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Urban Economic Growth in Europe – Before and After the EU Enlargements of 2004/2007

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Abstract

This paper reviews some of the more recent findings on the dynamics of regional economic growth from the perspective of European cities. Among other sources, the analysis draws on the Urban Audit, a city-level data base compiled by the European Commission in cooperation with member states. In a Europe-wide survey, the paper examines in what way regional conditions related to urban economic growth in the old and new member states before and after the most recent EU enlargements of 2004 and 2007. The analysis controls for spatial proximity in European macro-regions and incorporates a city typology derived from a range of Urban Audit indicators. It shows that urban economic growth accelerated considerably among cities in the least developed regions after 2004. However, large cities in the wealthiest parts of Europe also continued to grow at above-average rates. The analysis suggests that while the lagging regions have begun to catch up, in the medium term severe regional disparities are likely to prevail and in Central European countries, the poorest regions will find it very hard to adjust to the income levels of the capital city regions.

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Introduction

Even though the very fact of urbanisation manifests that "gravitation" is a characteristic of economic space, it is quite difficult to explain why people and firms locate in close proximity to one another instead of choosing to disperse across space and why disparities of regional income levels persist over very long periods of time. Studies based on the neoclassical theory of economic growth have found that growth tends to converge to a long-term steady state, which may be common to all regions or region-specific, and that in general poor economies tend to grow faster than rich ones. Yet, this literature has been criticised for a lack of theoretical foundation, because neoclassical theory assumes closed economies, i.e. basic conditions hardly applicable to regional analysis. A new impetus has been given by a strand of the literature, which is known as the "new economic geography", originating in the work of Krugman (1991). One of the central assumptions, which receive substantial empirical support (cf. Fingleton/Fischer 2010, Redding 2009) is that a considerable "home market effect", implies that firms tend to concentrate in a single location and close to a large market.

The following analysis will examine if (and to what extent) urban economic growth during the period from 2001 to 2008 suggests regional concentration or dispersion of wealth across Europe. This period is particularly interesting, because it comprises the EU enlargements of 2004 and 2007, during which ten former communist countries from Central Europe became more closely associated with Western Europe. The analysis draws, among other sources, on data from the European Urban Audit data base, which is a unique Europe-wide collection of administrative statistical data at the city, regional and national level. It is coordinated by the European Commission (Directorate-General for Regional Policy and Eurostat, the statistical office of the European Union) and conducted in cooperation with national statistical offices and cities (European Communities 2004). The main issues for this analysis are:

(i) Is economic growth in European cities related predominantly to the regional level of economic wealth, i.e. are cities in poor regions catching up to such an extent that in the long run, equalisation of regional disparities can be expected?

(ii) Has regional economic growth accelerated in the countries joining the EU in 2004 and 2007?

(iii) What is the importance of other growth determinants suggested by the recent literature?

(iv) In what way is economic growth related to intra-urban disparity?

Following a brief review of the literature in section 2, the third section presents the data base and empirical strategy. Section four shows the analysis and the final section discusses the findings.

2. Literature Review

As a theoretical framework for the analysis of convergence patterns across U.S. states, Barro/Sala-i-Martin (1991: 108-109) develop a growth equation

that derives from the transition path of the neoclassical growth model for closed economies. In their analysis, the convergence coefficient ß measures the rate at which per capita output approaches its long-term steady-state. As an empirical regularity, an estimated value of ß at around 2% per year has been found in many studies comprising different regional samples (U.S. states, European countries, Japanese regions and Australian states, cf. Magrini 2004). Other strands of the regional science literature predominantly suggest that long-term prevalence of disparities is the most likely scenario. Most importantly, the polarisation hypotheses from the 1950s (e.g. Perroux 1950) assumed that growth is based on specific core sectors of economic activity, which tend to agglomerate at particular locations and rather continue to concentrate than to disperse. In the latter part of the 20th century, key arguments of the polarisation hypotheses were integrated into the formalised framework of economic theory by the "new growth theory" (Mankiw et al. 1992) and, as mentioned before, the "new economic geography".

This research has provided strong evidence for an association between market access and the distribution of economic activity across space (cf. Redding/Sturm 2008). Regardless of its specific position in the urban hierarchy, the economic output of a city, or "central place", will represent the income level of its surrounding region (Fujita et al. 1999). According to the more recent "world city hypothesis" (Friedmann 1986), due to world-wide economic integration the systematic layout of "central places" is no longer determined by regional, national or even continental economic interaction alone. Instead, it can be understood as an outcome of a global hierarchy of specialised functions, particularly finance services, which concentrate in cities. Sassen (1991) argues that due to increasing migration into and between "global cities", urban globalisation may combine with an increasing intra-urban disparity between high-paid experts and low-paid manual service workers. Furthermore Ellison et al. (2007) find evidence for knowledge spillovers, which supports the concept of regional "clusters" (Porter 1990). In addition, Florida et al. (2008) emphasise that specific characteristics of human capital, which they describe as technology, talent and tolerance, i.e. cultural circumstances encouraging open-mindedness, must interrelate with economic performance to produce growth.
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Even if there is still a wide scope for research on the interrelation between the global and local determinants of urban economic growth, the literature suggests that regional economic analysis based on information about urban areas is likely to provide a precise picture of regional disparities and dynamics.

3. Data and empirical framework

The analysis draws on regional statistics (NUTS 3 level) provided by Eurostat, and on city-level data from the European Urban Audit. For the purposes of this paper selected indicators were extracted from the most recent and comprehensive Urban Audit data collections, referring to the years 2001, 2004 and 2008. The data base thus compiled comprises information about 329

cities from the current EU member states, Norway and Switzerland. Of these, 265 cities with over 100,000 inhabitants represent more than half of all cities with over 100,000 inhabitants in the European Union.

Even though the limits of the "regression approach" to growth analysis have become apparent in the literature (see above), it provides the most suitable framework for this analysis, which focuses on the relation between urban characteristics and economic growth. The empirical framework, which is outlined in this section, makes it possible to overcome arguably the most serious identification problems.

Most importantly, as an alternative concept of "neighbourhood", the analysis employs a measure of "city types", assuming that competition may be particularly high between cities, which are similar in basic characteristics such as size, wealth and regional economic specialisation. This city classification was derived by multivariate statistical procedures drawing on correlations among a set of 21 variables representing different topical domains of the Urban Audit (demography, economy, information technology, transport, training and education, social aspects, culture and recreation, environment)[1]. In contrast to studies controlling for spatial interdependence at the national level, the city typology allows for both spatial effects across borders and regional disparities within countries[2].

Since the data base used in the analysis only comprises observations at three points in time (2001, 2004, and 2008), growth can only be calculated as change over two separate periods (2001-2004 and 2004-2008). By estimation of two cross-sectional regressions, however, growth dynamics before and after the most recent EU enlargements of 2004 and 2007 will be compared. For many reasons, this before-and-after comparison will provide no causal evidence on the effects of EU enlargement[3]. However, by comparison between the 2001-

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[1]The classification was carried out in four steps, (i) the original variables from the differen Urban Audit domains were reduced to statistically independent factors by principal component analysis; subsequently, the variables correlated most strongly with the main factors (eigenvalue > 1) were orthogonalised in a separate principal component analysis; (ii) the orthogonalised variables representing the most important factors were used as index variables in a hierarchical cluster analysis (Ward´s method); (iii) the hierarchical cluster analysis was optimised by subsequent k-means clustering using cluster centres from the hierarchical analysis; (iv) a final correction was carried out by discriminant analysis.

[2]Since city type proxies were derived from a wider set of variables, which will not be controlled for in the analysis, it can be assumed that they will neither affect economic growth nor the other regressors independently from these omitted variables. We can also assume that unobserved regional heterogeneity due to the omission of variables, will be, by and large, accounted for by city type proxies and additional controls for macro-regions.

[3]Causal evaluation would require isolation of the effects of EU enlargement from other determinants of regional economic growth. An appropriate research design cannot be developed on the basis of the information available for this analysis. In particular, a causal evaluation would need to consider that accession to the EU in 2004 and 2007 was no administratively homogeneous process across the new member states, e.g. membership did not coincide with an opening of the EU labour market for all acceding countries to the same extent and at the same time.

2004 and 2004-2008 periods it can be examined if growth dynamics in the EU27 have changed in this early phase of closer economic integration at all.

As, apart from membership in a selected range of city types, it is not possible to control for regional fixed effects in a suitable cross-sectional regression model, a set of observable growth determinants as suggested by the recent literature (market size, accessibility, innovation, cultural diversity, intra-urban disparity) will be included in the analysis instead. The growth equation, in which the growth rate of economic output over the observation period (i.e. 2001-2004 and 2004-2008, respectively) is thought to depend on the initial income level, is therefore defined as

$$(1) \quad (1/T) \log(y_{i,t+T}/y_{it}) = a + b \log(y_{it}) + c\, X_{i,t} + d\, C_i + f\, R_i + u_{it}$$

with $i = 1, 2,...., 329$ cities, in which y_{it} is per capita output in city-region i at time t (2001, 2004), X is a set of additional characteristics of city i at time t, C is a city type dummy, R a macro-regional dummy, T is the observation interval (2001-2004, 2004-2008) and u_{it} is disturbance[12]. The base years 2001 and 2004 are separated in the estimates by full interaction of all variables with year dummies and an additional control for the base year 2004.

While labour productivity would be preferable as a measure of economic development, information on productivity could not be made available at the required territorial level. Therefore, y is approximated by per capita output, i.e. regional GDP per head. The macro-regional setting is represented by broad categories of European countries (North: Denmark, Finland, Norway, Sweden; Central: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia; Western: Austria, Belgium, France, Germany, Ireland, Luxembourg, Netherlands, Switzerland, UK; Southern: Cyprus, Greece, Italy, Malta, Portugal, Spain).

For lack of information about value creation at the city level, data on regional GDP has been extracted from Eurostat statistics for the NUTS 3 regions, in which Urban Audit cities are located[3]. While the Urban Audit also provides information about Functional Urban Regions (Larger Urban Zones), this analysis needs to refer to the territorial level of cities within their administrative boundaries (Core Cities), for which a sufficient amount of data has been delivered.

To control for regional disparities and unobserved heterogeneity among cities, the typology of European cities will be incorporated in addition to the city indicators selected according to the empirical literature. The typology was

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[1]OLS estimation of $(1/T) \log(y_{it,t+T}/y_{i,t}) = a - [(1-e^{-\beta T})/T] \log(y_{i,t}) +$ 'other variables' $+ u_{it}$ (Barro/Sala-i-Martin 1991)

[2]In a revision of the paper, an alternative specification comprising a spatial lag of y_{it} is currently being tested. So far, in equation (1) the population of cities i excludes neighbouring regions, apart from very few exceptions in the most densely populated parts of Europe (e.g. the Rhine-Ruhr conurbation in Germany), where cities taking part in the Urban Audit may be located in close proximity. Therefore, we do not expect a considerable effect of controlling for a spatial lag of per capita income on our results.

[3]Extraction from Eurostat web page on 11 May 2011 (http://ec.europa.eu/eurostat)

derived for the purposes of the Second State of European Cities Report, which was prepared for the European Commission on the basis of the 2004 collection of the Urban Audit (European Commission (ed.) 2010) (Map 1).

Map 1 *Basic types of European cities*
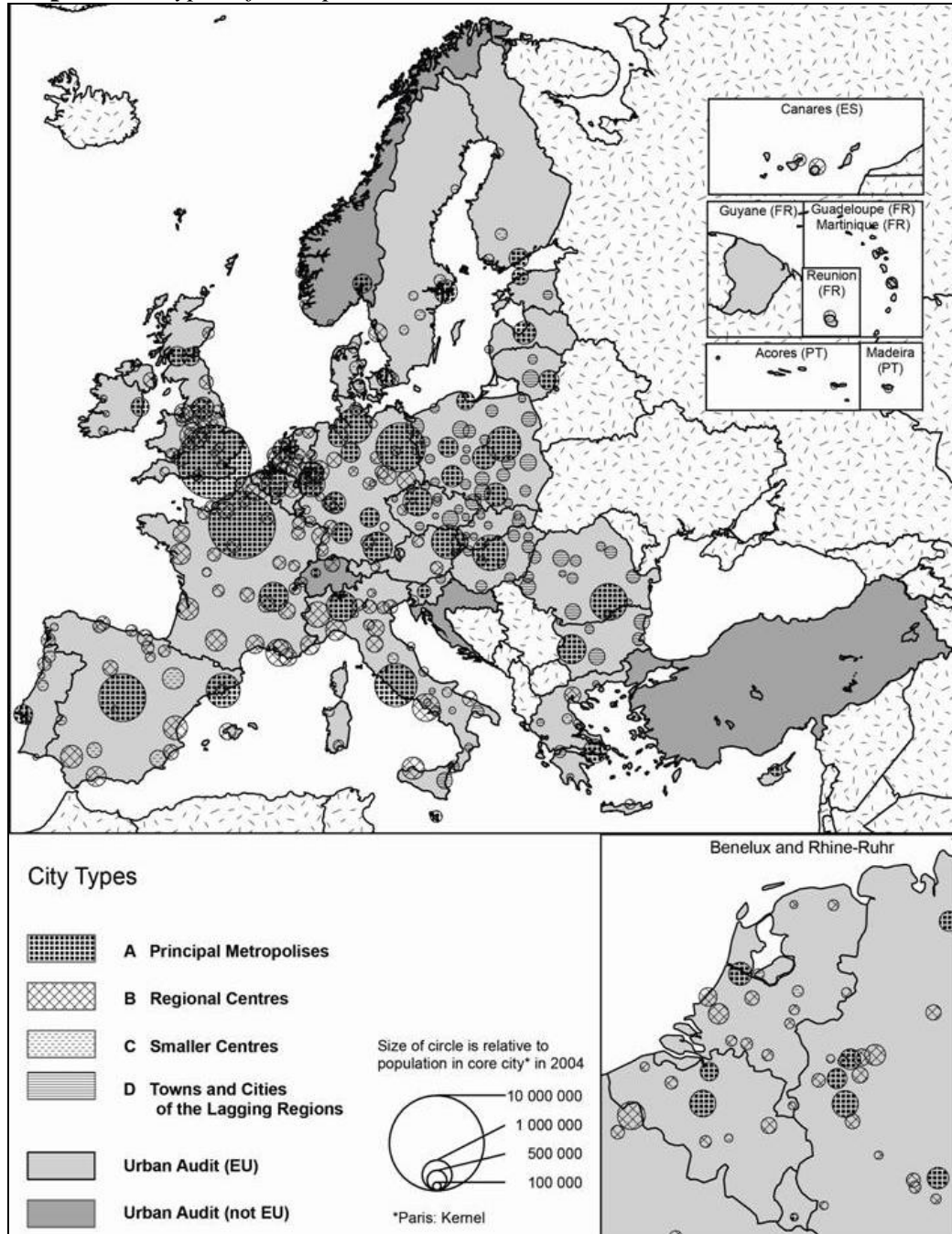
Own calculation based on the Urban Audit and regional statistics provided by Eurostat

Table 1 *Descriptive statistics, by city type (2004)*

Variable	Type A Principal		Type B Regional		All types	
	Obs	Mean	Obs	Mean	Obs	Mean
annual GDP growth (2004-2008) in NUTS 3 regions (in %)	48	4.6	141	0.4	302	3.8
GDP per head (in €) in NUTS 3 region	49	31,470	146	27,873	315	21,85
total population	52	1,048,778	151	290,37	329	357,6
annual population growth (2004-2008, in %)	49	0.6	144	0.4	311	0.3
ann. population growth in outer zone of LUZ (2004-2008, in %)	33	1.0	9	0.9	19	1.0
			1		4	
population < 25 (in %)	47	26.7	119	27.6	26	28.
population > 55 (in %)	47	27.7	119	28.4	26	26.
unemployment rate (in %)	52	9.4	149	9.0	304	9.7
multi-modal accessibility (EU27 = 100)	49	125.0	118	107.3	252	96.2
firms in ICT services sector (per 1,000 firms)	45	3.7	109	3.7	253	3.4
tourist overnight stays per resident population	44	5.2	123	4.1	281	3.5
patent intensity (applications per 100,000 inhabitants)	52	98.7	151	81.3	329	56.6
cities in countries joining the EU in 2004 or later	17		1		92	

Variable	Type C Smaller		Type D Lagging		All types	
	Obs	Mean	Obs	Mean	Obs	Mean
annual GDP growth (2004-2008) in NUTS 3 regions (in %)	35	1.0	78	10.5	302	3.8
GDP per head (in €) in NUTS 3 region	38	20,07	82	6,204	315	21,851
total population	44	143,6	82	157,91	329	357,60
annual population growth (2004-2008, in %)	41	0.7	77	-	311	0.3
ann. population growth in outer zone of LUZ (2004-2008, in %)	30	1.1	4	1.3	19	1.0
			0		4	
population < 25 (in %)	39	30.	63	30.6	26	28.5
population > 55 (in %)	39	25.	62	23.7	26	26.8
unemployment rate (in %)	38	10.4	65	11.0	304	9.7
multi-modal accessibility (EU27 = 100)	26	69.6	59	62.0	252	96.2
firms in ICT services sector (per 1,000 firms)	39	3.0	60	2.8	253	3.4
tourist overnight stays per resident population	40	3.4	74	1.5	281	3.5
patent intensity (applications per 100,000 inhabitants)	44	23.2	82	2.4	329	56.6
cities in countries joining the EU in 2004 or later	1		73		92	

Own calculation based on the Urban Audit, regional statistics from Eurostat (NUTS 3) and PATSTAT

The report identifies four basic groups of European cities (Table 1). The first group (type A) comprises very large cities from all parts of Europe, with an average of over 1,000,000 inhabitants, described as "Principal Metropolises". These cities also account for the most dynamic innovation activity and comprise specialised services aiming at national and international markets. Furthermore, they are central locations of private and public administrative functions. In the report it was found that the scope of municipal governments to shape city development relates to their formal status within national administrative systems. In this respect, a particular administrative "weight" must be attributed to capital cities. For want of a precise measure of the administrative power of a city, all capital cities were classified as "Principal Metropolis", because even if they are relatively small, concentration of administrative functions is likely to combine with a particular economic

"weight" within national urban hierarchies. The second group (Regional Centres, type B) comprises cities from all parts of Northern, Southern, and Western Europe, which are considerably smaller than the Principal Metropolises, but where economic output and entrepreneurial activity are still high above national averages. Type C (Smaller Centres) represents cities in more peripheral locations of Northern and Western Europe. The fourth group (Towns and Cities of the Lagging Regions, type D) consists of smaller cities from economically lagging regions in Central and Southern Europe (Map 1).

4. Urban economic growth in Europe before and after the EU enlargements of 2004/2007

As expected, GDP per head in 2001 and 2004 correlates with subsequent growth in per capita output (negative correlation) in the 2001-2004 and 2004-2008 periods (Figure 1). This is driven mainly by cities located in the Central European countries that joined the EU in 2004 (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) and 2007 (Bulgaria and Romania).

Figure 1 *GDP per head in 2001 and 2004 and subsequent growth in real GDP per head (NUTS 3 regions, 2005 prices)*
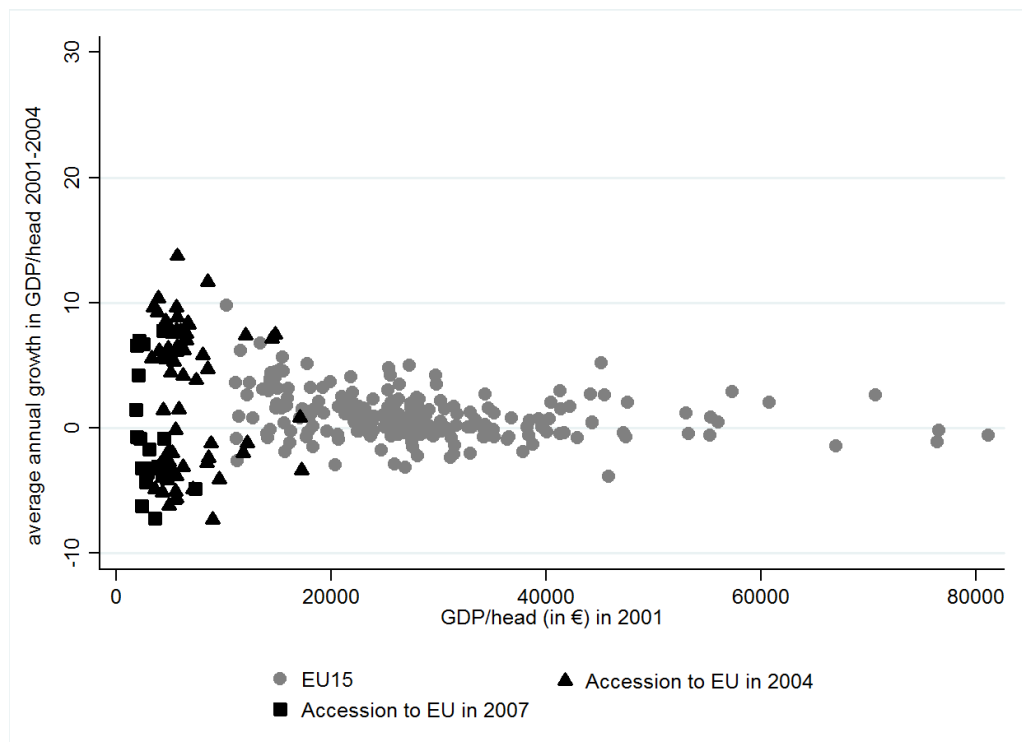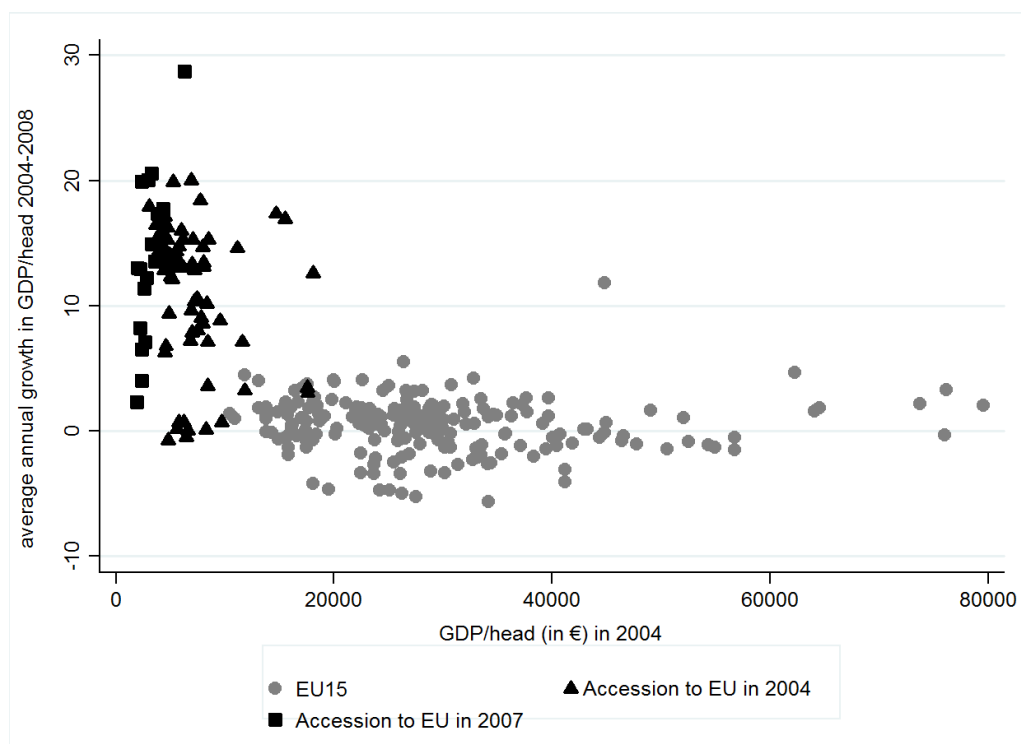
Own calculation based on the Urban Audit and regional statistics provided by Eurostat

Different specifications elaborate the relation between GDP per capita and growth (Table 2). The specifications represent different levels of control for spatial heterogeneity (column 1 to 4) and account for growth among city types A (Principal Metropolises), B (Regional Centres) and D (Towns and Cities of the Lagging Regions) (columns 5 to 7) and macro-regions (North/West, Central, South, columns 8 to 10). Due to a relatively small number of observations, no separate analyses are carried out for a sub-sample comprising Type C or macro-region "North".

Table 2 *OLS regression of average annual growth in real GDP per head 2001-2004 and 2004-2008 on city characteristics at base years 2001 and 2004*

independent variables	all cities	all cities	all cities	all cities
	(1)	(2)	(3)	(4)
2001				
real GDP per head (log)	-0.00316	0.00371	-0.00737	-0.000456
	(0.00283)	(0.00599)	(0.00917)	(0.0119)
total population (log)		-0.00959*	-0.0131*	-0.0135*
		(0.00567)	(0.00722)	(0.00711)
Δ pop. 01-04 (in %)		-0.00273	-0.00190	-0.00231
		(0.00349)	(0.00387)	(0.00396)
Δ pop. 01-04 (outer zone) (in %)		-0.00544*	-0.00618*	-0.00588*
		(0.00312)	(0.00315)	(0.00330)
unemployment rate		-0.00131*	-0.00108	-0.00121
		(0.000702)	(0.000714)	(0.000767)
multi-modal accessibility		0.000208	0.000214	0.000278
		(0.000149)	(0.000153)	(0.000178)
firms in ICT sector		0.00628	0.00748	0.00576
		(0.00557)	(0.00570)	(0.00555)
tourist overnight stays		0.00139	0.00137	0.00178
		(0.00124)	(0.00117)	(0.00128)
city types				

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	(1)	(2)	(3)	(4)
A Principal Metroplises			0.00331 (0.0198)	-0.0166 (0.0188)
B Regional Centres			0.000343 (0.0128)	-0.00666 (0.0108)
D Lagging Regions			-0.0277* (0.0164)	-0.0460** (0.0186)
macro-regions				
North				0.030841** (0.01422)
Central				.038327* (0.01944)
West				0.009958 (0.014217)
2004				
real GDP per head (log)	-0.0438*** (0.00279)	-0.0482*** (0.00606)	-0.0506*** (0.00964)	-0.0359*** (0.0114)
total population (log)		0.00334 (0.00451)	-0.00542 (0.00421)	-0.00289 (0.00419)
Δ pop. 04-08 (in %)		0.00882** (0.00351)	0.0101*** (0.00324)	0.00759** (0.00381)
Δ pop. 04-08 (outer zone) (in %)		-0.000793 (0.00258)	-0.000450 (0.00266)	-0.000536 (0.00296)
unemployment rate		-0.00115** (0.000575)	-0.000982* (0.000508)	-0.000704 (0.000611)
multi-modal accessibility		0.000121 (0.000113)	0.0000170 (0.000106)	-0.0000422 (0.0000991)
firms in ICT sector (in %)		0.00275 (0.00509)	0.00173 (0.00435)	-0.00433 (0.00715)
tourist overnight stays		-0.000330 (0.000374)	-0.000641* (0.000354)	-0.000346 (0.000368)
city type				
A Principal Metroplises			0.0442*** (0.0137)	0.0273* (0.0146)
B Regional Centres			0.0161 (0.0105)	0.0121 (0.00913)
D Lagging Regions			0.00379 (0.0126)	-0.00736 (0.0123)
macro-region				
North				0.01993** (0.00948)
Central				0.043291** (0.01791)
West				0.00778 (0.007986)
year 2004	0.416*** (0.0401)	0.375*** (0.109)	0.346** (0.162)	0.245 (0.190)
constant	0.0410* (0.0289)	0.0782 (0.0893)	0.232* (0.123)	0.157 (0.142)
R²		0.42	0.52	0.56	0.60
Observations	616	222	222	222

independent variables (core city level)	City Types			Macro-Regions		
	Type A	Type B	Type D	North/West	Central	South
	(5)	(6)	(7)	(8)	(9)	(10)
2001						
real GDP per head	-0.0123 (0.0227)	-0.0326** (0.0146)	-0.00924 (0.0174)	-0.00404 (0.00860)	0.0110 (0.0182)	-0.00741 (0.00909)
total population (log)	-0.0161 (0.0199)	-0.000277 (0.00712)	-0.0304** (0.0115)	-0.000932 (0.00300)	-0.0189** (0.00821)	-0.00671** (0.00253)
Δ pop. 01-04 (in %)	-0.00834 (0.0157)	0.00238 (0.00586)	0.00799 (0.0119)	-0.00619** (0.00260)	-0.0179 (0.0122)	0.00371*** (0.000926)
Δ pop. 01-04 (outer (in %)	0.0116 (0.0124)	-0.00463 (0.00374)	-0.0101*** (0.00340)	0.000852 (0.00209)	-0.00808** (0.00336)	-0.0129*** (0.00302)
unemployment rate	-0.00264 (0.00208)	0.000115 (0.000565)	-0.00210* (0.00122)	0.000274 (0.000384)	-0.00244** (0.00114)	-0.00137 (0.00142)
multi-modal	0.000392 (0.000364)	0.0000615 (0.000117)	0.0000685 (0.000586)	-0.0000197 (0.0000729)	0.000238 (0.000447)	- (0.000113)
firms in ICT sector	-0.000897 (0.00625)	0.00187 (0.00243)	0.0309** (0.0126)	-0.00183** (0.000735)	0.0146 (0.00890)	. .
tourist overnight stays	0.000438 (0.00341)	0.000466 (0.000819)	0.00996 (0.0208)	0.000111 (0.000663)	0.0128 (0.00910)	0.00790*** (0.00101)
2004						
real GDP per head	- (0.0231)	-0.00821 (0.0132)	-0.0605*** (0.00881)	0.00593 (0.00824)	-0.0414* (0.0227)	-0.0130 (0.0121)

total population (log)	-0.0143**	-	0.0376***	-0.00492	0.0328***	-0.00243
	(0.00556)	(0.00350)	(0.0131)	(0.00322)	(0.00740)	(0.00285)
Δ pop. 04-08 (in %)	0.0152**	-0.000742	0.0436***	-0.00742	0.0532***	0.00283
	(0.00558)	(0.00359)	(0.0160)	(0.00478)	(0.0115)	(0.00281)
Δ pop. 04-08 (outer (in %)	-0.00437	0.00368*	-	0.0105***	-	0.00231
	(0.00565)	(0.00212)	(0.00295)	(0.00282)	(0.00245)	(0.00159)
unemployment rate	-0.00270	0.000156	-0.00291	0.000555	0.000442	-0.000311
	(0.00173)	(0.000426)	(0.00235)	(0.000680)	(0.00164)	(0.000765)
multi-modal	0.000518*	-	-0.0000511	0.00000555	-0.000203	-0.0000705
	(0.000279)	(0.000105)	(0.000361)	(0.0000862)	(0.000358)	(0.000138)
firms in ICT sector	-0.0462	0.00196	0.0123	-0.000288	-0.0329	-0.00275
	(0.0283)	(0.00257)	(0.0328)	(0.00381)	(0.0604)	(0.0166)
tourist overnight stays	-0.000979	-0.000287	0.0211	-0.000134	-0.0123**	0.000202
	(0.000697)	(0.000259)	(0.0141)	(0.000510)	(0.00599)	(0.000383)
year 2004	0.769*	-0.141	-0.255	-0.0687	-0.0199	.
	(0.416)	(0.228)	(0.219)	(0.110)	(0.234)	
constant	0.317	0.336**	0.435***	0.0653	0.122	0.169
	(0.354)	(0.168)	(0.157)	(0.0781)	(0.161)	(0.119)
R²	0.59	0.40	0.77	0.37	0.78	0.47
observations	49	91	61	95	75	52

Authors´ calculation based on the Urban Audit and regional statistics from Eurostat. Robust standard errors in parentheses; */**/*** = significant at 10/5/1%-level; Δ pop. 01-04 (04-08): average annual population change 2001-2004 (2004-2008); Δ pop. 01-04 (outer zone): average annual population change in non-core-city part of larger urban zone

The most important result is that among European city regions growth during the period from 2004 to 2008 related strongly to the level of economic development, which confirms ß-convergence, whereas no such relation has been identified for the first period (2001-2004). The magnitude of ß-convergence, as measured in the analysis, increases slightly when controlling for the city type only but decreases when accounting for macro-regional proximity also (column 4). The regressions run separately for city types, by and large, corroborate that even when controlling for additional city characteristics, the growth rate interrelates strongly with initial per capita output (columns 5-7).

Among the "Principal Metropolises" (Type A), which comprise the largest and the capital cities, both heterogeneity of per capita income and convergence during 2004-2008 are higher than within the other city types. Among the Regional Centres, which comprise only one city from the newly acceding countries (Kecskemét, Hungary), no statistically significant effect of intitial per capita output on growth was measured in the post-accession period, but for the period between 2001 and 2004 the data suggest a ß-convergence rate of 3.5%[1]. One could argue, therefore, that convergence to a common growth rate before the EU enlargement of 2004 was more characteristic of cities across the old EU member states than of cities across Europe as a whole. In the post-enlargement period, however, cities from the least developed regions began to catch up. Within the group of cities from Central European lagging regions (Type D and macro-region "Central") the convergence rate was even higher than among all cities in the 2004-2008 period, i.e. in the poorest regions the very poorest cities began to grow at particularly fast rates (columns 4, 7, 9).

While the analysis suggests that cities in poorer regions have begun to "catch up", the precise role of some of the economic and demographic

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[1]The convergence parameter ß was calculated by using the equality $b = - (1-e^{-BT})/T$ (cf. Sala-i-Martin 1996).

determinants adopted from the more recent literature remains more ambiguous. In fact, a relatively large share of the total variation can be explained by the level of regional income alone (column 1 in Table 2). A regression, in which unobserved, time invariant hetereogeneity is eliminated by using differences over time, corroborates the outstanding role of per capita output as a growth determinant over both periods. Among the other indicators, only the unemployment rate and the share of ICT sector businesses are shown to be conditioning factors in this estimation, which was carried out as a robustness check of the cross-sectional regressions. It is plausible also that population growth correlated with economic growth in the 2004-2008 period. Also, while subsequent to the EU enlargements of 2004 and 2007 growth in the Central European lagging regions (Type D) accelerated, it concentrated more on the larger and, as explained, on the capital cities (columns 7, 9). While accessibilty is not shown to determine growth independently from the other variables, in the new member states accessibility and market size obviously related to growth after 2004.

Only in the pre-enlargement period (2001-2004), a relatively high number of ICT sector establishments, mainly in cities of the lagging regions, interrelated with economic growth among European cities. Analysis of patent intensity in cities taking part in the Urban Audit in 2004 revealed that while technological innovation emerges mainly in the most prosperous European regions, a number of cities in Central Europe accounted for relatively high innovation rates, if compared to national averages (European Commission (ed.) 2010: 82-86).

Differentials between the inner and outer zones of urban regions related with economic growth in both periods. In the pre-enlargment phase, concentration of the population in core cities among Regional Centres (Type B) and cities of the lagging regions (Type D) combined with economic growth. In the post-enlargement phase, intra-regional concentration continued to characterise growing cities in the lagging regions, while growth in the Regional Centres now combined with intra-regional dispersal.

5.   Conclusion

The first issue of the analysis was concerned with the relation between regional income and economic growth, assuming that poor regions grow fastest and will be catching up with the rich regions in the long run. In fact, the level of regional income turns out to be an important predictor, explaining much of the total variation in growth across urban regions in Europe. This analysis has modified the "regression approach" by
-    focusing on cities, which are likely to reflect inter-regional disparities across Europe more precisely than more heterogeneous spatial entites,
-    controlling for spatial interaction within macro-regions and
-    controlling for city characteristics likely to affect growth independently from the macro-regional and national setting.

The relation between regional income and growth was statistically significant only in the analysis representing the post-enlargement phase (2004-

2008). Urban economic growth definitely accelerated in the new member states after joining the EU; which answers the second research question. However, while growth was highest in the least developed regions in the period subsequent to 2004, the largest and wealthiest urban regions also accounted for an above-average growth rate of per capita output. Within the new Central European member states, growth concentrated on the relatively large and capital cities in particular. The analysis therefore shows that even if closer integration of less developed regions appears to favour growth in these regions, it is unlikely that income disparities between macro-regions and city types will diminish in the medium term. In this respect, the city typology developed for the purposes of this analysis has helped to generate a more precise outline of urban growth dynamics across Europe than the controls for macro-regions alone would have been able to.

The answer to the third initial question, which focused on the importance of growth determinants suggested by the more recent literature, is that apparently during the initial period of closer economic integration following the most recent EU enlargements, regional wealth was one of the most important predictors of economic growth. When unobserved, time invariant heterogeneity, which may affect cross-sectional results, is conditioned out by using first differences over time, apart from per capita output the unemployment rate and the share of firms in the ICT sector also turn out to be growth determinants, i.e. high unemployment is correlated with lower growth while regional economic specialisation and innovation appear to favour growth.

The fourth question enquired about the relation between economic growth and intra-city differentials. During the past decade, in most parts of Europe both inner and outer zones of cities have continued to grow in population at a moderate rate. It appears that economic growth in the post-enlargement period interrelated with growth of the population of core cities. While this result hints at an intra-urban concentration process affecting urban economic performance, more in-depth research is required to examine the way in which the composition of urban settlement patterns relate to regional prosperity. Knowledge about this interrelation is highly relevant for urban planning, which traditionally seeks to influence the distribution of people and firms across urban areas.

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