000540)
Doctors			-0.0332**	-0.0349***	-0.0292***	-0.0325***
			(0.0123)	(0.0104)	(0.00802)	(0.00773)
secondary education enrolment			-0.000372	-0.000576*	-0.000801**	-0.000752**
			(0.000370)	(0.000299)	(0.000286)	(0.000262)
male share			-0.0560**	-0.0551**	-0.0492**	-0.0448*
			(0.0199)	(0.0203)	(0.0215)	(0.0232)
old share			-0.00385	-0.00424	0.00904	0.0104
			(0.00573)	(0.00652)	(0.00774)	(0.00871)
rural share			0.00344***	0.00363***	0.00190**	0.00210**
			(0.000932)	(0.000945)	(0.000872)	(0.000856)
industry share			0.000205	0.000330	-0.00179***	-0.00157**
			(0.00111)	(0.000997)	(0.000530)	(0.000642)
_cons	3.031***	2.435***	5.320***	5.139***	5.076***	4.542***
	(0.159)	(0.00206)	(1.087)	(0.988)	(1.101)	(1.273)
Region fixed effects	Yes	yes	yes	yes	yes	Yes
Time fixed effects	Yes	yes	no	no	yes	Yes
N	756	756	756	756	756	756
Number of groups	42	42	42	42	42	42

Notes: Estimation using fixed-effects regression with Driscoll-Kraay standard errors (in parentheses). The maximum lag to be considered in the autocorrelation structure was 2. Significance levels * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: own calculations.

Except for respiratory diseases mortality, all the other types which make up 90% of overall mortality followed a countercyclical pattern (Models 5-9 in *Table 3*). Although unemployment is often seen as the main cause of a morbidity/mortality increase because of

harm to both psychological and physical health (Jin *et al*., 1995; Wilson, Walker, 1993), this is not the case in Romania. Except for the digestive diseases, unemployment is statistically insignificant for all mortality causes considered (Models 10-14 in *Table 3*). Our findings are therefore similar to those of Earle and Gehlbach (2011) who found little support for the idea that privatization influenced mortality by increasing unemployment in post-communist countries. In Romania, several factors which kept unemployment artificially low despite low employment too made the rate a bad proxy for the business cycle. After the fall of communism and in to the mid-90s, the easing up of early retirement conditions, large shadow economy (including a high share of population practicing subsistence agriculture) and high emigration flows decreased the labour force and prevented unemployment from spiking up compared to other European states (Incaltarau, Maha, 2014). Healthcare availability is very important for lowering mortality caused by circulatory, digestive diseases and neoplasms but not for respiratory disease mortality. The education level is important for preventing circulatory diseases, but not for neoplasms mortality as the association with neoplasms is positive. A lower male share and lower industry share are associated with a higher mortality caused by circulatory diseases, while a higher rural share and a higher share of population over 65 years old are associated with a higher neoplasm mortality rate. Respiratory diseases mortality is associated with a higher industry share of employment – a feature of transition economies. Also, external causes' mortality is prevailing in counties with a higher male and industry share.

Table 3. Regression results for fixed-effects models relating mortality rates by cause to economic conditions in Romania at NUTS III level

	(5) ln(circulatory)	(6) ln(neoplasms)	(7) ln(digestive)	(8) ln(respiratory)	(9) ln(external)	(10) ln(circulatory)	(11) ln(neoplasms)	(12) ln(digestive)	(13) ln(respiratory)	(14) ln(external)
ln(GDPpc)	-0.0554***	-0.0710*	-0.00294	0.235*	-0.0812***					
	(0.0171)	(0.0354)	(0.0416)	(0.125)	(0.0261)					
unemployment						-0.000755	0.00141	-0.00528***	-0.00385	0.00227
						(0.000545)	(0.000866)	(0.00102)	(0.00447)	(0.00208)
doctors	-0.0661***	-0.0317**	-0.0616**	0.185***	-0.0247	-0.0725***	-0.0396***	-0.0623***	0.211***	-0.0337
	(0.0167)	(0.0129)	(0.0225)	(0.0606)	(0.0224)	(0.0176)	(0.0112)	(0.0205)	(0.0629)	(0.0225)
secondary education enrolment	-0.00124***	0.00113*	-0.00114	0.00106	0.000453	-0.00113**	0.00118**	-0.000911	0.000873	0.000480
	(0.000405)	(0.000543)	(0.000693)	(0.00209)	(0.000904)	(0.000400)	(0.000535)	(0.000653)	(0.00222)	(0.000962)
male share	-0.0796*	0.00923	-0.0857	-0.0502	0.180***	-0.0709	0.0188	-0.0818	-0.0824	0.190***
	(0.0422)	(0.0202)	(0.0497)	(0.0749)	(0.0326)	(0.0439)	(0.0170)	(0.0487)	(0.0907)	(0.0358)
old share	0.00527	0.0164***	0.0161	0.0369	-0.00960	0.00746	0.0216***	0.0110	0.0205	-0.00301
	(0.0145)	(0.00516)	(0.0105)	(0.0218)	(0.0131)	(0.0149)	(0.00509)	(0.0114)	(0.0239)	(0.0138)
rural share	0.0000136	0.00166*	-0.00153	0.0148***	0.000688	0.000415	0.00206**	-0.00126	0.0134***	0.00112
	(0.00100)	(0.000818)	(0.00115)	(0.00385)	(0.00117)	(0.000940)	(0.000828)	(0.00112)	(0.00304)	(0.00110)
industry share	-0.00339***	-0.00125	-0.00435***	0.0163***	0.00217**	-0.00299**	-0.000657	-0.00452***	0.0143***	0.00288**
	(0.00111)	(0.000834)	(0.000770)	(0.00417)	(0.000943)	(0.00111)	(0.00115)	(0.000883)	(0.00394)	(0.00107)
_cons	6.628**	0.674	3.912	-2.561	-8.651***	5.594**	-0.609	3.768	1.702	-10.11***
	(2.294)	(1.246)	(2.649)	(3.296)	(1.786)	(2.378)	(0.855)	(2.544)	(4.673)	(1.972)
Region fixed effects	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time fixed effects	Yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	756	756	756	756	756	756	756	756	756	756
Number of groups	42	42	42	42	42	42	42	42	42	42

Notes: Estimation using fixed-effects regression with Driscoll-Kraay standard errors (in parentheses). The maximum lag to be considered in the autocorrelation structure was 2. Significance levels * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Source: own calculations.

The long and severe transition has driven into poverty a large share of the population and inevitably affected their health condition making it more sensitive to changes in economic

evolution and supporting a countercyclical pattern. The absolute poverty rate increased from 5.7 percent in 1990 to 28.2 percent in 1994 and 39.5 in 2000 (Zamfir *et al*., 2010). Because of mass layoffs in unprofitable state-owned enterprises and a slow development of private sector jobs due to human capital issues, unemployment became a "stagnant pool" with low chances of finding work in the new economy (Earle, Pauna, 1998). But the low unemployment rate didn't measure this well. Unemployment has not soared because there was no "shock-therapy" with privatisation. Also, the large shadow economy, high share of people practicing subsistence agriculture (thanks to an outflow from urban areas and repatriation of land taken by the Communist regime) and in 2002 emigration to the Schengen area absorbed some labour market distress.

Conclusions

Two studies (Neumayer, 2005; Gerdtham, Johannesson, 2005) show that economic activity generates a two-sided effect on mortality. As mortality is both pro-cyclical and counter-cyclical, research focusses on the net effect or which influence is stronger. We find mortality followed a countercyclical pattern in post-communist Romania at the subnational level 1997-2014. In the fixed-effects model, GDP per capita drives this result as the unemployment rate as an alternative proxy did not show a significant impact on overall mortality perhaps due to the nature of transition unemployment in Romania. Like other countries, more doctors and higher human capital negatively impact overall mortality. Circulatory diseases mortality, neoplasms mortality and external cause mortality followed a countercyclical pattern relative to economic growth with respiratory mortality alone not following a countercyclical pattern suggesting a different policy approach to this particular kind of mortality in Romania. Alone among all types of mortality including overall mortality, digestive disease mortality is partly explained by the unemployment rate which is an area for future research as no explanation is found here.

Decreasing mortality is one of the objectives in the National Sustainable Development Strategy for Romania 2013-2020-2030 (Government of Romania & United Nations Development Program, 2008). For example, in 2015 and 2016 the Ministry of Health developed and financed 15 national programs with a major impact on public health and mortality rates targeting certain diseases (e.g. communicable diseases, HIV, tuberculosis). Also, a national program for early active detection of cancer by organized screening is available starting with 2015 (Government of Romania, 2015). In addition to these programs, the National Health Insurance House in Romania is running 14 national curative health programs, including the National Program of Cardiovascular Diseases and the National Cancer Program (Government of Romania, 2015) to reduce mortality associated with these categories of diseases.

Across overall and various types of mortality, we find healthcare availability is very important to reduce mortality caused by circulatory, digestive diseases and neoplasms. The level of education also is an important factor for preventing circulatory diseases. As the risk of developing cardiovascular disease is higher in developing countries compared to developed countries (Gaziano, 2005), an education initiative in preventing such mortality is recommended. And such an initiative must begin early on in the educational process as the risk of developing circulatory disease is not only higher in developing countries, but also appears even earlier in individual`s lifetime compared to developed countries (Reddy, Yusuf, 1998). Our finding of a lower male share associated with a higher mortality caused by

circulatory diseases also suggests targeting more vulnerable males. Though the National Health Strategy 2014-2020 for Romania includes a National Prevention Plan (Ministry of Health, 2014) to reduce the mortality rate (one of the general objectives of the strategy), our paper argues for a more nuanced policy linking the National Plan to economic activity indicators and the counter-cyclical nature of mortality and subgroups within the population.

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PEREINAMUMO IR MIRTINGUMO POVEIKIS POSTKOMUNISTINĖJE RUMUNIJOJE

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SANTRAUKA

Straipsnyje, pasitelkus postkomunistinės Rumunijos apskrities 1997–2014 metų laikotarpio duomenis (NUTS III) ir taikant fiksuoto efekto modelį, analizuojama ekonominių sąlygų įtaka mirtingumui didelėje pereinamojoje ekonomikoje. Bendras mirtingumas, mirtingumas nuo kraujotakos ligų, mirtingumas nuo vėžio ligų ir išorinio poveikio, palyginus su ekonomikos augimu, juda priešciklišk ai. Ilgas ir sudėtingas perėjimas nuskurdino didelę gyventojų dalį ir pablogino visuomenės sveikatą. Ateityje, keičiantis ekonomikos sąlygoms, sveikata bus dar jautresnė pokyčiams. Nedarbas turi mažai įtakos mirtingumui, išskyrus mirtingumą nuo viršk inimo ligų. Sveikatos apsaugos prieinamumas, lytis, išsilavinimo lygis, gyvenamoji vieta ir užimtumo sektorius turi reikšmingą įtaką mirtingumui. Politinės priemonės turėtų būti nukreiptos į priešciklinį mirtingumą ir specifinius Rumunijos gyventojų pogrupius.

REIKŠMINIAI ŽODŽIAI: mirtingumas, ekonominis augimas, Rumunija.

1 APPENDIX

Table 1A. Descriptive statistics of the variables used in analysis

Variable	Obs.	Mean	Std. Dev.	Min	Max
All-cause mortality	756	11.7869	1.55914	9.183554	17.5696
Circulatory diseases mortality	756	7.299419	1.418343	4.717301	12.22923
Neoplasms mortality	756	1.959508	0.3048159	1.207714	2.890221
Respiratory diseases mortality	756	0.6282916	0.18711	0.233472	1.327058
Digestive diseases mortality	756	0.6721274	0.1641505	0.3064227	1.287373
External causes mortality	756	0.59814	0.1263476	0.2757311	1.193345
GDP per capita	756	18636.89	9455.175	5768.683	76008.93
Unemployment rate	756	7.637434	3.269143	1.3	21.3
Doctors	756	1.799619	0.9398064	0.7971908	5.639696
Secondary education share	756	76.00648	13.18846	37.95951	126.9737
Male share	756	49.11018	0.570159	46.65764	50.40533
Old share	756	14.16608	1.992167	8.974751	21.47624
Rural share	756	48.61233	14.00633	0	92.88013
Industry share	756	23.02277	6.115158	7.745098	43.40292

Source: own calculations.

2 APPENDIX

Table 2A. The Results of Model Specification Tests

	Models					
	(1) ln(mortality)	(2) ln(mortality)	(3a) ln(mortality)	(4a) ln(mortality)	(3b) ln(mortality)	(4b) ln(mortality)
Pesaran test	-1.876	-2.615	38.087	36.954	-2.280	-2.412
	(0.0607)	(0.0089)	(0.0000)	(0.0000)	0.0226	(0.0159)
Friedman test	7.435	5.390	210.399	202.003	4.538	3.679
	(1.0000)	(1.0000)	(0.0000)	(0.0000)	(1.0000)	(1.0000)
Frees test	5.753	7.429	5.871	5.573	5.512	5.754
	0.1294*	0.1438*	0.1438*	0.1438*	0.1438*	0.1438*
	0.1695**	0.18885**	0.18885**	0.18885**	0.18885**	0.18885**
	0.2468***	0.2763***	0.2763***	0.2763***	0.2763***	0.2763***
Wooldridge test****	37.265	39.881	72.867	64.656	72.867	64.656
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
	df=(1, 41)	df=(1, 41)	df=(1, 41)	df=(1, 41)	df=(1, 41)	df=(1, 41)
Modified Wald χ^2	1139.78	991.96	334.60	357.42	950.32	954.43
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Note: ρ value is given in parenthesis; *α=0,10; ** α=0,05; *** α=0,01; ****without region and time fixed effects.

Source: own calculations.