I dedicate this thesis to Frank, the person who supports me and from whom I always learn new things; most of all, Economics is not a science but a way of life

To my parents, Alexandra and Vasile Dogaru, the people who taught me

how to walk through life and science

To my grandparents, Tudora and Nicolae, who taught me how

two persons can make a difference in the World

To my second parents,

Frans and Dien who always believed in me

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Summary

Where and how does the European economy organize its welfare and well-being in the global economy of the 21st century, with large geopolitical shifts between metropolitan regions, countries and continents? Of course on the whole continent: from Helsinki to Seville, Galati to Limerick, and Catania to Rotterdam. But the global economy becomes increasingly competitive, and economic advantages appear to be attached to cities and agglomerations – characterized by increasing economic mass and combining locally functioning advantages for firms and people (endogenous growth, or "local buzz") with international connectedness (exogenous growth, or "global pipelines"). How can Europe, without extreme large economic agglomerations as on other continents, play a significant role in the global economy? How to quantify untapped and unused economic potentials in an economy that may be less resilient after the crisis? This dissertation critically discusses four themes that are increasingly important for local economic development strategies in a globalising and restructuring urban world: (1) agglomeration economies and local economic growth, (2) economic diversification strategies of European regions in relation to existent clusters and specializations, (3) regional competitiveness in relation to attracting foreign direct investment, and (4) the position and policies of second-tier city regions especially in CEE countries, which may contribute to development. Conclusions for regional policy are drawn.

Resumen

¿Dónde y cómo la economía europea organiza su bienestar en la economía global del siclo 21, con largas movimientos geopolíticas entre las regiones metropolitanas, países y continentes? Por supuesto que por el entero continente: de Helsinki a Sevilla, de Galati a Limerick, y de Catania a Rotterdam. Sin embargo, la economía mundial está aumentando su competitividad y las ventajas económicas parecen conectadas a las ciudades y aglomeraciones – caracterizadas por aumento de la masa económica y combinación de las ventajas funcionales locales de empresas y personas (crecimiento endógeno, o "local buzz") con conexiones internacionales (crecimiento exógeno, o "tuberías globales"). ¿Cómo puede actuar Europa en la economía global sin aglomeraciones económicas largas como otros continentes? Cómo cuantificar el potencial económico no explotado y no utilizado en una economía que puede ser menos resistente después de la crisis? Esta tesis debate de manera crítica cuatro temas que son cada vez más importantes por estrategias locales de desarrollo económico en un mundo globalizado y en reestructuración urbana: (1) aglomeraciones urbanas y crecimiento económico local, (2) estrategias de diversificación económica en relación a las agrupaciones existentes y especializaciones de las regiones europeas, (3) competitividad

regional en relación a las atracciones de inversiones extranjeras directas, y (4) la posición y políticas de las regiones con ciudades secundarias, especialmente en los países del centro y este de Europa, cuales pueden contribuir al desarrollo. Llegamos a conclusiones para políticas regionales.

Resumo:

¿Dónde e cómo a economía europea organiza o seu benestar na economía global do seculo 21, con largos movimentos xeopolíticos entre as rexions metropolitanas, países e continentes? Por suposto que polo continente enteiro: de Helsinki a Sevilla, de Galati a Limerick, e de Catania a Rotterdam.

Nembargantes, a economía mundial está aumentando a sua competitividade e as ventaxas económicas parecen conectadas as cidades e aglomeracions – caracterizadas polo aumento da masa económica e combinación das ventaxas funcionais locales de empresas e persoas (crecemento endóxeno, o "local buzz") con conexions internacionais (crecemento exógeno, o "tuberías globales").

¿Cómo pode actuar Europa na economía global sin aglomeracions económicas longas como outros continentes? Cómo cuantificar o potencial económico non explotado e non utilizado nunha economía que pode ser menos resistente despois da crise?

Esta tesis debate de manera crítica cuatro temas que son cada vez máis importantes por estratexias locais de desenvolvemento económico nun mundo globalizado e en reestructuración urbana: (1) aglomeracions urbanas e crecemento económico local, (2) estratexias de diversificación económica en relación as agrupacions existentes e especializacions nas rexions europeas, (3) competitividade rexional en relación as atraccions de inversions extranxeiras diretas, e (4) a posición e políticas das rexions con cidades secundarias, especialmente nos países do centro e leste de Europa, cales poden contribuir o desenvolvemento.Chegamos as conclusions para políticas rexionais.

INTRODUCTION

Innovative regional policies for medium-sized city regions

Europe is an important economic actor on the World map. Compared to its fellow continents, it has a special feature, the European Union. Many different countries with their individual history and culture agreed to join a unique alliance for the final goal of a better quality of life. They achieved cooperation – free movement of people, goods and capital within the EU – and increasingly act as part of a single European identity in the face of globalisation and world competition. In this framework, in the past decade, Member States succeeded in decreasing economic disparities among them. As we live in a knowledge society (even more prominent since the industrial revolution), global competition increases simultaneously with information speed, involving all scales of places. In this context, it is realistic to observe that even in this mutual European agreement, nations are still competing. The only difference now consists of the fact that the results of this competition are targeted to be used at continental level. However, even though the European policies target a more balanced socio-economic Europe, disparities still prevail, moving from national to regional levels, among the same Member State (Montfort, 2009).

In this view, scientific debates have been perpetuated to attempt improving this deficiency. Neoclassical theories are now being challenged by new empirical findings regarding the individuality of smaller scale places (for this debate see Garretsen et al. 2010, Puga, 2002). In the context of continuous competition and the new regulations such as the free movement of human and physical capital and goods, regions and cities started to differentiate themselves by size and location advantages such as favoured trade network positions. Due to globalization and European mobility, scale started to matter much more, bringing negative consequences for smaller, geographically and network isolated places (McCann, 2013). If the initial location inequality debate was core-periphery, now this turned into capitals and city-regions versus other types of global network positions and sizes. Theories of economic geography, new economic geography, endogenous growth theory and urban economics help explaining geographical variations in economic density and growth (Kresl & Ietri, 2014). They all contribute to the recently advocated European regional policy of smart, sustainable and inclusive growth (European Commission, 2010). This policy supports the individuality of regions and the mobilisation of their potentially unused resources for economic growth rather than the homogeneous regional and local policies which simply aim at attracting investments without a clear strategically long-term growth oriented agenda.

The smart growth concept implies long term development rooted in a resilient economic framework. In the face of the recent economic crisis, European development is uncertain, both in its wealthy regions as well as the ones lagging behind (European Commission, 2013). The competitive regions were a considerable growth source for Member States, but the objective of regional convergence is challenged by sudden negative growth trajectories of regions. The global unexpected negative shift emphasizes the need of new innovative regional policies based on competitive advantages and unexploited resources. New targets such as innovation, globalised public policies and a qualitative institutional capacity are important for this (Cooke et al., 2012).

As a whole, Europe and its composite Member States require growth strategies which look beyond the main growth poles. Capital cities and their adjacent region become congested, rents are high, infrastructure quality decreases and land becomes scarce (ESPON, 2013). If we would consider a life-cycle of places as growth sources, the capitals would be in their maturity phase. Recent literature brings the secondary sized city regions in the spotlight (Dijkstra et al., 2013), as additional potential growth pillars for the European economy. Second-tier cities are still questioned by policy-makers if they can capitalize on medium-term investments and become a regional growth source (Parkinson and Meegan, 2013). However, their regional competitive advantages can be identified and may be fostered by adequate policies through specific long term objective-oriented agendas. Regional and local governments need to identify more opportunities for cooperation, and secondary sized regions are required to become competitive economies through international economic distinctive features (eg. focus on new markets). Smart specialization strategies (Foray, 2014) and place-based development conceptualisations (Barca et al, 2012) may be innovative steps forward in this debate, but empirical back-up for CEE regions is not substantive yet.

Central and Eastern European regions and their cities belong to former centralized economies, where capitals and their corresponding region traditionally form the heart of regional planning. Capital regions contain governmental and service oriented activities. The rest of the regions with their cities, following in size, were designated to production (Muller *et al.*, 2005). After 1990, CEE countries were opened up to market forces. Technological growth trajectories loomed. Large scale production sites became obsolete in a short time span, leaving the regions' profile inadequate for a knowledge-based society. Moreover, the knowledge institutions in connection to these industries had to reorganise and adapt to the requirements of an open and trade networked economy. Among such institutions were universities, vocational training schools, public industrial management institutions, and even chambers of commerce and social organisations. In the absence of expertise

in decentralised regional and urban planning strategies second tier city regions followed random development opportunities without a long term growth strategy. The fast lane of competitiveness provided by the other Western European economies added to that. Multinational Corporations (MNCs) spotted these places for their cheap labour, low taxes, natural resources and low rents. In addition to the small national financial capacity for investments, FDI (Foreign Direct Investment) attraction became a development target itself, some small cities building an economy oriented solely to the specificity of international firms, in connection to the jobs provided (Müller et al., 2005).

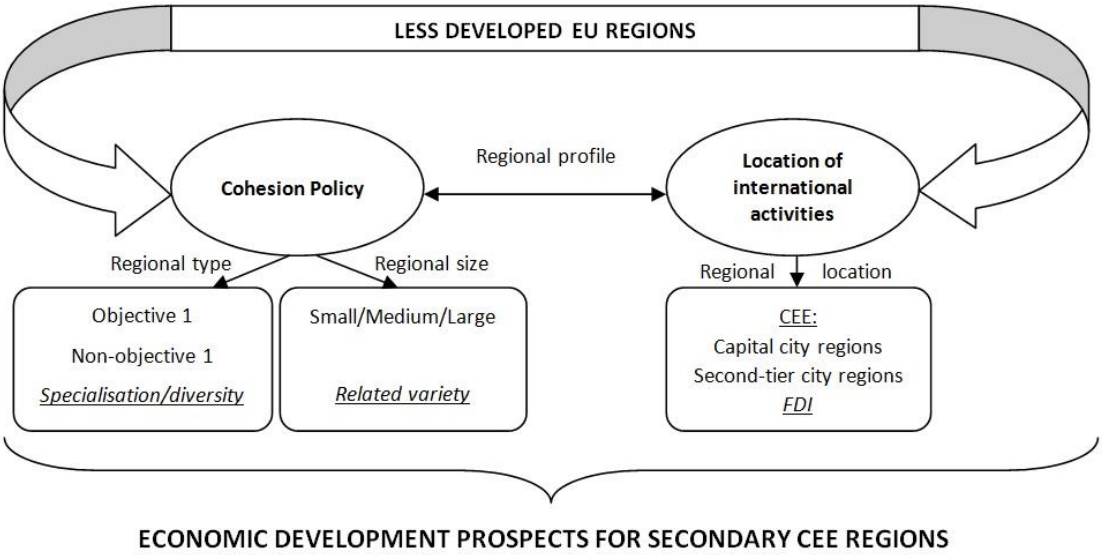
However, despite the sudden shift towards the knowledge society, the latest enlargements of the EU helped these Member States to integrate further. New targets such as entrepreneurship, lifelong learning, technological update, inter- and intra-regional cooperation and sustainable environment prepared the first steps towards decentralised regional planning (Horvath, 2014). Having European examples of best practices, guided by National Development Plans and Strategic Frameworks (European Communities, 2007), and in the context of European structural funding, second tier cities and regions enhanced their growth opportunities towards becoming growth poles.

Finally, the required growth stage which could enable these secondary regions to converge more with capital regions consists of innovative policies oriented towards socio-economic self-support by investments in European connecting infrastructure, qualitative and international oriented institutions, global trade network embeddedness, high-skilled labour force, controlled brain drain, entrepreneurship, inter-regional cooperation and regional innovation clustering (Pike *et al.*, 2006).

Research questions

Less developed EU regions continue to represent a challenge for Europe, in the sense of "updating" their economic context and make them more competitive and self-sufficient. This dissertation approaches this issue from three different perspectives related to type, size and location. The methodology treats these regional features separately in order to stress specific strengths and weaknesses and positions the results within wider theoretical debates. The analyses fit in the framework of regional and urban economic development. The three characteristics of type, size and location aim at creating a common language, identifying regional profiles for a development in European regions. Figure 1 shows the three characteristics linked to broader theoretical and policy themes.

Figure 1. Overview of the research



When observing less developed regions in Europe one can regard them as part of the European Union or as actors on the international stage. Starting from this point, our research looks at regional types and sizes within the cohesion policy framework and at regional location in connection to foreign investments. Regional convergence, the first objective of the cohesion policy, describes the regions with a GDP less than 75% of the EU28 average. The European Union expanded its range widely in 2004 when ten countries became new Member States[1] . In 2007, two more Member States added to the Community, Romania and Bulgaria. The new joining regions show different socio-economic statuses and growth speeds compared to the Western ones. Therefore, Cohesion Policy has been designed ever since for these new states' to converge towards more competitive economies. Given their present economic level, heavy and strategically long-term oriented investments are required in order to turn them into assets for the European economy. In addition, looking at the industrial specificities of these regions, we identified them as specialized low- and medium tech economies. This is relevant in the context of their convergence opportunities towards competitive growth paths. The **typology** of objective-one versus non-objective-one regions is therefore crucial in our research.

Looking at regional **sizes**, one can notice differences in population density or geographical surface. Metropolitan regions, city-regions or (congested) capital cities show different growth trajectories and investment policy agendas than medium-sized or small regions. As innovation prevails in

[1] Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Czech Republic, Slovakia and Slovenia

places where diverse economies are an umbrella for creative human capital, adequate knowledge institutions and a healthy international business environment with strong private R&D, regulation by competitive regional policies may be appropriate. In order to increase and drive innovation, policies can support different industries with a common knowledge factor that endogenously build-up the local economy (related variety) in large as well as medium-sized and smaller regions.

From an exogenous growth point of view, regions are attractive for multinational corporations. The later ones bring along benefits for their destinations, from job creation to physical investments or know-how. They also become a bridge between the international and the local economies. This study therefore also wants to contribute to the debate on how certain types of regions in Central and Eastern Europe become location choices for Foreign Direct Investment (FDI). In addition, by observing FDI in sectors and functions, one can reveal competitive advantages of (types and sizes of) regions. Accessible cities, belonging to international business networks, with high-skilled human capital and qualitative institutions, complemented by new markets are an addition to traditional arguments of low taxes, land ownership and less expensive labour force. All these are present in Central and Eastern European regions in different degrees. We will explicitly focus on the debate of second-tier city-region chances in comparison to larger and capital cities.

The general objective of the work presented is to identify development paths for CEE regions towards more competitive economies. These regions have been recently discussed to be potential European growth sources. Such results trigger high levels of responsibility from regional policy makers. Meanwhile, empirical evidence on (endogenous) diversification, (exogenous) attraction of FDI and the influence of scale and place is still scarce. When innovative, adaptable and long-term policies are required, regional-specific research is needed as well.

The investigation line of this publication follows the CEE regions, as part of former centralized economies, in different frameworks. In our empirical chapters, these currently lagging regions in Europe are given attributes of size, location and typology in relation to analysis of economic growth, diversification and foreign investments respectively. Each chapter contributes to the larger objective of identifying CEE regional development perspectives, but also supports academic and policy debates on its own.

Methodology and overview

The present study advocates place-based development in the context of agglomeration economies and FDI as relevant regional growth sources in Central Eastern Europe. These two factors stimulate both endogenous and exogenous growth while enhancing diversity and knowledge (if placed in the appropriate regional and local strategic planning background). The book further consists of four chapters that approach regional development in the light of cohesion policy (chapter 1), smart specialization and diversification (chapter 2) and foreign direct investment (FDI) (chapters 3 and 4). The methodologies used are quantitative in nature, applying multiple regression analysis (chapters 1 and 2) and logit modelling (chapters 3 and 4), controlling for regional heterogeneity (according to size and location) and spatial autoregressive correlation (chapters 3 and 4). Within this framework, various indicators from several databases (eg. Cambridge Econometrics, Eurostat, Netherlands Environmental Agency PBL, fDi Markets and Tempus) are used for the explanation of regional inequalities, convergence prospects and growth opportunities. The essential focus in this research is on medium sized city regions in CEE countries. However, in order to better underline their present economic development context and opportunities, they have been positioned in multiple comparisons with other types of regions.

Chapter 1 provides an insight for regional inequalities within the Cohesion Policy framework. Here, convergence (Objective 1) regions are observed to be related with specialized economies showing more than average productivity growth, while competitive (Non-objective 1) regions show more diversified economic contexts resulting in more profound employment growth. To increase their chances in converging towards being competitive, Objective 1 regions are advised to diversify their economies. However, this goal is difficult to be achieved in the context of former centralized economies, medium-low technological level and insufficient high-skilled labour force.

Chapter 2 is placed in the framework of smart specialization, place-based development and regional economic diversification. Exogenously, different regional economies can overcome physical distance barriers by networking, if they share the same type of cognition (cognitive proximity). Clusters can and are being formed by knowledge institutions that are best exploited by agents with advanced technologies, know-how, high managerial skills and capital. Endogenously, to reap the benefits from these networks, CEE regions require a medium-term advantage to catch up with high-speed competitive economies. To make up for the current lagging behind, specialized industries can potentially diversify their economic scope by innovation and entrance to new markets (related variety). On the other hand, more mature industries may gain in productivity from

specialization. Finally, diversification of region's industries over broad sectors (unrelated variety) may work as a portfolio (hedging) effect in times of crisis and lower unemployment. However, not all regions have capacities and profiles to foster all these opportunities. In this view, the spatial regimes applied in the analysis of this chapter show different growth options depending upon regional size.

Chapters 3 and 4 focus on the discussion on FDI as a regional economic catalyst. CEE regions became a receiver of multiple foreign industries immediately after the communist regime decay. This increased in time due to factors such as cheap labour force, low taxes and natural resources or geographical positions. Joining the EU, markets opened and transportation costs lowered thanks to the free movement of people, goods and capital. Nevertheless, CEE regions are subject to different treatments when foreign firms decide to locate. In this view, the debate regarding the capital city region versus the other types becomes even more prominent and emphasizes the still existent print of former centralized economies. In this chapter it is shown how CEE regions gain from different economic profiles. Looking at the functional and sectoral division of labour determined by the presence of MNCs, capital city regions are the first location choice for top sectors and high-end functions. The next best options are medium-sized city regions, leaving, sometimes, the other regions for production functions. Various decision factors such as market accessibility, strategic assets or institutional quality are weighed in choosing a future site for their venture. In this respect, CEE regions are expected to consider these capacities in consolidating their embeddedness in international networks and enhance their economic prospects.

The issues dealt with are complex and extensive. The following chapters intend to add to the already existing debates, by supporting specific policy guidelines for long-term economic development towards Member States. However, it is up to every national and regional planning authority along with the correspondent economic agents if the targeted growth opportunities will be capitalized upon.

CHAPTER 1. PLACE-BASED DEVELOPMENT AND AGGLOMERATION ECONOMIES WITHIN THE COHESION POLICY[1]

Abstract:

Economic growth is one of the main European policy objectives of structural funds targeted at objective 1 regions. In an empirical analysis on growth differentials over 227 European regions between 2000 and 2010, we find that - controlled for other determinants – objective 1 regions grow in productivity due to higher degrees of specialization, while other regions grow faster in employment, being embedded in a diverse economic environment.

We argue that the type of agglomeration economies in combination with the structure of the economy is crucial for future long-term development prospects of regions – and that especially the larger objective 1 regions should diversify their economy more to reap long-term convergence prospects. This outcome favours a focus on place-based development, as advocated recently by the European Union.

Key words: *agglomeration economies, regime analysis, objective 1 regions, cohesion policy, European Union, specialisation*

[1] This chapter is based on the article entitled "Agglomeration economies in European regions: perspectives for Objective 1 regions", published in Journal of Economic and Social Geography, in September 2011, vol. 102, no. 4, pp. 486 – 494. Here, the analysis from the article has been extended to sectoral levels. The inclusion of the paper in this thesis was allowed by Wiley-Blackwell and The Royal Dutch Geographical Society.

1.1 Cohesion Policy and regionally tailored development agendas

The Treaty establishing the European Community sets economic and social cohesion as one of the main priorities of the Union. This priority is operated by the EU cohesion policy that should promote economic and social progress as well as a high level of employment, and to achieve balanced and sustainable development.

Evolutionary economics in Europe shows different lessons learnt with regard to policy implementation. Each year's Social and Cohesion Report presents different socio-economic frameworks for regions in Europe. Patterns of economic growth paths can be distinguished at first glance between West, Central and East. Regional inequalities increased in the last fifteen years among the regions of the same Member State (Montfort, 2009). Looking back on CEE regional economic heritage, typologies of regional profiles can be identified within the former centralized economies in Eastern European Member States. In this view, the Cohesion Policy designed its objectives and operational targets step-by-step through ex-ante analyses, socio-economic priorities, benchmarks, monitoring and evaluation. Learning-by-doing has also been a part of its improvement process. Structural funds have been created one by one, as a response to incoming regional disparities issues occurred along EU enlargements.

The implementation of the Cohesion Policy constitutes different systems of policy definition and financial distribution at national levels. Considering the limited national budgets of the new Members, one can observe at a general view that European public projects are shaping parts of national budgets towards regional competitiveness. This fact can be proved by the national contributions required for European projects which involve at partner level the public authorities. For instance, in implementing a public transport infrastructure project, the national authorities have their own financial contribution up to 15% of the total budget (Implementation framework document of the Operational Programme for Transport, 2013). Thus, structural funds play also a limited distributive role in regional development. Observing the evolution of structural funds' own distribution, a continuous progress in their implementation is noted by the literature. The monitoring and evaluation of the Cohesion Policy has been one of the main critical points. Bachtler and Wren show the need for flexible and innovative monitoring units, especially for projects where outcomes are difficult to measure. They base their study on a thorough analysis of European policy reports.

In researching indicators for capturing regional development prospects, several measurement tools have been unfolded. Regional convergence can be measured as β and σ convergence. β convergence reveals catching-up practices while σ convergence focuses exclusively on diminishing regional inequalities in time (Montfort, 2008). HERMIN (previously HERMES) model presents neoclassical features in its structure (supply, absorption and income distribution). The analysis involves GDP at five-level production decomposition: manufacturing, building and construction, public services, market services and agriculture (Gakova & Co, 2009). Ferrara & Co present the RHOMOLO model. This approach involves trade flows among regions and multi-level governance within the theoretical context of endogenous growth theory and the New Economic Geography (NEG).

Since its inception and the first programming period, the Treaty's text has very often been interpreted as the promotion of convergence among regions, as measured in terms of GDP per head. Monfort (2009) argues that the perspective of per-capita income convergence is actually quite limited, for two reasons. First, income captures (especially from the point of view of measuring inequality) only one of the several dimensions of economic development and well-being. Second, and apart from that, regional convergence does not always adequately capture or reflect economic development opportunities. Especially the efficiency goal of cohesion policy is targeted at a full use of a region's potential and economic growth and does not necessarily results in convergence. Diverging growth trajectories and speeds on varying spatial scales due to the existence of agglomeration economies (advantages of larger urban regions or specialized regions), differing strategies for regional economic resilience and technology adaptation, or localized national or regional policies contribute to these differences (Baldwin & Wyplosz 2009, Capello et al 2008).

The recent discussion on reforming cohesion policy (Barca, 2009) is in line with other reports on place-based development policies in the context of agglomeration economies and economic growth (Worldbank, 2009). The discussion highlights the importance of agglomeration for efficiency and economic growth due to an underutilization of potential resources, persistent social exclusion, and the possible detrimental effect if place-based policies inhibit agglomeration in an attempt to influence regional inequality (Thissen & Van Oort, 2010). Insight in localized agglomeration economies for growth will contribute to our understanding of effective place-based policies in European regions.

In this chapter, we investigate the contribution of agglomeration economies to economic growth in European regions that received objective 1 funds compared to regions that did not. We hypothesize that while employment growth is related to the opening up of new markets and product innovation in a diverse economy, productivity growth links to process improvements in existing markets in economies that are specialized in the production of certain goods and services. To test this, we conduct an empirical analysis on growth differentials over 227 European regions – including the 8 Romanian NUTS2-regions, between 2000 and 2010. As our hypothesis is confirmed, we argue that the type of agglomeration circumstances related to the type of growth is crucial for future long-term development prospects of regions.

Besides the testing of this central hypothesis, this chapter aims at answering five related research questions:

(1) How should agglomeration economies be measured, and what theoretical and conceptual frameworks are relevant for that?
(2) What is the spatial pattern (mapping) of productivity growth and regional employment growth across European regions?
(3) Are regional productivity growth and employment growth patterns displaying converge?
(4) What is the relation between objective 1 funding and regional economic development?
(5) How do the Romanian regions perform on the indicators and estimated relations, and what can be learned from (causal relations in) other European regions?

The chapter is structured as follows. The second section summarizes the main arguments for differences in regional growth given by modern agglomeration theories, like the New Economic Geography, Urban Economics and Endogenous Growth Theory. This section ends with our hypothesis on the relationship between agglomeration economies and economic growth in objective 1 regions versus other regions in Europe. The third section distils from the empirical literature the variables needed to test our hypothesis in a statistical model, and subsequently introduces and describes the data used. The fourth section presents econometric models for regional growth in Europe. We present models for both productivity growth and employment growth, for all economic activities in regions taken together and for six distinctive (broadly defined) sectors: agriculture, traditional manufacturing, modern manufacturing, distribution, business services and consumer services. Earlier research showed that these sectors each require different locational assets and circumstances for growth (Van Oort, 2004; Henderson et al., 1995),

and hence testing of sectoral models provides important insights on our hypothesis and research questions. The fifth section draws conclusions, and links the discussion to policy implications for the European Union and future research opportunities.

1.2 Regional growth differentials and agglomeration economies

The recent regional economic development literature has shown a renewed interest in agglomeration economies from the New Economic Geography (NEG) and the related empirical literature on economic geography and urban economics (Puga, 2002). Thissen and Van Oort (2010) argue that the main difference between the NEG proper and related economic geography theories is that the former describes a distribution of economic activity and population resulting in different welfare effects while the latter concerns the implications of different spatial distributions of people and activity for productivity and GDP levels or growth. Both sets of theories share the recently observed trend towards increased urbanization as an outcome.

The new theoretical insights from NEG are in line with the empirical observation that inter-regional disparities in Europe, especially within countries, have grown since the 1980s. The evidence reviewed in Montfort (2009) leads to the conclusion that in the last ten to fifteen years disparities have diminished *among* countries and increased *within* countries. Theories on agglomeration advantages as an explanation for such observed spatial concentration of economic activities are increasingly used in economic geography (McCann & Van Oort, 2009). The New Economic Geography describes agglomeration forces leading towards a dynamic and self-enforcing process of increased agglomeration, and higher levels of welfare of the population in these agglomerations. According to the NEG, these welfare effects are generated by a "love of variety" by consumers and a "supply of varieties" that increases with the economic size of a region.

The role of knowledge and human capital as a determinant of economic growth has gained greater appeal after its incorporation in economic growth models (Thissen & Van Oort 2010). In these models, knowledge spillovers between economic agents play a crucial role in the growth and innovation process and lead to external economies of scale in production. New technological knowledge is seen as tacit, meaning that its accessibility, as well as its growth spillovers, is bounded by geographic proximity of high-tech firms or knowledge institutions.

Both the NEG and economic geography build on this concept of externalities or spillovers. Externalities or spillovers occur if the behaviour of a firm increases the performance of other firms

without the latter having to pay compensation. Spatially bounded externalities are related to location decisions of firms or individuals within their network. The driving mechanism in agglomeration economies is then that increased size of (urban) agglomerations leads to increased productivity, which will attract more people to migrate to larger agglomerations (Fujita et al., 1999). This in turn will cumulatively cause higher productivity levels and higher economic growth again. Naturally, there are also dispersion forces at work, but after a certain threshold of transport costs and freeness of trade has been reached, the strength of agglomeration economies outweighs the dispersion factors.

Most discussions of spatial externalities link to a twofold classification. First, external economies may exist within a group of local firms in a certain sector due to firm size or the existence of a large number of local firms: localization economies. These may occur due to labour pooling, specialized suppliers or knowledge spillovers (so-called Marshallian externalities). Second, external economies may be available to all local firms in dense urban areas, irrespective of the sector: so-called urbanization economies. Urbanization economies are often viewed as interchangeable with variety or Jacobs' externalities, but it is also argued that in addition to spillovers occurring between firms within a sector, spillovers can also occur between sectors, aside from urbanization per se (Frenken et al., 2007).

The empirical evidence of agglomeration economies is strong, and in an overview paper by Rosenthal and Strange (2004) it is shown that a doubling in the size of an agglomeration leads to an increase in productivity somewhere between 3 and 11 percent. Melo et al. (2009), using a sample of 34 studies on agglomeration economies for 729 estimated values of elasticity, find a variation up to 29%. In another meta-analysis considering 31 studies, De Groot et al. (2009) conclude that the theory provides "strong indications for sectoral, temporal and spatial heterogeneity". Beaudry and Schiffauerova (2009) confirm this view in their extensive - qualitative - overview of most recent agglomeration studies. Determining factors appear to include the spatial unit of analysis, the measurement of localized growth, the time frame of analysis, and the number and detail of economic sectors included in the analysis.

There is a burgeoning literature looking for micro-foundations and causes of agglomeration economies (Rosenthal and Strange, 2004; Feser, 2002). Whether due to firm size or a large initial number of local firms, a high level of local factor employment may allow the development of external economies within the group of local firms in a sector. These are termed localization economies. The strength of these local externalities is assumed to vary, so that these are stronger in some sectors and weaker in others (Duranton and Puga, 2001). The associated economies of scale comprise factors that reduce the average cost of producing outputs in that locality. On the other

hand, urbanization economies reflect external economies passed to enterprises as a result from savings from the large-scale operation of the agglomeration or city as a whole, and which are therefore independent from industry structure. Relatively more populous localities, or places more easily accessible to metropolitan areas, are also more likely to house universities, industry research laboratories, trade associations and other knowledge generating institutions. It is the dense presence of these institutions, which are not solely economic in character, but are social, political and cultural in nature, that support the production and absorption of know-how, stimulating innovative behaviour and differential rates of interregional growth (Frenken et al, 2007). The diverse industry mix in an urbanized locality therefore improves the opportunities to interact, copy and modify practices and innovative behaviour in the same or related industries.

According to Frenken et al (2007), an interesting theoretical contribution to the specialization-variety debate has been provided by lifecycle theory, which holds that industry evolution is characterized by product innovation in the first stage and process innovation in a second stage (Saviotti, 1996). Following this two-stage logic, Pasinetti (1993) explains growth as a combination of structural change caused by process innovation within existing sectors and product innovation as leading to new sectors. Two consequences arise from this: the growth in variety is a necessary requirement for long-term economic development; and growth in variety leading to new sectors and productivity growth in pre-existing sectors, are complementary and not independent aspects of economic development. This distinction does not imply that product innovation occurs exclusively at the time of birth of a new industry with process innovation taking only occurring thereafter. Rather, product lifecycle theory assumes product innovation peaks before process innovation peaks. In a geographical framework this translates into new lifecycles starting in urban environments and which move to more rural environments over time (Vernon, 1966). The knowledge of the urban labour force, capital services, and product markets in urban environments foster the incubator function for starting firms (Duranton & Puga, 2005). In accordance to the economics of agglomeration, evolutionary economists also stress the important role of variety to create new varieties. In other words, Jacobs externalities are assumed to play an important role in urban areas in creating new varieties, new sectors and employment growth. When firms survive and become mature, they tend to standardize production and become more capital-intensive and productive. The initial advantages of the urban agglomeration core can now become disadvantages: growth is difficult to realize *in situ* and physical movement becomes opportune when limited accessibility and high wages become disadvantageous. Growing firms are expected to 'filter down' towards more peripheral locations and regions where land, labour and transport costs are lower. This reasoning lies behind the notion of an 'urban product lifecycle' that new products are

developed in large diverse metropolitan areas with a diversified skill base, but that mature firms eventually move to more peripheral regions. In Europe, this filtering down process might have taken place on a larger scale: from the economic core regions to the peripheral objective 1 regions. We will therefore test in our empirical analysis whether employment growth is related to a diverse economy in non-objective 1 regions, while productivity growth positively relates to specialized objective 1 regions.

1.3 Data and variables used in modelling

According to the literature, many factors can contribute to employment and productivity growth in regions and cities. Overviews can be found in Capello et al (2008), Combes & Overman (2004), Crespo-Cuaresma et al (2009) and Rodrigues-Pose & Tselios (2010). Our empirical analysis uses data on 227 NUTS2-regional level for Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Hungary, Ireland, Italy, The Netherlands, Poland, Portugal, Romania, Sweden, Slovakia and the United Kingdom[1]. 84 regions receive objective 1 funding in the period 2000-2006, 135 regions do not. The 8 Romanian regions received pre-accession funds, which we treated as objective 1 funding. The variables we introduce in our model are summarized in Table 1.2. We will present and discuss them, together with their hypothesized sign, in more detail.

Employment and labour productivity (output per employee) data are obtained from the Cambridge Econometrics statistical database on European regions. Data on the NUTS-2 level of European regions are provided by Cambridge Econometrics for 15 sectors. These sectors have been grouped into six broad sectors, using the aggregation schedule of table 1.1.

[1] For reasons of optimal data comparability, small modifications were made to the regional divisions in Belgium, Sweden and the UK (Scotland). Data from regions in Norway, Switzerland, Luxemburg and the Czech Republic are missing for the trade data.

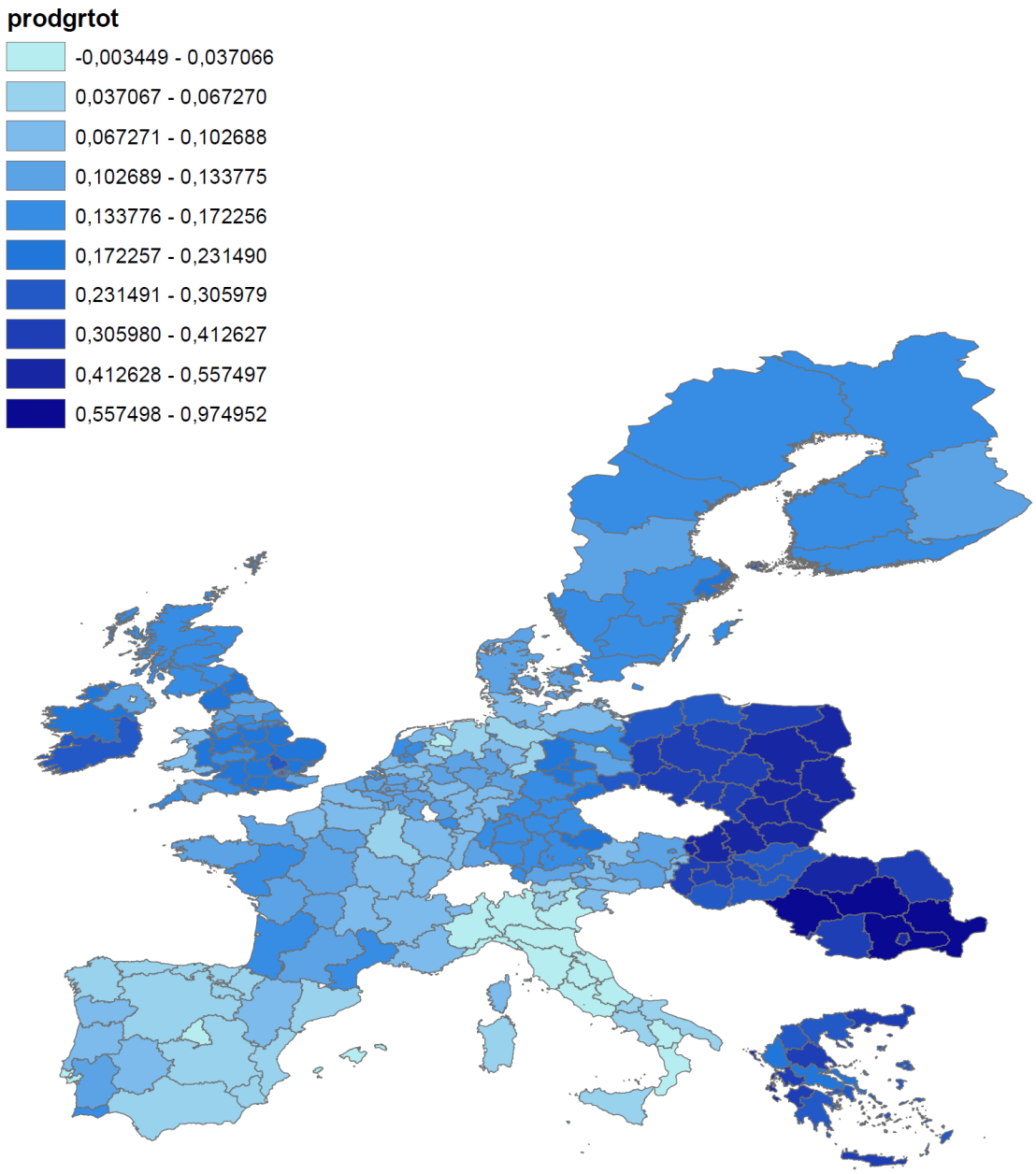
Table 1.1: Aggregation of Cambridge Econometrics sectors into six broad sectors of analysis

Broad sector:	Cambridge Econometrics Sector
Agriculture	Agriculture (A+B)
Traditional Industry	Mining, quarrying and energy supply (C+E)
	Food, beverages and tobacco (DA)
	Textiles and leather (DB + DC)
	Other manufacturing (DD – DK)
Modern Industry	Refined petroleum, nuclear fuel & chemicals (DF-DH)
	Electrical and optical equipment (DL)
	Transport equipment (DM)
Distribution	Distribution (G)
	Transport, storage and communication (I)
Business Services	Financial intermediation (J)
	Real estate and business activities (K)
Consumer Services	Hotels and restaurants (H)
	Non-market services (L-P)

Not allocated: construction (F)

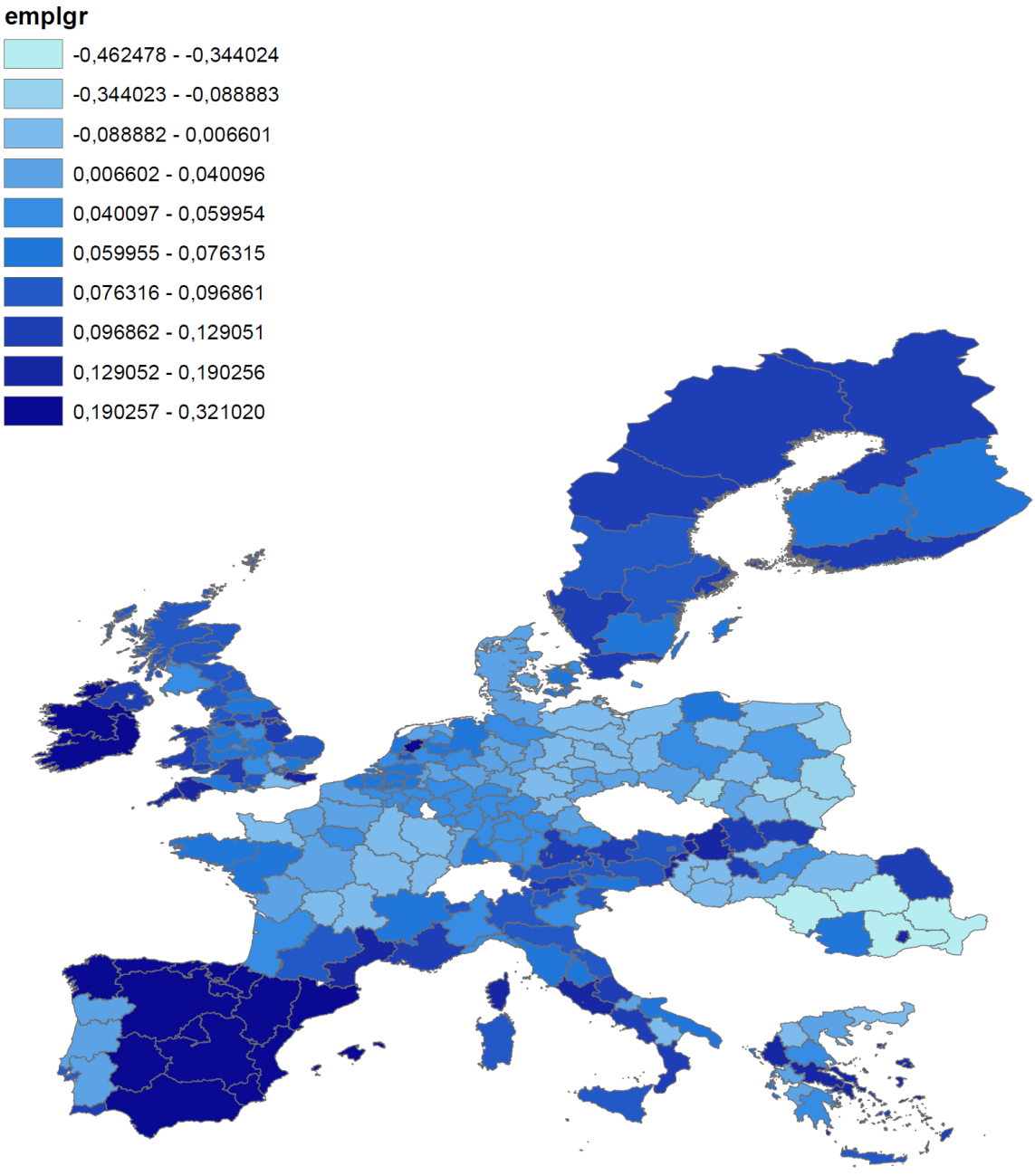
From the Cambridge Econometrics dataset, we took the data for 2000 and 2010. For this period we are able to link Objective 1 funding to regions, including the pre-accession funds for Romania. Further research should also focus on other periods of analysis. Productivity growth and employment growth are defined as $\ln(emp_{2010}/emp_{2000})$ and $\ln(prod_{2010}/prod_{2000})$, in order to normalize its distributions. Figure 1 shows the distribution of productivity growth over the regions in our analysis.

Figure 1: Productivity growth 2000-2010 in European regions



The largest growth rates are in the eastern European regions, especially in Poland, Hungary, Slovakia and Romania. Also Greek regions show a considerable growth in productivity. Outside the eastern European countries, regions that show relative high productivity growth rates are London, Dublin, Amsterdam and Utrecht in the Netherlands, and German regions in Bayern and in former Eastern-Germany. Figure 2 provides a map of employment growth rates over the European regions.

Figure 2: Employment growth 2000-2010 in European regions



A different pattern emerges. Regions in Spain, Ireland, Italy, Austria and Scandinavia now particularly come to the fore. Only a few eastern European regions that grow fast in productivity also grow fast in employment. In Romania, Bucharest is the fastest growing region in employment.

In order to test (and control) for convergence, we relate regional productivity growth in the period 2000-2010 with the *productivity level* in 2000 (and similarly, we relate the employment level of 2000 to employment growth). Figure 3 shows the distribution of productivity levels in the 227 European regions in 2000. The "old" economic core regions of Europe show the highest productivity levels: a band ranging from London to Belgium, the Netherlands, Western Germany, Northern Italy and Western France, Paris (Ile-de-France) and Scandinavian regions show the highest scores. The lowest score are in the eastern European regions of Poland, Slovakia, Romania and Hungary. The relationship between productivity level (in 2000) and productivity growth (in the period 2000-2010) is hypothesized to be negative: a lower level of productivity leads to higher productivity growth: convergence. Figure 4 confirms this negative relationship. The figure also shows that this relation is especially determined by the scores of the regions that received objective 1 funding in the period 2000-2006, with low productivity levels and high productivity growth. The eight Romania regions show the lowest scores on productivity level in 2000, and among the highest scores on productivity growth in the next ten years. Especially the regions Vest, Sud, Sud-Est and Centru show higher than average productivity growth figures. This strong relation confirms that using objective 1 regions versus other regions to determine the relationship between to the explanatory variables (among which the degree of specialization and sectoral diversity) and productivity growth is potentially useful. Figure 5 similarly shows the relation between the employment level in 2000 in the 227 region and employment growth in the period 2000-2010 in the same regions. This relation is less profoundly negative than that of productivity and productivity growth. Also, the distinction between objective 1 region and non-objective 1 regions is less clear for employment. Some Romanian regions come to the fore because of relatively high levels of employment, paired to relative low (or even negative) growth rates.

All other explanatory variables in our models for employment and productivity growth are also measured for the year 2000, because of endogeneity reasons. 2000-circumstances can cause subsequent growth in the period 2000-2010, but 2010 circumstances cannot. Therefore we measured all explanatory variables in 2000. *Investments in private and public research and development (R&D)* are calculated as percentages of GDP from Eurostat statistics. These investments in innovation are hypothesized to positively relate to economic growth (Moreno et al, 2005).

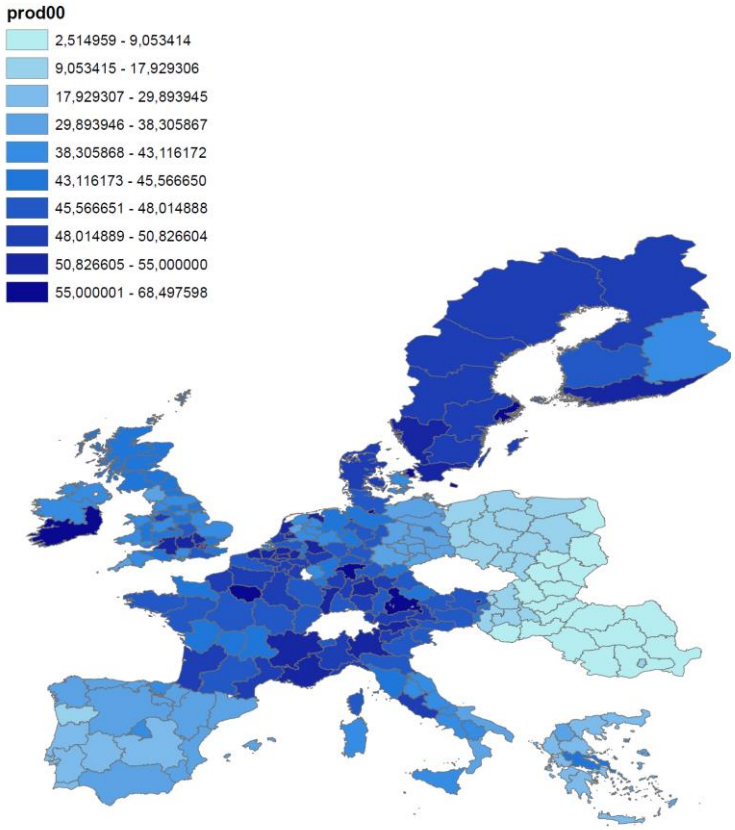
Table 1.2: descriptive statistics of variables used in models (n=227)

	Min.	Max.	Mean	St. dev.
Private R&D (%GDP, 2000)	0,000	5,008	0,853	0,949
Public R&D (%GDP, 2000)	0,000	2,280	0,511	0,408
Volume of trade (imports + exports, 2000)	407,174	205229,464	25372,121	26435,199
Market potential (2000)	4634,412	38017,453	16474,108	7013,161
Population density (2000)	4,700	8494,200	355,490	852,926
Educational level (2000)	5,488	45,818	20,735	7,798
Wage level (2000)	1072,018	81837,801	21296,313	12348,732
Productivity level total (ln,2000)	0,922	4,230	3,502	0,668
Productivity level agriculture (ln, 2000)	-0,461	4,404	2,907	0,936
Productivity level traditional industry (ln, 2000	1,594	4,799	3,645	0,716
Productivity level modern industry (ln, 2000)	1,903	4,727	3,758	0,667
Productivity level distribution (ln, 2000)	-0,265	4,203	3,375	0,703
Productivity level business services (ln, 2000)	1,668	5,036	4,115	0,644
Productivity level consumer services (ln, 2000)	-0,094	3,932	3,170	0,683
Specialisation/diversity (Theil over LQ's, 2000)	0,020	0,329	0,075	0,057
Location quotient output agriculture (2000)	0,002	9,095	1,786	1,757
Location quotient output traditional industry (2000)	0,157	2,584	1,078	0,388
Location quotient output modern industry (2000)	0,026	2,813	0,965	0,489
Location quotient output distribution (2000)	0,072	2,158	0,993	0,264
Location quotient output producer services (2000)	0,077	1,645	0,839	0,252
Location quotient output consumer services (2000)	0,011	2,389	1,108	0,515
Productivity growth total (2000-2010)	-0,003	0,775	0,174	0,139
Productivity growth agriculture (2000-2010)	-0,645	2,244	0,261	0,331
Productivity growth traditional industry (2000-2010)	-0,310	0,951	0,266	0,157
Productivity growth modern industry (2000-2010)	-0,189	1,084	0,296	0,163
Productivity growth distribution (2000-2010)	-2,022	2,543	0,132	0,292
Productivity growth producer services (2000-2010)	-2,373	2,368	0,060	0,384
Productivity growth consumer services (2000-2010)	-2,551	2,750	0,101	0,453
Employment growth total (2000-2010)	-0,304	0,321	0,067	0,089
Employment growth agriculture (2000-2010)	-1,364	0,366	-0,215	0,226
Employment growth traditional industry (2000-2010)	-0,491	0,168	-0,089	0,131
Employment growth modern industry (2000-2010)	-0,803	2,163	-0,076	0,241
Employment growth distribution (2000-2010)	-0,179	0,383	0,102	0,101
Employment growth producer services (2000-2010)	-0,025	0,553	0,248	0,120
Employment growth consumer services (2000-2010)	-0,152	0,380	0,126	0,080

Private R&D investments (its regional pattern is shown in figure 6, top left) mainly occurs in regions with larger multinational enterprises, like Eindhoven (Philips), Stockholm (Ericsson), Helsinki (Nokia), Leverkusen (Bayer), Stuttgart (BMW, Mercedes) and Toulouse (Airbus). Public

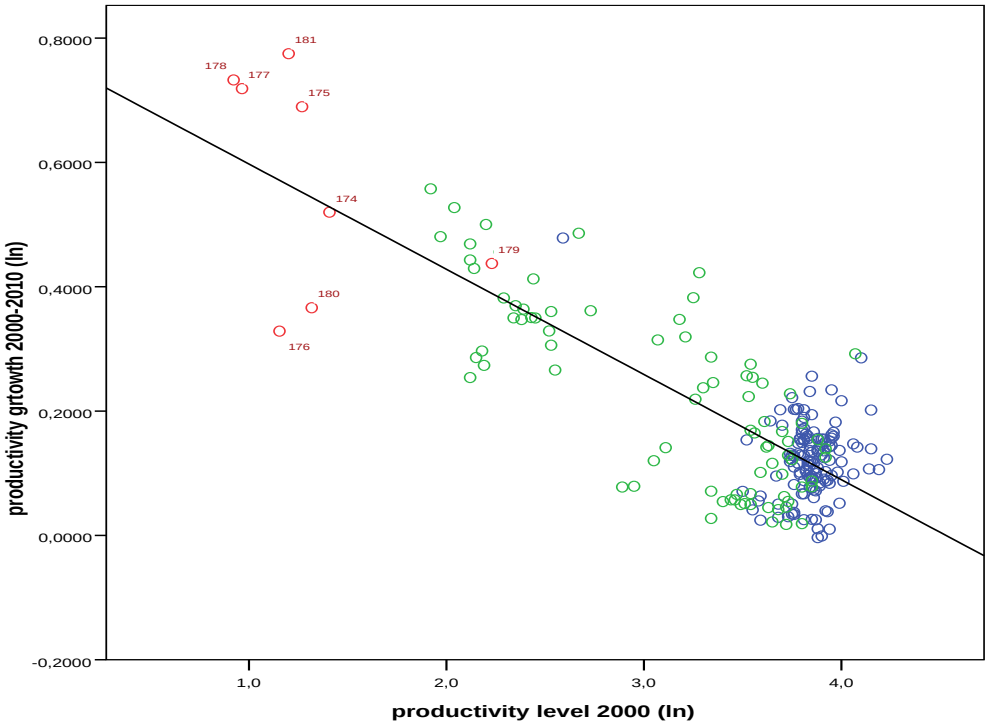
R&D (also in figure 6, top right) is more related to regions with technological universities and regions where universities and firms alliance, like Cambridge UK, Leiden Netherlands, Braunschweig Germany and Rome Italy.

Figure 3: Productivity levels in 2000 in 227 European regions



The *degree of sectoral specialization and diversity* is a crucial variable in our models, as it tests our central hypothesis (specialization is related to productivity growth, especially in objective 1 regions; while sectoral diversity is related to employment growth, especially in non-objective 1 regions). The degree of regional specialization is measured by the Theil index over the location quotients of 59 products including agriculture, manufacturing and services.

Figure 4: the relation between productivity growth (2000-10) and productivity level (2000) in 227 European regions



Red: Romanian regions (174 = Nord-Vest, 175 = Centru, 176 = Nord-Est, 177 = Sud-Est, 178 = Sud Muntenia, 179 = Bucharest/Ilfov, 180 = Sudvest Ottenia, 181 = Vest)

Green: other Objective 1 regions,

Blue: non-objective 1 regions.

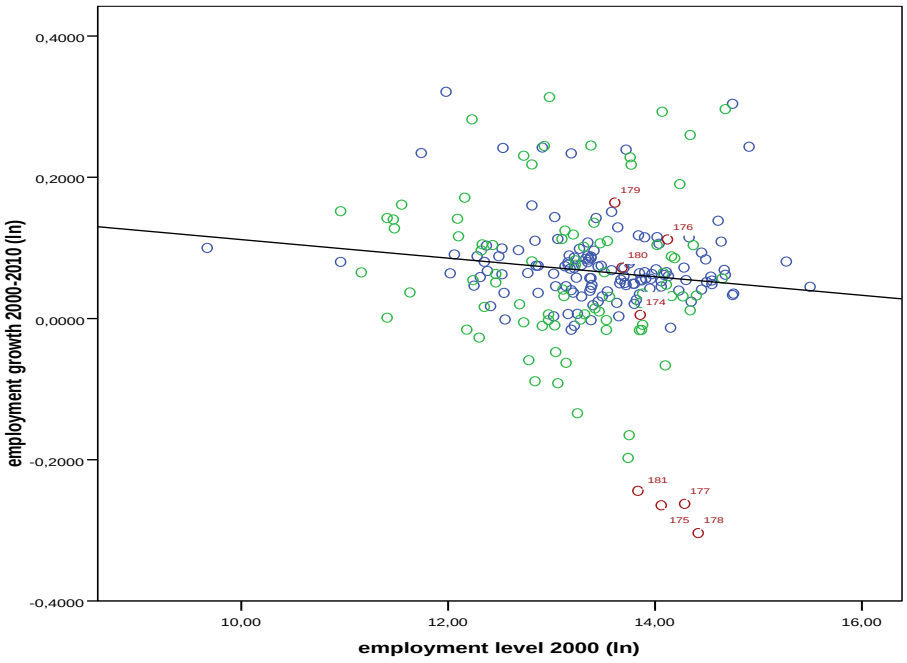
This unique dataset has been collected by the Netherlands Environmental Assessment Agency (PBL) and is based on regionalized production and trade data for 256 European nuts2 regions, 14 sectors, and 59 product categories (compare Combes & Overman, 2004). Location quotients measure the relative specialization of a region in a certain sector as the percentage of employment accounted for by a sector in a region relative to the percentage of employment accounted for by that sector in Europe as a whole:

$$LQ_i = \frac{E_{i,j} / \sum_j E_{i,j}}{\sum_i E_{i,j} / \sum_{i,j} E_{i,j}}$$

in which E represents employment level and i and j the location and sector respectively. This quotient measures whether a sector is over- or underrepresented in a region compared with its

average representation in a larger area, and therefore is to comprise localization or specialization economies of agglomeration. The Theil coefficient then measures deviations from the European average distribution of employment specializations in all sectors. A high score represents a large degree of sectoral specialization in a region, and a low score represents sectoral diversity. Figure 6 (bottom left) shows that in our 227 regions, in the largest national economies of Germany, France and the United Kingdom regions have high levels of sectoral diversity (all regions contain most of the existing sectors, including services). Eastern European regions in Romania, Poland, Slovakia and Hungary are relatively specialized, as are Scandinavian, Greek and Irish regions. These regions miss concentrations of certain activities, e.g. specific types of services, manufacturing, distribution or agricultural activities. A group of medium-sized economies, like The Netherlands, Austria, Belgium, Denmark, Italy, Portugal and Spain, show moderate levels of specialization.

Figure 5: the relation between employment growth (2000-10) and employment level (2000) in 227 European regions

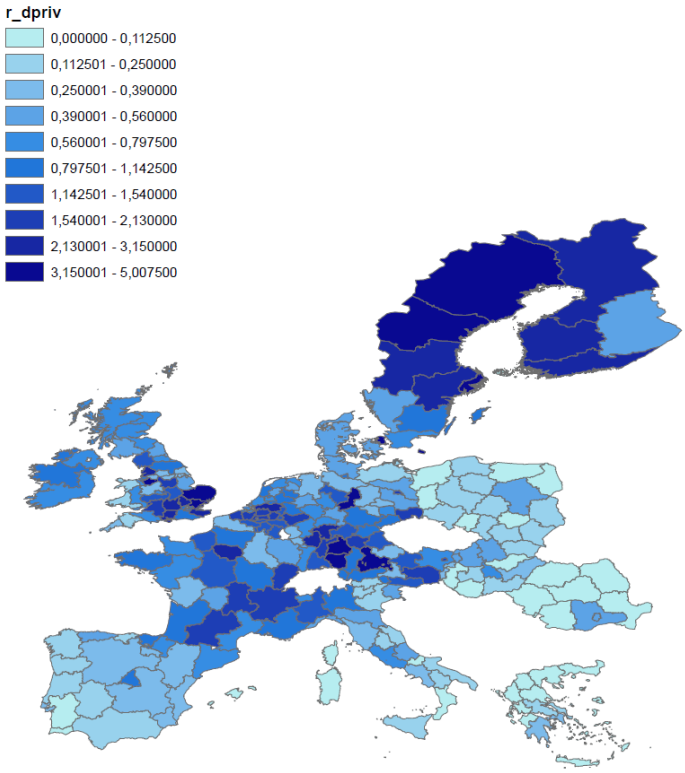


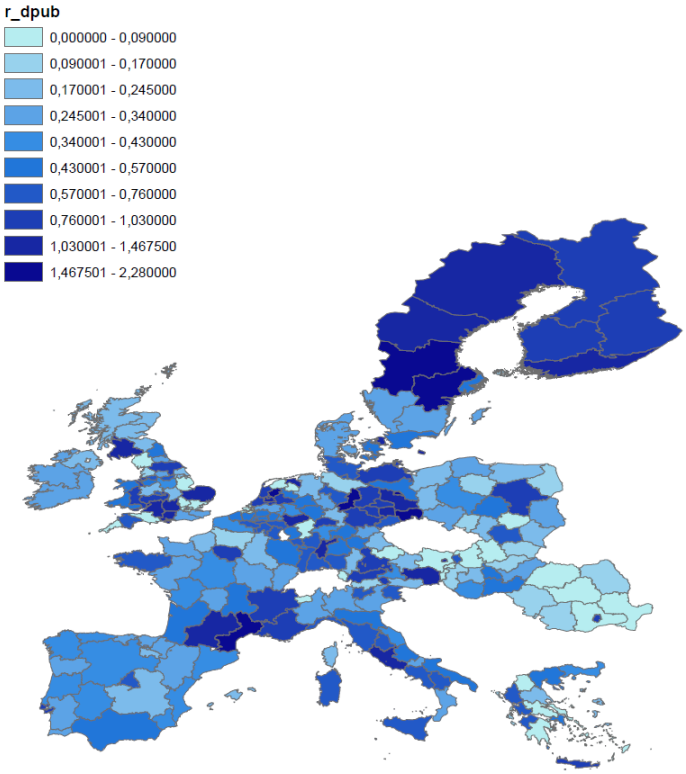
Red: Romanian regions (174 = Nord-Vest, 175 = Centru, 176 = Nord-Est, 177 = Sud-Est, 178 = Sud Muntenia, 179 = Bucharest/Ilfov, 180 = Sudvest Ottenia, 181 = Vest)

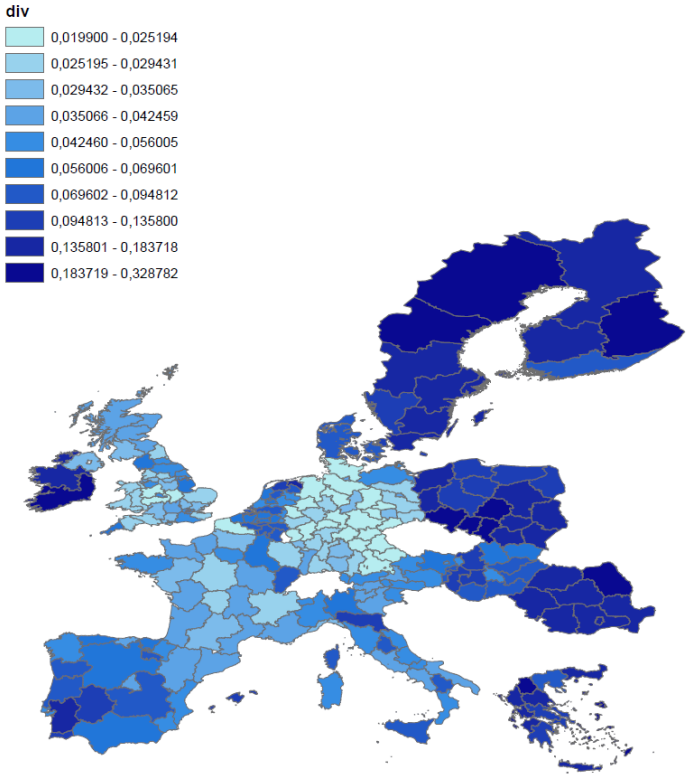
Green: other Objective 1 regions,

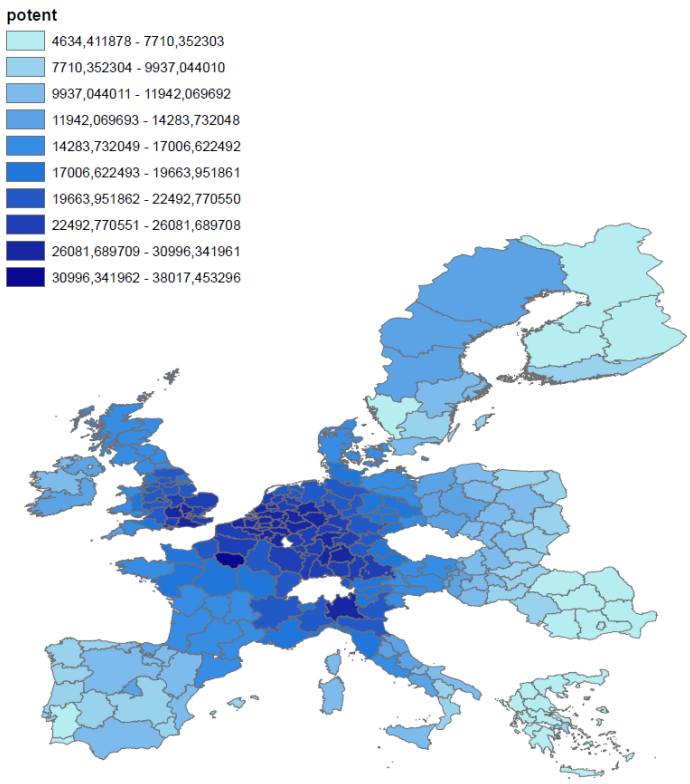
Blue: non-objective 1 regions.

Figure 6: Private R&D (top left), Public R&D (top right), degree of specialization (bottom left) and market potential (bottom right) in 227 European regions









Objective 1 regions are generally more specialized than the other regions – probably causing a positive general relationship between specialization and productivity growth.

Levels of productivity and employment, R&D and the degree of specialization and diversity are important determinants of employment and productivity growth. Based on the literature and previous research (Capello et al, 2008; Crespo-Cuaresma et al, 2009; Rodrigues-Pose & Tselios, 2010) we also introduce several other variables in our models that are theoretically linked to growth. First, a gravity model of the employment of regions, estimating interaction potentials for each region by its size and the sizes of all other regions in Europe, corrected for the distance to reach those other regions, determines the *market potential* of regions, following the formula:

$$P_i = \sum_{i \neq j} \frac{M_j}{d_{ij}^{\alpha}} + \frac{M_i}{d_{ii}^{\beta}}$$

in which P is the gravity value of region I (market potential), measured by total employment (M) in the locality itself as well as in all other localities, the latter being corrected for distances (d). We took aggregated employment as a measure, for it is perceived as a prominent indicator of economic density. Physical distances are extracted from a GIS-database and the intra-regional distance is calculated by means of the formula:

$$d_{ii} = \frac{2}{3}\sqrt{\frac{A_i}{\pi}}$$

in which the intra-regional distance d is two third of the radius of the presumed circular area A, see Van Oort (2004) for the exact derivation and overview of considerations of this. The values of α and β, measuring the magnitude of the intra- and interregional distance decay, is set at one for national gravity values. Figure 6 (bottom right) maps this variable for our 227 regions. The economic core of Europe (Benelux, South-east England, Germany, Northern Italy, Paris) is also the macro-region with the highest market potential (accessible customers and employees). Large market potential may lead to higher growth rates because of larger business and customer opportunities, potentially higher profits and more incentives for innovation and renewal.

The *volume of trade* of European regions (figure 7, top left) is calculated as the total value of imports and exports in a region. This volume of trade indicator is based on make-and-use tables (IO-table) for 2000 on NUTS2-level concerning 14 sectors and 59 product categories, including

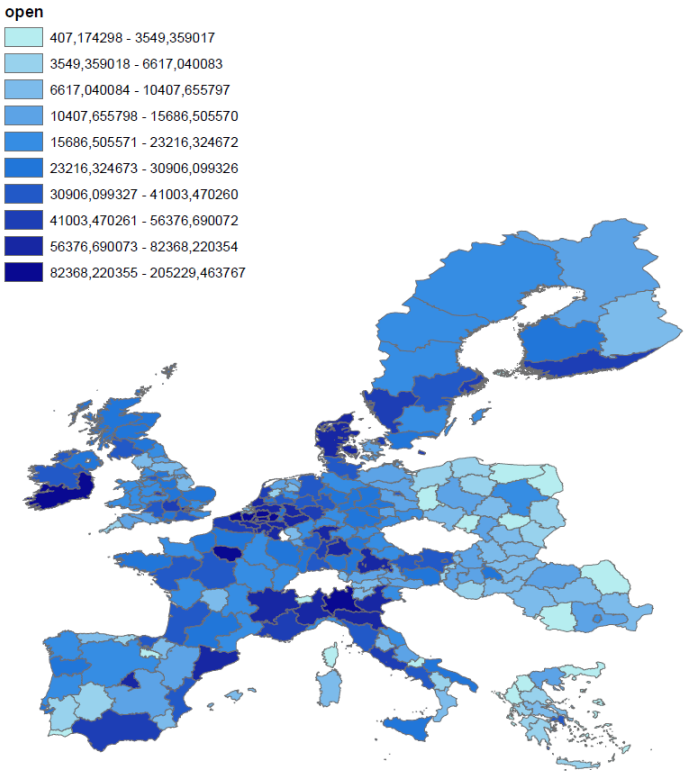
services. This dataset is developed by the Netherlands Environmental Assessment Agency (PBL). The volume of trade goes up with the size of the region at a declining rate. It is strongly dependent on global economic development with competition on global markets, driving up productivity and attracting new investments and collaborations. High potential may also spill over to nearby regions or in the regional network of specialized and subcontracting industries and regions. The map shows that especially some (but not all) larger regions score high on this indicator: Barcelona, Madrid and Andalucía in Spain, The Low Countries (Belgium and The Netherlands), Dublin, Northern Italy, Paris and some internationally oriented trade-intensive regions in Germany.

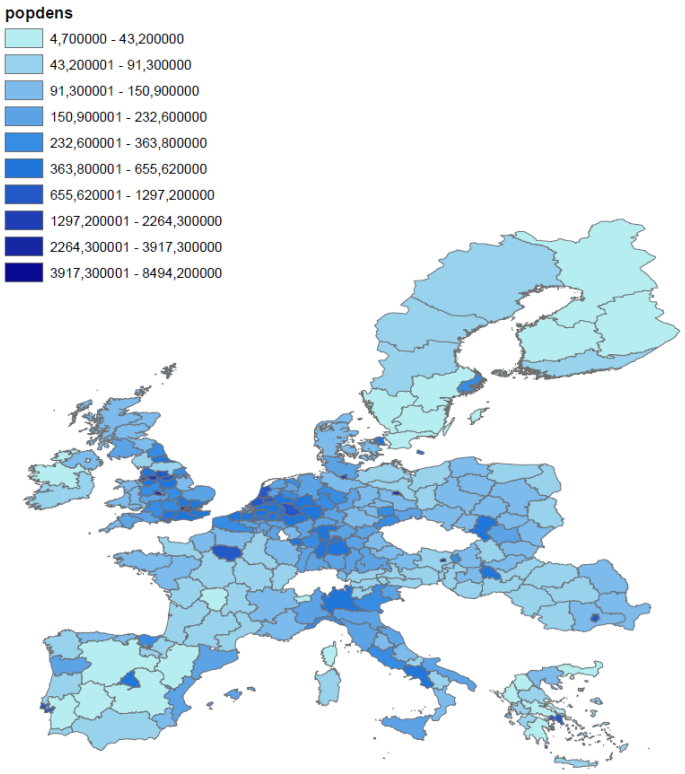
Density (measured as population density, mapped in figure 7, top right) measures whether agglomeration (economic size) matters for economic growth. This dimension of agglomeration is not directly related to localization economies (specialization) and diversity economies, but to pure urban size effects (Frenken et al, 2007). The variable of density correlates strongly with an indicator of physical accessibility (by car and train) that we also constructed. The latter is therefore not included in the analyses. In general the literature suggests that higher density enables better interaction, enhancing growth (Puga, 2002).

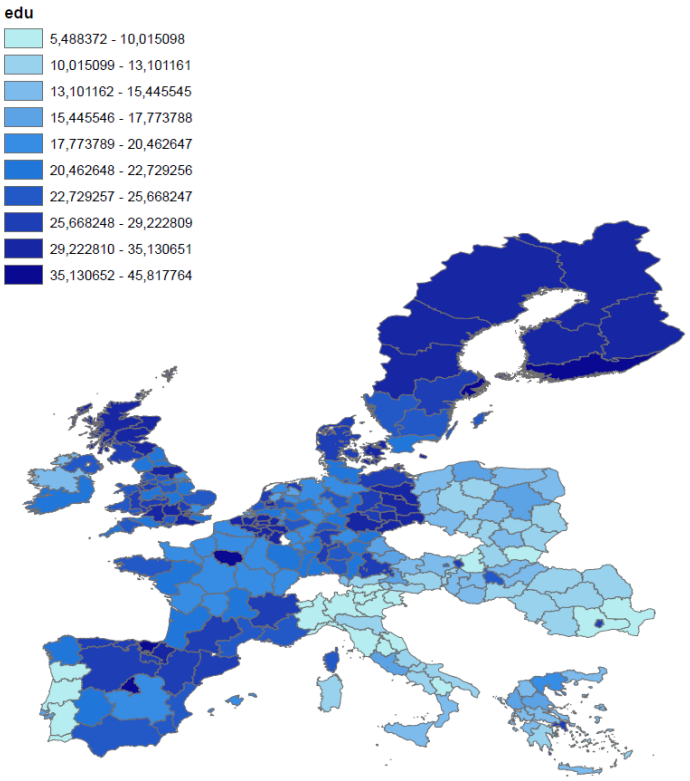
We measured the average educational level of regions by the percentage of tertiary and higher educated in the total population (mapped in figure 7, bottom left). The hypothesized relationship with (employment and productivity) growth is positive, as more skilled people can be more productive, and agglomeration may attract more of these people. Remarkable low scores on this indicator are found in Greece, eastern European regions and Italian regions. In Romania, Bucharest scores high on this indicator.

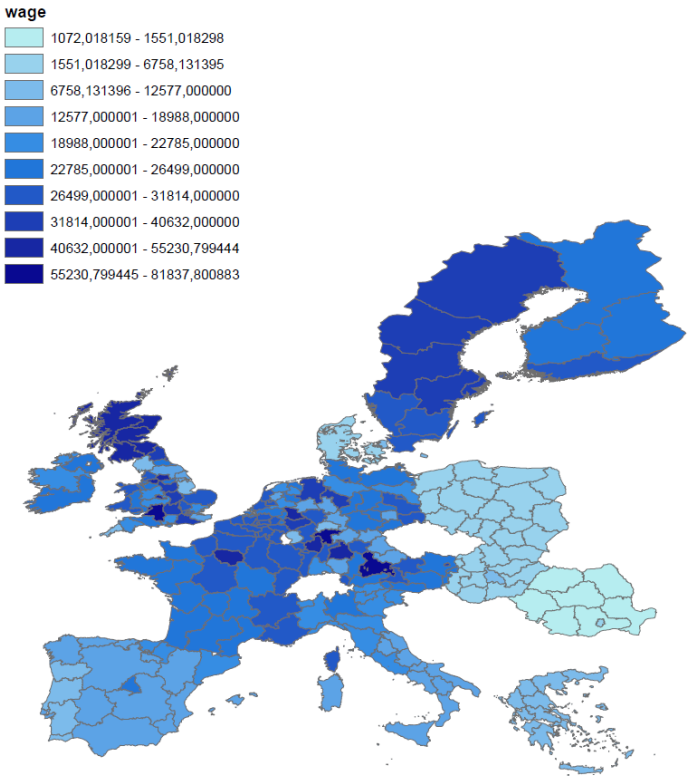
The regional *wage level*, as in indicator of personal income, is hypothesized to positively relate to growth. The wage level variable correlates high with GDP per capita as an indicator. The latter is therefore not included in the analyses. Figure 7 (bottom right) maps this indicator, and shows that average wages are low in eastern European countries, Denmark and Portugal. Average wage levels and productivity levels are highly correlated. In the productivity growth models, the wage level is therefore excluded from the analysis (and productivity level included).

Figure 7: Volume of trade (top left), population density (top right), percentage of higher educated (bottom left) and wage levels (bottom right) in 227 European regions









Finally, one dummy variable is introduced in the OLS-models: for those regions that received objective 1 funding in the period 2000-2006. For Romania, we regarded the pre-accession funds as objective 1 funding as well. Although there is considerable debate on how the impact of these funds on productivity growth should actually be estimated (see Lopez-Roderiguez & Faiña, 2006), using time lags and controlling for the heterogeneity within the funds, we use this indicator to preliminary test for the relation of objective 1 funds with growth – controlled for the many other possible factors influencing growth.

To avoid multicollinearity in our models, we tested for high correlations between all these explanatory variables, and we analyzed Variance Inflation factors for each variable added to models. None of the correlations are disturbingly high (above 0.65) – except for those mentioned above (wage and productivity level, density and accessibility).

1.4 Models on productivity growth and employment growth

We present models for productivity growth (2000-2010) and employment growth (2000-2010) in Tables 2 & 3 and 4 & 5 respectively. Reading from left to right, the first model in table 2 explains productivity growth using explanatory variables according to Ordinary Least Squares (OLS) estimation. The first model presented in table 2, for total productivity growth, confirms the regional convergence hypothesized, witnessed by the negative and significant parameter for the productivity level coefficient. Concerning the agglomeration variables, both density and degree of specialization (with a coefficient of 0.625) are positively related to productivity growth in European regions. We hypothesized that for productivity growth, specialization and not diversification is important. The control variables mostly perform as expected. Investments in private R&D are positively related to productivity growth, but public R&D is negatively related. Public R&D may not have a positive effect because it seems to be (a less productive) substitute for private R&D (compare Guellec & Van Pottelsberghe, 2001). Higher educational levels significantly coincide with higher productivity. The volume of trade is negatively related to growth: the negative spillover effects seem larger than the potential learning effects of interaction. Wage levels appear to be unrelated to productivity growth.

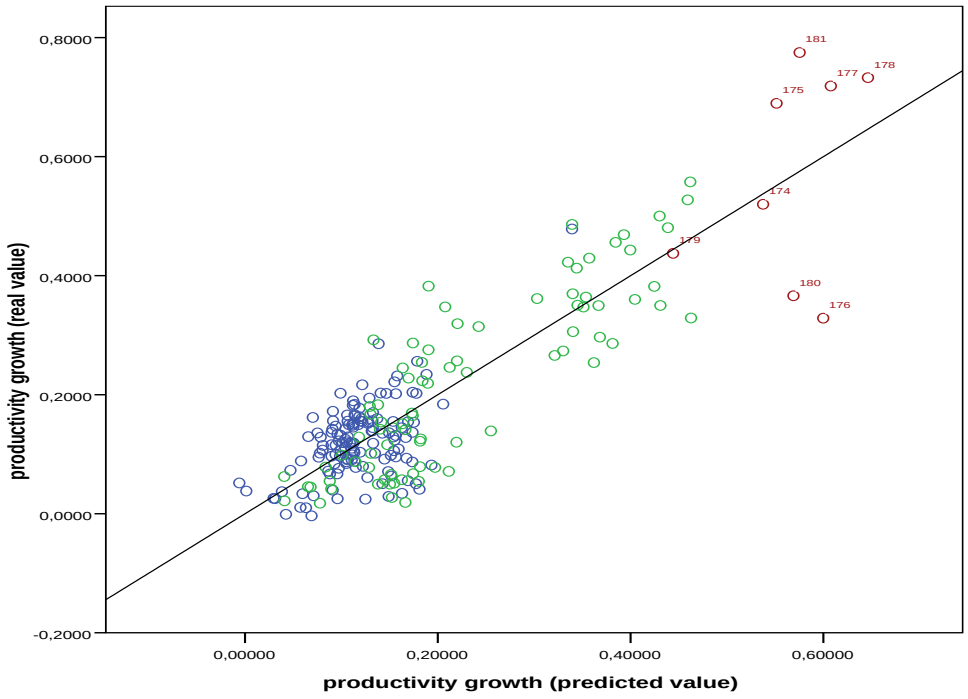
The other six columns in table 2 present models for individual (broadly defined) sectors. In these models, the regional specialization (measured by location its location quotients of production, see section 3 for the explanation of this variable) is added to the models. The general specialization/diversity variables (measured by the Theil coefficient over location quotients)

measures only a general degree of specialization (or its reciprocal: diversity). The fact that a region is specialized in a certain sector may cause this region to grow faster. The model for productivity growth in agriculture shows that many coefficients are similarly significant as in the total growth model. But some differences come to the fore. For agricultural productivity growth, general sectoral diversity is important (according to the significant coefficient for the Theil index of -1.025), and not specialization. Also, the degree of market potential is negatively related (at 10% significance level) to agricultural productivity growth.

Similarly, we can discuss the modelling outcomes of all other sectoral models presented in table 2. We will highlight the most important similarities and deviations from the general growth model (in column 1 in table 2). In all models, the productivity level in 2000 is negatively related to productivity growth the next ten years. This finding of convergence is robust over all sectors. For growth in agricultural productivity specifically, we already noticed that diversity instead of (general) specialization is important. For the traditional and modern manufacturing industries, neither specialization nor diversity is related to productivity growth. For traditional manufacturing, the own local specialization in this is negatively related to productivity growth (a finding found in many studies; compare Van Oort, 2004). The volume of trade is negatively related to growth in this sector. For modern industrial sectors, population density and own specialization are positively related to growth, while market potential is negatively related. For productivity growth in the distribution sector, not much of the variables are found significant, except the degree of general specialization – as in the total growth model. For business and consumer services, a specialization in these sectors does hamper growth. For consumer services, the dummy measuring objective 1 regions is significantly positive attached to growth. For all other sectors and total productivity growth, this was not the case. The consumer service sector is anno 2010 the most important sector in terms of employment level. The explained variance in the sectoral models is considerably lower than that of the total growth model (0.742). This is a common characteristic of sectoral models (Van Oort, 2004) – meaning that unobserved characteristics of regions are responsible for growth as well. Including country level fixed effects to control for these specific, unobserved local factors, does not alter the conclusions much. We can conclude that introducing sectoral heterogeneity in our models provides insights in varying (policy) relevant factors. This is important for policymakers when aiming for productivity growth in regions: there is no one-size-fits-all combination of factors stimulating this. Regional and sectoral specificity explicitly have to be taken into account. The pattern of convergence is robust over all specifications.

Finally, we can plot the predicted value of productivity growth based on the total model presented, against the true, observed value of growth in regions. Figure 8 shows this relationship. The line represents the situation in which the estimated and real value is identical. For Romanian regions, the model predicts correct value of productivity growth for two regions: Nord-Vest (174) and Bucharest Ilfov (179), as they are on the line in figure 8. For two regions, Sudvest (180) and Nord-Est, the predicted value of productivity growth is considerably larger than the real value. For the other four regions, the estimated value is larger than the real value. Besides the variables included in the model, with the level of specialization as the main predictor, other, unobserved characteristics of the Romanian regions cause deviations from the average European productivity growth relation.

Figure 8: Predicted and real values of productivity growth between 2000 and 2010 in 227 European regions



Red: Romanian regions (174 = Nord-Vest, 175 = Centru, 176 = Nord-Est, 177 = Sud-Est, 178 = Sud Muntenia, 179 = Bucharest/Ilfov, 180 = Sudvest Ottenia, 181 = Vest)

Green: other Objective 1 regions,

Blue: non-objective 1 regions.

In table 3, the same types of models of productivity growth split the sample in two regimes: those regions that received objective 1 funds in the period 2000-2006 (including the eight Romanian regions), and those that did not. Regime analysis estimates the two equations simultaneously, and performs a spatial Chow-Wald test to determine the significance of the regime. The estimation program used, Spacestat, also provides information on which variables especially cause the regimes to be different. In table 3, those variables are pair wise marked by a box. The spatial Chow-Wald test for the total productivity growth equation (1.856, with high probability) shows that the two regimes significantly differ. The most important variable, the relationship between productivity growth and the degree of specialization turns out to be relevant in the subset of objective 1 regions, and not in the other regions – as hypothesized. The convergence indicator (productivity level) is negatively related to productivity growth in both objective 1 and non-objective 1 regions. The volume of trade has a negative effect in objective 1

regions and is apparently leading to spillovers in non-objective 1 regions. Private R&D and higher educational level have higher positive coefficients in non-objective 1 regions. The regime analysis also shows that regions receiving objective 1 funds perform fundamentally differently on certain variables than other regions. This is important for policymakers in those regions.

The other columns in table 3 show the OLS-models with regimes for objective 1 and non-objective 1 regions for the six broad sectors defined. The most consistent outcomes over these models, are the role of convergence (all regions with low levels of productivity, grow faster in it than other regions) and the role of higher education in objective 1 regions (including the Romanian regions). Also, private R&D is practically always positively attached to productivity growth. Investments in the regional knowledge economy, in education and R&D, thus seem profitable strategies for (Romanian) regions for growth. The variable of our main interest, the degree of specialization and diversity, shows changing signs and degrees of significance for different sectors. For agricultural productivity growth in objective 1 regions, and for modern industrial productivity growth in objective 1 regions, a diversified economic structure is positive. For growth in productivity in distribution, a specialized sectoral structure is profitable. The own specialization of sectors in a region is in general not profitable, especially for traditional industry, distribution, consumer services and business services.

The sectoral regime analysis shows the complexity of regional productivity growth, and its determining factors. Again, the heterogeneity found makes clear that policies and strategies for productivity improvement should be tailor made on specific regions. Investments in the knowledge economy (educational level and business R&D) are in general the most promising factors to be stimulated – focused on the specific sectoral specializations in (objective 1) regions.

Table 2: Modelling outcomes for regional productivity growth (2000-2010): OLS-models (n=227)

OLS-models	**Productivity growth**						
	Total	Agricult.	Trad. Ind.	Mod. Ind	Distrib.	Bus. Serv.	Cons. Serv.
Constant	0.495**	1.988**	0.48	0.924**	-0.054	0.201	0.98
	-2.529	-3.311	-1.26	-2.188	(-0.073)	-0.189	-0.87
Productivity level (ln)	-0.177**	-0.221**	-0.117**	-0.050**	-0.154**	-0.242**	-0.297**
	(-16.752)	(-8.047)	(-5.611)	(-1.998)	(-4.969)	(-3.772)	(-6.529)
Population density (ln)	0.009	-0.003	0.014	0.034**	0.021	-0.003	0.002
	-1.622	(-0.094)	-1.259	-2.8	-0.99	(-0.092)	-0.071
Specialization - diversity	0.625**	-1.025**	0.069	-0.162	1.006**	0.407	0.496
	-5.496	(-2.391)	-0.314	(-0.653)	-2.372	-0.745	-0.782
Own specialization	-	0.006	-0.117**	0.063**	-0.016	-0.189*	-0.063*
	-	-0.221	(-5.611)	-3.442	(-0.592)	(-1.739)	(-1.899)
Objective 1 (dummy)	-0.016	0.067	0.023	0.024	-0.018	-0.079	0.195**
	(-1.051)	-1.211	-0.781	-0.751	(-0.325)	(-1.136)	-2.379
Private R&D (ln)	0.017**	0.043**	0.039**	0.031**	-0.004	0.017	-0.04
	-2.895	-1.997	-3.39	-2.269	(-0.073)	-0.624	(-1.217)
Public R&D (ln)	-0.010**	-0.041**	-0.017	-0.028**	0.004	-0.003	-0.022
	(-1.959)	(-2.096)	(-1.611)	(-2.470)	-0.179	(-0.119)	(-0.750)
Higher education (ln)	0.056**	0.005	0.145**	0.103**	0.100*	0.129*	0.130*
	-3.897	-0.086	-5.03	-3.415	-1.896	-1.915	-1.69
Volume of Trade (ln)	-0.012	0.024	-0.039**	-0.005	-0.053	0.013	0.055
	(-1.669)	-0.919	(-2.737)	(-0.312)	(-0.179)	-0.373	-1.068
Market potential (ln)	0.017	-0.133*	0.009	-0.089**	0.031	0.034	-0.081
	-0.846	(-1.815)	-0.238	(-2.063)	-0.407	-0.347	(-0.710)
Adjusted R2	0.742	0.395	0.249	0.162	0.199	0.22	0.225

* p<0.1; ** p<0.05; t-values in parentheses.

Table 3: Modeling outcomes for regional productivity growth (2000-2010): OLS-models with regimes for Objective 1 regions (n=227)

OLS-models (regimes)	**Productivity growth**							
	Total		**Agricult.**		**Trad. Ind.**		**Mod. Ind.**	
	Obj.1	Non-obj.1	Obj.1	Non-obj.1	Obj.1	Non-obj.1	Obj.1	Non-obj.1
Constant	0.445*	0.305	2.511**	0.786	0,045	0,504	1.536**	-0.449
	-1.63	-1.021	-2.161	-0.733	-0.081	-0.901	-2.516	(-0.735)
Productivity level (ln)	-0.169**	-0.096**	-0.211**	-0.168**	-0.153**	-0,036	-0.048	0.078
	(-14.190)	(-2.247)	(-6.048)	(-1.967)	(-5.645)	(-0.705)	(-1.534)	-1.536
Population density (ln)	-0.007	0.006	0.01	-0.045	-0.001	0,015	0.068**	-0.007
	(-0.795)	-0.896	-0.194	(-1.147)	(-0.034)	-1.024	-3.562	(-0.436)
Specialization - diversity	0.754**	0.069	-1.132**	-0.9	0.044	-0,301	-0.06	-0.950**
	-5.375	-0.311	(-2.062)	(-1.122)	-0.161	(-0.685)	(-0.205)	(-2.042)
Own specialization	-	-	-0.013	-0.016	-0.075**	0,025	0.086**	0.133
	-	-	(-0.209)	(-0.424)	(-2.055)	-0.611	-3.737	-0.418
Private R&D (ln)	0.012*	0.017**	0.039	0.042	0.059**	0,017	0.037**	0.005
	-1.565	-2.02	-1.248	-1.32	-3.587	-1.037	-2.019	-0.287
Public R&D (ln)	-0.003**	-0.004	-0.085**	-0.016	-0.057*	-0,002	-0.086**	0.001
	(-2.119)	(-0.673)	(-2.246)	(-0.683)	(-2.744)	(-0.143)	(-4.175)	-0.1
Higher education (ln)	0.061**	0.075**	0.0001	0.043	0.172**	0.147**	0.224**	0.121**
	-2.403	-4.077	-0.001	-0.609	-3.385	-3.954	-4.361	-3.236
Volume of Trade (ln)	-0.007	-0.020**	0.05	-0.008	-0.023	-0.045**	-0.011	-0.007
	(-0.061)	(-2.172)	-1.182	(-0.218)	(-0.989)	(-2.521)	(-0.443)	(-0.379)
Market potential (ln)	0.008	0.012	-0.220**	0.015	0.053	-0,018	-0.208**	0.021
	-0.309	-0.403	(-2.026)	-0.13	-0.95	(-0.309)	(-3.331)	-0.352
Adjusted R2	0.75		0.387		0.26		0.255	
Spatial Chow-Wald test	1.856	-0.06	0.758	-0.669	1.285	-0.24	3.653	0

* p<0.1; ** p<0.05; t-values in parentheses. Coefficients that significantly differ over regimes are boxed.

Table 3 continued

OLS-models (regimes)	**Productivity growth (continued)**					
	Distrib.		**Business Serv.**		**Consumer Serv.**	
	Obj.1	Non-obj.1	Obj.1	Non-obj.1	Obj.1	Non-obj.1
Constant	-0.68	-0.111	-1.239	1.077	1.458	0,548
	(-0.690)	(-0.105)	(-0.846)	-0.687	-0.92	-0.336
Productivity level (ln)	0.011	-0.092	-0.126	-0.280**	-0.052	-0.450**
	-0.239	(-0.701)	(-1.612)	(-2.152)	(-0.681)	(-8.102)
Population density (ln)	0.073**	-0.022	0.045	-0.018	0.043	-0.012
	-2.202	-0.782	-0.97	(-0.444)	-0.895	(-0.265)
Specialization - diversity	1.663**	0.22	0.075	0.718	1.155	0.505
	-3.287	-0.284	-0.116	-0.725	-1.513	-0.432
Own specialization	-0.500**	0.144	-0.729**	0.254	-0.217**	-0.017
	(-7.220)	-1.027	(-4.938)	-1.553	(-2.662)	(-0.460)
Private R&D (ln)	-0.025	0.032	-0.024	0.026	-0.031	-0.056
	(-0.865)	-1.056	(-0.633)	-0.688	(-0.685)	(-1.216)
Public R&D (ln)	0.037	-0.024	0.034	-0.023	0.074	-0.062*
	-1.002	(-1.041)	-0.735	(-0.771)	-1.313	(-1.763)
Higher education (ln)	0.053	0.132**	0.204**	0.117	0.01	0.126
	-0.593	-2.01	-1.765	-1.315	-0.069	-1.22
Volume of Trade (ln)	-0.048	-0.05	0.011	-0.009	0.03	0.041
	(-1.202)	(-1.480)	-0.219	(-0.204)	-0.473	-0.809
Market potential (ln)	0.059	0.076	0.065	-0.003	-0.195	0.023
	-0.596	-0.7	-0.486	(-0.020)	(-1.231)	-0.135
Adjusted R2	0.285		0.306		0.284	
Spatial Chow-Wald test	3.493	0	3.717	0	3.273	-0.001

* p<0.1; ** p<0.05; t-values in parentheses.

Coefficients that significantly differ over regimes are boxed.

Table 4: Modelling outcomes for regional employment growth (2000-2010): OLS-models (n=227)

OLS-models	**Employment growth**						
	OLS						
	Total	Agricult.	Trad. Ind	Mod. Ind.	Distr.	Bus. Serv.	Cons. Serv.
Constant	0.781**	-0.461	-0.136	1.751**	0.745**	0.993**	0.061
	-3.117	-0.791	(-0.384)	-3.088	-2.728	-3.304	-0.304
Employment level (ln)	-0.528**	-0.079**	0.072**	-0.068**	0.002	0.081**	-0.015
	(-3.788)	(-2.903)	-3.736	(-2.405)	-0.122	-4.362	(-1.175)
Population density (ln)	0.009	0.040*	-0.045**	-0.048**	-0.01	-0.006	0.002
	-1.506	-1.867	(-4.904)	-2.763	(-1.354)	(-0.728)	-0.384
Specialization - diversity	-0.323**	-0.818**	0.234	-0.124	0.084	-0.316**	-0.134
	(-2.640)	(-2.725)	-1.263	(-0.348)	-0.577	-1.975	(-1.169)
Own specialization	-	0.039*	-0.032	-0.04	0.026*	0.043**	0.017**
	-	-1.82	(-1.176)	(-1.083)	-1.637	(-1.959)	-3.295
Objective 1 (dummy)	0.001	0.016	-0.0037	0.0012	0.0053	-0.016**	0.0136
	-0.351	-1.373	(-0.520)	-0.859	-0.982	(-2.701)	-3.271
Private R&D (ln)	-0.01	-0.008	0.007	0.051**	0.005	0	-0.003
	(-1.559)*	(-0.497)	-0.714	-2.559	-0.59	(-0.038)	-0.462
Public R&D (ln)	-0.005	0.023*	0.014	0.028*	-0.01	0.01	-0.015**
	(-0.014)	-1.679	-1.56	-1.798	(-1.439)	-1.326	(-2.697)
higher education (ln)	0.036**	-0.056	-0.03	0.075*	0.071**	-0.028	0.034**
	-2.336	(-1.420)	(-1.270)	(-1.720)	-3.914	(-1.398)	-2.419
Openness economy (ln)	0.054**	0.078**	-0.050**	0.028	0.009	-0.058**	0.021*
	-3.569	-2.276	(-2.290)	-0.813	-0.5	(-3.270)	-1.655
Market potential (ln)	-0.098**	-0.075	-0.001	-0.038	0.061**	-0.111**	-0.046**
	(-4.388)	(-1.367)	(-0.032)	(-0.615)	-2.297	-3.786	(-2.218)
Wage level (ln)	0.032**	0.117**	0.005	-0.051*	-0.035**	0	0.037**
	-2.622	-3.454	-0.265	(-1.647)	(-2.572)	(-0.011)	-3.918
Adjusted R2	0.296	0.343	0.267	0.231	0.231	0.36	0.258

* p<0.1; ** p<0.05; t-values in parentheses.

Table 5: Modelling outcomes for regional employment growth (2000-2010): OLS-models with regimes for Objective 1 regions (n=227)

OLS-models (regimes)	**Employment growth (continued)**							
	Total		**Agricult.**		**Trad. Ind.**		**Mod. Ind.**	
	Obj.1	Non-obj.1	Obj.1	Non-obj.1	Obj.1	Non-obj.1	Obj.1	Non-obj.1
Constant	0.14 7	1.036**	-0.45	0.649	-1.535**	1.030**	-0.343	2.141**
	-0.432	-2.618	(-0.572)	-0.881	(-3.166)	-1.907	(-0.403)	-2.368
Employment level (ln)	-0.03	0.017	-0.077**	-0.052	0.119**	0.060*	-0.119**	0.085
	(-1.455)	-0.504	(-3.129)	(-1.160)	-3.798	-1.795	(-3.510)	-1.387
Population density (ln)	0.011	0.014*	0.134**	0.048**	-0.061**	-0.025**	-0.090**	-0.02
	-1.191	-1.688	-3.792	-1.934	(-4.020)	(-2.078)	(-3.119)	(-0.911)
Specialization - diversity	-0.088	-0.870**	-0.735**	0.549	0.298	0.533	-0.479	0.1
	(-0.591)	(-2.316)	(-2.216)	-1.058	-1.357	-1.328	(-1.159)	-1.385
Own specialization	-	-	0.240**	0.046	-0.076*	-0.061*	-0.113**	-0.076
	-	-	-4.92	-1.363	(-1.838)	(-1.613)	(-2.432)	(-1.253)
Private R&D (ln)	-0.011	-0.007	0.002	-0.026	0.009	0.015	0.102**	0.028
	(-1.257)	(-0.772)	-0.116	(-1.343)	-0.63	-1.128	-3.716	-1.054
Public R&D (ln)	-0.019*	0.003	0.011	0.032**	-0.014	0.011	0.02	0.018
	(-1.675)	-0.378	-0.448	-2.174	(-0.779)	-1.058	-0.646	-1.001
Higher education (ln)	0.057**	0.019	0.042	-0.114**	0.033	-0.099**	-0.181**	-0.071
	-2.13	-0.984	-0.707	(-2.646)	-0.813	(-3.292)	(-2.495)	(-1.368)
Volume of Trade (ln)	0.048**	-0.017	0.044	0.05	-0.066**	-0.041	0.055	-0.088
	-2.297	(-0.532)	-1.367	-1.089	(-2.022)	(-1.114)	-1.213	(-1.320)
Market potential (ln)	-0.112**	-0.104**	-0.254**	-0.033	0.063	-0.072	0.332**	-0.133
	(-3.652)	(-3.203)	(-3.738)	(-0.468)	-1.329	(-1.483)	-3.393	(-1.566)
Wage (ln)	0.073**	-0.011	0.231**	-0.036	0.039	-0.029	-0.101**	-0.067
	-3.76	(-0.647)	-5.954	(-0.922)	-1.208	(-1.158)	(-2.217)	(-1.492)
Adjusted R2	0.348		0.498		0.331		0.336	
Spatial Chow-Wald test	2.651	-0.005	4.652	0	2.818	-0.002	4.062	0

* p<0.1; ** p<0.05; t-values in parentheses. Coefficients that significantly differ over regimes are boxed.

Table 5 (continued)

OLS-models (regimes)	**Employment growth**					
	Distrib.		**Business Serv.**		**Consumer Serv.**	
	Obj.1	Non-obj.1	Obj.1	Non-obj.1	Obj.1	Non-obj.1
Constant	0.327	0.980**	-0.112	2.390**	0.29	0.345
	-0.889	-2.34	(-0.280)	-5.051	-1.034	-0.978
Employment level (ln)	0.019	-0.029	0.137**	-0.086**	0.001	0.023
	-0.722	(-0.824)	-5.655	(-2.352)	-0.042	-0.871
Population density (ln)	0.004	-0.013	-0.027**	0.015	0.004	0.007
	-0.326	(-1.309)	(-2.165)	-1.553	-0.496	-0.863
Specialization - diversity	0.430**	-0.686**	0.495**	-0.599*	0.026	-0.066
	-2.43	(-2.266)	-2.661	(-1.858)	-0.188	(-0.278)
Own specialization	0.025	0.017	-0.029	-0.051*	0.008	0.019**
	-1.34	-0.584	(-0.874)	(-1.743)	-0.586	-3.237
Private R&D (ln)	0.002	-0.008	0.019*	-0.017	-0.007	-0.007
	-0.213	(-0.791)	-1.744	(-1.415)	(-0.911)	(-0.778)
Public R&D (ln)	-0.049**	0.006	-0.013	0.016*	-0.037**	-0.007
	(-3.681)	-0.818	(-0.911)	-1.734	(-3.344)	(-1.135)
Higher education (ln)	0.102**	0.088**	0.015	-0.035	0.052**	0.029
	-3.249	-3.884	-0.458	(-1.414)	-2.062	-1.548
Volume of Trade (ln)	0.011	0.023	-0.083**	0.096**	0.017	-0.02
	-0.44	-0.694	(-3.720)	-2.742	-1.025	(-0.075)
Market potential (ln)	-0.101**	-0.070*	-0.023	-0.193**	-0.140**	-0.044
	(-2.787)	(-1.807)	(-0.604)	(-4.624)	(-4.691)	(-1.397)
Wage (ln)	0.003	-0.026	-0.02	-0.012	0.080**	0.001
	-0.118	(-1.323)	(-1.046)	(-0.609)	-6.48	-0.031
Adjusted R2	0.287		0.44		0.291	
Spatial Chow-Wald test	2.544	-0.005	4.485	0	2.861	-0.002

* p<0.1; ** p<0.05; t-values in parentheses.

Coefficients that significantly differ over regimes are boxed.

Tables 4 and 5 show similar models for employment growth across the European regions. In these models, the average wage level is included in the analysis (it was left out of the productivity growth analyses because of a high correlation with productivity level). Most important, and as hypothesized, the degree of diversity (and not the degree of specialization) is positively linked to growth, especially in non-objective 1 regions (the economic core regions of Europe).[4] This result holds over the sectoral models of employment growth in agriculture and in business services as well. Contrary to the productivity growth analyses, own regional specialization in a certain sector is in general positively attached to employment growth in that sector. Private and public R&D are not as clearly (positively) linked to employment growth as to productivity growth (except for employment growth in modern industries). For employment, we also notice a limited process of "convergence", as regions with a low level of employment show faster growth, but the regime analysis indicates that this is especially the case in the objective 1 regions. The volume of trade is in general positively attached to employment growth, but especially so in objective 1 regions. Again, the educational level is a factor that is positively attached to growth in practically all models. Owns specialization is good for business services sectors only. Objective 1 funding is, again, positively attached to employment growth in consumer services.

1.5 Conclusions and policy implications

In this chapter, we investigated the contribution of agglomeration economies to economic growth in European regions that received objective 1 funds as compared to regions that did not. We found, in line with our hypothesis, that employment growth is more related to a diverse economy in non-objective 1 regions, while productivity growth links to specialized objective 1 regions. The type of agglomeration economies (specialization or diversity) related to the type of growth is crucial for future long-term development prospects of regions. Our analysis suggests that at least the large objective 1 regions should increasingly diversify their economy to reap long-term innovation and employment. Investments in higher education and (business) R&D are the most clear strategies to be taken by local policymakers (in objective 1 regions, e.g. in Romania). Applying regime analysis and presenting models for different distinctive sector, we find that these general relationships do not hold for all specifications.

[4] Note that a negative relation between specialization and employment implies a positive relation between diversity and employment.

The heterogeneity in significant results indicates that policies for productivity growth as well as for employment growth should be tailor made and region and sector specific.

This outcome favors a focus on place-based development, as advocated recently by the European Union. Since its inception, European cohesion policy has been a subject of criticism (Bachtler & Wren, 2006; Martin & Tyler, 2006). Manzella (2009) summarizes main criticisms and concludes that it has developed into a 'catch-all' policy without a clear mission and has insufficiently focus on growth. One of the biggest problems to proponents of Cohesion policy is the difficulty in providing a credible economic case for the policy, which is based on conclusive evidence of effective results (Lopez-Rodriguez & Faiña, 2006). In the recent discussion on the future of Cohesion policy, fuelled by Barca (2009), both critics and supporters have tended to agree on the need for a "modernization" of the policy, in recognition of the weakness in the current approach and of the emerging challenges faced by the European economy, society and broader integration process. In this context of reform, it is of ever more importance to have insight in the relation between types of agglomeration economies, the economic structure of regions and regional economic development in regions with and without structural funds.

Besides the testing of this central hypothesis and its policy implications, this chapter aimed at answering six related research questions. We will discuss these now in more detail, also mentioning further lines for research.

(1) How should agglomeration economies be measured, and what theoretical and conceptual frameworks are relevant for that?

In our analysis, we measured agglomeration economies in two ways: as the degree of population density, measuring agglomeration per se. This indicator turns out to be positively related to several sectors, and negative to others. Positive relations are found with employment growth in agriculture and productivity growth in distribution activities and industrial activities in objective 1 regions. Negative relations are found between employment growth in industrial sectors and density. The other measurement of agglomeration economies concerned the specialization/diversity indicator. We found, in line with our hypothesis, that employment growth is more related to a diverse economy in non-objective 1 regions, while productivity growth links to specialized objective 1 regions. There is much debate on the measurement of agglomeration economies (Melo et al, 2009). The line of causality is often

questioned (does agglomeration lead to growth, or do growing regions attract more firms and thus enhance agglomeration?), and more research on that issue in the context of European economic growth is needed. Another discussion focuses on the exact transfer mechanisms that lead to agglomeration advantages for firms. Important contributions (see for an overview De Graaff et al., 2011) have so far identified efficiency effects in intermediate products, available varieties in production, regional knowledge spillovers fuelled by labour mobility, spinoff dynamics, informal networking and research collaboration, shared intermediate and labour markets and urbanization and density advantages of services and infrastructure. Linking these mechanisms to growth in European regions in empirical research requires big efforts.

(2) What is the spatial pattern (mapping) of productivity growth and regional employment growth across European regions?

We found clear differences in the levels of employment and productivity across the 227 European regions, as well as significant variations in growth figures. Objective 1 regions grow very fast in productivity (starting from low base values though), and the non-objective 1 regions perform better in employment growth. Our models do not distinguish in the types of jobs provided by growth. A common belief is that specializations of regions are not identical over Europe, causing different development trajectories to emerge, with some regions specializing in qualitatively high-level jobs, and others in low or medium level jobs. The European Union focuses on this issue lately in the debate on "smart specialization", aiming for investments in specializations in regions that are in line with the current activities present.

(3) Are regional productivity growth and employment growth patterns displaying converge?

Productivity growth certainly shows clear signs of convergence, in general and in specific sectors as well. Employment growth shows much less so. This might be due to the relation with different agglomeration circumstances, as researched in this chapter.

(4) What is the relation between objective 1 funding and regional economic development?

The only direct positive relation of objective 1 funding with growth is found for consumer service activities, like retail, schools and public services. In the long run, this might not de that sustainable for growth, as these activities are solely dependent on the living population in regions. It would be more interesting to find a relation between basic sectors that add value to the economy) production, distribution and business services), as this may lead to long term locational advantage. More research on this issue is needed (compare De Graaff et al., 2011).

(5) How do the Romanian regions perform on the indicators and estimated relations, and what can be learned from (causal relations in) other European regions?

The Romanian regions grow very fast in productivity (starting from low initial levels), but less in employment growth. The city of Bucharest shows very high growth figures. The Romanian regions are catching up to the average European levels of productivity – but there is a long way to go in this. Long term investments in the knowledge economy (education and R&D) are necessary, also preventing the most talented (and younger) employees to leave for job opportunities elsewhere in Europe.

CHAPTER 2. RELATED VARIETY WITHIN THE SMART SPECIALISATION AGENDA[5]

Abstract

This chapter introduces indicators of regional related variety and unrelated variety to conceptually overcome the current impasse in the specialisation-diversity debate in agglomeration economics. Although various country-level studies have been published on this conceptualisation in recent years, a pan-European test has until now been missing from the literature. A pan-European test is more interesting than country-level tests, as newly defined cohesion policies, smart-specialisation policies, place-based development strategies and competitiveness policies may be especially served by related and unrelated variety conceptualisations.

We test empirically for the significance of variables based on these concepts, using a cross-sectional dataset for 205 European regions during the period 2000-2010. The results confirming our hypotheses are that related variety is significantly related to employment growth, especially in small and medium sized city-regions, and that specialisation is significantly related to productivity growth. We do not find robust relationships that are hypothesised between unrelated variety and unemployment growth.

Key words: *related variety, smart specialisation, medium-sized city regions, Cohesion Policy*

[5] This chapter is based on the paper "Related variety and regional economic growth in a cross-section of European urban regions" published in *European Planning Studies*, on June 4, 2014, DOI: 10.1080/09654313.2014.905003

2.1 Related variety and smart specialisation

This chapter focuses on agglomeration circumstances influencing economic growth across European urban regions. Empirical studies on agglomeration economies are characterised by a high diversity of approaches. Rosenthal and Strange (2004) present a brief review of papers focusing on urbanisation economies as advantages of cities applying to every firm or consumer. Noteworthy is that most early (pre-1990s) works on agglomeration simply used cities' population as a measure of agglomeration. These studies assume that the population elasticity of productivity is constant. Rosenthal and Strange (2004) conclude that this literature has found relatively consistent evidence: doubling the population of a city increases productivity by 3-8%. Since the findings of Glaeser et al. (1992), who studied sectoral agglomeration effects more than the aggregated effect, it has become more commonplace to analyse growth variables using employment in cities, suggesting a relationship between agglomeration and economic growth and thereby introducing the possibility that increasing returns in an urban context operate in a dynamic, rather than static, context (De Groot et al., 2009; Melo et al. 2009; Beaudry and Schiffauerova, 2009). Sector-specific localisation economies, stemming from input-output relations and firms' transport cost savings, human capital externalities and knowledge spillovers, are generally offset against the general urbanisation economies. A large body of literature builds on this new conceptualisation of agglomeration economies, as reflected in three recent overviews and meta-studies. These studies show that the relation between agglomeration and growth is ambiguous and indecisive with regard to whether specialisation or diversity is facilitated by (sheer) urbanisation as context. The first goal of this chapter is to take a step towards the concept of renewal as a possible way out of this currently seemingly locked-in debate and to introduce related and unrelated variety as concepts in the empirical modelling of growth across European regions. These concepts have until now been tested only at the country level in Europe[6], and no pan-European test has been provided due to data limitations. This chapter provides a first pan-European test of these concepts.

The second goal of the chapter is to contribute to the recent policy discussion on place-based or place-neutral development strategies in the European Union. This debate is highlighted in the context of a series of recent major policy reports: the place-neutral policies in the 2009

[6] Studies using the same methodology report similar results in Great Britain (Bishop and Gripaios 2010, Essletzbichler 2013), Italy (Boschma and Iammarino 2009, Quatraro 2010, Antonietti and Cainelli 2011, Cainelli and Iacobucci 2012, Mameli et al 2012), Germany (Brachert et al 2011), Finland (Hartog et al 2011), Spain (Boschma et al. 2012, 2013), the US (Castaldi et al 2013).

World Bank report (World Bank, 2009) and the European place-based development strategies in the studies of Barca (2009) and Barca et al. (2012). As highlighted by Van Oort & Bosma (2013) and Barca et al. (2012), place-neutral strategies rely on the agglomerative forces of the largest cities and metropolitan regions to attract talent and growth potential. Place-based development strategists claim that the polycentric nature of a set of smaller and medium-sized cities in Europe (often also called 'second-tier' cities), each with its own peculiar characteristics and specialisation in the activities to which it is best suited, creates fruitful urban variety, which optimises economic development. This perspective implies that medium-sized city-regions have not declined in importance relative to larger urban ones, a proposition that has indeed been indicated in monitoring publications by the OECD (2009, 2011 and 2012). Until now, however, there has been little empirical support for explanations based on the concepts of related and unrelated variety and sectoral specialisation.

The analysis in this chapter is positioned in the present European policy context of smart specialisation. Presently, European regional policies advocate the identification of regional competitive advantages by capturing partially unexploited resources, expertise and unidentified growth potential (McCann and Ortega-Argiles, 2011). On the one hand, Europe has regions with cities that act as growth fuels by fitting perfectly in the knowledge society, using advanced technological levels and enhancing innovation. On the other hand, a significant part of places (mostly in the recent CEE member states) are still overshadowed by their past outdated heavy industrial activities, which prevent their economies from diversifying. Smart specialisation European policies have a particular focus on these regions, as they advocate identification of knowledge sectors and knowledge initiatives within industrial sectors which can lead to innovative ideas and new markets. However, not all regions can be innovators. Therefore, regions can project smart specialisation features by being "followers". Some regions can bring new technological products while others can develop further the new markets through additional services and features (Wintjes and Hollanders, 2011). A series of regional policy papers define the guidelines of smart specialisation implementation (Pontikakis et al., 2009; Foray and Goenaga, 2013; Foray and Rainoldi, 2013). The literature also identified several case studies which show good practices of smart specialisation agendas (Ortega-Argiles, 2012). The ongoing debate regarding 'smart' policies is extensive (Morgan, 2013; Arancegui et al., 2011). This chapter, in line with the literature on agglomeration, introduces related variety as an indicator for innovation in Europe

(Frenken et al., 2007). Related variety implies transfer of knowledge within the same sector and development of new products and markets.

For our empirical testing, we use a fairly standardised setup entailing the cross-sectional modelling of agglomeration externalities and economic growth (employment growth and productivity growth between 2000 and 2010) that distinguishes among various drivers of localised growth processes. In line with Dogaru et al. (2011), we show that this type of modelling is informative for competitive and cohesive growth policies in the European Union, especially those with a focus on the role of medium-sized urban regions.

This chapter is structured as follows. Section 2 introduces the current locked-in debate on specialisation versus diversity dominance in agglomeration economics. This section shows that the dominance of neither concept can be established and that conceptual renewal is needed to move past this controversy. Section 3 introduces related and unrelated variety as such a conceptual renewal to act in empirical modelling instead of generalised indicators for urbanisation economies that have usually been applied in modelling. This section ends with three hypotheses concerning the effects of related variety, unrelated variety and sectoral specialisation on regional economic development. A fourth hypothesis is formulated based on smaller and medium-sized European regions in relation to economic development. Section 4 introduces the data and variables used in our regional cross-sectional growth models. Section 5 presents our modelling outcomes for regional employment growth, productivity growth and unemployment growth for the period 2000-2010. Section 6 concludes and directly addresses the four hypotheses and the issues of place-based development strategies.

2.2 Agglomeration economies between specialisation and diversity

Agglomeration economies in relation to urban and regional growth are receiving attention in an ever-burgeoning literature on its causes, magnitude and (policy) consequences. This rise of agglomeration economies in economic and geographical studies has met much criticism (McCann and Van Oort, 2009). Some observers have argued that the modern treatment of agglomeration economies and regional growth in fact represents a rediscovery by economists of well-rehearsed concepts and ideas with a long pedigree in economic geography. Several criticisms of the monopolistic modelling logic underpinning New Economic Geography have come from economic geography schools of thought and from both orthodox and heterodox schools of economics. Conversely, advocates of relatively new economic approaches, such as

institutional economics and evolutionary economic geography, argue that their analyses do provide insights into spatial economic phenomena that were previously unattainable under existing analytical frameworks and toolkits.

A prime example of potential gains of different theories and conceptual frameworks is the specialisation-diversity debate in the urban economics and economic geography literatures. Should regions and cities specialise in certain products or technologies to locally gain from economies of scale (in so-called clusters), shared labour markets and input-output relations, or should regions diversify over various products and industries and hence have both growth opportunities from inter-industry spillovers as well as portfolio advantages that hedge a regional economy in times of economic turmoil? This question has captured the attention of many researchers over the last two decades, following papers by Gleaser et al. (1992) and Henderson et al. (1995) that, respectively, advocate sectoral diversity and specialisation as the main economic-geographic circumstance propagating growth. The dichotomy specialisation-diversity has ever since been treated as a rather strict division – many studies try to find the definitive answer to the question "Who is right: Marshall or Jacobs?" (quoted from the title of Beaudry and Schiffauerova, 2009). Although practically every study conducted in the framework tries to conclude that either specialisation or diversity is a driver of growth and innovation, the studies by Van Oort (2004), Paci and Usai (2000), Neffke et al. (2011) Shefer and Frenkel (1998), Duranton and Puga (2001) and O'Huallachain and Lee (2011) prove that this is in fact not an "either-or" question, finding that both specialisation and diversity matter for regional economic performance – on different geographical levels, for different time periods, over the industry life-cycle and in different institutional settings.

That the specialisation-diversity issue is not an "either-or" question has now been concluded by two meta-studies and an extensive overview of all published empirical analyses on this matter (De Groot et al. 2009; Melo et al. 2009; Beaudry and Schiffauerova, 2009). From these three overviews, it becomes clear that the specialisation-diversity debate appears to become an unproductive line of argument in addressing the nature, magnitude and determinants of agglomeration externalities (see also Desrochers & Leppald 2011). The answer to the "either-or" diversity-specialisation question is at best inconclusive, with outcomes being dependent on measurement in many respects (e.g., scale, composition, context, period, type of performance indicators). Aside from these methodological issues, the many tests provided do not actually measure knowledge transfer or knowledge spillovers (Van Oort & Lambooy, 2014) – one of the main mechanisms supposed to drive agglomeration economies. Finally,

theoretically the debate focuses on the old theory of agglomeration as introduced by Marshall (1890) and does not use insights from newly developed theoretical models and conceptualisations in evolutionary and institutional geographical approaches.

2.3 Conceptual renewal and hypotheses: related and unrelated variety, specialisation and place-based development

The divergence observed in the literature concerning diversification and specialisation, in addition to the observed differences in measurements of classifications and methodological issues, is most likely related to the weak conceptualisation and limited theoretical underpinning of the concepts. New theoretical developments in institutional and evolutionary economic geography have recently emerged, offering heterodox economic explanations for the regional economic development and the role of relatedness and diversification (Boschma and Martin, 2010). For economic geographers, as well as institutional and evolutionary economists working in this tradition, cultural and cognitive proximity are deemed to be equally as important as geographical proximity in the transmission of ideas and knowledge (Boschma, 2005). Boschma and Lambooy (1999) further argue that the generation of local externalities are also crucially linked to the importance of variety and selection in terms of the 'fitness' of a local milieu. The now-burgeoning tradition in evolutionary economic geography has prompted the question of whether concepts of diversification and specialisation may fully capture the complex role of variety within the capitalist economy. This development has led to a recent revival of interest in the role of specific forms of variety, specifically related and unrelated variety (Frenken et al. 2007). Jacobs (1969) initiated the idea that the variety of a region's industry or technological base may affect economic growth. Frenken et al. (2007) state that variety and diversification consist of related and unrelated variety, arguing that not simply the presence of different technological or industrial sectors will trigger positive results but that sectors require complementarities that exist in terms of shared competences. This need induces a distinction in related and unrelated variety because knowledge spillovers will not transfer to all different industries evenly, due to the varying cognitive distances between each pair of industries. It is argued that industries are more highly related when they are closer to each other within the SIC classification system. Frenken et al. (2007) find that for Dutch urban regions, the positive results of knowledge spillovers are higher in regions with related variety, whereas regions characterised by unrelated variety are better hedged for economic shocks (portfolio effect). The authors also find marked differences between employment

growth and productivity growth. An interesting theoretical contribution to the specialisation-variety debate that focuses on these explained variables has been provided by lifecycle theory, which holds that industry evolution is characterised by product innovation (and more employment growth) in a first stage and process innovation (and more productivity growth) in a second stage. This distinction does not imply that product innovation occurs exclusively at the time of birth of a new industry, with process innovation only occurring thereafter. Rather, product lifecycle theory assumes that product innovation peaks before process innovation peaks. In accordance with the economics of agglomeration, evolutionary economists also stress the important role of variety in creating new varieties. In other words, Jacobs' externalities are assumed to play an important role in urban areas in creating new varieties, new sectors and employment growth. When firms survive and become mature, they tend to standardise production and become more capital-intensive and productive.

This background leads to three hypotheses on the relation between specialisation, variety and economic development in regions:

Hypothesis 1: Urban regions with a sector structure of *related variety* experience an increased rate of product innovation, co-evolving with higher *employment* in the short run. We summarise this hypothesis as follows to create a testable version for this chapter: *In the short run, employment growth is positively related to related variety and negatively related to specialisation.*

Hypothesis 2: Regions with a sector structure of *unrelated variety* experience fewer job losses from asymmetric shocks, which lead to *lower unemployment growth.* We summarise this hypothesis as follows to create a testable version for this chapter: In the short run, unemployment growth is negatively related to unrelated variety.

Hypothesis 3: Regions with a specialised sector structure experience an increased rate of process innovation and reduced production costs, which potentially leads to higher *productivity growth.* This phenomenon is more pronounced in the short run than in the long run. We summarise this hypothesis as follows to create a testable version for this chapter: *In the short run, labour productivity growth is positively related to specialisation.*

A fourth hypothesis relates the agglomeration concepts to urban population size of regions, and may be indirectly linked to urban structure. In Europe, the character of urban regions is fundamentally different from that of urban regions in other parts of the world (such as the US

and Asia). It is exactly this urban structure that has fuelled the recent place-based versus place-neutral development debate. Barca et al. (2012) and Van Oort & Bosma (2013) summarise the place- and people-based policy debate in the European context in detail. Based on current economic geographical theories of innovation and the density of skills and human capital in cities, globalisation, and endogenous growth through urban learning opportunities, spatially blind approaches argue that intervention, regardless of context, is the best way to resolve the old dilemma of whether development should be about "places" or "people" (Barca et al., 2012). It is argued that agglomeration in combination with encouraging people's mobility not only allows individuals to live where they expect to be better off but also increases individual incomes, productivity, knowledge, and aggregate growth (World Bank, 2009). Consequently, development intervention should be space-neutral, and factors should be encouraged to move to where they are most productive. In reality, this phenomenon occurs primarily in large cities and city-regions. In contrast, the place-based approach assumes that the interactions between institutions and geography are critical for development, and many of the clues for development policy lie in these interactions. Investigating the interactions between institutions and geography to understand the likely impacts of a policy requires the explicit consideration of the specifics of the local and regional contexts (Barca et al., 2012). The various forms that proximity may take in networks (e.g., physical, social, technological and institutional) are important in this respect (Thissen et al., 2013).

According to place-based development strategists, economic growth is not uniquely related to mega-city regions (Barca et al., 2012). Instead, growth may be distributed across various urban systems in different ways in different countries (OECD 2009, 2011). The place-based approach's emphasis on interactions between institutions and economic geography has allowed for the examination of development in European regions of *all* sizes (Dijkstra et al., 2013). Because the roles of very large and small communities have been addressed extensively in the literature (Dijkstra et al., 2013), Barca et al. (2012) emphasise the simultaneous role of medium-sized ('second tier') urban regions and argue that these are over-represented in Europe. Many highly productive urban regions in the EU are indeed small-to medium-sized whose dominant competitive advantage is that they exhibit high degrees of connectivity compared to urban or home market scales (ESPON, 2013). This phenomenon leads to the formulation of our fourth hypothesis:

Hypothesis 4: *Agglomeration externalities are related to economic performance in all sizes of urban regions in Europe.*

2.4 Data and variables used in empirical analysis

Our empirical analysis will test the relationship between productivity growth and employment growth in distinctive large, capital regions in Europe on the one hand and medium-sized and small urban regions on the other, controlling for other important factors, and will make conclusions on the place-based policy implications suggested in the recent policy discourse. To test our hypotheses, we conduct an empirical analysis on growth differentials over 205 European NUTS2 regions in 15 EU countries[7] between 2000 and 2010, focusing on different population sizes of regions.

Measuring diversification over sectors in regional economies is sensitive to the indicator applied. In our empirical analysis, we apply an entropy measure (see Frenken et al., 2007 for a detailed discussion). The main advantage of the entropy measure, and the reason for its use in the context of diversification, is that entropy can be decomposed at each sectoral digit level. The decomposable nature of entropy implies that variety at several digit levels can enter a regression analysis without necessarily causing collinearity. In the context of measuring regional variety to analyse the effects on growth, decomposition is informative, as one expects entropy/variety at a high level of sector aggregation to have a portfolio effect on the regional economy, protecting it from unemployment, whereas one expects entropy/variety at a low level of sector aggregation to generate knowledge spillovers and employment growth. Put differently, entropy at a high level of sector aggregation measures unrelated variety, whereas entropy at a low level of sector aggregation measures related variety. We use geo-coded AMADEUS micro data (provided by Bureau van Dijk) on European firms aggregated into European NUTS2 regions as a source for the calculation of related and unrelated variety. Because small firms are underrepresented in this database, firm level data are weighted by turnover values (inverse). This approach allows us to best capture the large and sectorally heterogeneous regional economy. Marginal variety may be computed at all four-digit SIC levels in the dataset, indicating an increase in variety when moving from one digit level to the next. Because the marginal entropy levels at the three- and four-digit levels are correlated strongly, we chose to compute the marginal increase when moving from the one-digit level to the four-digit level. We label this variety indicator as *related variety*, as opposed to the two-

[7] Belgium, Denmark, Finland, France, Ireland, Italy, Portugal, The Netherlands, Spain, Sweden, the United Kingdom, Czech Republic, Hungary, Poland, and Slovakia. For other countries data in AMADEUS were found unreliable.

digit level entropy, which we associate with *unrelated variety*. We will include both types of variety to test whether related variety and unrelated variety have different effects.

Formally, all four-digit sectors *i* fall exclusively under a two-digit sector S_g, where $g=1,\ldots,G$, one can derive the two digit shares P_g by summing the four-digit shares p_i:

$$P_g = \sum_{i \in S_g} p_i \tag{1}$$

The entropy at the two-digit level, or unrelated variety (UV), is given by:

$$UV = \sum_{g=1}^{G} P_g \log_2 \left(\frac{1}{P_g} \right) \tag{2}$$

And, the weighted sum of entropy within each one-digit sector is given by:

$$RV = \sum_{g=1}^{G} P_g H_g \tag{3}$$

where:

$$H_g = \sum_{i \in S_g} \frac{p_i}{P_g} \log_2 \left(\frac{1}{p_i / P_g} \right) \quad g = 1,\ldots,G \tag{4}$$

As argued earlier, we consider related variety to be the indicator for Jacobs externalities because it measures the variety *within* each of two digit classes. We expect the economies arising from variety to be especially strong between sub-sectors, as knowledge spills over primarily between firms selling related products. By contrast, unrelated variety measures the extent to which a region is diversified in very different types of activity. This type of variety is expected to be instrumental in avoiding unemployment.

The maps of related and unrelated variety in European regions are provided in figures 1 and 2, which present two different regional patterns for unrelated variety (between-two-digit variety) and related variety (marginal increase in entropy when moving from one- to four-digit differences, so within one-digit variety). As the maps clearly show, variety at high levels of aggregation shows no strong resemblance with variety at low levels, which strongly suggests that the choice of sector aggregation is not trivial. Related variety appears to be a somewhat more *urban* regional feature than unrelated variety (compare Frenken et al., 2007).

Figure 1: Related variety across European regions

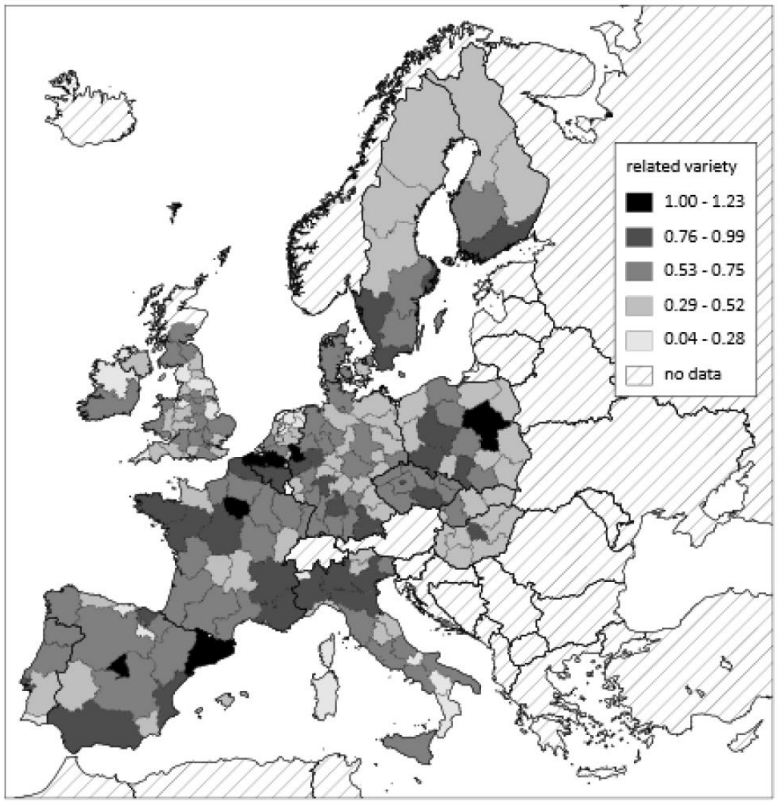
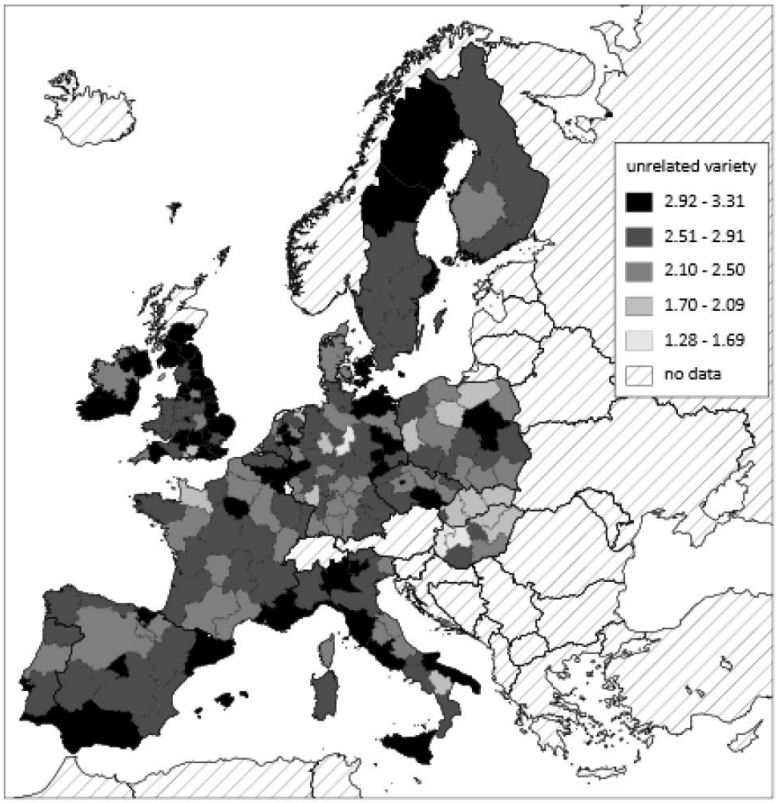


Figure 2: Unrelated variety across European regions



Employment and labour productivity (output per employee) data were obtained from the Cambridge Econometrics statistical database on European regions. We obtained data from this dataset for the years 2000 and 2010. Productivity growth and employment growth are defined as $\ln(emp_{2010}/emp_{2000})$ and $\ln(prod_{2010}/prod_{2000})$ to normalise their distributions.

Localisation economies, measured in 2000 for endogeneity reasons, are associated with the concentration of a particular sector in a region. This type of economy is often captured using specialisation indicators. The degree of regional specialisation in our models is measured using the Theil index over the location quotients of production in 59 products, including agriculture, manufacturing and services. This unique dataset has been collected by the Netherlands Environmental Assessment Agency PBL (for a description see Thissen et al, 2013) and is based on regionalised production and trade data for European nuts2 regions, 14 sectors, and 59 product categories (compare Combes & Overman, 2004). Location quotients measure the relative concentration sectors in a region as the percentage of employment accounted for by a sector in a region relative to the percentage of employment accounted for by that sector in Europe as a whole. This quotient measures whether a sector is over- or underrepresented in a region compared with its average representation in a larger area and thus is to comprise localisation or specialisation economies of agglomeration. The Theil coefficient then measures deviations from the European average distribution of employment specialisations in all sectors. This transformation transforms the individual sectoral concentration measures in a generalized specialization measure. A high score represents a large degree of sectoral specialisation in a region, and a low score represents sectoral diversity. In the largest national economies of Germany, France and the United Kingdom, regions have high levels of sectoral diversity (all regions contain most of the existing sectors, including services). Eastern European regions in Poland, Slovakia, the Czech Republic and Hungary are relatively specialised, as are Scandinavian and Irish regions. These regions lack concentrations of certain activities, e.g., specific types of services, manufacturing, distribution or agricultural activities. A group of medium-sized economies – such as the Netherlands, Belgium, Denmark, Italy, Portugal and Spain – show moderate levels of specialisation.

To test and control for either convergence or divergence, both productivity and employment growth in the period 2000-2010 are, respectively, related to the productivity and employment levels in 2000. These relations are hypothesised to be negative (convergence). All other explanatory variables in our models for employment and productivity growth are also

measured for the year 2000 because of endogeneity reasons. The circumstances shown in 2000 may cause subsequent growth in the period 2000-2010, but those shown in 2010 cannot. *Investments in private and public research and development (R&D)* are calculated as percentages of GDP from Eurostat statistics. These investments in innovation are generally believed to be positively related to economic growth (Moreno et al, 2005). Private R&D investments occur mainly in regions with larger multinational enterprises. Public R&D is more highly related to regions with technological universities and regions where universities and firms ally.

The *degree of economic openness* of European regions is calculated as the total value of imports and exports in a region divided by the region's GDP. This indicator for the volume of trade is based on a make-and-use table (IO-table) for 2000 at the nuts2 level concerning 14 sectors and 59 product categories, including services. This dataset is developed by the Netherlands Environmental Assessment Agency (PBL). The volume of trade increases with the size of the region at a declining rate and is strongly dependent on global economic development with competition in global markets, driving up productivity and attracting new investments and collaborations. High potential may also spill over to nearby regions or in the regional network of specialised and subcontracting industries and regions. *Density* (measured as population density) measures whether agglomeration (economic size) plays a role in economic growth. This dimension of agglomeration is related not to localisation economies (specialisation) and diversity economies but to pure urban size effects (Frenken et al., 2007). In general, the literature suggests that higher density enables better interaction, enhancing growth (Puga, 2002).

We measured the *average educational level* of regions by the percentage of the tertiary and higher educated population within the total population. The relationship of education with (employment and productivity) growth is thought to be positive, as more highly skilled people can be more productive, and agglomeration may attract more of these people. Remarkably low scores on this indicator are found in eastern European regions and Italian regions. The regional *wage level*, as an indicator of personal income, is hypothesised to be positively related to growth. The wage level variable is highly correlated with GDP per capita as an indicator. Higher wage levels and productivity levels are also highly correlated. In the productivity growth models, the wage level is thus excluded from the analysis (and the productivity level is included). *Market potential* is measured by a gravity equation on production in all regions, corrected for distances. Finally, a dummy variable is introduced into

the models for large and capital regions opposed to medium-sized and smaller regions. The degree of urbanisation over the 205 regions is determined by the *distribution of classes* distinguished in OECD (2012, 2013) comprising large and capital regions (at least 3 million inhabitants), medium-sized regions (between 1.5 and 3 million inhabitants) and small regions (fewer than 1.5 million inhabitants). Although this distinction differs from the one originally presented for all cities in the world in OECD (2012, 2013), these cut-off points yield a distribution for the European regional classification adopted in this chapter that is comparable to the OECD distribution on a global scale. In our analysis, large and capital regions are categorised within the large urban regime, and small- and medium-sized regions are categorised within the medium-sized urban regime.

To avoid multicollinearity in our models, we tested for high correlations among these explanatory variables, and we analysed variance inflation factors for each variable added to the models. None of the correlations is disturbingly high. As previous research has shown that spatial dependence between proximate regions in Europe is an important source for divergent growth opportunities in productivity and employment (Le Gallo et al., 2011), we will control for this finding in our analyses by introducing ML estimation, which includes spatial lags, using inverse distance weighting matrices (noted W_1) and squared inverse distance matrices (noted W_2). Inverse distances are calculated from core to core without cut-off point.

2.5 Modelling outcomes

This section discusses modelling outcomes presented in Tables 1, 2 and 3 for employment growth, productivity growth and unemployment growth, respectively. The models are constructed in similar ways, starting with a ML spatial-lag model that corrects for spatial dependence (the spatial lag variable is denoted as w_growth in the Tables), moving into a ML-spatial lag model that decomposes the observation into the following two regimes, which are estimated simultaneously and which we wish to use to test our hypotheses: the regime of large and capital regions and the regime of medium-sized and smaller regions. The model fit usually increases over these successive modelling steps, the significance of spatial regimes are indicated by the outcomes of a spatial Chow-Wald test, and variables that significantly differ from each other over regimes are presented in boxes in the tables. In all three models the BP tests indicate problems of heteroskedasticity, which makes our interpretation cautious. Due to space limitations, we focus on our four hypotheses in our discussion of the outcomes.

Hypothesis 1 links related variety to employment growth positively and to specialisation negatively. Table 1 shows that that this hypothesis is confirmed in the spatial lag models (2) and (3). The regime analysis in column (3) shows that this relationship particularly holds true for medium-sized and smaller regions and not for larger capital regions. Hypothesis 2 positively linked specialisation to productivity growth. Table 2 confirms this for all models and all regimes applied, indicating that this relation is very robust.

The regime analysis shows that large urban and capital regions feature a stronger relationship between specialisation and productivity growth compared to medium-sized regions. The third hypothesis proposes that unemployment growth is negatively related to unrelated variety (portfolio argument). The findings presented in table 3 indicate that this hypothesis is rejected for all specifications. The reasons for this finding may be diverging national regulations and institutions in Europe, which cause national regimes to exist across the continent. This finding also indicates that for this variable, pan-European relations highly diverge from those found at individual country levels. Our fourth hypothesis, stating that regions of all sizes are involved in growth accounting, is confirmed. Employment growth is more naturally suited in medium-sized regions, whereas productivity growth is enabled by specialisation patterns in both large and medium-sized regions (with a higher coefficient being found in large urban regions). When Jacobs' externalities are an important ingredient for employment growth in small and medium sized urban regions, this means that these regions are well equipped for creating new varieties and attract new and related sectors. This economical vital role of medium-sized and small urban regions has not been suggested before. Perhaps due to agglomeration disadvantages, the largest urban regions do not automatically show this dynamics.

Table 1: modelling outcomes for employment growth 2000-2010

	(1)		(2)		(3) Regimes' Urban Size			
Explanatory Variables	Spatial Lag Model W_1		Spatial Lag Model W_2		Small- & Medium-Sized		Large & Capital Regions	
(Constant)	0,30	*0,19*	0,31*	*0,16*	0,71**	*0,21*	-0,15	*0,54*
Employment 2000	-0,03**	*0,01*	-0,03**	*0,01*	-0,04**	*0,01*	0,03	*0,05*
Private R&D	0,00	*0,01*	0,00	*0,01*	0,00	*0,01*	-0,01	*0,03*
Public R&D	0,00	*0,01*	0,00	*0,01*	0,00	*0,01*	-0,02	*0,02*
Openness Economy	0,05**	*0,01*	0,03**	*0,01*	0,02	*0,01*	0,06	*0,06*
Market Potential	-0,07**	*0,02*	-0,05**	*0,02*	-0,05**	*0,02*	-0,04	*0,06*
Education	0,02	*0,01*	0,01	*0,01*	0,01	*0,01*	0,04	*0,07*
Population Density	0,01	*0,01*	0,01*	*0,01*	0,01	*0,01*	-0,02	*0,02*
Wages	0,03**	*0,01*	0,02**	*0,01*	0,01	*0,01*	0,01	*0,03*
Related Variety	0,09**	*0,03*	0,09**	*0,03*	0,11**	*0,03*	-0,07	*0,12*
Unrelated Variety	0,03**	*0,01*	0,02**	*0,01*	0,02	*0,01*	0,07	*0,08*
Specialisation	-0,28**	*0,11*	-0,19**	*0,09*	-0,24**	*0,09*	-0,22	*0,37*
W_Employment Growth	0,95**	*0,04*	0,92**	*0,04*		0,92**	*0,039*	
Summary Statistics:								
N	205		205			205		
R^2	0,291		0,402			0,447		
Chow-Wald	-		-			18,6	*0,1*	
BP (heteroskedasticity)	42,002	*0*	45,915	*0*		3,565	*0,059*	
LR (spatial lag)	37,583	*0*	80,966	*0*		83,4	*0*	
LM (spatial error)	48,364	*0*	2,484	*0,115*		1,042	*0,307*	

Coefficients and t-values; significance: .* p <0.10, ** p<0.05.

Table 2: modelling outcomes for productivity growth 2000-10

	(1)		(2)		(3) Regimes' Urban Size			
	Spatial Lag Model W_1		Spatial Lag Model W_2		Small- & Medium-Sized		Large & Capital Regions	
(Constant)	0,05	*0,14*	-0,04	*0,12*	-0,23	*0,12*	-1,16	*0,39*
Productivity 2000	-0,17**	*0,02*	-0,09**	*0,01*	-0,10**	*0,013*	-0,15**	*0,06*
Private R&D	0,02**	*0,00*	0,01	*0,01*	0,01**	*0,00*	-0,029	*0,03*
Public R&D	-0,01	*0,01*	-0,01	*0,04*	-0,01	*0,00*	0,04**	*0,01*
Openness Economy	-0,03**	*0,01*	-0,02**	*0,01*	-0,04**	*0,01*	0,04	*0,04*
Market Potential	0,08**	*0,01*	0,06**	*0,01*	0,05**	*0,01*	0,12**	*0,03*
Education	0,05**	*0,01*	0,03**	*0,01*	0,03**	*0,01*	0,10**	*0,05*
Population Density	0,00	*0,00*	0,00	*0,00*	0,00	*0,010*	-0,04**	*0,01*
Wages	0,01	*0,01*	0,00	*0,01*	0,01	*0,01*	0,03	*0,05*
Related Variety	-0,03	*0,02*	-0,02	*0,02*	-0,03*	*0,02*	-0,09	*0,07*
Unrelated Variety	0,00	*0,01*	0,00	*0,01*	-0,01	*0,01*	0,10	*0,07*
Specialisation	0,41**	*0,08*	0,27**	*0,07*	0,19**	*0,06*	0,96**	*0,26*
W_Productivity Growth	0,96**	*0,02*	0,89	*0,04*		0,89	*0,04*	
Summary Statistics:								
N	205		205			205		
R^2	0,781		0,837			0,887		
	-		-			85,8	*0*	
BP (heteroskedasticity)	55,01	*0*	78,453	*0*		0,033	*0,857*	
LR (spatial lag)	57,061	*0*	113,714	*0*		127,6	*0*	
LM (spatial error)	39,49	*0*	0,051	*0,821*		0,742	*0,389*	

Coefficients and t-values; significance: .* p <0.10, ** p<0.05. . Coefficients that significantly differ over regimes are boxed.

Table 3: modelling outcomes for unemployment growth 2000-2010

	(1)		(2)		(3) Regimes' Urban Size			
Explanatory Variables	Spatial Lag Model W_1		Spatial Lag Model W_2		Small- & Medium-Sized		Large & Capital Regions	
(Constant)	1,53	*0,84*	1,39	*0,78*	2,51	*0,84*	-1,12	*2,12*
Unemployment 2000	-0,45**	*0,03*	-0,37**	*0,03*	-0,38**	*0,03*	-0,07	*0,10*
Private R&D	-0,07**	*0,03*	-0,05**	*0,02*	-0,05*	*0,03*	0,49**	*0,14*
Public R&D	0,008	*0,026*	0,008	*0,025*	0,031	*0,024*	-0,124	*0,09*
Openness Economy	0,52**	*0,08*	0,43**	*0,07*	0,41**	*0,07*	1,04**	*0,28*
Market Potential	-0,43**	*0,09*	-0,32**	*0,09*	-0,37**	*0,09*	-0,56*	*0,26*
Education	-0,13*	*0,07*	-0,12**	*0,06*	-0,16	*0,06*	-0,43	*0,35*
Population Density	0,04	*0,03*	0,03	*0,03*	0,01	*0,03*	0,26**	*0,09*
Wages	0,12**	*0,05*	0,08	*0,05*	0,03	*0,05*	0,45**	*0,17*
Related Variety	0,21	*0,11*	0,19	*0,10*	0,23**	*0,10*	-0,47	*0,48*
Unrelated Variety	0,05	*0,07*	-0,010	*0,06*	0,00	*0,06*	0,94**	*0,44*
Specialisation	-3,10**	*0,53*	-2,31**	*0,50*	-2,95**	*0,50*	-3,22*	*1,79*
W_Unemployment Growth	0,96**	*0,03*	0,76**	*0,06*	0,76**	*0,06*		
Summary Statistics:								
N	205		205		205			
R^2	0,766		0,814		0,844			
Chow-Wald	-		-		40,6	*0*		
BP (heteroskedasticity)	24,087	*0,012*	23,267	*0,016*	0,016	*0,899*		
LR (spatial lag)	77,163	*0*	101,389	*0*	107,3	*0*		
LM (spatial error)	21,683	*0*	1,992	*0,158*	5,239	*0,022*		

Coefficients and t-values; significance: .* p <0.10, ** p<0.05. . Coefficients that significantly differ over regimes are boxed.

2.6 Conclusions and discussion

This chapter introduces indicators of regional related variety and unrelated variety to conceptually overcome the current impasse in the specialisation-diversity debate in agglomeration economics. Although various country-level studies have been introduced on this conceptualisation in recent years, a pan-European test has until now been missing from the literature. A pan-European test is more interesting than country-level tests, as newly defined cohesion policies, smart-specialisation policies, place-based development strategies and policies aimed at fostering competitiveness may be served particularly well by related and unrelated variety conceptualisations.

We empirically investigated the contribution of agglomeration economies to economic growth in European regions while separating regions by population size. A conceptual discussion on

development burgeons between, on the one hand, spatially blind approaches that argue that intervention regardless of context ("people-based policy") is the best means of development and, on the other hand, place-based approaches that assume that interactions between institutions and geography are more critical for this purpose. This idea has recently been translated into a focus on either the largest regional concentrations ("people-based policies") or an urban network setting combining clusters of cities ("place-based policies"). Our framework combining productivity growth and employment growth shows that spatial regimes classified by the population size of urban regions differ significantly in both sets of models, confirming their *joint* significance. In medium-sized urban regions private R&D and specialisation levels (inter alia) are especially important in relation to productivity growth, and sectoral specialisation (negatively), related variety and the openness of the economy (inter alia) are especially important in relation to employment growth. In large urban regions, population density (negative), educational level, public R&D and the degree of specialisation (inter alia) are relatively more important for productivity growth. The outcomes of these analyses suggest particular roles in development processes for medium-sized ('second-tier') urban regions *alongside* the largest urban regions. Especially related variety – employment growth is a particular feature of small medium-sized urban regions. Perhaps due to agglomeration disadvantages, the largest urban regions do not show the highest employment growth rates. This marked regional heterogeneity indicates that micro-economic processes play out differently in different types of regions, thereby confirming that European place-based policy strategies may play an important role for regional development alongside place-neutral (people-based) policy strategies. However, this heterogeneity also suggests that, similar to European regional innovation patterns, which are differentiated among regions according to their regional context conditions (Camagni & Capello, 2013), regional heterogeneity and inter-regional network positions support the careful consideration of how 'smart specialisation' is evaluated in Europe (Thissen et al., 2013).

The hypothesised relationship between unemployment growth and unrelated variety is not confirmed in our first pan-European exercise. This finding suggests that national regulations and institutions in Europe cause the pan-European model to deviate from national models. More research is needed on this issue. In addition, future work should pay more attention to causality (i.e., whether variety induces development or whether developing regions create more variety), panel estimation to ensure the robustness of the relations found, the testing of other types of spatial heterogeneity (e.g., cohesion regions versus core regions, or university

regions versus non-university regions), and continuous space modelling of firm-level data to avoid spatial scale and selection processes. Recall that our analyses (also) do not address many of the critiques formulated in the meta-analyses on measurement and selection issues. This chapter does show that conceptual renewal may represent a fruitful and exciting way to advance the debate on agglomeration and spatial heterogeneity in light of European reforms and policy formulations.

CHAPTER 3. FDI AND REGIONAL PROFILES[8]

Abstract

We analyse the sectoral and functional division of labour in CEE regions within the convergence debate. By analysing the investment decisions of multinational corporations in 49 NUTS-2 regions across 6 European CEE countries (Poland, Czech Republic, Slovakia, Hungary, Romania, and Bulgaria), we show that capital city regions not only receive more Greenfield FDI but also attract a larger variety of investments in terms of sectors and functions. Capital cities are more likely to host higher-end sectors and functions, which provides an explanation for the existing regional disparities within CEE countries. These results highlight the importance of functional and sectoral divisions of labour in the view of regional profiling and contribute to the recent EU Cohesion Policy debate.

Key words: Greenfield FDI, CEE regions, location factors

[8] This chapter is based on the paper: "*Functional and sectoral division of labour within Central and Eastern European countries: evidence from Greenfield FDI*" published in *Journal of Economic and Social Geography* in November 2014, DOI: 10.1111/tesg.12093. This paper is included in this PhD thanks to the *Journal of Economic and Social Geography* and *Wiley-Blackwell*.

3.1 Foreign investments in Central and Eastern Europe

Despite regional convergence among Central and Eastern European (CEE) countries and between CEE and Western European countries, regional disparities within the CEE countries have increased considerably over the past years (e.g., Ezcurra et al., 2007; Niebuhr and Schlitte, 2009; Rodriguez-Pose and Ezcurra, 2010; Kallioras and Petrakos, 2010; Chapman et al., 2012; Parkinson and Meegan, 2013). In the wake of EU enlargement, capital city regions started following different development trajectories and grew at a faster pace than the other regions in CEE countries. Several studies pointed to differences with respect to embeddedness in international networks and industrial restructuring as the driving forces behind regional disparities in the CEE countries (Heidenreich and Wunder, 2008; Chapman and Valentina, 2012). Although most CEE regions experienced productivity growth in manufacturing industries, the CEE capital city regions are converging at a faster rate due to their networked, service oriented economies (Dogaru et al., 2011).

First, the CEE capital city regions are better embedded in international investment and trade networks than the other CEE cities and regions (Karreman, 2009; Bassens et al., 2010). Foreign direct investment and trade allow regions to grow faster by providing the required funding for capital projects that create jobs, enabling the transfer of new technologies, improving the productivity and the ability of firms to produce new products, expanding the scale of production by reaching new markets, and integrating into global production sharing networks. In this view, Frenken and Hoekman (2006) found that European cities that operate in international trade networks are converging faster than regions that are mostly locally oriented.

Second, there is an important role for sectoral specialisation in explaining disparities (Mora et al., 2005; Chapman and Valentina, 2012). Within the CEE countries, capital city regions are characterised by large service sectors that have developed through good national and international accessibility, advanced technology, highly qualified labour and pre-existing administrative functions. Most of the other CEE regions are characterised by a low-skilled labour force and insufficient infrastructure, advanced technologies and regional innovation policies; they are also missing the minimum conditions to increase access to international business networks. Indeed, as Mora et al. (2005) and Chapman and Valentina (2012) argue, the economic profile of a region shapes its opportunities because some sectors offer better opportunities than others (e.g., the services sector has grown worldwide over the past decades,

while manufacturing has declined), and the sectoral specialisations of regions do not change radically over time.

Yet, the competitive advantage of a region is not only dependent on the sectors present in the region but also on the type of activities it employs. As indicated by Chapman and Valentina (2012), the spatial concentration of white collar labour and headquarter functions in combination with a dynamic service sector can lead to self-enforcing mechanisms of economic development. Furthermore, Duranton and Puga (2005) emphasised that the outsourcing and clustering of service functions in urban areas increases the importance of functional specialisation relative to sectoral specialisation on the regional level. Firms are more likely to locate high-end functions in metropolitan areas due to higher needs for face-to-face communication, skilled labour, and demand. At the same time, production plants and low-end service functions end up in rural areas and smaller cities due to factor cost considerations. Defever (2012) observed a similar pattern when examining the location of different business functions by multinational corporations (MNCs).[9] Accordingly, it is expected that the faster growing capital city regions not only receive more FDI overall (because they are better globally embedded) and relatively more FDI in high-end sectors but also target high-end services functions such as headquarters, research and development, and sales and marketing offices. Nevertheless, the literature on regional development in the CEE countries emphasises the importance of sectoral specialisation while only limited attention has been paid to the functional division of labour among regions as a driver of regional disparities.

The aim of this chapter is to analyse to what extent regional disparities within Eastern European countries can be connected to the existence of a division of labour between the capital and the other regions. To provide a comprehensive examination of both the sectoral and functional division of labour in the CEE countries, this article focuses on the investment location decisions of MNCs in the NUTS-2 regions of CEE countries. Overall, the number of alternative locations is larger for MNCs than for domestic firms when making an investment decision. In addition, MNCs are expected to select the foreign investment locations that best fit the characteristics of the investment project and yield the largest benefits for the firm. This is particularly true for Greenfield FDI that does not face constraints from existing capital instalments or prior investments (unlike mergers and acquisitions). Hence, the location

[9] Sectoral division between manufacturing and services also inadequately acknowledges the fact that service functions are increasingly carried out by firms in the manufacturing sector.

decisions of MNCs clearly reflect the particular competitive advantage of certain regions and provide a meaningful way to compare the attractiveness of different regions for particular sectors and functions. In the remainder of this article, Section 2 introduces the data while Section 3 provides an overview of the empirical results. Section 4 discusses the findings and our conclusions.

3.2 Data

In this article, we focus on Greenfield FDI in 49 NUTS-2 regions in 6 CEE countries (Poland, Czech Republic, Slovakia, Hungary, Romania, and Bulgaria). Information on Greenfield FDI comes from the Financial Times fDi Markets database. This project-level data was collected primarily from publicly available resources such as formal announcements by the media, financial information providers, industry organisations, and publication companies. Overall, we have information on 7,284 investments made by 3,465 different MNCs in the 6 CEE countries between January 2003 and December 2010.[10] Most Greenfield investments in the CEE countries originated from within the European Union and EFTA (71%) and North America (16%), and these were targeted at low-tech manufacturing (21%), medium-tech manufacturing (19%), and commercial services (17%). In terms of functions, most investments were made in production plants (43%), business, sales and marketing offices (23%), and building construction (11%).

Building on Eurostat's taxonomy of metropolitan regions, the NUTS-2 regions were divided into one of the following four categories (Dijkstra, 2009; see Appendix A):

- Capital city regions: NUTS-2 regions that contain the capital city. In the 6 CEE countries, these capital city regions are also regarded as the regions that are best integrated into international markets (Fratesi, 2012).
- Regions with a second-tier city: NUTS-2 regions that include at least one second-tier city. Second-tier cities are the largest cities in the country, excluding the capital. In the CEE countries, there is a maximum of 5 second-tier cities per country.
- Regions with a smaller city: NUTS-2 regions that include at least one larger urban zone of at least 250,000 inhabitants. These larger urban zones contain major cities and are adjacent travel-to-work areas.

[10] For 52 investments (0.7%), we were unable to obtain the region in which the investment was made. Hence, these investments were omitted from the database. See Burger et al. (2013) for a more elaborate description of the European database on Greenfield investments.

- Non-metropolitan regions: NUTS-2 regions without an urban zone of at least 250,000 inhabitants.

Table 1: Economic development in CEE countries by region type.

	Bulgaria	**Czech Republic**	**Hungary**	**Poland**	**Romania**	**Slovakia**
GDP per Capita - PPS (2003)						
Capital city region	10100	29700	20590	15720	12970	25830
Regions with second-tier city	5700	13600	8580	10250	5620	8610
Regions with smaller city	N/A	14600	N/A	8442	6700	N/A
Non-metropolitan regions	5967	13220	11742	8804	6020	10430
GDP per Capita Average Annual Growth Rate (2003-2010)						
Capital city region	8.6%	3.2%	3.4%	6.6%	10.5%	7.3%
Regions with second-tier city	4.9%	3.3%	2.1%	6.1%	6.7%	4.9%
Regions with smaller city	N/A	2.1%	N/A	5.0%	6.9%	N/A
Non-metropolitan regions	3.7%	2.5%	2.1%	5.5%	8.4%	6.2%
Source: Eurostat Regions Database and fDi Markets.						

Table 1 displays the large differences in level of development between the capital city regions and the other types of regions in the CEE countries; in all CEE countries, the capital city region had the highest GDP per capita in 2003. The most extreme case was Slovakia, in which the capital city region, Bratislava, had an average GDP per capita that was 2.5-3 times higher than in the other regions. The average annual growth rate of GDP per capita was also substantially higher in the capital city regions in the CEE countries (with exception of the Czech Republic). In Bulgaria, Romania, and Slovakia, the average annual growth rate (2003-2010) of the capital city regions was over two percentage points higher than the other regions. This indicates that regional disparities within the CEE countries have increased over the past decade.

Table 2: Frequency and distribution of Greenfield FDI across broad economic sectors and functions by region types in CEE.

	Capital City Regions	Regions with Second-Tier City	Regions with Smaller City	Non-Metropolitan Region	Total
Sector					
Natural Resources	179 (6)	152 (7)	43 (8)	132 (8)	506 (7)
Low-Tech Manufacturing	385 (13)	546 (25)	184 (32)	449 (28)	1564 (21)
Medium-Tech Manufacturing	301 (10)	517 (24)	143 (25)	477 (29)	1438 (20)
High-Tech Manufacturing	331 (11)	285 (13)	65 (11)	215 (13)	896 (12)
Transport Services	182 (6)	130 (6)	30 (5)	59 (4)	401 (6)
Software & ICT	424 (15)	165 (8)	26 (5)	69 (4)	684 (9)
Financial Services	327 (11)	100 (5)	10 (2)	74 (5)	511 (7)
Commercial Services	786 (27)	281 (13)	69 (12)	148 (9)	1284 (18)
Total	2915 (100)	2176 (100)	570 (100)	1623 (100)	7284 (100)
Function					
Headquarters	66 (2)	10 (0)	6 (1)	4 (0)	86 (1)
R&D	179 (6)	99 (5)	22 (4)	39 (2)	339 (5)
Construction	490 (17)	182 (8)	46 (8)	121 (7)	839 (12)
Extraction & Energy	70 (2)	87 (4)	23 (4)	67 (4)	247 (3)
Production Plants	497 (17)	1167 (53)	341 (60)	1094 (67)	3099 (43)
Logistics & Distribution	247 (8)	205 (9)	62 (11)	111 (7)	625 (9)
Business, Sales & Marketing	1177 (40)	304 (14)	51 (9)	147 (9)	1679 (23)
Support & Servicing	189 (6)	122 (6)	19 (3)	40 (2)	370 (5)
Total	2915 (100)	2176 (100)	570 (100)	1623 (100)	7284 (100)

Note: For both sectors and functions, the column percentages are in parentheses.

Source: own calculations based on fDi Markets.

One reason for the persistence of these disparities might be the existence of a functional and sectoral division of labour among the different types of regions. Table 2 presents the number and distribution of Greenfield investments in the CEE regions by broad sector and function (see Appendix B and C for the taxonomy). Compared to the other types of regions, the capital city regions received many Greenfield investments in the higher-end services sectors (software & ICT, financial services, and commercial services) and in the headquarters, R&D, construction and business, sales and marketing functions. At the same time, capital city

regions received relatively little Greenfield investment in the low- and medium-tech manufacturing sectors and production plants. This strongly suggests the existence of a functional and sectoral division of labour within the regions of the CEE countries.

3.3 Empirical Model and Results

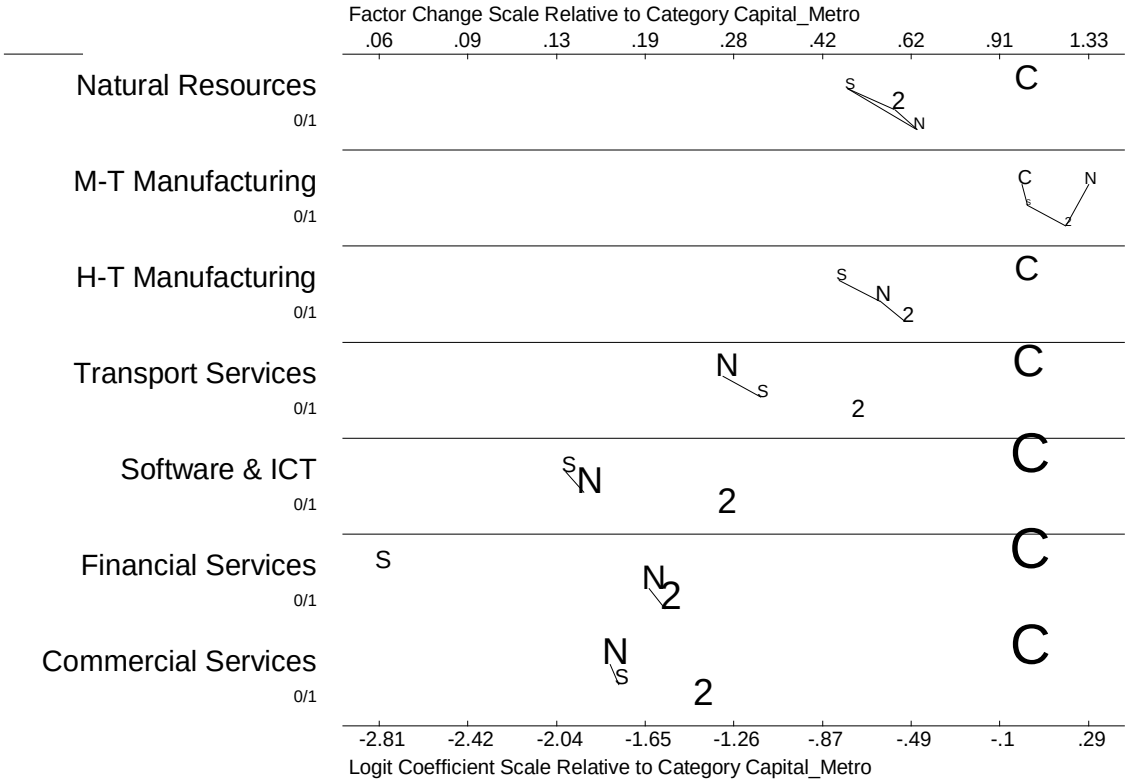
To formally test whether the economic structure of the region types indeed differs, we complement our descriptive statistics with the estimation of discrete choice models (Wrigley, 1985; Long, 1997). When applying a discrete choice model to analyse the FDI location decisions of MNCs, it is assumed that MNCs will choose to establish a subsidiary in the location that maximises their benefit. One of the most frequently used models to analyse location decisions is the multinomial logit model (MNL). In a MNL model, the choice probabilities among a set of categorically distributed alternatives (in our case, the four types of regions) are simultaneously estimated. However, MNL assumes the independence of irrelevant alternatives (IIA), meaning that the addition or removal of a category should not affect the odds among the remaining alternatives. As a result, MNL estimation would only function well when alternatives are dissimilar (Cheng and Long, 2007). A violation of the IIA assumption results in inconsistent estimates and would require the estimation of alternative models, such as the multinomial probit (MNP) model. To test for a potential violation of the IIA assumption, we performed a Hausman-McFadden test and a Small-Hsiao test. Because the results of both the Hausman-McFadden and Small-Hsiao tests pointed at a confirmation of the IIA assumption, we can safely use the MNL estimation.

A common problem with the interpretation of MNL outcomes is the large number of coefficients that has to be taken into account. To facilitate interpretation, odds-ratio plots are used to display the results (Long and Freese, 2006). Figure 1 displays the odds-ratio plot based on the MNL estimates for sectors, controlling for the year in which the investment was made and the world region of origin of the investing firm (European Union/European Free Trade Association[11], North America, Former USSR, Rest of Europe or Rest of World). The symbols in Figure 1 refer to Capital Regions (C), Regions with Second-Tier Cities (2), Regions with Smaller City (S), and Regions with No Metropolitan Areas (N). In the analysis, low-tech manufacturing, which has the lowest value added, functions as the reference category to which all other sectors are compared. Correspondingly, each row in the figure represents the odds of investing in a particular sector compared to investing in low-tech

[11] This includes Iceland, Liechtenstein, Norway, and Switzerland.

manufacturing for each particular type of region. The scale of the figure is set relative to capital regions because the aim of the analysis is to examine to what extent regional disparities within Eastern European countries can be connected to the existence of a division of labour between the capital and the other regions. If a symbol is positioned to the right of another symbol, then an additional investment in the particular sector is more likely to be located in that region. The distance between a pair of symbols indicates the magnitude of the effect, while a line between adjacent symbols shows that the difference between the two regions is not statistically significant (at the 5% level). Finally, it is important to take the base odds and the discrete changes in the odds into account. Note that an increase in the odds by a factor 10 has only a small impact when the current odds are 1 in 1000 and a large impact when the odds are 1 in 5. Therefore, the size of a symbol is proportional to the magnitude of the discrete change in the odds. The vertical spacing has no meaning and is only included to improve the legibility of the figure. Several conclusions can be drawn from Figure 1. First, capital regions distinguish themselves by specialising in services sectors. Relative to the low-tech manufacturing sector, investments in natural resources, high-tech manufacturing, transport services, software and ICT, commercial services or financial services increase the odds that an MNC will locate its affiliate in one of the capital regions and not in one of the other types of regions. In addition, relative to the low-tech manufacturing sector, investment in one of the services sectors (except for financial services) increases the odds that an MNC will invest in a region containing a second-tier city as compared to a region with a smaller city or a non-metropolitan region. These results provide some support for the observation that higher-order cities are relatively specialised in services.

Figure 1: Odds-Ratio Plot of Investing in a Particular Sector Compared to Investing in Low-Tech Manufacturing Relative to Capital Regions.

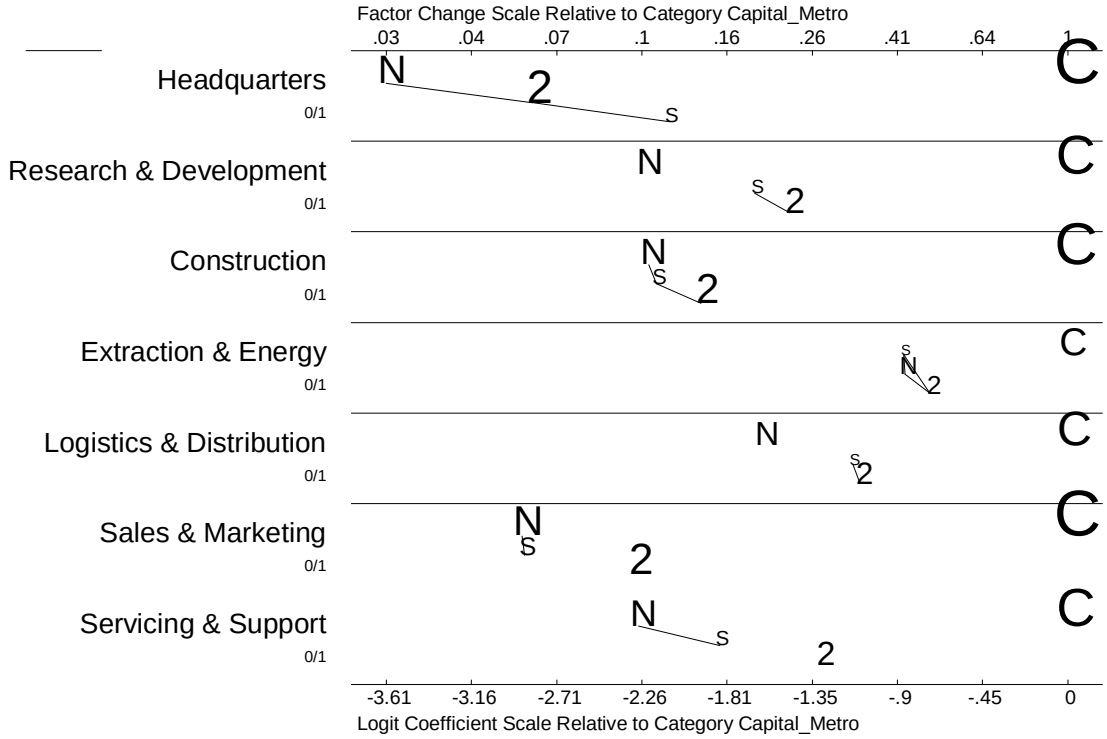


Notes: C=Capital Regions; 2=Regions with Second-Tier Cities; S=Regions with Smaller City; N=Regions with No Metropolitan Areas.

Figure 2 shows the odds-ratio plot of the MNL estimates for the functions, controlling for the year in which the investment was made and the continent from which the investments originated. The function with the lowest value-added production plants was chosen as the base category. Figure 2 reveals that investing in a function other than production plants increases the likelihood that an MNC will invest in a capital city region compared to one of the other types of regions. This provides, at least partly, an explanation for the persistence of regional disparities in the CEE countries. Furthermore, the figure shows less pronounced differences among the other types of regions. An MNC investing in a market-seeking function, in a business, sales and marketing office, or in a servicing and support unit instead of a production plant is more likely to locate the investment in a region with a second-tier city than in a region with a smaller city or non-metropolitan region. Unfortunately, based on our

results, we cannot conclude whether the differences among the CEE regions presented are more pronounced for sectors or functions. Hence, we can only partly confirm the observation by Duranton and Puga (2005) that besides sectoral specialisation, functional specialisation also matters.

Figure 2: Odds-Ratio Plot of Investing in a Particular Sector Compared to Investing in Production Plants Relative to Capital Regions.



Notes: C=Capital Regions; 2=Regions with Second-Tier Cities; S=Regions with Smaller City; N=Regions with No Metropolitan Areas.

3.4 Concluding Remarks

In this study, we examined the functional and sectoral division of labour among regions within CEE countries. The results indicate that capital city regions not only receive more Greenfield FDI but also attract different types of investment in terms of sectors and functions. Because capital cities are more likely to host higher-order sectors and functions, this provides an explanation for the existing regional disparities within CEE countries. However, future research linking the sectoral and functional profile of a region to economic growth models is necessary to further test this hypothesis.

Our analysis of Greenfield FDI has shown that the CEE regions have distinct competitive advantages and that some regions have better opportunities to grow than other regions. Although the convergence process of the CEE regions implies the diversification of their economies, sectoral and functional specialisations of regions do not tend to change drastically over time. Hence, this analysis is consistent with the recent EU Cohesion Policy that aims to support the economic activities in which a region has a competitive advantage (Barca et al., 2012). Likewise, it supports the view that a thorough analysis of each region's specific profile should be performed to adequately implement regional economic policies.

CHAPTER 4. FDI AND REGIONAL COMPETITIVE ADVANTAGES[12]

Abstract

We analyse the sectoral and functional division of labour in CEE regions within the convergence debate. By analysing the investment decisions of multinational corporations in 49 NUTS-2 regions across 6 European CEE countries (Poland, Czech Republic, Slovakia, Hungary, Romania, and Bulgaria), we show that capital city regions not only receive more Greenfield FDI but also attract a larger variety of investments in terms of sectors and functions. Capital cities are more likely to host higher-end sectors and functions, which provides an explanation for the existing regional disparities within CEE countries. These results highlight the importance of functional and sectoral divisions of labour in the view of regional profiling and contribute to the recent EU Cohesion Policy debate.

Key words: Greenfield FDI, CEE regions, location factors

[12] This chapter is based on the paper entitled *"The geography of Multinational Corporations in CEE countries: perspectives for second-tier city regions and European Cohesion Policy",* published in Journal *Investigaciones Regionales* No. 29 (2014) - Pages 193 to 214. This research is included in this PhD thanks to the *Investigaciones Regionales* and *Asociación Española de Ciencia Regional.*

4.1 Economic development context in Central and Eastern Europe for Greenfield FDI

When identifying growth opportunities for Europe, one cannot overlook the regional patterns of its composite member states. The difference in growth opportunities between Western and Central Eastern (CEE) countries and regions is obvious but complex (Dogaru et al. 2011, Maroccu et al. 2012, Capello et al. 2008). Western European regions identify themselves through internationally competitive cities like London, München, Paris, Barcelona or Amsterdam. Such places became landmarks for their surrounding regions and function in larger-scale city-regions. They distinguish themselves through competitive advantages in innovation capacity, labour market efficiency and productive economic specializations (Annoni and Dijkstra, 2013). Policy makers in these places strive for better quality of life – the ultimate goal of competitiveness (Gardiner et al., 2004). In this view, they develop strategic innovative regional and urban development plans which target continuous employment, sustainable environment and accessible housing schemes, public amenities, qualitative and affordable education and healthcare or cultural enhancement and harmonization. But all these objectives are generally supported by a healthy business environment, embedded in a regional knowledge economy with knowledge-intensive specializations and sound institutions as well as good functioning multilevel governance structures (Barca et al., 2012). Strong financial sectors support entrepreneurship. Qualitative transport infrastructure increases accessibility and supports a good position in international trade networks. Highly qualified human resources drive the development of top sectors and in combination with other factors lead towards a service economy.

Central Eastern European regions are part of more recent member states characterized by former communist regimes – such as regions in Poland, Czech Republic, Slovakia, Hungary, Romania or Bulgaria. These countries used to be centralized economies where the capital city was the most important location of decision and development (Gorzelak et al., 2012, Müller et al., 2005). Besides some secondary city regions that focus on industrial specialization, university capacity or touristic centres, the rest of the regions in these countries largely remained agricultural-based economies. Building on their basic industrial composition heritage, these countries and their regions developed only little beyond their former profile. However, due to their entry in the EU and its trade benefits, as well as their strategic geographic location, low levels of wages and taxes or even natural resources, they increasingly become an attraction for international corporations mostly for production and

medium-low service functions. Frequently, the major landmarks are at national level and in capital city regions.

Dogaru et al. (2014) note that there is regional convergence among Central and Eastern European countries and between CEE and Western European countries. However, regional disparities within the CEE countries have yet prevailed over the past years (Ezcurra et al., 2007; Niebuhr and Schlitte, 2009; Rodriguez-Pose and Ezcurra, 2010; Kallioras and Petrakos, 2010; Chapman et al., 2012). In the wake of EU enlargement, capital city regions started taking different development paths and grew with a faster rhythm than the other regions in CEE countries. Nevertheless, recent evidence by Dijkstra (2013), Dijkstra et al. (2013) and ESPON (2013) suggests that non-capital city regions or regions containing so-called secondary cities show better growth figures over the last years. Arguably, both agglomeration diseconomies in the largest cities and untapped potential and knowledge intensive specializations in cities other than the capitals (like in München in Germany, Milano in Italy, Eindhoven in The Netherlands, and Barcelona in Spain) may contribute to this finding (Camagni et al. 2014; Angoletti et al 2014; Camagni and Capello, 2014). It is argued by Thissen et al. (2013) that besides endogenous agglomeration forces, linking up with specialized international knowledge networks and the embedding of international knowledge, trade and FDI networks in local knowledge intensive environments (of firms, universities and governmental agencies) may foster growth opportunities in second tier city regions relatively more than in capital regions. Still, the applicability of these findings in CEE countries remains uncertain. Endogenous growth opportunities may be limited in CEE countries because of less knowledge-intensive specializations, less learning experiences, culturally different evolved social capital and institutional constraints (Rodriguez-Pose et al. 2013, 2014). Besides this, several studies have pointed to differences with respect to embeddedness in international networks and industrial restructuring as the reason for regional disparities in the CEE countries (Heidenreich and Wunder, 2008; Chapman and Valentina, 2011).

The degree in which regions in CEE countries are able to attract and embed foreign investments, and particularly what role capital and secondary city regions may play in this, has not received much attention. This is mainly due to data limitations. Concerning regional development, Malecki (2002), Frenken and Hoekman (2006) as well as Tracey and Clark (2003) have drawn attention to the potential importance of global networks as sources of goods and knowledge in shaping firm competitiveness in a particular area. This issue becomes more prominent as regional positions in knowledge, trade and FDI networks are regarded as

important attributes of smart specialization strategies of European regions, aiming at future cohesion (Thissen et al., 2013). Barca et al. (2012) argue why place-based development strategies in European Union in relation to international network positions may be determining for future cohesive development. In spatially blind approaches it is argued that agglomeration in combination with encouraging people's mobility not only allows individuals to live where they expect to be better off but also increases individual incomes, productivity, knowledge and aggregate growth. From this perspective, spatially blind policies are also seen as "people-based", representing the best approach to improving inhabitants' lives. Consequently, development intervention should be space-neutral, and factors should be encouraged to move where they are most productive. In reality, this is primarily in large cities. In contrast, the place-based approach assumes that the interactions between institutions and geography are critical for development, and many of the clues for development policy lie in these interactions. To understand the likely impacts of a policy, the interactions between institutions and geography, therefore, requires explicit consideration over specifics of the local and wider regional context. In Europe, all urban regions may inhabit such unique development features (Barca et al. 2012).

This article aims at testing whether the position of CEE regions in international networks of multinational corporations (MNCs) attributes to regional development potentials and future competitiveness and cohesion. We are especially interested in the position of capital city regions versus second tier city regions in networks of foreign direct investments. Despite the suggested advantages of second tier city regions and the fact that most CEE regions experienced productivity growth in manufacturing industries, the CEE capital city regions are converging at a faster rate due to their networked, service oriented economies (Dogaru et al., 2011). Reasons for this matter may be related to international (FDI) network positions. The present analysis focuses on the location decisions of MNCs investment in the NUTS-2 regions of CEE countries. Overall, the number of alternative locations is larger for MNCs than for domestic firms when making an investment decision. In addition, MNCs are expected to select the foreign investment locations that best fit the characteristics of the investment project and yield the largest benefits for the firm. This applies to Greenfield FDI that does not face constraints from existing capital instalments or prior investments (unlike mergers and acquisitions). Hence, the location decisions of MNCs clearly reflect the particular competitive advantage of certain regions and provide a meaningful way to compare the attractiveness of different regions for particular sectors and functions. We hypothesize that competitive

advantages of regions may be in market accessibility, labour cost advantages, strategic assets, natural resources, institutional quality and agglomeration, in the post-crisis era even more than before. Section 2 discusses more detailed the motivations for location of MNCs in regions. Section 3 then introduces both the data used for empirical testing and a classification of capital and second tier city regions in CEE countries. Section 4 provides an overview of the empirical results and discusses the findings. Section 5 presents conclusions and discusses what our results suggest for competitiveness, cohesion policy and place-based development strategies.

4.2 Motivations for MNCs to invest in CEE regions

As Brienen et al. (2010) and Burger et al. (2013) summarize, the literature on FDI generally acknowledges that an increase in FDI is beneficial for home activities through the acquisition of skills and technology from abroad, when foreign employment does not replace national employment. However, for host countries and regions, the location decision of MNCs is also important, as FDI can boost a host country's prospects for (regional) economic development through effects such as the creation of employment, growth of the capital stock, and the promotion of exports. As the FDI literature on economic geography, international business, and international economics suggests, investments by MNCs are attracted by favourable economic location factors. Moreover, as MNCs expanding internationally into new geographical markets encounter uncertainty, the imitation of past behavior by other MNCs can stimulate investments.

Foreign direct investments (FDI) are long-range investments in a country other than the country in which the foreign direct investor is based. Firms internationalize if the competitive advantages gained from operating abroad are high enough to cover the additional costs and risks that are associated with this action. Following Dunning's OLI paradigm, Brienen et al. (2010) argue that firms decide to invest abroad when they have market power, given by the ownership (O) of products or production processes, a location advantage (L) in placing their plant in a foreign country rather than their homeland, and an advantage gained from internationalizing (I) their foreign activities in fully owned subsidiaries rather than carrying them out through market transactions (trade) or networked relationships with other firms (licensing and franchising).

From the perspective of the internal organization of the MNC, FDI can be horizontal and vertical (Barba Navaretti and Venables, 2004; Iammarino and McCann, 2013). Horizontal FDI are investments in which a firm duplicates a number of its own activities abroad that are carried out in the home country. The main trade-off faced by firms for this type of investment is between the increased sales (market access), strategic advantage and lower transportation costs that are gained by operating abroad versus the foregone internal economies of scale and disintegration costs. Vertical FDI are investments in which a firm decides to geographically disperse its activities by function, whereby some of these functions are now carried out abroad. In this case, the main trade-off is between the lower factor costs associated with investing abroad versus the increased trade and disintegration costs. In relation to the distinction between horizontal and vertical FDI, Brienen et al. (2010) and Burger et al. (2013) distinguish between four reasons of firms to internationalize the production process, which stress the location aspects of FDI.

1. *Foreign-market-seeking FDI.* Firms will supply their goods or services to foreign markets and possibly enhance third markets from this location. In most cases these markets are previously served through exports from the domestic market. This type of FDI is usually a form of horizontal investment, whereby (emerging) markets are served by a local affiliate. Except for market size, accessibility and infrastructure also play a key role.
2. *Efficiency-seeking FDI.* Firms are trying to reduce their costs of production related to labor, machinery and materials. Differences in the costs of production factors across regions can make a firm decide to geographically separate its tasks. These lower production costs abroad are often associated with labor market and trade circumstances - lower wages, taxes and trade costs as well as the availability of grants and subsidies in a host country. This type of investment is most often vertical FDI.
3. *Resource-seeking FDI.* The firm invests abroad to procure certain resources at lower costs than those in their original market. In this case, the availability of natural resources, the presence of a good infrastructure (to secure physical supply), and local partners to obtain knowledge and exploit these resources are relevant reasons to place investments abroad.
4. *Strategic asset-seeking FDI*. The firm aims at purchasing assets of foreign firms to foster their long-term strategic objectives, sustaining and advancing the firm's international competitiveness. This FDI category is determined by the requisite of firms to obtain assets and knowledge ranging from specific technological capabilities to management or marketing expertise. This type of investment features both horizontal and vertical FDI.

In short, it can be expected that horizontal FDI will be drawn to locations with good market access, while vertical FDI will be drawn to places with lower factor costs. A distinction in functions of investments (R&D, production, sales, etc.) will be informative as well, as this is closely related to the motivations for their location choice.

Two more important explanations for regional attractiveness (for FDI) should be mentioned for CEE regions. First, good institutions, legal frameworks and trust among citizens and government may be of key importance (Rodriguez-Pose, 2013). For practically all regions in CEE countries, the recently developed key indicator of "quality of government" scores particularly low (Charron et al., 2014). Still, variation across regions in CEE countries may pose important attractions to firms (re)locating activities abroad. Second, agglomeration patterns are more polarized in CEE countries compared to West-European countries. CEE country regions also exhibit marked different sectoral structures compared to West-European regions (Van Oort et al., 2014) and FDI seems to foster productivity and vertical spillovers more than in Western European countries (Lipsey, 2006). It is therefore important to test for agglomeration (productivity) magnitudes and composition explicitly.

4.3 Data and variables

In this article, we concentrate on Greenfield FDI in 49 NUTS-2 regions in 6 CEE countries. Information on Greenfield FDI is provided by the Financial Times fDi Markets database. This project-level data was gathered primarily from publicly available resources such as formal media sources, financial information databases, industry organisations, and publications of companies. Overall, our database comprises 7,284 investments belonging to 3,465 different MNCs in 6 CEE countries (Poland, Czech Republic, Slovakia, Hungary, Romania and Bulgaria) between January 2003 and December 2010.[13] Most Greenfield investments in the CEE countries originated from within the European Union, EFTA (71%) and North America (16%), aiming at low-tech manufacturing (21%), medium-tech manufacturing (19%), and commercial services (17%).

By using Eurostat's taxonomy of metropolitan regions, the NUTS-2 regions were grouped into one of the following three categories (Dijkstra, 2009; Chapman and Valentina, 2012; see Appendix D):

[13] For 52 investments (0.7%), we were unable to obtain the region in which the investment was made. Hence, these investments were omitted from the database. See Burger et al. (2013) for a more elaborate description of the European database on Greenfield investments.

- Capital city regions: NUTS-2 regions around the capital city. In the analysed CEE countries, these capital city regions are also the ones which are best embedded into international markets (Fratesi, 2012).
- Regions with a second-tier city: NUTS-2 regions with at least one second-tier city. Second-tier cities are the largest cities in the country, excluding the capital. In the CEE countries, there is a maximum of 5 second-tier cities per country.
- Other regions: regions with a smaller city and non-metropolitan regions. Smaller city-regions are NUTS-2 regions with at least one urban area of 250,000 inhabitants. These larger urban zones include major cities and are adjoining travel-to-work areas. Non-metropolitan regions are NUTS-2 regions without at least a 250,000 inhabitant urban zone.

Table 1 shows the number of investments in the period 2003-2010 by CEE countries and these three region types. Capital city regions attract by far most investments in all CEE countries. Second tier city regions appear as particularly attractive destinations for foreign investors in Poland.

Table 1: Number of investments (2003-2010) by destination country and region type

	Capital City Region	**Region with Second-Tier City**	**Other Region**
Bulgaria	436 (52.1)	197 (23.6)	203 (24.2)
Czech Republic	429 (41.6)	234 (22.7)	368 (35.7)
Hungary	534 (44.3)	176 (14.6)	495 (41.1)
Poland	528 (27.4)	1075 (55.9)	320 (16.6)
Romania	742 (47.6)	354 (22.7)	462 (29.7)
Slovakia	198 (32.9)	101 (16.8)	303 (50.3)
Total Investments	2867 (40.1)	2137 (29.9)	2151 (30.0)
Number of Regions	7	17	25
Row percentages in parentheses. Other regions are NUTS-2 regions with smaller city or non-metropolitan regions. A taxonomy of regions can be found in Appendix D.			

In terms of functions, most investments were made in production plants (43%), business, sales and marketing offices (23%) as well as building and construction (11%). This study focuses on which functions attract FDI, using information about the economic activities pursued by MNCs. These functions can be linked to the quality of the investment made and to the various motivations why MNCs have to invest abroad. Building on earlier research by Defever (2006) and Spies (2010), we group the economic functions into four different categories (see Appendix C): upstream activities (i.e., management, headquarters and R&D), construction and utilities, production plants, and downstream activities (i.e., business services, sales and

marketing, support functions, and logistics). Table 2 displays the distribution of the investments across region type. Both upstream activities and services and downstream functions tend to be concentrated in the capital city regions. Production facilities and resource-seeking investments (extraction & energy) are relatively more oriented towards second tier and smaller city regions. Logistics and distribution activities are more evenly spread across the three types of regions.

Table 2: Number of investments (2003-2010) by broad function and region type

	Capital City Region	**Region with Second-Tier City**	**Other Region**
Headquarters	64 (77.1)	10 (12.1)	9 (10.8)
R&D	177 (53.2)	97 (29.1)	59 (17.7)
Construction	487 (58.3)	183 (21.9)	165 (19.8)
Extraction & Energy	67 (28.3)	86 (36.7)	83 (35.0)
Production Plants	486 (16.0)	1146 (37.7)	1410 (46.3)
Business, Sales & Marketing	1157 (70.4)	293 (17.8)	194 (11.8)
Support & Servicing	184 (51.0)	118 (32.7)	59 (16.3)
Logistics & Distribution	245 (39.5)	203 (32.8)	172 (27.7)
Total Investments	2867 (40.1)	2137 (29.9)	2151 (30.0)
Number of Regions	7	17	25
Row percentages in parentheses. Other regions are NUTS-2 regions with smaller city or non-metropolitan regions. A taxonomy of regions can be found in Appendix D. A taxonomy of broad functions can be found in Appendix C.			

The explanatory variables used in the analysis represent or proxy the motives of foreign firms for investment. Appendix F provides descriptive statistics of the variables used. In the baseline model, only the distinction in capital city regions (reference), second tier city regions and other regions will be used by introducing dummy variables. Multimodal accessibility (by road, air and rail) of regions captures the market accessibility motive of investments. This indicator is highly correlated with other indicators, like market potential and traffic indicators (compare Dogaru et al., 2011). The labour market argument is captured by the wage costs and unemployment rate variables. (Long-term) unemployment may be an (additional) source of cheap labour, but may also reflect an inefficient labour market system where demand does not meet supply (Elhorst, 2003). The strategic assets argument is captured by the number of patents issued in the regions and the share of the working population with a university degree. The resource seeking argument is captured by the share of mining employment in total employment. Finally, the institutional quality index for European regions is a composite measure concerning corruption, impartial public services, and rule of law. This indicator is

highly correlated to sub-national levels of socio-economic development and levels of social trust. It is noted in Charron et al. (2014) that the indicator is not correlated with the degree of political decentralization (devolution). The degree of agglomeration in regions is captured by the density of capital stock. All investments in a certain year (2003-2010) are linked to time corresponding indicators. Appendix F provides a correlation matrix of all explanatory variables used, showing that multicollinearity is a limited problem in our analyses.

4.4 The model

Location choices of multinational corporations are often modelled using discrete choice models (see Crozet et al., 2004; Head and Mayer, 2004; Defever, 2006; Basile et al., 2008; Schmidheiny and Brülhart, 2011). Probably the most often discrete choice model used is the conditional logit (McFadden, 1974). In our context, this model assumes that each multinational investing in CEE countries is faced with a set of alternative investment regions for the location of its establishment abroad, with each multinational comparing relevant location attributes. Accordingly, each location decision is considered to be the outcome of a discrete choice among a set of alternatives, where it is assumed that a utility-maximizing firm will choose to locate its subsidiary in a region if this decision maximizes the expected future profits from its investment (Long, 1997).

The conditional logit model is subject to restrictive assumptions regarding the substitution patterns across alternative investment locations. This is better known as the independence of irrelevant alternatives (IIA) and violation of this assumption is common to datasets with a large number of alternatives. Not accounting for the violation of the IIA assumption can result in inconsistent and biased estimates. Accordingly, we use mixed logit estimation, allowing for random taste variation and unrestricted substitution patterns in the discrete choice model (see Defever, 2006 and Basile et al., 2008 for similar empirical strategies in the context of location decision of multinational corporations).

Table 3 presents the outcomes of our models. Among the random terms of the coefficients, a number of variables show significant variation, indicating that the multinational firms tend to value the different location characteristics not uniformly in their location decision. As indicatively suggested by the typology of functions (Table 2 and Appendix C) and the typology of motivations for investment, this is related to the functional division of labour in capital city regions versus that in other types of regions. In column (1), outcomes of a baseline

model are presented, where the only explanatory variables are the division of regions containing capital cities, second-tier cities and other regions. The capital city region category is taken as reference. Both regions with second-tier cities and other cities receive significant and substantially less foreign investments than capital city regions, confirming earlier research by Dogaru et al. (2014). The second model presented in column (2) introduces multimodal accessibility of regions as an indicator of the market access reason of foreign investments. Better accessibility is associated with more foreign investments, as the coefficient is highly significant.

	(1) Baseline	(2) + Market Accessibility	(3) +Labour Costs	(4) +Strategic Assets	(5) + Presence Resources	(6) + Institutional Quality and Agglomeration	(7) Full Specification
Region type							
- Capital city region	•	•	•	•	•	•	•
- Region with second-tier city	-1.417 (0.057)***	-0.404 (0.088)***	-1.388 (0.067)***	-0.265 (0.091)***	-1.682 (0.057)***	-0.836 (0.070)***	0.204 (0.091)**
- Other region	-1.946 (0.064)***	-0.670 (0.082)***	-1.837 (0.073)***	-0.345 (0.091)***	-2.100 (0.062)***	-1.327 (0.083)***	0.009 (0.115)
Ln multimodal accessibility		1.593 (0.083)***					1.056 (0.098)***
Ln unit wage costs			-0.903 (0.230)***				-0.098 (0.245)
Long-term unemployment rate			-0.023 (0.012)**				-0.027 (0.012)**
Ln number of patents				0.454 (0.030)***			0.378 (0.033)***
University degree rate				0.044 (0.005)***			0.022 (0.008)***
Share mining					0.155 (0.013)***		0.101 (0.014)***
Institutional quality						-0.075 (0.067)	0.130 (0.069)*
Ln capital stock density						0.238 (0.024)***	0.075 (0.034)**
Random Parts Coefficients							
- Capital city region	•	•	•	•	•	•	•
- Region with second-tier city	1.223 (0.109)***	1.209 (0.137)***	1.101 (0.146)***	0.849 (0.148)***	1.258 (0.103)***	0.980 (0.158)***	0.543 (0.136)***
- Other region	1.615 (0.108)***	1.532 (0.160)***	1.696 (0.135)***	0.988 (0.225)***	1.638 (0.117)***	1.673 (0.210)***	1.082 (0.187)***
Ln multimodal accessibility		0.475 (0.135)***					0.669 (0.135)***
Ln unit wage costs			1.750 (0.494)***				2.352 (0.305)***
Long-term unemployment rate			0.109 (0.025)***				0.101 (0.023)***
Ln number of patents				0.179 (0.068)***			0.224 (0.048)***
University degree rate				0.073 (0.008)***			0.073 (0.009)***
Institutional quality						0.489 (0.093)***	0.780 (0.066)***
Country Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Number of Observations	350595	350595	350595	350595	350595	350595	350595
Number of Investment Decisions	7155	7155	7155	7155	7155	7155	7155
Number of Alternatives	49	49	49	49	49	49	49
Wald Chi-Square	1181	1440	992	1005	1616	814	955
Robust standard errors in parentheses. Error terms are clustered by parent firm ***p<0.01; **p<0.05, *p<0.10. • = Reference category. Only significant random components of the coefficients are reported.							

Market access (foreign market seeking motivation) is a major reason for investments. Controlled for market access, which is high in the capital city regions, second-tier and other types of regions still receive significantly less investments than capital city regions. The third model in Table 3 introduces labour costs (efficiency seeking) as a motive for investments, proxied by wages and unemployment levels. High wages are negatively related to foreign investments in regions in CEE-countries. Second-tier and smaller urban regions, in particular, have such cost advantages (Dogaru et al., 2014). Controlling for cost advantages, non-capital city regions receive significant less investments than capital city regions. Other advantages of capital regions therefore have to be explored as well. Higher (long-term) unemployment rates attract less foreign investments. The inefficient labour market argument hampering the attraction of FDI appears more important than the potential (and additional) cheap labour argument. In column (4) in Table 3, the strategic asset motivation for investments is tested. Measured by a larger share of higher educated workforce and the number of patents, it turns out that this argument is a very important explanation for investments in the capital regions compared to regions with second-tier cities and other regions. The variable is highly significant and positive: high scores on these indicators are associated with higher investment levels. Still, after controlling for this motive, second-tier city-regions and other regions receive fewer investments. Model (5) tests for the resource seeking argument – measured as location factor by the share of mining in the regional labour force. A high share of mining is significantly correlated with more foreign investments, confirming the resource motivation hypothesis. Again, controlled for this, the regions with second-tier cities and the smaller urban regions receive less investment than capital regions.

Having confirmed all four hypothesized motivations for foreign investments in our CEE-setting, we also tested for institutional quality and agglomeration (model 6 in Table 3). Institutional quality did not come out as an individual significant (positive or negative) driving force. Agglomeration (measured by capital stock), does. Economic mass is thus important and probably instrumental for other motives for investments, like market access and strategic asset seeking. In column (7) of Table 3 we present a model in which all explanatory variables are introduced simultaneously. Now, the wage variable is not significantly attached to (less) investments anymore, indicating the little importance of the efficiency seeking argument of investments compared to other motives. All other motivation-based indicators remain significant and of the hypothesized sign. Remarkably, the good-institutions variable

becomes significant now in explaining investment attraction: better institutions are associated with more investments.

Controlled for all these factors, model (7) shows that regions with second-tier cities receive relatively *more* investments than capital city regions. Once controlled for all hypothesized motivations, we can remark that smaller urban regions do not receive more investments. In line with ESPON (2013), Breuss et al. (2010) and Scherpenzeel (2010), we are inclined to hypothesize that subsidies, region-specific economic and cohesion programmes may be responsible for this favourable outcome for second-tier city regions. It may well be that for future investment potentials, such subsidies and programmes in second-tier city regions should be connected more to several of the motivation factors distinguished in our analyses simultaneously. This may be a severe task, as our models clearly indicate that capital cities and capital city-regions score high on those indicators that attract most investments (market seeking) and the potentially most productive and innovative ones (strategic asset seeking). A simultaneous improvement of critical mass, accessibility (market potential), and strategic asset concentration (universities, R&D) may be too much to demand from second-tier urban regions.

Because FDI is argued to be one of the variables very sensitive to economic shocks (The Economist, 2012), the full model 7 in Table 3 is re-estimated for two periods in time: a pre-crisis period (2003-2007) and a (post) crisis period (2008-2010). Table 4 reports the results of this analysis. The general structure of factors influencing locational decisions of multinational investments is similar in both periods. Important for our analysis is to notice that controlled for all factors, the position of regions with second-tier cities does not significantly contribute to the attraction of investments. The labour market arguments (wages and unemployment) are insignificant in the (post) crisis model compared to the pre-crisis period. Agglomeration (measured by capital stock density) is significantly attached to investments in the (post) crisis period, and not in the per-crisis period. Combined, this suggests that economic agglomeration in larger city-regions provides larger opportunities of attracting investments in post-crisis circumstances, arguably due to the concentration of talent and a diversified economy that may mitigate the worse effects of recession (see for this argumentation Clark, 2009 and Cohen, 2012).

Table 4: Mixed Logit Estimates for Location Choices of Multinationals in CEE Regions by Period

	2003-2007	2008-2010
Region type		
- Capital city region	•	•
- Region with second-tier city	0.040 (0.129)	-0.186 (0.149)
- Other region	-0.044 (0.141)	-0.437 (0.166)***
Ln multimodal accessibility	0.989 (0.134)***	0.726 (0.162)***
Ln unit wage costs	-0.641 (0.350)*	-0.266 (0.360)
Long-term unemployment rate	-0.025 (0.012)**	-0.012 (0.034)
Ln number of patents	0.304 (0.033)***	0.416 (0.049)***
University degree rate	0.025 (0.010)***	-0.006 (0.012)
Share mining	0.098 (0.015)***	0.084 (0.024)***
Institutional quality	0.046 (0.078)	0.142 (0.099)
Ln capital stock density	0.068 (0.041)	0.156 (0.055)***
Random Parts Coefficients		
- Capital city region	•	•
- Region with second-tier city	1.091 (0.162)***	
- Other region	1.256 (0.215)***	0.981 (0.166)***
Ln multimodal accessibility		0.490 (0.192)**
Ln unit wage costs		3.074 (0.369)***
Long-term unemployment rate	0.132 (0.017)***	0.145 (0.046)***
University degree rate	0.065 (0.010)***	0.074 (0.012)***
Share mining	0.096 (0.025)***	
Institutional quality	0.713 (0.071)***	
Ln capital stock density		0.124 (0.063)**
Country Fixed Effects	YES	YES
Number of Observations	226821	123774
Number of Investment Decisions	4629	2526
Number of Alternatives	49	49
Wald Chi-Square	1218	663
Robust standard errors in parentheses. Error terms are clustered by parent firm ***p<0.01; **p<0.05, *p<0.10. • = Reference category Only significant random components of the coefficients are reported.		

4.5 Conclusions and discussion

In this chapter we were looking for explanations of foreign direct investments in various types of regions in Central and Eastern European countries. Capital city regions attract by far most investments during 2003-2010, especially investments with motivations for market-seeking and strategic asset seeking. Agglomeration economies are also important, indicating that a critical mass is needed to attract (more) investments. This critical mass may well be instrumental for market-seeking and strategic-asset seeking investments as well. Despite recently suggested advantages of second-tier city regions (less congestion, growth opportunities in niche markets, strategic network connections in value chains, lower costs of

living), our findings foresee difficulties in achieving better positions in FDI networks for such cities and regions. As exogenous growth facilitator in regions, FDI "loves agglomeration".

Although agglomeration economies in the capital cities are already developed and their costs (negative externalities) are already high, these cities benefit from the critical size requirement that obviously plays a dominant role in investment decisions. It should be remarked that the capital city regions are a heterogeneous and expanding group themselves. Between 1914 and 2014 there were drastic changes in the number of independent countries in Central and Eastern Europe, implying also a large variation in capital cities. Before 1914 there were five recognized capitals[14], after 1920 this grew to eleven[15], after 1945 it declined to eight again[16], and after 1992 it grew to twenty-one[17]. All differ in size and structure – and not all of them are in the European Union. In the same vein, second-tier cities differ in structure and sizes. Rotterdam (The Netherlands), Milano (Italy), München (Germany) and Barcelona (Spain) are somewhat at odds in size, agglomeration and functional structure with Timisoara (Romania), Krakow (Poland), Brno (Czech Republic) or Szeged (Hungary). Still, all these cities are marked as second-tier cities (ESPON, 2013). The often suggested functioning of such cities in polycentric urban networks that collective may form a critical mass, is often met with institutional and cognitive barriers between the cities (Davoudi, 2003). For such a strategy to be successful, efforts of local and national governments in working on economic complementarities, infrastructure connections, translocal service provision and a supra-regional strategy is necessary. It requires an adjusted strategy on place-based development, taking into account positions in networks of trade, knowledge and FDI as growth factors both (inter) regionally and (inter) nationally.

In order to create conditions for the economic performance of secondary city regions, strong public interventions are advocated by ESPON (2013), aiming at the creation of integrated, multi-level and participatory governance. These interventions should come, on the one hand, from the cities themselves, and, one the other hand, from the national and European level. Second-tier city regions are supposed to open up their internal structures towards cooperation with other stakeholders, mainly the economic and educational partners (triple Helix). They are also stimulated to open up in territorial sense, towards their surrounding areas, aiming at

[14] Vienna, Belgrade, Bucharest, Sofia, Cetinie (Montenegro).
[15] Vienna, Belgrade, Bucharest, Sofia, Budapest, Warsaw, Prague, Tirana, Tallinn, Riga, Vilnius.
[16] Vienna, Belgrade, Bucharest, Sofia, Budapest, Warsaw, Prague, Tirana.
[17] Vienna, Belgrade, Bucharest, Sofia, Budapest, Warsaw, Prague, Tirana, Tallinn, Riga, Vilnius, Bratislava, Ljubljana, Zagreb, Sarajevo, Podgorica, Pristine, Skopje, Minsk, Kiev, Chisinau.

uniting the functional urban area – economic development needs well organized functional cooperation area to allow agglomeration economies. The tasks of national governments then is to establish overarching governance reforms to initiate cooperation between local governments within the same urban area and stimulate more regional decentralization: regions with more regional independence in planning would give more power to secondary cities as centres of the regions. However, in CEE countries this decentralization process has not yet been experienced before at such levels. There is little experience and, more important, institutional and human resources are lacking. In consequence, future decentralization policies should come in well-planned and safe steps in order to avoid unstable public institutional capacity regarding public safety or local healthcare systems especially affecting smaller cities or rural areas within a region.

In the case of the Central East European secondary city regions there is little progress regarding their own efforts and more open and flexible government policies (Parkinson et al., 2014).There is a clear need for more European involvement in redirecting financing to secondary city regions. In this view, cohesion policy should partly shift its emphasis from compensating for deficient regional growth to encouraging secondary growth centres. Additionally, EU guidelines should emphasize the importance of more decentralized regional development.

Our research outcomes confirm that a positive development of second-tier city regions in Europe is not as straightforward as recently suggested. Second-tier city regions do not have an overall central position in networks of foreign direct investment – an important (exogenous) development factor of regions and cities. Given the simultaneously needed critical mass, knowledge endowments and physical accessibility, especially in post-crisis investment trajectories of multinationals, a networked FDI based development will be difficult. Presently, second-tier city regions, and even some of the smaller CEE capital city regions, are not capable of offering all these factors simultaneously in sufficient quantities. For improving their opportunities and contribution to European cohesion and convergence, more substantial and directed investments are needed. Without these, the suggested competitiveness opportunities of second-tier city regions are difficult to obtain.

FINAL REMARKS AND POLICY DEBATE

The economic and social cohesion among member states and its regions differs greatly over Europe. In the light of new cohesion policy to be formulated in the very near future, it is important to determine what fosters local economic growth, and how untapped potentials of regions for development and cohesion can be fostered. This dissertation contributes to this identification of potentials by investigating regional economic growth and foreign investments from new perspectives. This dissertation also has a special emphasis on Central and Eastern European (CEE) countries, as these are under-researched in the present empirical literature. Their unique institutional and transitional backgrounds make them extremely interesting for learning – especially on cohesion and convergent issues. Throughout the four empirical chapters, we respectively look at (1) objective-1 regions (which are predominantly in Eastern Europe) compared to other European regions, (2) medium-sized city-regions as opposed to larger capital regions (not differentiated over Eastern and Western European regions), (3) and (4) so-called second-tier city-regions as opposed to larger capital regions in CEE-regions. The analyses contribute to the discussion on cohesion and competitiveness policies on regional level in the EU. The main research question in this thesis is: *What are economic growth potentials for second tier and Objective 1 CEE regions, and what is the role of regional policy?* The first two chapters focus on economic growth opportunities of European regions in relation to economic variety. The type of modelling fits into an endogenous growth conceptualisation. The third and fourth chapters focus on regional-external (exogenous) growth potentials related to foreign direct investments in CEE regions. The most important conclusions of the four chapters will be presented in relation to the research questions of each chapter. After that, the implications and conclusions for European and regional level policy are summarized.

Diversification, specialisation and objective-1 regions in Europe

The analyses in the first empirical chapter focuses on the influence of economic diversification on the regional development compared to economic specialization. Although the either/or discussion on the specialization-trade-off is a long standing issue in agglomeration economies, recent insights show that this discussion is not optimally positioned. Serious questions have been raised on the influence of measurement, variable

definition, quality of data and issues on sectoral and spatial scale, causality and endogeneity. Also, even after controlling for this heterogeneity, several studies find simultaneous evidence for the existence of specialization and diversification externalities, using conceptualizations like lifecycles of industries and time varying contexts.

The first empirical chapter in this dissertation contributes to this discussion by focusing on the role of objective-1 regions in economic growth in the period 2000-2010. Objective-1 regions are predominantly situated in Central and Eastern European countries – meaning the average GDP in these regions is significantly lower than the EU average. The chapter hypothesises that a diversified regional economy may facilitate crossovers between industries, learning opportunities and hence growth potentials in early stages of industries' life-cycles. On the medium long-run, this would hypothetically co-evolve with employment growth, creating new jobs in a setting of product innovation. Contrary to this, specialization of regional economy potentially contributes more to a higher productivity of firms, as economies of scale in a dominant technological regime can be capitalized on. The application of this simple two-set of hypotheses (although the models control for other issues related to regional employment and productivity growth) to Western and Eastern European (objective-1) regions provides an interesting background of the analysis. Objective-1 regions are in general more specialized, but especially in medium-tech activities.

Five questions were central in the first chapter. The first question asked how agglomeration economies can be measured, and what theoretical and conceptual frameworks are relevant for that. In our analysis, the most important way of measurement of agglomeration economies concerned the specialization/diversity indicator on which we formulated different hypotheses in relation to growth. We found, in line with our hypothesis, that employment growth is more related to a diverse economy in non-objective 1 (Western-European) regions, while productivity growth links to specialized objective 1 (Eastern-European) regions. More research on that issue in the context of European economic growth is needed, as the research in this chapter is not exact on causality yet – as many other studies.

The second question asked what spatial patterns of productivity growth and regional employment growth across European regions exist. We found clear differences in the levels of employment and productivity across the 227 European regions, as well as significant variations in growth figures. Objective 1 regions grow very fast in productivity (starting from low base values though), and the non-objective 1 regions perform better in employment

growth. Our models do not distinguish in the types of jobs provided by growth. A common belief is that specializations of regions are not identical over Europe, causing different development trajectories to emerge, with some regions specializing in qualitatively high-level jobs, and others in low or medium level jobs. Lately, the European Union focuses on this issue in the debate on "smart specialization", aiming at investments in specializations in regions that are in line with the current activities present.

The third question was whether regional productivity growth and employment growth patterns display convergence. Productivity growth certainly shows clear signs of convergence (high growth rates in low-level regions and vice versa), in general and in specific sectors as well. Employment growth shows much less. This might be due to the relation with different agglomeration circumstances, as researched in this chapter.

The fourth question focused on the relation between objective 1 funding and regional economic development. Most importantly, in objective-1 regions the relation between growth and agglomeration was found to be very different than in non-objective-1 regions. As indicated, the diversity-employment growth relation holds generally more in non-objective-1 regions, and the specialization-productivity growth relation in objective-1 regions.

The final research question in this chapter concerned the position of Romanian regions as an example of recently EU-entered objective-1 regions. Previously, no consistent Romanian regional data were available, and considerable effort has been made to include reliable Romanian data into the dataset. The Romanian regions grow very fast in productivity (starting from low initial levels), but less in employment growth. The city of Bucharest shows very high growth figures. The Romanian regions are catching up to the average European levels of productivity – but there is a long way to go in this. Building on relationships found significant in our models, we conclude that long term investments in the knowledge economy (education and R&D) are necessary, also preventing the most talented (and younger) employees to leave for job opportunities elsewhere in Europe.

Reframing the diversification discussion in an EU medium-sized cities context

This chapter aims at addressing the diversity-specialisation controversy by arguing that the debate needs conceptual renewal before becoming conclusive. It is also argued that the

divergence observed in the literature concerning diversification and specialisation may be related to most likely to weak conceptualisation and limited theoretical underpinning of the concepts, apart from the observed differences in the measurement of classifications and methodological issues. New theoretical developments in institutional and evolutionary economic geography have recently emerged, offering heterodox economic explanations for regional economic development and the role of relatedness and diversification (Van Oort, 2014).

The now burgeoning evolutionary economic geography tradition has called into question whether the concepts of diversification and specialisation can fully capture the complex role of variety within an economy (Van Oort, 2014). Interest in the role of specific forms of variety, notably related and unrelated variety (Frenken et al., 2007; Boschma and Iammarino, 2009), has thus been revived, following earlier attempts to construct measures of relatedness and variety. Jacobs (1969) proposed the idea that the variety of a city's or region's industry or technological base can affect economic growth. Frenken et al. (2007) argue that variety and diversification consist of related and unrelated variety, specifying that the mere presence of different technological or industrial sectors is insufficient to trigger positive results – sectors need further complementarity that exists in terms of shared competences. Nooteboom (2000) indicates that for this complementarity to hold, the cognitive distance between economic entities should be neither too large (this counteracts effective communication) nor too small (this hampers the transfer of truly novel ideas). Cognitive distance is thus the basis of the distinction between related and unrelated variety, as knowledge spillovers will not transfer to all industries evenly owing to the varying cognitive distances between each pair of industries. It is argued that industries are more related when they are closer to each other in the Standard Industrial Classification system. Frenken et al. (2007) find that for Dutch urban regions, the positive results of knowledge spillovers are higher in regions with related variety, while regions characterised by unrelated variety are better hedged for economic shocks (portfolio effect). They also find marked differences between employment growth and productivity growth – similar to those discussed in the first chapter of this dissertation.

The chapter introduces indicators of regional related variety and unrelated variety. Although various country-level studies have been introduced on this conceptualisation in recent years, a pan-European test has until now been missing from the literature. A pan-European test is more interesting than country-level tests, as newly defined cohesion policies, smart-specialisation policies, place-based development strategies and policies aimed at fostering

competitiveness may be served particularly well by related and unrelated variety conceptualisations.

We analyze economic growth in European regions while separating regions by population size. A conceptual discussion on development burgeons between, on the one hand, spatially blind approaches that argue that intervention regardless of context ("people-based policy") is the best means of development and, on the other hand, place-based approaches that assume that interactions between institutions and geography are more critical for this purpose. This idea has recently been translated into a focus on either the largest regional concentrations ("people-based policies") or an urban network setting combining clusters of cities ("place-based policies"). Our framework combining productivity growth and employment growth shows that spatial regimes classified by the population size of urban regions differ significantly in both sets of models, confirming their *joint* significance. In medium-sized urban regions private R&D and specialisation levels (inter alia) are especially important in relation to productivity growth, and sectoral specialisation (negatively), related variety and the openness of the economy (inter alia) are especially important in relation to employment growth. In large urban regions, population density (negative), educational level, public R&D and the degree of specialisation (inter alia) are relatively more important for productivity growth. The outcomes of these analyses suggest particular roles in development processes for medium-sized ('second-tier') urban regions *alongside* the largest urban regions. Especially related variety – employment growth is a particular feature of small medium-sized urban regions. Perhaps due to agglomeration disadvantages, the largest urban regions do not show the highest employment growth rates. This marked regional heterogeneity indicates that micro-economic processes play out differently in different types of regions, thereby confirming that European place-based policy strategies may play an important role for regional development alongside place-neutral (people-based) policy strategies.

The hypothesised relationship between unemployment growth and unrelated variety is not confirmed in this first pan-European exercise. This finding suggests that national regulations and institutions in Europe cause the pan-European model to deviate from national models. More research is needed on this issue. In addition, future work should pay more attention to causality (i.e., whether variety induces development or whether developing regions create more variety), panel estimation to ensure the robustness of the relations found, the testing of other types of spatial heterogeneity (e.g., cohesion regions versus core regions, or university

regions versus non-university regions), and continuous space modelling of firm-level data to avoid spatial scale and selection processes.

Foreign direct investment projects in CEE-regions: why invest beyond the capital?

The largest regional disparities in Central and Eastern European (CEE) countries are between capital and non-capital city regions. In this third and fourth chapter we approach this issue from two perspectives using FDI analysis for regional profiling and identification of competitive advantages. In chapter 3 we analyse the sectoral and functional division of labour in CEE regions within the convergence debate. By analysing the investment decisions of multinational corporations in 49 NUTS-2 regions across 6 European CEE countries (Poland, Czech Republic, Slovakia, Hungary, Romania, and Bulgaria), we show that capital city regions not only receive more Greenfield FDI but also attract a larger variety of investments in terms of sectors and functions. Capital cities are more likely to host higher-end sectors and functions, which provides an explanation for the existing regional disparities within CEE countries. These results highlight the importance of functional and sectoral divisions of labour in the view of regional profiling and contribute to the recent EU Cohesion Policy debate.

CEE regions are treated from an exogenous growth perspective. In this view, Greenfield FDI location patterns are telling a story about the competitive advantages of regions. At a general glance, we can see that multinationals choose to locate their activities in such geographical points due to potential new markets, property ownership, low taxes or cheap labour force. However, thoroughly analysed, these investments reveal results of cost-benefit analyses at different stages.

Looking at the database used, most funds were directed towards medium/low-tech manufacturing and commercial services. In terms of functions, investments were made into production plants, business, sales and marketing offices or building construction.

Dividing these regions into capital, second tier and small, the results exhibit how foreign capital is used for top functions and service-oriented sectors in capital city regions. This latter category is more attractive due to embeddedness in international trade networks, faster industrial restructuring and the presence of top level governments.

Second tier city regions are less connected to international economies, are less adaptable to the present knowledge society and are smaller in size. Small city regions are mainly former heavy industrial sites or agricultural based economies. The human capital is scarce and they

lack knowledge institutions. In this light, a sectoral and functional division of labour can be noticed. Capital city regions attract investments in top sectors and functions. Secondary city regions receive investments such as market-seeking functions, business sales or marketing offices. Small city regions are targeted as locations for production plants, construction or extraction and energy activities.

In chapter 4 we look for explanations of foreign direct investments in various types of regions in Central and Eastern European countries. Capital city regions attract by far most investments during 2003-2010, especially investments with motivations for market-seeking and strategic asset seeking. Agglomeration economies are also important, indicating that a critical mass is needed to attract (more) investments. This critical mass may well be instrumental for market-seeking and strategic-asset seeking investments as well. Despite recently suggested advantages of second-tier city regions (less congestion, growth opportunities in niche markets, strategic network connections in value chains, lower costs of living), our findings foresee difficulties in achieving better positions in FDI networks for such cities and regions. As exogenous growth facilitator in regions, FDI "loves agglomeration".

Although agglomeration economies in the capital cities are already developed and their costs (negative externalities) are already high, these cities benefit from the critical size requirement that obviously plays a dominant role in investment decisions. All differ in size and structure – and not all of them are in the European Union. In the same vein, second-tier cities differ in structure and sizes. Rotterdam (The Netherlands), Milano (Italy), München (Germany) and Barcelona (Spain) are somewhat at odds in size, agglomeration and functional structure with Timisoara (Romania), Krakow (Poland), Brno (Czech Republic) or Szeged (Hungary). Still, all these cities are marked as second-tier cities (ESPON, 2013). The often suggested functioning of such cities in polycentric urban networks that collective may form a critical mass, is often met with institutional and cognitive barriers between the cities. For such a strategy to be successful, efforts of local and national governments in working on economic complementarities, infrastructure connections, translocal service provision and a supra-regional strategy is necessary. It requires an adjusted strategy on place-based development, taking into account positions in networks of trade, knowledge and FDI as growth factors both (inter) regionally and (inter) nationally.

In order to create conditions for the economic performance of secondary city regions, strong public interventions are advocated by ESPON (2013), aiming at the creation of integrated,

multi-level and participatory governance. These interventions should come, on the one hand, from the cities themselves, and, one the other hand, from the national and European level. Second-tier city regions are supposed to open up their internal structures towards cooperation with other stakeholders, mainly the economic and educational partners (triple Helix). They are also stimulated to open up in territorial sense, towards their surrounding areas, aiming at uniting the functional urban area – economic development needs well organized functional cooperation area to allow agglomeration economies. The tasks of national governments then is to establish overarching governance reforms to initiate cooperation between local governments within the same urban area and stimulate more regional decentralization: regions with more regional independence in planning would give more power to secondary cities as centres of the regions. However, in CEE countries this decentralization process has not yet been experienced before at such levels. There is little experience and, more important, institutional and human resources are lacking. In consequence, future decentralization policies should come in well-planned and safe steps in order to avoid unstable public institutional capacity regarding public safety or local healthcare systems especially affecting smaller cities or rural areas within a region.

In the case of the Central East European secondary city regions there is little progress regarding their own efforts and more open and flexible government policies (Parkinson et al., 2014).There is a clear need for more European involvement in redirecting financing to secondary city regions. In this view, cohesion policy should partly shift its emphasis from compensating for deficient regional growth to encouraging secondary growth centres. Additionally, EU guidelines should emphasize the importance of more decentralized regional development.

When watching attractive features of regions for FDI several factors can be considered. The baseline of the location decision is that CEE capital city regions are the first option. In order to see if second tier city regions can become more viable in this context, we weigh the choices with multiple variables. In the case of multimodal accessibility, second tier city regions are still not prevailing even though a slight change can be noticed. Thus, better accessibility by train, car or by air does not interfere in the decision. A better labour market in terms of wages and unemployment does not contribute either. The relation is negative. Nonetheless, when adding strategic assets such as patents or higher education a considerable change can be noticed, but not definitive. An innovative region with high-skilled human capital attracts much more FDI than the baseline level. Such a region can be regarded as a knowledge-hub

and therefore relate or adapt faster to advanced technologies or innovative processes. The presence of resources does not change much. Finally, institutional quality and agglomeration contribute to improving the shift towards second tier city regions.

Overall and in relation to policies, second tier city regions could have a chance in attracting FDI more than capital city regions if they would provide all these competitive advantages at the same time. However, these differences between them and capital city regions are too high and have gone even worse with the economic crisis. As a result, we join the cohesion policy agenda in targeting structural funds towards projects improving these competitive advantages. In addition, we encourage regional and local policy makers in driving national financial resources towards the same way in order to build competitive economies, with varied sectoral portfolios and challenge entrepreneurship and innovation.

Not an easy policy agenda for second-tier CEE-regions!

Collection and combining the policy recommendations on objective-1 regional economic development (chapter 1), economic growth in medium-sized city-regions in Europe (chapter 2) and investment strategies in CEE-regions (chapter 3 and 4) and the policy agenda for economic development prospects of secondary CEE-regions appears highly complex.

Chapter 1 on regional economic growth suggested investments in R&D, education, diversification of the economy (for innovation and employment growth) and an upgrading of the economy to higher-skilled labour force, needing jobs and educated (not brain-drained) talents. All broadly defined smart-specialization themes come together here (Foray 2014), but critical mass and governmental and governance power of regional and local policymakers may be the true obstacles in the short run.

Chapter 2 on related and unrelated variety adds important issues to the policy agenda. Place-based development strategies need sound institutions and transparent regulations. Private R&D shoulders alongside specialization as essential for productivity growth. It is important to stress that all three concepts – related variety, unrelated variety and specialization – together make up a resilient production structure in a region. Only focussing on relatedness for innovation and growth, while neglecting the advantages of specialized clusters (in growth markets) and the portfolio implications of unrelated variety causing potentially less unemployment (although not proven on an EU-scale in the chapter), clearly misses out on

opportunities. The openness of regional economies is found important, as is public R&D. Second-tier cities may have an advantage in growth over capital and larger cities in Europe. Addressing all these issues simultaneously from CEE-regional and second-tier city mayors and policymakers may be impossible to ask.

Chapters 3 and 4 broaden the policy discussion, by implying that supra-regional vision making and budgeting may be needed – on national or EU levels – on infrastructure, identifying economic complementarities, triple-helix organisation, best practices governance and devolution processes.

All these suggestions confirm that a positive development of second-tier city regions in Central and Eastern Europe is not as straightforward as often suggested. Second-tier city regions do not have an overall central position in networks of foreign direct investment – an important (exogenous) development factor of regions and cities. They have less organizing capacity and experience in most of the local policy instruments suggested. Given the simultaneously needed critical mass, knowledge endowments and physical accessibility, especially in post-crisis investment trajectories of multinationals, a networked FDI based or structural diversification development will be difficult. Presently, second-tier city regions, and even some of the smaller CEE capital city regions, are not capable of offering all these factors simultaneously in sufficient quantities. For improving their opportunities and contribution to European cohesion and convergence, more substantial and directed investments are indeed needed. Without these, the suggested competitiveness opportunities of second-tier city regions are difficult to obtain.

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APPENDICES

Appendix A: Taxonomy of Regions

NUTS-code	**Region Type**	**NUTS-code**	**Region Type**
BG31	Non-Metropolitan Region	PL31	Region with Smaller City
BG32	Non-Metropolitan Region	PL32	Region with Smaller City
BG33	Region with Second-Tier City	PL33	Region with Smaller City
BG34	Non-Metropolitan Region	PL34	Region with Smaller City
BG41	Capital City Region	PL41	Region with Second-Tier City
BG42	Region with Second-Tier City	PL42	Region with Smaller City
CZ01	Capital City Region	PL43	Non-Metropolitan Region
CZ02*	Capital City Region	PL51	Region with Second-Tier City
CZ03	Region with Smaller City	PL52	Region with Smaller City
CZ04	Non-Metropolitan Region	PL61	Region with Smaller City
CZ05	Non-Metropolitan Region	PL62	Region with Smaller City
CZ06	Region with Second-Tier City	PL63	Region with Second-Tier City
CZ07	Non-Metropolitan Region	RO11	Region with Second-Tier City
CZ08	Region with Second-Tier City	RO12	Region with Smaller City
HU10	Capital City Region	RO21	Region with Second-Tier City
HU21	Non-Metropolitan Region	RO22	Region with Second-Tier City
HU22	Non-Metropolitan Region	RO31	Non-Metropolitan Region
HU23	Non-Metropolitan Region	RO32	Capital City Region
HU31	Region with Second-Tier City	RO41	Region with Second-Tier City
HU32	Region with Second-Tier City	RO42	Non-Metropolitan Region
HU33	Non-Metropolitan Region	SK01	Capital City Region
PL11	Region with Second-Tier City	SK02	Non-Metropolitan Region
PL12	Capital City Region	SK03	Non-Metropolitan Region
PL21	Region with Second-Tier City	SK04	Region with Second-Tier City
PL22	Region with Second-Tier City		

* Constitutes travel-to-work area of Prague (CZ01)

Appendix B: Taxonomy of Investments by Broad Sectors

Category	**Sectors**
Natural Resources	Alternative/Renewable Energy Chemicals Coal, Oil & Natural Gas Minerals
Low-Tech Manufacturing	Beverages Ceramics & Glass Consumer Products Food & Tobacco Metals Paper, Printing & Packaging Plastics Rubber Textiles Wood Products
Medium-Tech Manufacturing	Automotive Components Automotive OEM Building & Construction Materials Engines & Turbines Industrial Machinery Non-Automotive Transport OEM
High-Tech Manufacturing	Aerospace Biotechnology Business Machines & Equipment Consumer Electronics Electronics Components Medical Devices Pharmaceuticals Semiconductors
Transport Services	Transportation Warehousing & Storage
Software & ICT	Communications Software & IT Services Space & Defence
Financial Services	Financial Services
Commercial Services	Business Services Real Estate Healthcare Hotels & Tourism Leisure & Entertainment

Appendix C: Taxonomy of Investments by Broad Functions

Category	**Functions**
Headquarters	Headquarters
R&D	Design, Development, and Testing Education and Training Research and Development
Construction	Construction ICT and Internet Infrastructure
Extraction & Energy	Extraction Energy
Production Plants	Manufacturing
Business, Sales & Marketing	Business Services Sales, Marketing, and Support
Support & Servicing	Customer Contact Centres Maintenance & Servicing Shared Service Centres Technical Support Centres
Logistics & Distribution	Logistics, Distribution and Transportation Retail

Appendix D: Taxonomy of regions

NUTS-code	**Region Type**	**NUTS-code**	**Region Type**
BG31	Other Region	PL31	Other Region
BG32	Other Region	PL32	Other Region
BG33	Region with Second-Tier City	PL33	Other Region
BG34	Other Region	PL34	Other Region
BG41	Capital City Region	PL41	Region with Second-Tier City
BG42	Region with Second-Tier City	PL42	Other Region
CZ01	Capital City Region	PL43	Other Region
CZ02*	Capital City Region	PL51	Region with Second-Tier City
CZ03	Other Region	PL52	Other Region
CZ04	Other Region	PL61	Other Region
CZ05	Other Region	PL62	Other Region
CZ06	Region with Second-Tier City	PL63	Region with Second-Tier City
CZ07	Other Region	RO11	Region with Second-Tier City
CZ08	Region with Second-Tier City	RO12	Other Region
HU10	Capital City Region	RO21	Region with Second-Tier City
HU21	Other Region	RO22	Region with Second-Tier City
HU22	Other Region	RO31	Other Region
HU23	Other Region	RO32	Capital City Region
HU31	Region with Second-Tier City	RO41	Region with Second-Tier City
HU32	Region with Second-Tier City	RO42	Other Region
HU33	Other Region	SK01	Capital City Region
PL11	Region with Second-Tier City	SK02	Other Region
PL12	Capital City Region	SK03	Other Region
PL21	Region with Second-Tier City	SK04	Region with Second-Tier City
PL22	Region with Second-Tier City		

* Constitutes travel-to-work area of Prague (CZ01)

Appendix E: Descriptive statistics of variables included in the regressions

Name	Description	Mean	SD
Region with second-tier city dummy	Takes value 1 if region with second-tier city. Classification based on Dijkstra (2009).	0.35	0.48
Other region dummy	Takes value 1 if region is not capital city region or region with second-tier city. Classification based on Dijkstra (2009).	0.51	0.50
Ln multimodal accessibility	Natural logarithm of number of people that can potentially be accessed by air, rail, and road. Obtained from Spiekermann and Wegener (2006)	16.60	0.40
Ln unit wage costs	Natural logarithm of regional wage costs divided by regional gross value added. Obtained from Cambridge Econometrics.	0.54	0.22
Long-term unemployment rate	Long-term unemployment rate in a region. Obtained from Eurostat	5.14	3.33
Ln number of patents	Natural logarithm of number of patent applications. Obtained from Eurostat.	1.62	0.98
University degree rate	Percentage of the workforce between 25 and 64 with tertiary (ISCED 5-6) education. Obtained from Eurostat	19.10	6.53
Share mining	Employment in mining and utilities as percentage of total employment. Obtained from Cambridge Econometrics.	2.62	1.38
Institutional quality	Institutional quality index for European regions by Charron et al. (2014).	-1.01	0.62
Ln capital stock density	Natural logarithm of (capital stock / total area in km^2). Obtained from Cambridge Econometrics.	0.51	1.32
Number of observations=350595. Please note that for all logarithmic transformation we applied an inverse hyperbolic sine transformation (Burbidge et al. 1988) when we had to deal with variables that included observations with zero value.			

APPENDIX F: Correlation table of main variables included in the analyses (N=350595)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Region with second-tier city	1.00									
(2) Other region dummy	-0.74	1.00								
(3)Ln multimodal accessibility	-0.14	-0.35	1.00							
(4) Ln unit wage costs	0.04	0.07	-0.25	1.00						
(5)Long-term unemployment rate	0.13	0.09	-0.19	0.45	1.00					
(6) Ln number of patents	-0.02	-0.32	0.72	-0.29	-0.16	1.00				
(7) University degree rate	-0.13	-0.27	0.43	0.20	-0.10	0.47	1.00			
(8) Share mining	0.23	-0.04	-0.15	0.07	0.16	-0.33	-0.35	1.00		
(9) Institutional quality	0.04	0.06	0.23	-0.23	0.01	0.43	0.02	-0.41	1.00	
(10) Ln capital density	-0.11	-0.29	0.81	-0.34	-0.18	0.75	0.49	-0.26	0.35	1.00