# *CONVERGENCE IN AN ENLARGED EUROPE: THE ROLE OF NETWORK CITIES*

KOEN FRENKEN & JARNO HOEKMAN

**ABSTRACT**

**Using economic growth data on 1088 regions (NUTS3) we analyse the determinants of regional convergence in an enlarged Europe (EU25). We introduce a number of qualitative city classifications to test whether network cities, which operate in global trade networks and relatively independent from their hinterland, converge more quickly than other areas. Evidence suggests that, apart from the traditional determinants of growth (initial income, population density, technology), network cities indeed foster higher growth than other cities and than rural areas. A short discussion of European policy follows.**

## INTRODUCTION

Few topics are so heavily researched in regional economics as the convergence process, or the lack hereof, among European regions. The interest in this field of research is understandable because the objective of regional convergence is at the core of EU policy. A systematic understanding of the mechanisms and contingencies behind growth in European regions is therefore highly demanded. At the risk of simplification, one can summarise the main result of convergence research as follows (Martin and Sunley 1998; Puga, 2002): European countries converge, but European regions do not (exceptions aside). These stylised facts suggest that the processes operating at regional levels are more complicated than implied by simple theories of convergence through factor mobility and knowledge diffusion, and that, correspondingly, policies designed on this basis may well have ambiguous effects (Puga, 2002; Heidenreich, 2003).

A major drawback of research done so far is its reliance on NUTS2 level due to limited availability of data at lower levels of spatial aggregation. The NUTS2 level corresponds, in most countries, to a rather high level of spatial aggregation. This implies that regions at NUTS2 level are rather poorly defined, generally containing both urbanised and rural areas. NUTS3 level data correspond, roughly speaking, to more homogenous labour market regions, which can be reasonably characterised as either urban or rural areas. For this reason, NUTS3 level data are more appropriate to test theoretical propositions from urban economists, who stress that the growth-enhancing effects of agglomeration economies in cities (Glaeser *et al.* 1992 and 1995; Van Oort 2004), and from urban geographers, who stress that network cities have a higher growth potential than 'Christallerian' cities (Hohenberg and Lees 1996; Castells 1996). Whereas the recent growth literature focuses mainly on agglomeration economies, our study intends to incorporate as well the latter proposition about network cities into an econometric analysis of convergence.

Urban geographers have argued that the process of global economic growth is driven by cities rather than their hinterland, and also that different cities fulfil different functions within this process. To understand the convergence or divergence between regional income levels, an urban perspective implies that qualitative differences between cities have to be taken into account. In particular, one expects different rates of growth for cities that are central nodes in global networks of trade, finance and knowledge ('network cities') compared to cities that solely serve their respective regional hinterlands by

Tijdschrift voor Economische en Sociale Geografie – 2006, Vol. 97, No. 3, pp. 321–326.

Published by Blackwell Publishing Ltd., 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA

providing space-bounded services ('Christallerian cities'). In the context of convergence in an enlarged Europe, this perspective leads us to the hypothesis that network cities will converge more rapidly to the North-Western European income standards, while rural areas and Christallerian cities stay behind. As a consequence, regional income differences at national levels may well increase, even if regional income differences at the European level converge.[1]

## HYPOTHESES

We collected data on NUTS3 regions in the enlarged Europe (EU25) thus including the new 10 member states. Eurostat provides data at the NUTS3 level on regional income as well as number of patents, population density and unemployment levels for the period 1995–2002. In the analysis we make a distinction between three different subsets of countries being the 25 member states of the enlarged Europe (EU25), the 15 member states of the European Union during the study period (EU15) and the new 10 member states of the European Union (EU10). Beside this, we also present a simple convergence analysis at the national level to understand the differences resulting from aggregating at national and European levels.

Convergence can be understood as a process in which poorer regions catch up with income levels of richer countries. This process is generally analysed by regressing income growth on initial income. For convergence to take place, the coefficient ($\beta$) should be negative reflecting that regions with lower income growth faster than regions with higher income, also called beta-convergence (Barro and Sala-i-Martin 1992). Conditional beta-convergence analysis includes, apart from initial income, other explanatory variables. First, we take into account population density as a proxy for agglomeration economies arising from urban density (urbanisation economies). We expect a positive sign of population density on growth. Second, we take into account unemployment where high unemployment levels signal problems of structural adjustment. Here, we expect a negative impact of high unemployment levels on regional economic growth. Finally, patents as an indicator of R&D output are also expected to contribute to growth. Note, however, that patent data at the NUTS3 level are only available for the EU15. Regression results including patenting activity are therefore only reported for the EU15.

Qualitative differences between cities are accounted for in two ways using qualitative categorizations (dummies). First, we attempt to operationalise the network city concept by distinguishing between network cities and other cities.[2] To this end, we make use of a list available from Beaverstock *et al.* (1999), who classified European cities into three categories: (*i*) a world city, (*ii*) a city with some world city evidence, and (*iii*) other cities and rural areas. The list of world cities is based on a large number of indicators on advanced producer services, which are considered to be the main vehicles of global networking in the modern economy. For the purpose of our study, we therefore consider the world cities and network cities as equivalent. Our hypothesis is that world cities, and cities with world city evidence, experience higher growth rates than other areas.

To contrast the new logic of economic growth driven by world cities in global networks with the older logic of economic growth driven by national systems of governance, we also created a second classification based on the political geography of nation states. We are interested in whether the formerly dominant political geography of the nation state still affects the growth opportunities of regions within each country. To this end, we constructed three categories of regions being (*i*) capital cities, (*ii*) border regions and (*iii*) any other region. Here, the hypothesis holds that capital cities drive economic growth while border regions experience negative effect of national borders.

## RESULTS

Table 1 shows the findings based on the absolute convergence model, that is regressing income growth on initial income. We only show the results for regressions that yielded a significant beta coefficient. The results are calculated on European as well as national levels. Although absolute convergence is observed for the regions within the three subsets (EU25, EU15 and EU10), this is not the case for the regions within the different member states. Per capita incomes of the new members of the European Union and the regions of Ireland and United

Table 1. *Absolute convergence model.*

| | EU25 | EU15 | EU10 | Germany | Spain | Estonia |
|---|---|---|---|---|---|---|
| Beta | −0.0320*** | −0.0330*** | −0.0330*** | −0.0060*** | −0.0160*** | 0.0420* |
| $R^2$ | 0.442 | 0.222 | 0.364 | 0.026 | 0.120 | 0.708 |
| | Czech Rep | Hungary | Ireland | Italy | Lithuania | UK |
| Beta | 0.0380*** | 0.0290* | 0.0420* | −0.0150*** | 0.0670*** | 0.0140*** |
| $R^2$ | 0.318 | 0.171 | 0.457 | 0.335 | 0.307 | 0.037 |

*** significant at the 0.01 level, * significant at 0.10 level.

Kingdom diverged in the period 1995–2002, implying that, within the European context, convergence results are dependent on the spatial level applied. Regional convergence on a European level does not automatically imply regional convergence on a national level. The inconsistency between different levels is the consequence of the geographic clustering of regional growth rates within countries. The results suggest a national effect in the analysis that determines convergence on a European level not because of the growth rates of separate regions, but because of the growth rates of whole countries. Thus, European countries have converged in the period 1995–2002, but regions within some European countries have not. This conclusion is in line with earlier research (Martin and Sunley 1998; Puga, 2002).

Regional divergence at the national levels is clearly related to high growth in national income levels. Regional growth rates within the new member states and within the United Kingdom and Ireland are far above average. In these countries, regions have diverged as shown by the positive beta coefficient for these countries in table 1. Figure 1 shows the regression plot for the new member states (excluding Malta and Cyprus because of lack of cases). The figure suggests that capital cities are mainly responsible for regional divergence within the new member states. In the figure, the regions of the new member states are plotted on their initial income per capita for 1995 and their growth rates in the period 1995–2002. Regions within the same country are distinguished by outlines and symbols. The outlines of the countries lean to the right and the capital regions of the countries are situated at the top of the outlines. This suggests that these regions have grown faster in comparison to the other regions within their country, despite their higher initial income per capita.

This finding holds for Estonia, Latvia, Lithuania, the Czech Republic, Slovakia and Slovenia. Hungary shows different results due to the high growth of income level of the region Pest, which surrounds the capital region of Budapest. However, the pattern gives an initial indication that the growth paths of capital regions differ from other cities and rural areas. Therefore, it seems likely that at least part of their rapid growth relates to their embeddedness in international operating networks thus acting as the growth poles in the new member states. This conjecture also supports our qualitative city classifications in a conditional convergence analysis, which follows.

Table 2 shows the results of the conditional convergence analysis for the three subsets of countries.[3] We distinguish between the world city classification (models 1–3) and the political classification (models 4–6). The first result from our analysis is that, despite the inclusion of other growth determinants, beta is still significantly negative. Thus, regional convergence at the European level is a robust phenomenon. Second, our hypotheses concerning the traditional growth determinants are all supported by the results. Population density is positively related to economic growth, which means that high-density regions seem to profit from agglomeration economies. Unemployment is negatively related to income growth, implying that regions with problems of structural adjustment experience lower growth rates. R&D output measured by the number of patents positively contributes to growth, at least, for what concerns EU15.

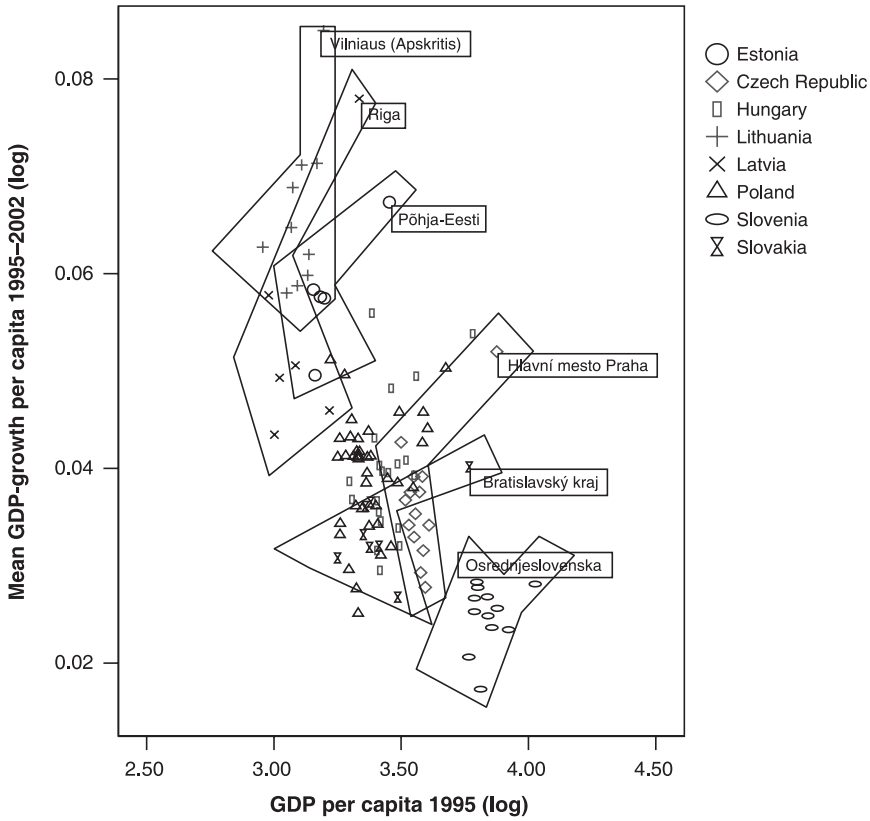


Figure 1. *Regression plot (EU10).*

The results of the qualitative differences between cities are also convincing. In column 1–3 of Table 2 the inclusion of the network city concept is shown. The findings confirm that network cities play a dominant economic role in the European Union. It is worth noting that, despite the inclusion of population density, which is obviously higher in world cities, the dummies for world city and world-city evidence are also positive and significant (except for EU10). We conclude that these network cities serve as centres through which capital, labour, information, commodities flow more freely and efficiently fostering high growth rates. Furthermore, evidence for a hierarchy in world-cities is found with world-city regions being more positive than regions with some world-city evidence. However, from the standard errors (not shown in the table) it is clear that this difference is only significant for the old members of the European Union (EU15). The insignificant sign for cities with world-city evidence for the new members of the European Union is the consequence of a lack of cities with world-city evidence.

The data presented in the columns 4–6 show the distinction between border-regions and capital regions based on the core-periphery hypothesis of the formerly dominant political geography of the nation-states. It is confirmed that a core-periphery distinction in Europe is still present with capital regions having a significant positive sign and border regions having a significant negative sign. This finding applies to all three subsets with the exception of the border regions in the EU10. Border regions are not significant due to the fact that almost sixty percent of the NUTS3 regions are bordering other countries.

A comparison between the two qualitative city classifications shows that it is difficult to determine which of the two concepts provides more

Table 2. *Conditional convergence model.*

| | EU25 (1) | EU15 (2) | EU10 (3) | EU25 (4) | EU15 (5) | EU10 (6) |
|---|---|---|---|---|---|---|
| Constant | 0.166*** | 0.236*** | 0.250*** | 0.169*** | 0.229*** | 0.244*** |
| GDP per capita | −0.038*** | −0.054*** | −0.059*** | −0.038*** | −0.053*** | −0.057*** |
| Unemployment | −0.023*** | −0.029*** | −0.116*** | −0.025*** | −0.026*** | −0.106*** |
| Population density | 0.004*** | 0.005*** | — | 0.004*** | 0.005*** | — |
| Patents | | 0.001*** | | | 0.001*** | |
| World-city | 0.012*** | 0.014*** | 0.023*** | | | |
| World-city evidence | 0.011*** | 0.010*** | — | | | |
| Capital city | | | | 0.015*** | 0.014*** | 0.024*** |
| Border region | | | | −0.003*** | −0.002*** | — |
| N | 1088 | 980 | 108 | 1088 | 980 | 108 |
| R square | 0.514 | 0.350 | 0.607 | 0.518 | 0.343 | 0.703 |

*** significant at the 0.01 level; ** significant at the 0.05 level; * significant at 0.10 level; – not significant.

explanatory power. This is partly due to the overlap between network-cities and capital regions. Due to high correlation between the two world city variables with the capital city, we cannot include world city and capital city variables in a single regression model. However, it is obvious that qualitative differences between regions matter.

## CONCLUSIONS

Processes underlying regional convergence in Europe are complex and take place at multiple levels of aggregation. Consequently, research in this field should take into account a wide range of relevant variables and spatial levels. Beside the traditional growth determinants, we proposed to take into account the role of network cities and capital cities within the urban system. To this end, we used NUTS3 data, which are most suited to differentiate between urban and rural areas.

The results of the absolute convergence analysis are in line with earlier research: European regions have converged, but regions within some European countries have not. In particular, regional divergence occurred in fast growing countries including the new EU member states. This finding suggests that processes of convergence are dependent on geographical scales. The conditional convergence analysis dealt with the logics underlying the convergence process. Apart from evidence on the effect of technology and unemployment, a new finding has been that network cities and capital cities have higher growth rates than other areas. This qualitative effect is present in addition to the positive effect on growth of population density *per se*. This suggests that the processes of divergence at the national level are a consequence of the asymmetric embeddedness of regions within the global system. A promising line of research is to analyse qualitative differences between cities with regard to the convergence process in greater depth. However, this will require the collection of data on flows between NUTS3 regions, which, hitherto, are scarce.

Our results also suggest that European policy-making should take into account the leading role of network cities and the accompanying problems of other cities and rural areas. The different policy instruments applied by the European Commission are expected to have rather different effects on different types of regions. Network cities are expected to profit from policies enhancing science and technology (which is concentrated in network cities) as well as investments in transnational infrastructure networks (which connect network cities). By contrast, rural areas will profit, if all, from income subsidies for farmers and structural funds. Consequently, cities that are not part of the global urban network and neither benefit from income subsidies or structural funds, are 'stuck in the middle', and deserve special attention, be it from national or European governments.

**Notes**

1. A stylised fact already discussed at length by Williamson (1965).
2. World cities like London and Paris are composed of multiple NUTS3 regions. This is accounted for by classifying all NUTS3 regions as a world city.
3. We checked the robustness of all regressions by substituting growth based on 1995–2002 by growth based on 1996–2002 and 1995–2001 (not shown). In all regressions, significance and sign of all variables were not affected. Besides, we also included country dummies to control for spatial autocorrelation between growth rates (not shown). In all regressions, significance and sign of all variables were not affected.

## REFERENCES

Barro, R.J. & X. Sala-i-Martin (1992) Convergence, *Journal of Political Economy* 100 (2): 223–251.

Beaverstock, J.V., P.J. Taylor & R.G. Smith (1999) A roster of world cities, *Cities* 16: 445–458.

Castells, M. (1996) *The Rise of the Network Society* (Cambridge, MA & Oxford, UK: Blackwell).

Glaeser, E.L., H.D. Kallal, J.A. Scheinkman & A. Shleifer (1992) Growth in cities, *Journal of Political Economy* 100 (6): 1126–1152.

Glaeser, E.L., J.A. Scheinkman & A. Shleifer (1995) Economic growth in a cross-section of cities, *Journal of Monetary Economics* 36 (1): 117–143.

Hohenberg, P. & L. Lees (1996) *The Making of Urban Europe, 1000–1994* (Harvard: Harvard University Press).

Heidenreich, M. (2003) Regional inequalities in the enlarged Europe, *Journal of European Social Policy* 13: 313–333.

Martin, R. & P. Sunley (1998) Slow convergence? The new endogenous growth theory and regional development, *Economic Geography* 74 (3): 201–227.

Puga, D. (2002) European regional policies in light of recent location theories, *Journal of Economic Geography* 2 (4): 373–406.

Van Oort, F.G. (2004) *Urban Growth and Innovation. Spatially bounded externalities in the Netherlands.* Aldershot: Ashgate.

Williamson, J.G. (1965) Regional inequality and the process of national development: A description of the patterns, *Economic Development and Cultural Change* 13: 3–45.