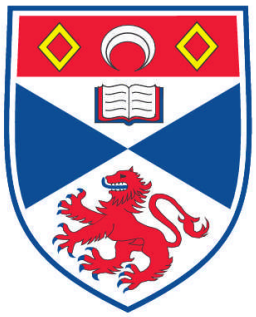
THREE EMPIRICAL ESSAYS ON DETERMINANTS OF INDUSTRY AND INVESTMENT LOCATION PATTERNS IN THE CONTEXT OF ECONOMIC TRANSITION AND REGIONAL INTEGRATION: THE EVIDENCE FROM CENTRAL AND EASTERN EUROPEAN COUNTRIES

Adnan Šerić

A Thesis Submitted for the Degree of PhD
at the
University of St. Andrews



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Three Empirical Essays on Determinants of Industry and Investment Location Patterns in the Context of Economic Transition and Regional Integration

- The Evidence from Central and Eastern European Countries -

Adnan Šerić

Submitted for the degree of
Doctor of Philosophy (Economics)
at the University of St Andrews

March 2011

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I dedicate this thesis to my family.

Abstract

The factor determinants of industry and investment location patterns in transition economies can be expected to differ from those frequently observed in developed countries. Historically, centrally planned economies have suffered from inefficient industrial policies that are generally assumed to have had distortive effects on spatial location of industry. The process of economic transition and regional integration that followed the demise of socialist structures is assumed to have subsequently affected the geographical distribution of economic activities within and between countries of the region. Given the above this thesis capitalises on the quasi-natural experiment setting to further explore industry and investment location decisions in transition economies.

In particular, the research presented here follows three main objectives. First, it intends to provide a comprehensive picture of changes in industry location patterns over time. Second, it aims to contribute to the debate on factor determinants of industry location at various levels of spatial aggregation. Third, it seeks to explore location determinants of foreign direct investors in particular, given their pivotal role for economic development of transition economies. In all instances, the research is geared towards a better understanding of the role of institutional factors, such as reforms and policies, in affecting distribution of economic activity across space. Thus, the work conducted qualifies as a further contribution to the analysis of structural changes that have affected the economies under examination. In broad terms, the findings presented here point towards significant changes in spatial location patterns of industry and investments that are leading to increased polarisation of economic landscape over time. Nonetheless, we find evidence that certain institutional factors qualify as viable policy levers, thereby providing ample scope for policy makers to impact existing location patterns of economic activity.

JEL Classifications: F15; P20; R12; F21; L50.
Keywords: Economic transition; economic integration; spatial distribution of economic activity; international investment; economic policy.

Contents

List of Figures and Maps

List of Tables

Abbreviations

BAFTA	Baltic Free Trade Agreement
CEEC	Central and Eastern European Countries
CEFTA	Central European Free Trade Agreement
CEPII	Centre d'Etudes Prospectives et d'Informations Internationales
CIS	Commonwealth of Independent States
CMEA	Council for Mutual Economic Assistance
CU	Custom Union
DWH	Durbin-Watson-Hausman statistic
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EFW	Economic Freedom of the World (Index)
ERDF	European Regional Development Fund
EU	European Union
FDI	Foreign Direct Investment
FGLS	Feasible Generalised Least Squares
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GLS	Generalised Least Squares
GMM	General Method of Moments
ICRG	International Country Risk Guide
ILO	International Labour Organisation
ISPA	Instrument for Structural Policies for Pre-Accession
LISA	Local Indicators of Spatial Association
LSDV	Least Square Dummy Variable
LQ	Location Quotient

MAUP	Modifiable Area Unit Problem
MNE	Multinational Enterprise
MES	Minimum Efficiency Scale
NACE	Nomenclature Statistique des Activités Economiques dans la Communauté Européenne
NAFTA	North American Free Trade Agreement
NEG	New Economic Geography
NIE	New Institutional Economics
NTB	Non-Tariff Barriers
NTT	New Trade Theory
NUTS	Nomenclature of Units for Territorial Statistics
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
PCSE	Panel Corrected Standard Errors
REER	Real Effective Exchange Rate
SAPARD	Special Accession Programme for Agriculture and Rural Development
SEEC	South-East European Countries
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organisation
US	United States
VIF	Vector Inflated Factor
WDI	World Development Indicators
WDR	World Development Report
WIIW	Vienna Institute for International Economic Studies
WTO	World Trade Organisation
2SLS	Two Stage Least Squares

Chapter 1

Introduction

In 2008, Paul Krugman became a Nobel laureate for his distinguished scholarly work dedicated to the 'analysis of trade patterns and location of economic activity'.[1] The prize certainly elevated the recipient into the economists hall of fame; more importantly, it reaffirmed the significance of New Economic Geography (hereafter NEG) as an important field of mainstream economics. Over the past two decades the work of spatial economics community has gradually expanded beyond the realm of academia to prominently feature in policy debates. As a recent testimony, the World Bank's flagship publication, *the World Development Report (WDR),* presented the title 'Reshaping Economic Geography' and stressed the need for a deepening of inquiry into the geographical aspects of uneven development and the structural changes affecting the spatial economy [WDR (2009); also, Behrens and Robert-Nicoud (2009)].

Yet, the inquiry into the spatial aspects of economy is not a recent phenomenon. Already in 1875, scholars associated with the 'German school of location theory' had raised one of the certainly most intriguing questions in the field of economics: *why do certain economic activities choose to establish themselves in particular places of a given area?* The early works of von Thunen (1875), Christaller (1933) and Weber (1929), among others, provided a simple yet powerful explanation to the question at hand: economic

[1] http://nobelprize.org/nobel_prizes/economics/laureates/2008/press.html

activity will tend to locate in places that generally maximise its profits. The idea of focusing on profits as the driving force behind the location decisions of firms is pervasive one; it suggests that if we were to search for factors explaining location of productive activity, these would have to be associated with the cost and revenue side of the production. This notion remained preserved throughout the time. For instance, within the confines of traditional trade theory, location of economic activity was a matter of supply-side dynamics assumed to be a result of different factor-proportions endowments between regions. Marshall (1920) approached the question from a regional science perspective adding additional explanatory factors to the equation. In particular, he introduced the concept of external economies of scale to explain the dynamics of early industrial districts. Accordingly, it was the tacit knowledge and technological spillovers present in such districts that were the true factor determinants of agglomeration, making the producers located within more cost effective and competitive [also, Arrow (1962); Romer (1986)].

On the revenue side, Harris (1954) initially suggested the concept of market potential as a determining factor of industry location. His analytical framework was simple and intuitive in that it linked demand for a product to firms' own prospects for generating greater turnover. The work has been subsequently expanded within the confines of the New Trade Theory (NTT) characterised by tractable general equilibrium models based on imperfect competition and in presence of transportation (trade) costs. More importantly, NTT gave rise to the development of NEG type of models that for the first time allowed agglomerations to arise endogenously as a result of a cumulative causation process.[2] They allowed for a more accessible and context specific framework to address some of the contemporary issues of economic integration, structural change and the role of state and policy in affecting locational outcomes [see, e.g., Martin and Rogers (1995); Dupont and Martin (2003); Forslid (2004); Blien and Wolf (2002)]. In other words, NEG significantly expanded our knowledge of how different location determinants affect industry location.

[2] We will describe the agglomeration process as proposed in basic NEG models in greater detail below. For a broad based discussion of the corresponding literature see Fujita and Krugman (2004).

At the same time, it highlighted the fact that location decisions of economic actors are non-trivial.

The empirical inquiry into the subject matter has followed rather slowly, often limited by data availability and largely confined to an examination of economic factors only. In a recent survey of the literature, Behrens and Robert-Nicoud conclude that "more work is needed on purely empirical front" (Behrens and Robert-Nicoud, 2009, p. 483). To this end, the work undertaken here is to be regarded as a contribution to existing stock of empirically motivated research on industry location factors in the context of transition economies. Hereby, it is explicitly assumed that the answers as to which location factors matter are context specific while being, above all, empirical in nature. In particular, we source insights from the main streams of economic literature to operationalise some of the theoretical prediction in a diverse array of empirical models on industry location. Results from cross- and within-country investigations are reported and demonstrate that economic transition and integration have indeed impacted spatial production patterns in a set of transition economies. Ultimately the findings highlight the role of institutional factors in affecting the industry location outcomes.

1.1 BACKGROUND

The determinants of industry and investment location patterns in the Central Eastern Europe Countries (hereafter CEEC) might be expected to differ from those frequently observed in developed countries.[3] Historically, centrally planned economies have suffered from inefficient industrial policies that are generally assumed to have had distortive effects on industry location decisions. In particular, their economic geography during the Soviet era was largely determined by political forces within the Council of Mutual Economic Assistance (CMEA), with relatively little consideration for country- and region-specific comparative advantages [Traistaru et al. (2003); Kancs (2007)].

Starting in 1989, the collapse of central planning set the stage for a wave of radical reforms that aimed at a fundamental re-organisation of existing economic and institutional structures within the region at large. The phenomenon has become to be known as 'the transition process'. In the process, government allocation-plans have been substituted by market forces resulting in greater inter-firm competition for resources and markets. Besides, early in the transition process the CEEC expressed also their intention to institutionally integrate into the European Union (EU). However, for that to happen market-based institutional structures had to be built first. Thus, the process of the EU integration started with the signing of Europe Agreements in the first half of the 1990s which established the legal framework of relations between the EU and the CEEC. These agreements were adapted to the specific situation of each integration partner individually, while highlighting common political, economic and institutional objectives to be reached as a pre-requisite for full membership (European Commission, 2009). Their role has therefore been instrumental in building up and aligning the inherited Soviet-style institutions of the CEEC with those operating in the single market, thus also changing the dynamics of economic interactions within and between the countries (Baldwin and

[3] Unless otherwise indicated, throughout this thesis the term CEEC includes following 10 transition economies: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

Wyplosz, 2006). The process has been further supported by the formation of regional trade initiatives (FTAs) that were encouraged as a means to foster market-based cross-border cooperation between the countries. In other words, they served the CEEC as a 'training-ground' for their wider integration into the EU (Dangerfield, 2006).[4] Those unprecedented changes are therefore expected to have also contributed to changes in the geographical distribution of economic activities within and between the CEEC.

However, transition process also entailed heavy costs that had to be offset by the society at large. Particularly, the process of structural change affected domestic production structures. Following the dissolution of the CMEA, most of its producers lost their previously secure export markets while being faced with growing competition from more efficient foreign producers. Even thought foreign direct investments (FDI) and trade have been embraced by the CEEC as drivers of change from the start, their direct consequences for the organisation of economic activities in native markets were not immediately evident. Thus, the role of policy became pivotal as a means to soothe the negative effects of structural change but also to further support emerging opportunities of economic transition. The complex nature of the transition process also implied the existence of a complex web of policies operating next to each other. In particular, a number of commentators reported on a noticeable trend towards the application of implicit vertical (i.e. sector-specific) policies introduced as a way to accommodate potentially negative effects of increased competition [e.g. Torok (2007); Fink (2001); Holscher and Stephan (2009); Hashi et al. (2007)]. Yet, the transition has also been marked by policy reform aimed at advancing the role of support institutions and making them an input factor that would advance countries' position in terms of generating investments and growth. This process has been actively supported by the EU which made available significant resources through its structural funds vehicle, to advance growth and

[4] Specifically, Czech Republic, Hungary, Poland and Slovakia established Central Europe Free Trade Agreement (CEFTA) in 1992. The agreement entered into force in 1994 and has been geographically expanded to include Slovenia (1996), Romania (1997) and Bulgaria (1999). In parallel, the three Baltic countries including Estonia, Latvia and Lithuania established Baltic Free Trade Agreement (BAFTA) in 1994 (Dangerfield, 2000; 2006).

catching up of prospective member states. When taken together, the role of policy may be expected to have a profound impact on the re-organisation of production structures and the geographical location of economic activity. There is an emerging empirical literature on the causal link between economic transition and regional integration in the context of Eastern European transition countries. Our research presented here builds on the existing insights coming out the existing studies, however, at the same time we intend to broaden the knowledge base in several different ways that are to be described further below.

1.2 RESEARCH OBJECTIVES

The purpose of the following research is to advance our understanding of the link between above mentioned structural changes and industry location proper, as measured by various spatial concentration measures. Hereby, the CEEC economies are deemed to be an especially suitable region for advancing the inquiry as they provide a quasi natural experiment type of setting. In particular, countries of the regions have experienced both centrally planned and free market economic systems within a relatively short period of time.

In general, we follow three main objectives here. The first is to provide a comprehensive picture of changes in industry location patterns over the course of time. The analysis is conducted at different levels of spatial aggregation thus accounting for changes within and between countries. The second main objective is to contribute to the debate on factor determinants of industry location at the sub-national level. In particular, our analysis qualifies as an original contribution to the ongoing debate on structural changes affecting the economies under examination. Here in particular we aim to account for the role of structural policies in determining the location of economic activity, controlling at the same time for more traditional economic factor determinants. We believe that policy aspects deserve greater attention in existing analytical frameworks: as better understanding of their impact on industry location is a pre-requisite for devising more

efficient policies that are indeed capable of stimulating regional convergence at national and supra-national levels. In this respect our study is exploratory in nature since the limited number of existing inquires have been predominantly focused on examining traditional factors of industry location. The third main objective directly builds on the policy argument in that we explore locational determinants of foreign direct investments (FDI) given its pivotal role in the economic development plans of transition countries. Here, our specific focus is geared towards understanding the role institutional reforms and quality play in the process. While FDI determinants have been previously explored in the context of transition economies, there is a dearth of knowledge on how specific institutional factors affect the location decision of international investors.

The process of economic transition and regional integration and their likely impacts have made understanding the evolution of production patterns an exciting topic in academic research. There have been nevertheless direct spillovers into the policy arena as well. In particular, the research topic has attracted great interest among policy makers in that a better understanding of issues at hand may also lead to a better design and implementation of policy tools. Although research conducted here is primarily of academic interest, it is nevertheless applied in nature and therefore might be regarded as a relevant contribution to the policy debate. We find this especially stimulating given the fact that other Eastern European countries are following the CEEC path of transition and European integration, hence may benefit from some of the lessons learned here.

1.3 STRUCTURE OF THE THESIS

This dissertation consists of *three self-contained empirical essays*. Each of the essays aims at making a reasonable contribution to the understanding of location determinants in in its own respective setting and literature. Following this introduction, Chapter 2 launches a broad based and comprehensive assessment of changes in patterns of geographical concentration (agglomeration) across 23 manufacturing industries. We use a

novel dataset for 10 CEEC and deploy industry-specific locational GINI coefficients to account for the extent of changes in spatial co-location patterns of industries over time, in our case 1995 to 2005. The role of economic transition, integration and (vertical) industrial policies is discussed in greater detail as we empirically uncover underlying determinants of industry location patterns. Chapter 2 therefore provides a solid basis for a more specific inquiry in the essays to follow.

Chapter 3 examines the location of 31 manufacturing and services industries at the regional, i.e sub-national, level. As a result, we are able to track temporal changes in secondary and tertiary sector location patterns within and between countries. Our special interest is dedicated to an empirical investigation of the border effect as a factor determinant of industry location. In the context of European integration, the changes in geo-political position of regions are expected to have a profound impact on location of economic activity. In other words, they may potentially lead to diverging development trajectories of homogenous types of regions, hence increasing the incidence of regional divergence. Given that the theoretical literature suggests border regions to be particularly affected by regional integration, we investigate in addition the role of regional policies and specifically European structural funds as a means to enhance border regions' geographical position and attractiveness for investment.

Chapter 4 shifts then the focus away from the border effects to the analysis of spatial determinants of FDI distribution, given the importance of the latter for economic growth and development of transition economies. Understanding FDI location patterns is therefore of vital interest for policy makers as well, especially those eager to stimulate economic development of disadvantaged regions by attracting foreign production. In contrast to existing research, however, our main focus in this chapter is dedicated to a better understanding of institutional determinants of FDI at the national level. In particular, we aim to explore the role of institutional factors in determining the extent of foreign presence in the countries under examination, in both secondary and tertiary

sectors. We do so by clearly distinguishing institutional factors between *institutional efforts*, i.e. structural reforms, and *institutional outcomes*, i.e. perceived institutional quality. In order to further enrich the discussion we apply both static and dynamic empirical modelling approaches in our panel dataset that spans over the period 1995 to 2005; hence, our approach considers almost the entire period of CEEC's EU integration process.

Finally, in Chapter 5 we summarise the main findings of the research, outlining some of the perceived limitations while also suggesting possible extensions for future research.

Chapter 2

*Transition, Integration and Geographical Location of Manufacturing**

2.1 INTRODUCTION

In the opening remarks we have argued that factor determinants of industry location in transition economies, such as the CEEC, may differ from those frequently observed in developed countries.[5] Indeed, their economic geography during the Soviet era was largely determined by political forces within the Council of Mutual Economic Assistance (CMEA), with little consideration for country-specific locational advantages (e.g., Traistaru et al., 2003). Over the past two decades, the simultaneous process of economic transition and regional integration has led to the introduction of market forces that are jointly expected to have also affected the distribution of economic activity within and between the countries.

However, the structural changes brought by the transition to market-based economic systems also entailed heavy costs, primarily for domestic producers. Following the

* A modified version of this chapter has been released as a part of the OECD Working Paper Series (Seric, 2010).

[5] CEEC include following transition economies: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

dissolution of CMEA, most of them lost their previously secure export markets while being faced with growing competition from more efficient foreign producers. As a consequence, there has been a noticeable trend towards application of various industrial policies, often vertical in nature, that have been frequently introduced as a way to soothe negative effects of increased competition [Fink (2001); Torok (2007)]. We might expect them also to have a profound impact on geographical location of economic activity. Hence, in addition to examining the effects of market forces and integration, we also aim at testing the potential impacts of policy intervention on location of economic activity in CEEC.

The aim of this chapter is as follows. First, using novel data for the period 1995 to 2005 we assess whether and to what extent have patterns of manufacturing location changed during CEECs' transition to market based economic systems. Second, we aim to uncover underlying determinants of those changes as we consider traditional location factors but also include some more specific components, such as the effect of targeted industrial policies.

There are a limited number of studies examining spatial location patterns of manufacturing industries in European transition economies (reviewed in next section). Although they have greatly contributed to our understanding of factors influencing industry location there remain a number of gaps in the literature. To this end, our paper makes several contributions to the existing literature. First, the time period considered so far has been limited to the 1990s. In addition, most of the studies examining location patterns in the context of Eastern European transition have been confined to individual or small number of countries. In contrast, our inquiry is based on a cross-country sample of 10 CEEC and focuses on the period 1995 to 2005. The length of our time series is worth highlighting as it spans almost the entire transition period. Thereby, we treat the time component as an important indicator of overall regional integration. Second, to the best of our knowledge this is the first study to use a comparatively larger number of industries

at lower level of industry aggregation. This allows us to sketch a more detailed and precise picture of concentration patterns across the region. Third, previous studies used a rather restricted number of explanatory variables in examining spatial location patterns which limited the analytical power of their inquires. This has been mainly due to the lack of reliable and comparable cross-country data. Instead, our study makes use of a new data set that enables us to construct somewhat more elaborate measures of spatial concentration as well as proxies for various theoretical concepts that have been put forward in the literature. EU KLEMS data set provides a detailed industry account at an adequately aggregated level for almost all countries in our sample. Finally, to the best of our knowledge there is no systematic study that accounts for the potential impact of industrial policies on geographical location in the Eastern European context of transition.[6] In this respect, our exploratory analysis provides a basis for a new field of inquiry.

The remainder of this chapter is organised as follows. In section 2 we introduce the theoretical concepts and summarise existing empirical evidence on industry location in the CEEC. In section 3 we then propose statistical measures of geographical concentration and present descriptive statistics. Subsequently, in section 4 we formally analyse the factors determining spatial concentration of manufacturing activity in the CEEC. Finally, in section 5 we conclude the discussion and highlight possible limitations.

2.2 THEORY AND EMPIRICS

2.2.1 Market Forces and Industry Location

Market forces are expected to have significant impact on location of economic activity, especially so in the context of transition economies. Scholarly work has examined industrial location and related spatial concentration phenomena based on the theoretical frameworks guided by, among others, the neoclassical trade, new trade and new

[6] For recent contributions examining the issue in the Chinese context see, among others, He et al. (2008), also Wei (2001).

economic geography models [see, for instance, Wolfmayr-Schnitzer (2000); He et al. (2008)]. We may summarise the most salient features of those theories as follows:

The neoclassical trade theory, according to Ricardo and Heckscher-Ohlin, postulates that industry location is determined exogenously by what has been labelled as "first nature" factors (Krugman, 1993). In other words, the observed production landscape may be explained with reference to the concept of comparative advantage whereby pronounced differences in terms of relative factor endowments determine location of economic activity. Hence, emerging agglomeration patterns are dominated by inter-industry specialisation, extent of which depends on the actual size of existing trade costs. Though intuitive, comparative advantage alone is insufficient to explain observed geographical concentration as it fails to clarify why seemingly identical countries (or regions) in terms of factor proportions develop different production structures. Besides, empirical evidence suggests that intra-industry trade flows by far outweigh inter-industry exchange of goods (Greenaway and Torstensson, 1997).

New trade models abstract from comparative advantage altogether as they advocate presence of internal scale economies in relation to market access as the main determinants of industry concentration [Krugman (1980); Helpman and Krugman (1985)]. Krugman and Venables (1990) show that more firms are willing to set up production in the country with the larger (core) market in order to avoid transportation (trade) costs in a larger fraction of their sales. Generally speaking, the combination of increasing returns to scale and trade costs encourages firms to locate close to large markets, i.e. those having relatively more firms. This creates pecuniary externalities which favour the agglomeration of economic activities. Although new trade models entail strong explanatory power they nevertheless describe the evolution of industrial location as a process driven by exogenously determined differences in market size. However, that is restrictive as it prevents us from understanding why seemingly identical locations can develop into developed cores and lagging peripheries over time.

New economic geography models formalise the so called cumulative causation process that can even explain diverging concentration patterns in locations with identical initial structures, i.e. market sizes (Ottaviano and Puga, 1997). In contrast to previous theories the process of industrial location is determined endogenously by interaction between demand and cost linkages on the one side and the level of trade costs on the other [Krugman (1991); Venables (1996)]. We will discuss the mechanisms of agglomeration as well as their implications in greater detail below.

Existing empirical research on Eastern European economies lends support to the view that location became increasingly determined by market forces following the transition. For instance, Hildebrandt and Woerz (2004) study determinants of geographical concentration of industries in 10 CEEC over the period 1993 to 2000. They show that region's trade (re-)orientation towards EU markets had a significant impact on geographical concentration of their respective manufacturing industries. In particular, relative concentration has increased over time and has been mainly driven by comparative advantages and location of demand while absolute concentration was crucially determined by differences in countries' human capital endowments. More interestingly however is the fact that neither scale economies nor transportation costs have any explanatory power in their econometric specification.[7]

Longhi et al. (2005) use a finer scale of spatial aggregation, NUTS 3 classification level of European regions, and conclude that overall geographic concentration of manufacturing in 5 CEEC has not changed considerably during the 1990s. In contrast to the previous study however, industries reliant on scale economies are more concentrated than industries exhibiting low use of technology. Here again, factor endowments and market size have strong explanatory power as determinants of industry agglomeration.

[7] This finding is rather surprising and may potentially be attributed to the aggregation problems, with respect to both spatial units and industries considered. The issue has been frequently highlighted in the literature, see for instance Ottaviano and Thisse (2004).

Country studies, such as the one on Hungary (Iara and Traistaru, 2003), find that market integration has led to an increase in regional disparities over the course of the 1990s. Specifically, regions bordering the EU as well as the metropolitan regions exhibited highest levels of manufacturing concentration while lowest levels have been observed in regions bordering other, non-EU countries. Those findings may be directly related to a study by Altomonte and Resmini (2002), who study location decisions of foreign firms in transition countries and conclude that FDI plays a significant role in shaping industry concentration in transition economies while its location is biased towards EU border and metropolitan regions as well as those with strong industrial bases.

In sum, from this concise literature review it appears that in the transition process there has been a major shift in industry location determinants, i.e. away from politically motivated location towards industry-specific responses to market forces. In line with predictions from theoretical models, we would therefore expect the location patterns of CEEC manufacturers to be determined by presence of comparative advantage, scale economies and linkages. Our first hypothesis can be summarised as follows:

H1: Broadly speaking, CEEC manufacturing industries are expected to have become more geographically concentrated over time since firms are motivated to exploit comparative advantages, scale economies and linkages.

2.2.2 Regional Integration and Industry Location

Economic integration is an integral part in nearly all streams of theoretical literature on location of production, often being the balancing force between agglomeration and dispersion phenomena. For instance, Venables (2003) considers elements from traditional trade theory and shows that progressive regional integration can significantly contribute to industry concentration. He derives this conclusion by comparing first the intensities of

relative comparative advantages among countries forming a custom union (CU), and subsequently those of the CU with the rest of the world. The most salient feature of the model relates to the prediction of unequal division of costs and benefits within the CU. In particular, it is the country with the "intermediate" comparative advantage that is expected to become net-exporter of skilled labour intensive good while the country with the "extreme" comparative advantage will specialise in exports of unskilled labour intensive good.[8] As a result, the model implies that there is a high likelihood of regional integration leading to growing economic disparities between the signatory countries. This is expected to be especially pronounced in the case of so-called South-South agreements that exclusively feature low-income economies (Venables, 2003).[9]

The emergence of regional inequalities following economic integration is examined in the context of NEG models as well. However, contrary to contributions from traditional and new trade theories, location of economic activity in NEG models is endogenous and described by a process in which distributional inequalities first rise and then fall with progressive market integration. A number of diverse mechanisms may explain theoretical agglomeration patterns though, in general, they all refer to the cumulative causation process first described by Krugman (1991). In particular, Krugman sources established assumptions from the new trade theory, i.e. presence of increasing returns and trade costs, while additionally assuming existence of labour migration between the regions. The latter may be interpreted as the result of greater regional integration and turns out to be crucial in explaining the model's dynamics. In particular, a rise in the number of local establishments in one of the regions increases demand for labour and results in higher wages, which in turn tend to attract more workers to the region. This creates a demand

[8] More formally, factor endowments in the model are formalised as availability of skilled labour. The definitions of comparative advantages are as follows: *i)* country with the "intermediate" comparative advantage in skilled labour has higher factor endowments compared to other CU members though still inferior to the rest of the world; *ii)* whereas the one with the "extreme" comparative advantage has comparatively lower factor endowments to everyone else within the CU as well as the rest of the world.

[9] Thus, South-South regional integration efforts may lack government commitment to implementation of provisions and as such may lead to abandonment. For instance, the East African Common Market collapsed in 1977 partly because of excessive concentration of manufacturing in a single country. In fact, Kenya produced more than 70 per cent of manufactures within the CU (Venables, 2003).

linkage through increased local spending on the one side, while it reduces competition in the labour market on the other. Attracted by higher local profits, additional firms decide then to locate closer to the comparatively larger market resulting in the cumulative causation process and ultimately a core-periphery pattern of industry location. Venables (1996) considers the relationship between imperfectly competitive upstream and downstream industries as an alternative to labour migration. Nevertheless, his framework provides results in line with Krugman's core-periphery structure, whereby the differences in market size of initially identical regions are explained through the presence of strong vertical linkages between the different industries.

However, trade integration may equivalently result in greater industry dispersion. Krugman and Elizondo (1996) argue that a reduction in trade costs increases the influence of external markets at the expense of core locations. The dispersion process is thus primarily driven by weakening cost and demand linkages which assign now greater value to exports and imports of products and input factors. As a result industry spreads to peripheral, often less developed regions. The tendency to locate at greater distance from the core may be further intensified if, in addition, there are some immobile or non-tradable factors which are particularly important for production (Ottaviano and Puga, 1997). Puga (1999) proposes a framework that captures both inter-regional migration and input-output linkages as forces which may drive agglomeration, but also takes into consideration the impact of non-tradable factors, such as local wages, on clustering of firms and workers. In particular, he shows that when trade costs are high, firm location is equally distributed between otherwise identical regions in order to satisfy the local demand. Interestingly however, the model also predicts a greater tendency for firms to disperse towards peripheral regions at lower trade costs. This holds only under the assumption of equilibrium wage differences not being eliminated by migration and thus firms facing higher production costs in locations with many other firms. It follows that for low trade costs it is the price of non-tradable factors that determines location. Hence,

it is only for intermediate trade costs that firms choose to agglomerate as cost and demand linkages dominate the other two cases.

In sum, NEG models predict that high trade costs encourage firms to disperse and settle in different regions to be able to supply markets locally. For low values of trade costs, location is determined by the price of those factors that are considered to be immobile, hence firms have an incentive to locate away from the core. Finally, agglomeration of economic activity is expected to take place only at intermediate trade costs as demand and cost linkages take over.

Nevertheless, most of the models reviewed so far illustrate fairly dramatic pictures whereby whole manufacturing activity moves together into and out of regions. This clearly does not correspond to observed location patterns in reality where industries geographically concentrate at a more disaggregated level than 'overall manufacturing'. Krugman and Venables (1996) model that process by highlighting the importance of differences in input-output linkages between different industries. In particular, they consider two imperfectly competitive industries characterised by higher ratios of intra-industry trade in intermediate inputs, with comparatively little inter-industry trade taking place. The prediction from the model can be summarised as follows: assuming that an additional firm locates in a particular region, the beneficial cost and demand linkages affect more intensely firms in the same sector. At the same time, increased product and labour market competition harms firms in both sectors equally. It follows therefore that, all else equal, integration leads each region to become specialised in the production of one sector. Summarising the discussion above we are able to set up our second hypothesis:

H2a: Following trade integration, industries characterised by comparatively high or low trade costs are expected to be more dispersed than industries with intermediate trade costs.

H2b: Moreover, industry linkages are important factor in explaining industry agglomeration. In particular, we expect intra-industry linkages to dominate inter-industry ones.

In the CEEC, clustering may have been further reinforced by strong FDI inflows following investment liberalisation and comprehensive privatisation programs. Relatively cheap and skilled labour force as well as the proximity to core EU markets allowed thereby foreign investors to benefit from the best utilisation of resources and endowments. Indeed, empirical evidence suggests that FDI in the CEEC has followed a strategy of international vertical integration. Foreign investors have exploited differences in comparative advantage for different stages of production while their location has been concentrated around strong industrial bases (Altomonte and Resmini, 2002).

However, Markusen and Venables (1999) show that foreign investments may facilitate geographical concentration even in the absence of already existing industrial areas. Specifically, location decision of FDI may trigger the cumulative causation process by creating demand for locally produced intermediate inputs and as such improve efficiency of the whole industry. In turn, further entry is encouraged thereby intensifying the centripetal forces and encouraging agglomeration. Nevertheless, it needs to be highlighted that their results depend on the assumption that foreign entry is generally characterised by positive externalities. Yet, as theory and growing empirical evidence suggest, foreign firms may as well impose negative externalities on domestic firms and therefore weaken or eventually reverse the cumulative causation mechanism. For instance, occupational choice models conclude that FDI results in a decreasing number of local entrepreneurs as lower prices on the product market reduce the entrepreneurial income more than the wage income (e.g. Grossman, 1984). Though a number of studies confirm existence of the crowding-out effect in relation to FDI, empirical evidence with

respect to the effects of foreign investments on industry agglomeration patterns remains nevertheless inconclusive.

2.2.3 (Vertical) Industrial Policies and Industry Location

From the theoretical point of view and under the assumption of absent economic growth, agglomeration of firms in one region implies also re-location or closure of firms in another. All else equal, it is to be anticipated that economic actors in the region that loses firms will be faced with higher costs in addition to increasing unemployment and decreasing fiscal revenues. Hence, policy makers may impose rules that make re-location of firms between countries either costly or impossible. For instance, Martin and Rogers (1995) point out that one common way to restrict re-location of firms is through enforcement of stricter labour laws.[10] Such measures certainly qualify as an example of horizontal, i.e. non-discriminatory policies at the disposal of policy makers. Alternatively, vertical (or targeted) policies may be offered to a selected number of industries. Thus, it is expected that application of such policies will have an impact on location of economic activity as well. Studies for China, another transition economy, find that provincial governments have been increasingly providing protection to selected few local industries in order to increase provincial tax revenues and generate economic development [e.g. He et al. (2008); also Bai et al. (2003)]. They conclude that policy induced protectionism through application of non-tariff barriers has also led to greater dispersion of protected industries.

According to Neck et al. (2000) progressive institutional integration into the EU has lowered the CEEC tariffs on manufactures so that they are generally comparable to those in other EU member states. Deeper institutional integration has therefore limited the possibility for application of explicit protectionist measures. However, countries with

[10] According to the authors, in the EU-15 member states it is Portugal, Spain, Italy and Greece that have the most restrictive policies while UK, Ireland and Denmark are the most laissez-faire countries (Martin and Rogers, 1995).

comparative disadvantages might be still geared towards choosing an economic policy mix that can exert substantial influence on the location of economic activity without discretionary restrictive practices (Wooton et al. 2004). For instance, there exist a number of viable policy tools at governments' disposal that may not be necessarily eliminated following deeper regional integration, among others: indirect subsidies, credit guarantees and government procurement laws.[11]

Brulhart and Trionfetti (2004) study the effect of government procurement on the likelihood and intensity of industrial agglomeration whereby national governments are characterised as being home-biased, i.e. they have a strong preference for domestic over foreign suppliers irrespective of cost and quality considerations.[12] They maintain that whether dispersion or agglomeration forces prevail is determined by the trade costs as well as the parameters of government procurement intensity. With respect to the latter, biased government procurement may lead to emergence of the so-called "spread effect", or industry dispersion (Brulhart and Trionfetti, 2004).[13] The authors find empirical support for the existence of the effect in a sample of European countries. Specifically, industries that are subject to a relatively large share of public expenditure tend also to be less concentrated (ibid).[14] In general, it could be argued that any sort of targeted government spending, when conducted by more than two agents at the same time, may intensify the centrifugal forces. For instance, governments may invoke explicit subsidies in form of cash payments to compete for new investments and foreign investors in

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[11] For a an excellent and exhaustive summary of existing policy tools see, for instance, Brewer and Young (1997).

[12] Discrimination by public purchasers in favour of local suppliers is a pervasive phenomenon and has been extensively examined in the past [for an overview see, for instance, Mattoo (1996)].

[13] In a nutshell, an increase of firms in one region, R_1, reduces government expenditure on each variety produced in R_1 and increases government spending on each variety produced in the other region, R_2. This in turn discourages further entry of firms in R_1 (while it encourages entry in R_2) and therefore acts as a dispersion force (Brulhart and Trionfetti, 2004).

[14] Mardas (2005) examines public procurement clauses (so called "Buy-national" clauses) in a set of Eastern European countries and finds evidence of targeted support for a selected number of industries. Though the range of industries and associated products varies across the countries, the industries prioritised tend to be either of strategic importance, e.g. textiles and automotive, or higher value added once, such as pharmaceuticals and engineered products.

particular. Egger and Falkinger (2006) formally consider such a scenario and conclude that it is always beneficial for a government to provide some sort of financial incentives to foster entry of foreign producers.[15] Their model predicts that the country with the largest payment towards the fixed cost of setting up production facility, all else equal, will also be the one with the best prospects for generating industry concentration within its borders. However, such a conclusion may be overly simplistic if we consider the mechanism through which the "spread effect" operates. In other words, targeted FDI subsidies may reverse the cumulative causation process that has been present in a particular region towards those that offer larger lump sum payments as opposed to comparative advantages and similar. In addition, implicit subsidies may be used to create competitive advantage for firms in targeted industries. Besley et al. (2000) provide a thought experiment in which they show that indirect subsidies often aim at inducing less aggressive behaviour on the part of more efficient competitors. Hence, they potentially act as a dispersion force by dissuading rivals from locating close to markets in which those government-favoured establishments operate.

In fact, direct and indirect subsidies were widely used in CEEC prior to their transition to market economies as a way to systematically correct persistent enterprise losses caused by non-market determined prices for goods and resources. Reforms in the early 1990s significantly reduced the value of direct subsidies flows, however, large-scale changes in the economic environment and the associated adverse effects on domestic industries frequently forced governments to step in through different types of state aid (Mulas-Granados et al. 2008). The existence of subsidies in form of debt relief programs, debt-equity swaps and preferential credits has been documented for a number of transition economies (Torok, 2008). According to a number of authors, when compared to the old EU member states, transition economies showed a greater tendency to support certain

[15] The authors assume that two small industrialised economies characterised by identical production technologies form a FTA. The idea that firms are located at some place implies that there are fixed costs which are incurred at a certain location and not at another. Hence, the attractiveness of a country depends on the fixed costs requirements for setting up a firm. A higher level of public infrastructure (e.g. a lump sum payment) reduces the fixed cost of setting up a firm in this economy and therefore raises the attractiveness of a country.

industries and use less transparent instruments to finance state aid [e.g. Holscher and Stephan (2009); also, Hashi et al. (2007); Cass (2007)]. In particular, Mulas-Grandos et al. (2008) conclude that over three quarters of total state aid in the CEEC was directed toward potentially more distorting sectoral aid.

However, according to which criteria do national policy makers determine the industries to be supported? There is some evidence to suggest that selective vertical policies in transition and developing economies have favoured profitable industries. From the theoretical standpoint, profitable and cash rich firms have more bargaining power than firms in declining industries and hence are able to demand more protection and resources from national policy makers. This argument is in line with the private interest hypothesis which has been empirically confirmed for a number of developed and developing countries (see, e.g., Kroszner and Strahan, 1999). Moreover, protecting profitable industries is also consistent with the efficiency-maximising objective governments may have. Evidence from emerging economies suggests that once domestic industries are exposed to potentially more efficient foreign competition, governments become more eager to protect the most profitable of them (Chari and Gupta, 2008). Studies on China, for instance, confirm that both national and provincial governments are more inclined to offer protection to industries that provide higher tax revenues and significantly contribute to economic development [e.g. Young (2000); He et al. (2008)].

Krugman (1993) on the other hand observes that protection in traditional, labour-intensive industries producing low externalities is still stronger than in technology-intensive ones. Labour-intensive industries may be regarded as strategic from the policy makers' perspective as it is in their very own interest to avoid political consequences resulting from, for instance, large-scale unemployment. This argument especially holds for countries undergoing significant structural changes such as the CEEC. We would therefore expect labour-intensive industries to be more insulated from competition than other industries, therefore also more dispersed.

In sum, even though CEEC industries have increasingly integrated into the global production networks following the transition to market based economies, there seems to be evidence leading us to believe that targeted government intervention has potentially resulted in fragmentation of markets in industries that have been in receipt of state support. As a consequence, we would expect to observe increasing dispersion of industries favoured by such vertical policies. Our last hypothesis can therefore be defined as follows:

H3: (Vertical) industrial policies in favour of profitable and/or strategically important domestic industries may have resulted in greater spatial dispersion of those industries.

2.3 DESCRIPTIVE STATISTICS

2.3.1 Measurement and Data

We consider an industry to be geographically concentrated if only a few spatial units hold a large share of that industry's total gross output or value added. In order to account for industry specific spatial agglomeration we construct geographical concentration indices for the period 1995 to 2005. Several indices have been suggested in the literature, such as the Herfindahl Index, Krugman Specialisation Index and Balassa Index, etc. However, the choice of suitable measures tends to be ad hoc and largely dependent on individual researcher's preferences (Combes and Overman, 2004).[16]

In this chapter, our focus is on computing industry-specific locational GINI coefficient, itself being one of the most widely used indices in the literature (Krugman, 1991b). In simple terms, the locational GINI index measures the concentration pattern of a particular industry in a particular location as opposed to the same industry in other locations. Similarly to the income inequality literature where it stems from, the locational GINI value can be treated as the summary statistic of spatial dispersion derived from a spatial Lorenz curve. In constructing the concentration measures we choose the uniform reference distribution whereby spatial units are assumed to be of same size. In other words, we choose to operate with a measure of absolute instead of relative industry concentration.[17] Formally, the locational GINI coefficient for an industry *i* can be expressed as follows:

[16] For a thorough explanation of computational methods as well as properties of some of these measures but also others see, for instance, Bickenbach and Bode (2008).

[17] For a more extensive discussion on the choice between absolute and relative measures see, e.g., Haaland et al. (1999) and Midelfart-Knarvik et al. (2000).

$$\text{Gini}_i = \frac{1}{2N^2\mu}\sum_j\sum_k\left|\frac{x_{ij}}{X_i} - \frac{x_{ik}}{X_i}\right| \quad (1)$$

where μ is the average country share of manufacturing industry i, N is the number of countries, X_i is the total gross output (or value added) of industry i, while x_{ij} and x_{ik} are the gross output (or value added) of industry i in countries j and k respectively.

The interpretation of the coefficient is relatively simple: if an industry is equally represented in all spatial units under examination, then its locational GINI coefficient is equal to 0 (lower boundary). In other words, that industry is thought to be dispersed across space. Instead, if the locational GINI coefficient approaches 1 (upper boundary) the industry is considered to be completely concentrated in a single spatial unit.[18]

Our main data source for constructing spatial concentration indexes is the EU KLEMS database. This is a new source of industry-level data that is primarily aimed at facilitating productivity analyses in the EU-25 member states.[19] Its key advantage lies in the provision of official statistics from national statistical offices while covering a wide range of industries in an internationally comparable way. Nonetheless, it should be emphasised that the EU KLEMS database is still work in progress. The level of detail varies across countries, industries and variables, while data on most of CEEC is only available from 1995 onwards. The database covers 8 out of 10 CEEC with Bulgaria and Romania not being represented in the current version of the database. Thus, for those two countries we

[18] More recently, generalised entropy indexes have been used in describing industry location patterns. In order to test robustness of our results we have also computed the absolute Theil Index in addition to our preferred locational GINI coefficient (for a calculation see Bickenbach and Bode, 2008). However, given the high correlation coefficient between the two measures, (0.95) based on gross output and (0.87) based on value added data, we continue the discussion by solely focusing on the properties of the locational GINI coefficient.

[19] The database is the result of a project carried out by a consortium of European research institutes that is also financially supported by the European Commission (for more information see http://www.euklems.net).

have sourced most of the data from the Eurostat Structural Business Statistics (SBS) database.[20]

In sum, our data set includes 10 CEEC: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. The sample includes all manufacturing activity in the countries under consideration, represented by 23 industries classified according to NACE Revision 1.1, two digit level. The time span chosen considers the period from 1995 to 2005. We use data on industry specific gross output and value added for the construction of locational GINI coefficients which we examine in greater detail in subsequent sections.[21] Hereby, we explicitly assume that changes in gross output and value added sufficiently explain changes in location patterns of manufacturing industries. Following, we examine some of the salient features present in the data.

2.3.2 Temporal Trends of Geographical Concentration

As shown in Figure 2.1, the average concentration of total manufacturing as measured by gross output data slightly increased during the second half of the 1990s and has been decreasing since early 2000s. A comparable trend could be observed in terms of value added.[22] Overall, locational GINI coefficient based on gross output and value added decreased by 2.8 and 6.6 percent between 1995 and 2005 respectively. In other words, our preliminary analysis suggests that CEEC have been characterised by a process of industrial dispersion during the period under examination.

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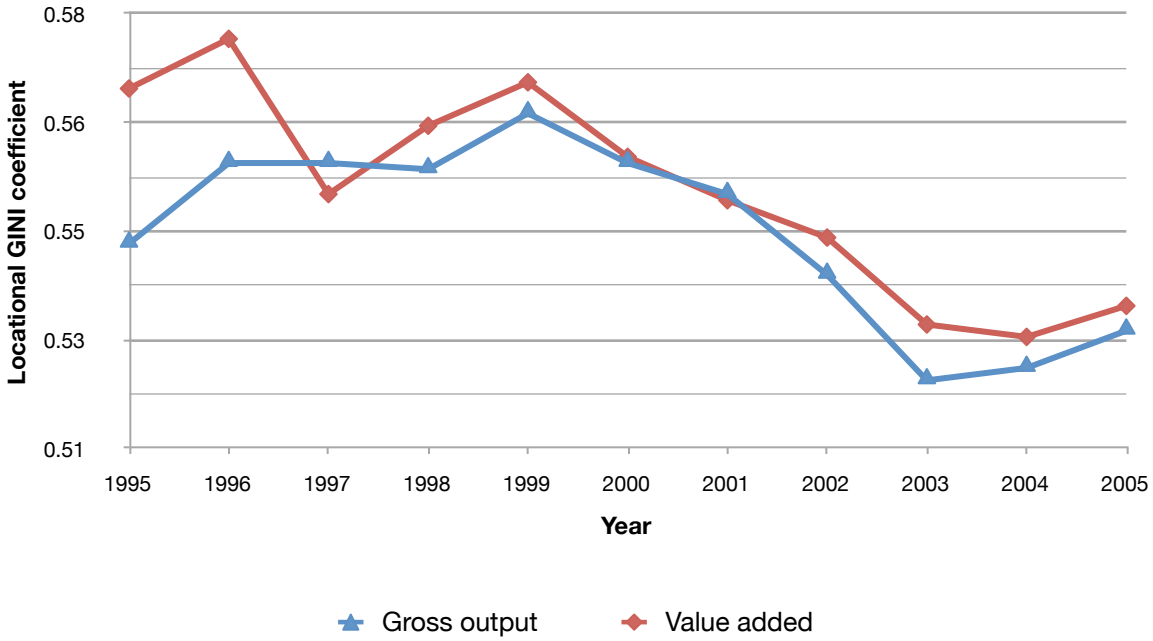
[20] http://epp.eurostat.ec.europa.eu/portal/page/portal/european_business/data/database.

[21] Gross output and value added data are expressed in constant prices and denominated in the common currency.

[22] However, results in terms of value added may be affected by data limitations in the initial years, especially for Bulgaria and Romania; hence should be carefully interpreted.

Figure 2.1: Average locational Gini coefficients of gross output and value added, 1995-2005



Source: own calculation.

In the next step, we make full use of the panel structure as a means to account for any potential outliers associated with individual years. Thus, we regress the averaged GINI coefficient on a time trend.[23] We report the results from pooled but also panel regressions featuring industry fixed effects in Table 2.1.

[23] See also Brulhart (2001) for a similar approach applied to a set of EU countries.

Table 2.1: OLS estimation of changes in locational GINI coefficients over time, 1995-2005

OLS estimation
Dependent variable: log locational GINI coefficient (based on gross output and value added)

	POOLED		PANEL	
	Gross Output	Value Added	Gross Output	Value Added
Year	-0.013**	-0.018***	-0.013***	-0.019***
t-stat	*-2.89*	*-4.07*	*-4.91*	*-6.77*
constant	26,19**	35.62***	26.23***	35.54***
t-stat	*2.76*	*3.93*	*4.69*	*6.54*
Industry fixed effects	No	No	Yes	Yes
R-squared	0.03	0.06	0.13	0.21
Observations	253	253	253	253

Heteroskedasticity corrected t-statistic in italics.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Clearly, assuming identical intercepts across industries is too restrictive as indicated by significant improvement in the overall fit of the regression following our panel estimation. More importantly, we find statistically significant evidence of a decreasing trend in locational GINI coefficients of gross output and value added. The negative and significant coefficient in front of the time trend indicates that, on average, industry concentration in terms of gross output and value added decreased by 1.3 and 1.8 per cent annually.

In addition to exploring changes of industry concentration over the entire period, we are also interested in examining predictions associated with potential structural breaks that may be present in our time series. However, we do not make an attempt to statistically isolate such breaks in our data. Instead, we choose to impose them exogenously by establishing a link to significant changes in economic policy at a particular point in time. In particular, we consider the effects of EU accession announcement and full trade

liberalisation between CEEC and the EU as our reference point.[24] We have therefore split our data set into two sub-periods, namely 1995 to 2000 and 2001 to 2005, according to the underlying process of wider regional integration. Table 2.2 summarises the results from our estimations featuring separate time trends for each interval.

Table 2.2: OLS estimation of changes in locational GINI coefficients prior and after EU accession announcement

OLS estimation
Dependent variable: log locational GINI coefficient (based on gross output and value added)

	Gross output		Value added	
	1995-2000	2001-2005	1995-2000	2001-2005
Year	0.004	-0.011***	-0.004	-0.011***
t-statistic	*1.13*	*-4.86*	*-1.63*	*-3.08*
constant	-7.65	21.75***	6.10	20.85**
t-statistic	*-1.22*	*4.72*	*1.51*	*2.99*
Industry fixed effects	*Yes*	*Yes*	*Yes*	*Yes*
R-squared	0.01	0.23	0.02	0.12
Observations	138	115	138	115

Notes: heteroskedasticity corrected t-statistic in italics

* significant at 10%; ** significant at 5%; *** significant at 1%

There is strong evidence that industry dispersion trends have accelerated in the first half of 2000s. For instance, the sign on parameter coefficient for gross output turns from being positive in the period prior to 2001 to negative and highly significant in the period thereafter. Overall, annual percentage decreases in the average location GINI coefficients for gross output and value added following EU accession announcement and complete trade liberalisation strongly contrast the concentration pattern observed in the earlier years. Hence, similar to Brulhart (2001) finding for EU countries, there is to some extent conflicting evidence in our data set as well contrary to the predictions predictions that

[24] At their June 2001 summit in Gothenburg (Sweden), EU members stated that the "enlargement process is irreversible....the road map should make it possible to complete negotiations by the end of 2002 for those candidates that are ready. The objective is that they should participate in the European Parliament elections of 2004 as members." (Archick, 2004, p.3). On May 1, 2004, the 8 CEEC became full members of the EU, increasing the EU's population to roughly 450 million. Bulgaria and Romania followed in 2007.

continuous integration within the European borders will encourage formation of more clustered industrial geography. Nevertheless, we are aware that it might be misleading to attribute industry concentration tendencies, represented as averages across industries, to the impact of a single policy measure. Instead, the evolution of concentration patterns will be influenced by a multitude of other relevant factors with most of them expected to be industry specific. We therefore proceed by describing industry-specific location patterns prior to examining their general determinants.

2.3.3 Industry Trend of Geographical Concentration

In order to simplify our analysis, we continue our discussion by focusing on location GINI coefficients based on gross output data solely.[25] As a first step, we aim to highlight and contrast industries that appear to be highly concentrated in the initial year of observations with those in the last year. The results are presented in Table 2.3.

Table 2.3: Changes in locational GINI coefficients in 1995 and 2005, by industry

			Locational GINI coeff.		
Industry code [a]	**TECH [b]**	**NTB [c]**	**1995**	**2005**	**Δ**
DA15	low	high	0.55	0.56	0.01
DA16	low	low	0.47	0.43	-0.04
DB17	low	high	0.48	0.43	-0.05
DB18	low	high	0.52	0.40	-0.12
DC19	low	medium	0.50	0.46	-0.04
DD20	low	low	0.50	0.44	-0.07
DE21	low	low	0.54	0.54	0.00
DE22	low	low	0.56	0.52	-0.04
DF23	medium-low	low	0.50	0.51	0.01
DG24	medium-high	medium	0.52	0.53	0.02
DH25	medium-low	low	0.57	0.56	-0.02
DI26	medium-low	medium	0.56	0.54	-0.02
DJ27	medium-low	high	0.56	0.52	-0.04
DJ28	medium-low	low	0.56	0.54	-0.02
DK29	medium-high	medium	0.55	0.52	-0.03

[25] In fact, there is high and statistically significant correlation between gross output and value added locational GINI coefficients (0.82). As gross output data is more complete it is our preferred choice. However, for the sake of robustness we re-estimate all specification using value added data as well. In general, the results do not appear to differ to those of gross output and we chose not to report them here. They are nevertheless available upon request.

DL30	high	medium	0.50	0.72	0.22
DL31	medium-high	medium	0.56	0.53	-0.03
DL32	high	medium	0.51	0.65	0.14
DL33	high	low	0.56	0.52	-0.04
DM34	medium-high	high	0.59	0.61	0.03
DM35	medium-high	high	0.63	0.56	-0.07
DN36	low	low	0.59	0.55	-0.03
DN37	low	low	0.63	0.52	-0.11

Notes:
a) See Table A2.1 in Appendix A for exact definition of industry codes.
b) Classification of industries according to the economies of scale intensity in the production (OECD, 2003).
c) Classification of industries according to applicable non-tariff barriers (Lee and Swagel, 1997).

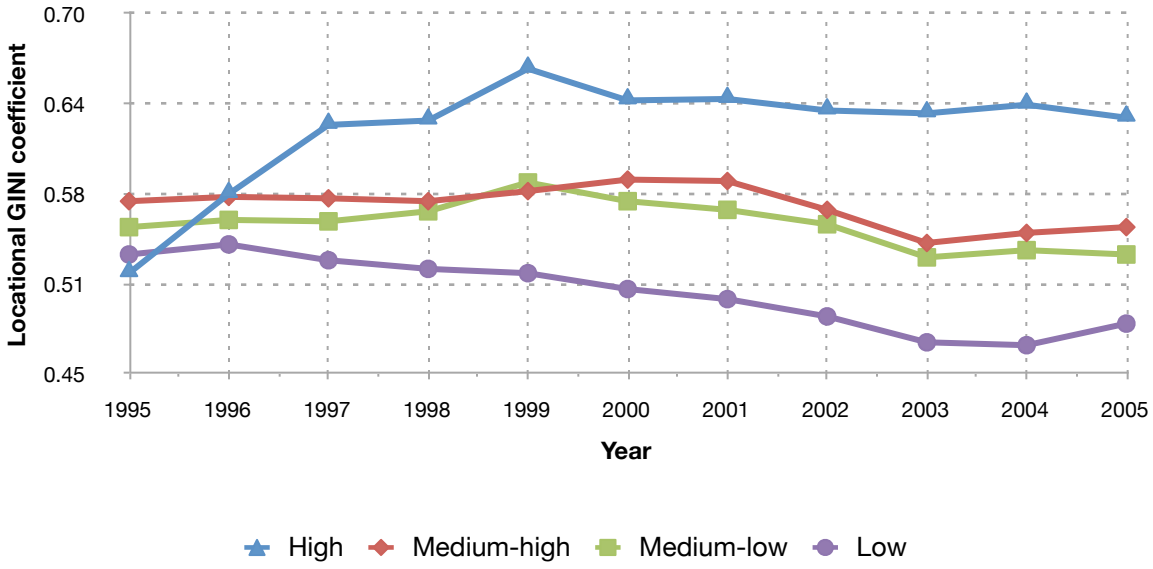
Industries with the highest level of geographic concentration in 1995 were: DM35 - Other transport equipment (GINI: 0.63), DN37 - Recycling (0.63), DM34 - Motor vehicles, trailers and semi-trailers (0.59), DN36 - Manufacturing n.e.c. (0.58) and DH25 - Rubber and plastic products (0.57). Interestingly, industries that belonged to the group of most dispersed industries in 1995, namely DL30 - Office machinery and computers and DL32 Radio, television and communication equipment and apparatus, ranked as the most concentrated once in 2005. Over the period under consideration, they achieved significant increases in their locational GINI coefficients (from 0.50 to 0.72 and 0.51 to 0.65 respectively) as they have increasingly came to concentrate in a limited number of countries. For instance, approximately 80 percent of total output in office machinery and computers (DL30) has been produced by Czech Republic and Hungary alone, while Hungary produced half of the total industry output for radio, television and communication equipment and apparatus (DL32) in 2005. Other spatially concentrated industries in 2005 included manufacturers of transport equipment (DM34 and DM35) as well as food and beverages producers (DA15). The striking difference between the two examination points in time is that increased geographical concentration in the latter is almost exclusively associated with industries frequently referred to as medium- to high-technology intensive. Overall, Krugman's (1991) finding for the United States where traditional, labour-intensive industries dominate geographical concentration does not receive support in our data. In fact, traditional industries belong to the most dispersed manufacturing activities in our sample. In 2005, the five least concentrated industries are:

DB18 - Wearing apparel, dressing and dying of fur (0.40), DB17 - Textiles (0.43), DA16 – Tobacco products (0.43), DD20 - Wood and products of wood and cork (0.44) and DC19 - Tanning, dressing of leather and footwear (0.47).

In order to further examine the apparent differences in agglomeration patterns between technology and labour intensive industries, we proceed by grouping industries according to the OECD classification of technology intensity in the production (OECD, 2003). In particular, we compute group-wise average locational GINI coefficients for each of the industry groupings. In general, the use of such aggregated measures is not without problems as its interpretation may be influenced by what Krugman (1991a) highlights as potentially obsolete merger of industries into statistical headings.[26] In other words, relatively higher levels of industry aggregation potentially mask pronounced differences within and between defined industries. We still believe that useful insights can be derived from our approach though we restrain from broad generalisation of the results. Our envisaged analysis lends itself to graphical representation. In Figure 2.2 we compute and compare temporal trends of geographic concentration according to the degree of technology-intensity in the production process.

[26] In the best optimal case, one would prefer product-level instead of industry-level data. Yet, the nature of our inquiry as well as data limitations associated with such a low level of aggregation prevent us from doing so.

Figure 2.2: Locational GINI coefficients of gross output by technology intensity in production, 1995-2005



Source: own calculation.

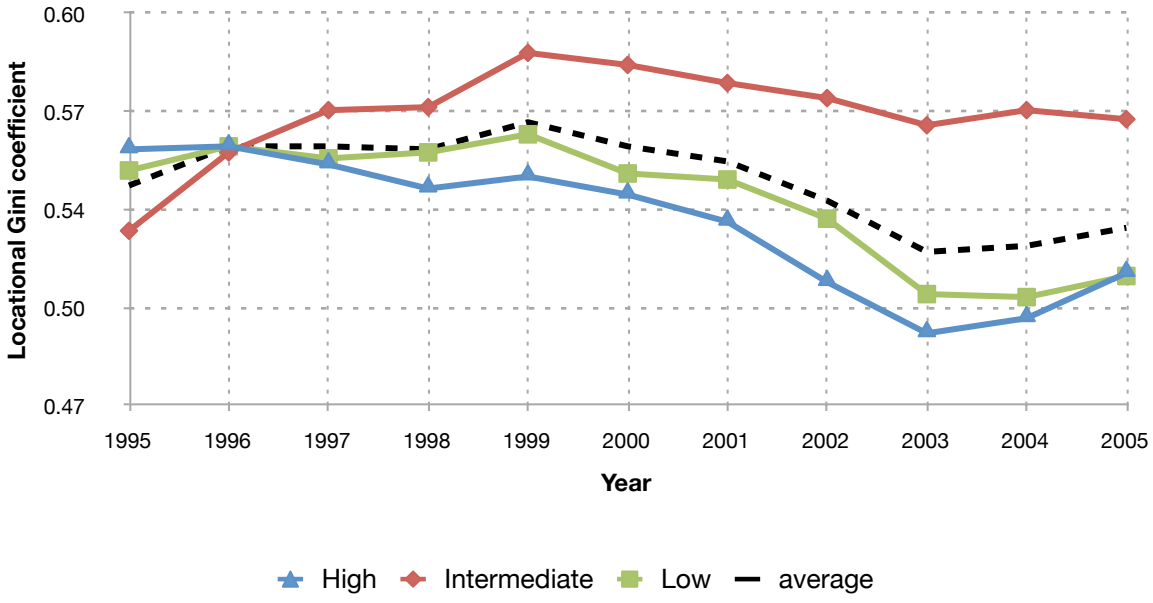
The strongest concentration appears in the non-traditional, high-technology industries. Those industries were increasingly concentrating in the pre-2001 period, while their concentration levels remain constant thereafter. This finding is not particularly surprising but rather in line with theoretical predictions that provide a rational for technology-intensive industries to cluster following regional integration and market expansion. Low-technology intensive or labour-intensive industries on the other hand experienced a process of continued dispersion throughout the period under consideration. The observed pattern might be partially due to increased FDI inflows and technological upgrades that have been experienced in those industries across the CEEC. However, an alternative explanation may be related to the significant labour component these industries maintain , thus being of strategic importance to national policy makers.

As previously outlined, already early in the transition process the CEEC industries have faced global competition for markets and resources while at the same time, introduction of market forces demanded restructuring of their inefficient organisational structures and production methods. They have been particularly affected by broad economic changes

and have frequently resorted to demand greater protection from domestic policy makers [see, for instance, Torok (2007)]. While deeper institutional integration has limited scope for application of explicit measures, governments have frequently responded to industry demands by making use of distinct measures that qualify as non-tariff barriers (NTBs).

In order to examine the effects such policies may have on geographical concentration of industries we categorise industries according to their specific level of experienced NTBs. In the absence of relevant data for CEEC our proxies are sourced from Lee and Swagel (1997) with the potentially restricting assumption that NTB levels in CEECs' industries have broadly followed global trends. The measure reports coverage ratios for core NTBs including all non-tariff restrictions applied at the border, such as the quantitative restrictions, voluntary export restraints and advanced payment requirements. The authors source the data from UNCTAD's Trade Control Measures database (Lee and Swagel, 1997). Figure 2.3 shows development of locational GINI coefficients according to the degree of industry-specific NTBs.

Figure 2.3: Locational GINI coefficients of gross output by experienced level of NTBs, 1995-2005



Source: own calculation.

Overall, industries frequently considered to feature high NTBs were significantly dispersed during the period under consideration. The decrease in geographical concentration is especially pronounced in the period preceding the first round of EU accession in 2004. Industries characterised by intermediate trade costs were increasingly concentrated in the pre-2001 period, showing rather constant agglomeration patterns thereafter. Still, it needs to be emphasised that the results for the latter group are to some extent driven by strong agglomeration in the two previously mentioned high-tech industries (i.e., DL30 and DL32).[27] Interestingly, industries facing low NTBs have been increasingly dispersed over time, though the changes in their locational GINI coefficients were not as significant as in the two previous groups. In general, our observations are in line with the main predictions from the NEG models. We thus find preliminary support for our hypothesis (H2a) that industries characterised by high or low trade costs are more geographically dispersed than industries facing intermediate trade costs. Overall, location of manufacturing in CEEC appears to be industry specific with progressive regional integration exercising a significant impact on that process. To probe deeper into the effects of regional integration on industry location, we regress industry-specific locational GINI coefficients on a time trend as the indicator of progressive regional integration. The results are reported in Table 2.4.

[27] The potential effects of the increases in locational GINI coefficients for these two industries need to be taken into account when analysing determinants of industry concentration in CEEC.

Table 2.4: Temporal changes in locational GINI coefficients between 1995 and 2005, by industry

			OLS estimation [d]		
Industry code [a]	**TECH [b]**	**NTB [c]**	**1995-2005**	**1995-2000**	**2001-2005**
DA15	low	high	-0.002	0.004*	-0.007
DA16	low	low	-0.016***	-0.010**	0.001
DB17	low	high	-0.016***	-0.010**	-0.005
DB18	low	high	-0.033***	-0.036***	-0.015
DC19	low	medium	-0.011*	-0.022**	0.014***
DD20	low	low	-0.022***	-0.014**	-0.019
DE21	low	low	-0.002	0.007***	-0.014
DE22	low	low	-0.009*	0.009**	-0.035*
DF23	medium-low	low	0.007	0.026*	-0.006
DG24	medium-high	medium	0.004**	0.010**	-0.005
DH25	medium-low	low	-0.006	0.012**	-0.022**
DI26	medium-low	medium	-0.005	0.010***	-0.024**
DJ27	medium-low	high	-0.012***	-0.006	0.000
DJ28	medium-low	low	-0.007*	0.004	-0.020**
DK29	medium-high	medium	-0.010***	-0.004	-0.014
DL30	high	medium	0.019	0.076**	-0.006
DL31	medium-high	medium	-0.004	0.011***	-0.025***
DL32	high	medium	0.028***	0.040***	0.026
DL33	high	low	-0.011*	0.006	-0.033**
DM34	medium-high	high	0.003	0.009***	-0.006
DM35	medium-high	high	-0.016***	-0.004	-0.021
DN36	low	low	-0.012**	-0.003	-0.008
DN37	low	low	-0.021***	-0.035**	-0.012**

Notes:

a) See Table A2.1 in the Appendix A for exact definition of industry codes.

b) Classification of industries according to the technology intensity in the production (OECD, 2003).

c) Classification of industries according to the applicable non-tariff barriers (Lee and Swagel, 1997).

d) Dependent variable: log locational GINI coefficient (based on gross output data).

Reported coefficients relate to the time trend (independent variable: year). Heteroskedasticity corrected t-statistics not reported here. * significant at 10%; ** significant at 5%; *** significant at 1%.

Our particular interest applies to columns 5 and 6 that show results from log-linear OLS regressions on a pre- and post-2001 time trends. Overall, there seems to be a tendency towards industry dispersion as a consequence of advanced regional integration and trade liberalisation. In particular, we find evidence for a slowdown in geographical concentration of CEEC industries in the post-2001 period, as 12 out of 23 industries switch signs from positive to negative. Industries marked by dispersion in the pre-2001 period continued, on average, to exhibit the same pattern in the post-2001 period

although at a less pronounced rate. These industries are mainly the labour-intensive ones as evident form column 2 of Table 2.4. A notable exception is the leather and leather products industry (DC19) which experienced an estimated 2.2 per cent annual decrease in spatial concentration followed by an estimated 1.4 per cent annual increase in the post-2001 period.

Summarising, the results from our preliminary analysis are interesting in that they highlight some of the theoretical predictions described in the preceding section. While progressive regional integration has led to greater geographical dispersion of industries, the location patterns remain nevertheless industry-specific. Especially, technology intensity in the production appears to be one of the main distinguishing factors amongst different industry location patterns. In line with NEG models, industries characterised by higher technology intensity in the production also appear to be more spatially concentrated. In the next section, we intend to further test this proposition. Following, we introduce the empirical model to be estimated.

2.4. EMPIRICAL MODEL

2.4.1 Variables and Data

Our aim here is to further contribute to understanding of the variation in terms of spatial concentration across industries. Thereby, we perform a systematic test of the factors determining geographical concentration. The conducted analysis is based on a number of sources that will be acknowledged further below while discussing individual variables. To recall, the data set includes 10 CEEC and features all manufacturing activity in the

countries under consideration, that can be summarised under 23 industry headings classified according to NACE Revision 1.1.[28]

We start with a description of explanatory variables associated with the traditional trade theory that highlight the role of factor intensities in impacting the extent of industries' spatial concentration. Hereby, the level of concentration of individual industries is assumed to be directly related to the intensity of industry use of a certain production factor. For instance, it can be posited that raw material dependent producers will be drawn to locations rich in natural resources while those reliant on skilled labour force will be attracted to locations with comparatively larger pools of skilled work force. To further operationalise the concepts, we use industry-specific measures of intensity of energy consumption in the production, variable *Energy,* as well as skilled labour use in the production, variable *Skill,* as proxies for comparative advantages. The inputs for construction of these proxies are sourced from the EU KLEMS and Eurostat SBS databases respectively. In both instances, we would expect to observe a positive sign in front of the coefficient estimates.

New trade theory maintains that the presence of economies of scale in the production positively correlates with the agglomeration of industries. In order to account for the impact of internal scale economies on industry concentration, we use the engineering estimates of minimum efficient scale (MES) calculated by Pratten (1988) and converted into appropriate measures by Cawley and Davenport (1988).[29] The variable *Econ_scale* therefore accounts for the size of internal scale economies being directly sourced from Haaland et al. (1999). In addition, a further related measure is considered in terms of

[28] NACE (Nomenclature statistique des Activités économiques dans la Communauté Européenne) is the statistical classification of economic activities in the European Community. Statistics produced on the basis of NACE are comparable at European level and, in general, at world level in line with the United Nations' International Standard Industrial Classification of all Economic Activities (ISIC). In this paper we focus on examining *manufacturing activities* corresponding to NACE Rev 1.1., section D, 2-digit level (see Table A2.1 in the Appendix A).

[29] The latter transform the MES into "percentage reduction in average costs for a one percent increase in output" (see also Haaland et al., 1999).

technology-intensity in the production as a potential indicator of industry-level scale economies. We make use of the OECD classification of technology-intensity in the production. The scaling indicator *Technology* has a value between 1 and 4, with the former indicating low-technology intensity in the production (OECD, 2003). The values in between indicate medium-low and medium-high technology deployment respectively. In general, both variables are expected to relate positively to greater spatial concentration.

NEG models emphasise importance of intra- and inter-industry linkages in stimulating spatial concentration of production. Following He et al. (2008), we construct proxy variables for both types of linkages, variables *Intra_linkages and Inter_linkages* respectively. Based on information provided in Input-Output matrices we construct the proxies as follows:

$$Intra\_linkages_i = 100 * (x_{ii} / x_i) \tag{2}$$

$$Inter\_linkages = \frac{1}{2} * 100 \left(\sum_{i=1,\neq j} x_{ij} / x_i + \sum_{j=1,\neq i} x_{ij} / x_i \right) \tag{3}$$

where x_{ij} is the value flow from industry *i* to industry *j*, and x_i represents the total output and total input of industry *i*.[30]

The latest available Input-Output matrices for CEEC refer to the year 2000 and are sourced from Eurostat. Due to data limitations we assume the linkages to remain constant over the period under consideration. Given the relatively short time series, this may not be necessarily regarded as overly restrictive assumption as linkages seem to evolve rather slowly over time [see Maestad (1997)]. In general, we would expect positive signs in front of both variables.

[30] Note that we only consider linkages within the manufacturing sector.

As previously argued, deeper regional integration is expected to have impacted geographical concentration of industries. In the CEEC, increased economic and institutional integration with the EU has led to larger investment and trade flows (Resmini, 2007). To test for the effects of progressive regional integration, we construct a number of proxy variables.

First, we account for industry level FDI intensity by assuming that industries with comparatively higher shares of FDI are also more internationally integrated. The variable *FDI_share* is calculated as the ratio of industry-specific FDI stock to total manufacturing FDI stock. The data is partially sourced from the Vienna Institute for International Economics (WIIW, 2008) database on FDI including relatively complete information on Czech Republic and Slovakia, as well as from publicly available Central Bank data for Latvia and Slovenia.[31] Evidently, data limitations with respect to this particular variable remain an issue as we have to make a number of restrictive assumptions. First, we have to assume equal industry-level FDI shares across countries as we have data available for only 4 out of 10 countries. Second, we have to use imputation methods for missing data to generate a more complete time series due to lower coverage of FDI data prior to 2000.[32] Obviously, these limitations should be kept in mind when analysing and interpreting the results. Second, to further account for the extent of industries' integration with rest of the world we proxy for their degree of vertical integration into regional and global value chains. Industries sourcing higher shares of production components from non-domestic markets are expected to be more interrelated with the regional (global) economy. Thus, we use the ratio of industry-specific imported intermediate inputs to total intermediate inputs as a proxy for the described phenomenon. Similar to the preceding proxies, the variable *Intermed_imports* is also constructed using information from the Input-Output tables provided by Eurostat. Finally, we argue that export-orientated

[31] http://www.wiiw.ac.at/e/statistics.html
http://www.bank.lv/en/statistics/data-room/main-indicators/direct-investments
http://www.bsi.si/en/financial-data.asp?MapaId=64

[32] For this purpose, STATA 11 command *impute* for missing data is used.

industries, i.e. industries with comparatively higher shares of exports in their total gross output, tend to be more globally integrated than industries producing for domestic markets only.[33] The variable *Export_intensity* is constructed using two distinct resources: industry-specific values of exports are obtained from UNIDO's INDSTAT-3 database while gross output data is sourced EU KLEMS and Eurostat SBS databases.

In general, the expected signs on the three proxy variables cannot be determined a priori. For instance, theory stipulates that FDI may imply presence of positive externalities for the recipient location in that it can trigger the cumulative causation process and, thus, agglomeration (Markusen, 2002). However, as growing empirical evidence suggests, it may also lead to negative externalities by crowding out domestic firms hence potentially reversing the agglomeration process (ibid). In addition, increasing regional integration may lead export-orientated industries to locate at greater distance from each other in order to enjoy benefits from locations with lower factor costs (Krugman and Elizondo, 1996). Yet at the same time, empirical evidence for developed and developing countries indicates that trading establishments tend to locate close to each other [e.g. Shelburne and Bednarzik (1993); Sjoberg and Sjoholm (2004)].

Finally, a set of variable is included in the model to account for possible effects of vertical industrial policies. As a proxy for broader trade costs we consider including in the estimation of the aforementioned NTBs (Lee and Swagel, 1997). Thus, the variable *NTB* is expected to be positively correlated with the likelihood of a certain industry being also a potential target of vertical industrial policies. The task of deriving vertical policy indicators is not an easy one in view of the fact that policy makers are faced with a large menu of options that may qualify as restrictive policy tools. Thus, we are not in a position to consider all of them here, neither is this the aim of the exercise. Instead, we are concerned with providing an alternative or indirect way to examining potential effects of

[33] Industries considered to be export-oriented are those that export more than 2/3 of their overall gross output.

government intervention.[34] Our discussion above rested on the assumption that, all else equal, policy makers in transition economies chose to offer support to profitable industries as, hypothetically speaking, these industries are expected to commit more resources to lobby for protection. Thus, we construct an indicator of industry-level profitability by computing the ratio of value-added to gross industrial output. The variable *Policy_VA* is sourced from EU KLEMS and Eurostat SBS datasets. At the same time, policy makers might be as well tempted to take the initiative and offer protection to what they consider to be industries of strategic importance. In CEEC, opening up of formerly protected markets to competition has threatened the hegemony of established domestic industries, therefore increasing the social costs as revenues declined and unemployment increased. Hence, we would anticipate that policy makers may be tempted to offer protection to labour-intensive industries in particular as a way to ease the negative effects associated with increased foreign competition and economic restructuring. Following, we provide a proxy of industries' strategic importance by calculating the ratio of industries' employment to total manufacturing employment. As with the preceding indicator, the variable *Policy_EMP* comes from the EU KLEMS and Eurostat SBS datasets. In sum, industries characterised by higher NTBs, higher value-added or larger labour-intensity in the production are expected to be subject to comparatively higher protection in the context of economic transition. As a result, we would expect to observe a negative sign in front of the coefficients on these three variables. Finally, based on the preceding discussion Table 2.5 summarises the variables deployed in the empirical model.

[34] For a similar approach applied to the case of China see He et al. (2008).

Table 2.5: Summary of the variables used in the empirical model

Variable	Definition	Type	Exp. sign	Source
GINI	Locational GINI coefficients of gross output and value added as per equation (1)	(Dependent)		EU KLEMS, Eurostat
Energy	Ratio of intermediate energy inputs	Market forces	+	EU KLEMS, Eurostat
Skill	Ratio of highly skilled labour compensation to total compensation	Market forces	+	EU KLEMS, Eurostat
Econ_scale	Measure of industry-specific scale intensity in production	Market forces	+	Haaland et al. (1999)
Technology	Dummy variable for industry-specific technology intensity in production	Market forces	+	OECD STAN
Intra_linkages	Ratio of intermediate inputs from own industry as per equation (2)	Market forces	+	Eurostat - IO Tables
Inter_linkages	Ratio of intermediate sale to and inputs from other industries as per equation (3)	Market forces	+	Eurostat - IO Tables
FDI_share	Ratio of industry FDI stock to total manufacturing FDI stock	Integration	+	WIIW; Central Banks
Intermed_imports	Ratio of imported intermediate inputs to total inputs	Integration	+	Eurostat - IO Tables
Export_intensity	Ratio of exports to gross output	Integration	+	UNIDO, EU KLEMS, Eurostat
NTB	Industry specific (production weighted) non-tariff barriers to trade	Industrial policy (vert.)	-	Lee and Swagel (1997)
Policy_VA	Ratio of value added to total gross output	Industrial policy (vert.)	-	EU KLEMS, Eurostat
Policy_EMP	Ratio of total industry employment to total manufacturing employment	Industrial policy (vert.)	-	EU KLEMS, Eurostat

2.4.2 Estimation Approach

The variables in Table 2.5 are calculated for each industry as averages across 10 CEEC resulting in a balanced panel data set covering 22 industries over the period 1995 to 2005.[35] Note that due to data limitations, especially in the period 1995 to 2000, we use interpolation methods for missing values. The dependent variable is the industry-specific locational GINI coefficient calculated using gross output data.[36] Since our dependent variable ranges between 0 and 1, we subject it to a logistic transformation in order to avoid the truncated variable problem. Based on the above, following panel structure is assumed:

$$\ln\left(\frac{GINI_{it}}{1-GINI_{it}}\right) = \alpha + \beta_1 \mathbf{M}_{it} + \beta_2 \mathbf{I}_{it} + \beta_3 \Pi_{it} + \lambda_{it} + \upsilon_t + \varepsilon_{it} \qquad (4)$$

where i denotes industry and t denotes time. $\mathbf{M}_{it}$ is the vector of variables approximating effects of market forces, while $\mathbf{I}_{it}$ and Π_{it} summarise the regional integration and vertical industrial policies proxies respectively. We control for potential outliers, high-tech industries DL30 and DL32, by introducing a dummy variable λ_{it} . The industry invariant time trend that accounts for any time-specific effects not accounted for by the regression is represented by υ_t . Failing to account for those effects may result in a biased assessment of geographical concentration of industries. Lastly, ε_{it} can be classified as the remainder stochastic disturbance term.

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[35] Note that industry DN37 (recycling) has been excluded from the analysis due to largely missing data.

[36] We have also estimated the same equation featuring value added. The results are qualitatively the same and hence not reported directly.

Equation (4) is first estimated using OLS. Generally speaking, its parameter estimates will be consistent though inefficient in presence of both heteroskedasticity and autocorrelation (Greene, 2003). As a result, probability of a Type I error increases in estimations with inefficient estimators (ibid). Thus, we consider two alternative estimation methods that simultaneously correct for the presence of group-wise heteroskedasticity and temporally correlated error terms. The Parks-Kmenta feasible generalised least squares (FGLS) method is expected to yield unbiased and efficient parameter estimates (Beck and Katz, 1995). It performs the estimation by applying two sequential transformations on the estimated model, first removing the serial correlation and subsequently correcting for contemporaneous correlation and heteroskedasticity (Beck and Katz, 1996). Furthermore, Beck and Katz (1995, 1996) propose a less complex method, which retains OLS parameters estimates but replaces its standard errors by the so-called panel corrected standard errors (PCSE). For the sake of robustness, we subsequently present the estimation results based on both methods (FGLS and OLS-PCSE) including time-fixed effects.

Our estimation approach can be described as general-to-specific. Thus, we first estimate the full model in that we consider all location determinants at once. Next, we test down until only statistically significant variables remain (at the standard 10% significance level). This is then our baseline model. According to Bellak et al. (2010), such an estimation approach is beneficial in that it reduces likelihood of the estimation being plagued by the omitted variable bias. Moreover, it tests the robustness of underlying results subject to inclusion and exclusion of particular location factors. The empirical model is estimated in log-linear form whereby independent variables enter equation (4) in their one year lags.[37] This is to consider the transitory time period it takes for explanatory variable to affect the level of spatial concentration. The lagged-variable approach is furthermore beneficial in that it reduces the likelihood of estimation being plagued by endogeneity issues (Wooldridge, 2002).

[37] Note that we have also estimated the model in log-log form obtaining qualitatively similar results.

Finally, to explore incidence of collinearity among the independent variables we present the correlation matrix in Table 2.6. Failure to account for its presence in a regression may result in inaccurate coefficient estimates, frequently characterised by high standard errors, often changing variable signs or implausibly large magnitudes (Greene, 2003). From the Table 2.6, it is evident that there seems to be rather high correlation between proxies for technology and economies of scales. To avoid potential issues associated with high collinearity among indicator variables we therefore decide to exclude the variable *Technology* from our initial estimations. Still, we re-estimate all empirical specifications separately featuring the proxy *Technology*.[38]

As a final remark, the empirical analysis in this chapter, but also in those to follow, is performed using the statistical software package STATA.[39]

[38] However, the results do not qualitative differ from those presented here and we decide not to report them.

[39] The corresponding programming files are available upon request.

Table 2.6: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12
1	Energy	1.00											
2	Skill	0.30	1.00										
3	Econ_scale	0.36	0.45	1.00									
4	Technology	-0.21	0.17	0.60	1.00								
5	Intra_linkages	-0.32	0.04	0.03	-0.09	1.00							
6	Inter_linkages	-0.09	0.02	-0.18	-0.34	0.36	1.00						
7	FDI_share	0.15	0.33	0.40	0.15	0.07	-0.12	1.00					
8	Intermed_imports	-0.07	0.21	0.34	0.62	-0.25	-0.38	0.13	1.00				
9	Export_intensity	0.38	0.20	0.32	0.01	-0.12	-0.02	0.13	0.06	1.00			
10	NTB	-0.10	-0.48	-0.11	-0.10	0.13	-0.01	0.05	0.02	0.03	1.00		
11	Policy_VA	-0.35	-0.18	-0.45	-0.05	-0.24	0.01	-0.27	-0.08	-0.34	-0.04	1.00	
12	Policy_EMP	-0.17	-0.19	-0.26	-0.16	-0.08	-0.10	0.30	-0.14	-0.14	0.46	0.13	1.00

2.4.3 Results

In the first column of Table 2.7, we displays the results of the OLS estimation performed on our full model as specified in equation (4). The model has a satisfactory goodness of fit in that it explains 63 percentage points of the total variation in locational GINI coefficient. Furthermore, we report the mean Variance Inflation Factor (VIF) as we are interested in detecting cases of (near) collinearity between pairs of regressors. Our mean VIF statistic is low (2.37), with the maximum VIF still below commonly accepted threshold level of 10 (Kutner et al., 2004). This suggests that collinearity may not present an eminent issue in our specification of the model.

We briefly summarise underlying results of the full model specification using OLS. They appear to be broadly in line with at least some of the theoretical predictions. In line with the NEG literature, industries that are more reliant on skilled labour force and economies of scale in the production appear to be geographically concentrated as indicated by positive and highly significant coefficient estimates. Moreover, *FDI_share* features the expected sign in addition to being statistically significant thus highlighting the effect of progressive regional integration on industry concentration. As regards remaining integration proxies, both *Intermed_inputs* and *Export_intensity* fail the significance test while also featuring negative sings in front of their coefficient estimates. It follows that industries exporting higher shares of their gross output seem to be locating at greater distance from each other. Thus, our finding lends some tentative support to the theoretical argument which states that deeper integration, characterised by continuous reduction in transportation costs, fosters dispersion as it allows industries to serve core markets through exporting while exploiting comparative advantages of periphery regions (Puga, 1998). Surprisingly, intra-industry linkages seem to act as centrifugal rather than expected centripetal force in our sample, whereas the results pertaining to the effects of vertical industrial policy on industry location largely correspond to our expectations.

Table 2.7: Determinants of geographical concentration, fully specified model

Dependent variable: log locational GINI coefficient (gross output)			
	OLS	PCSE	FGLS
Variable (L-1)	(1)	(2)	(3)
Energy	-1.408***	-0.894***	-0.948***
	[0.243]	[0.259]	[0.220]
Skills	0.022***	0.009*	0.008*
	[0.008]	[0.005]	[0.005]
Econ_scale	0.185***	0.217***	0.203***
	[0.042]	[0.043]	[0.037]
Intra_linkages	-1.830***	-0.967*	-0.971**
	[0.466]	[0.531]	[0.417]
Inter_linkages	0.202	0.428	0.468
	[0.306]	[0.332]	[0.295]
FDI_share	1.592***	1.080**	1.326***
	[0.478]	[0.452]	[0.377]
Intermed_imports	-0.068	-0.009	-0.182
	[0.115]	[0.142]	[0.134]
Export_intensity	-0.012	-0.010	-0.008
	[0.014]	[0.010]	[0.009]
NTB	-0.216**	-0.309***	-0.324***
	[0.094]	[0.114]	[0.092]
Policy_VA	-1.350***	-0.474	-0.529*
	[0.454]	[0.346]	[0.280]
Policy_EMP	0.109	0.752	0.433
	[0.600]	[0.629]	[0.576]
Dummy [a]	Yes	Yes	Yes
Fixed effects (time)	Yes	Yes	Yes
R-squared	0.63	0.46	-
Wald-chi-squared	-	151.13***	238.97***
Mean VIF	2.37	-	-
Arellano-Bond (AR1)	8.32***	-	-
RMSE	0.18	0.10	-
Observations	220	220	220

Note: All independent variables enter regression function in their one year lags (L-1).

Heteroskedasticity consistent standard errors in square brackets.

a) Dummy variable: industry codes DL30 and DL32.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Although we consider presence of group-wise heteroskedasticity in our initial estimation, the conclusions about the statistical significance of the parameter estimates will depend on the assumption of non-temporally correlated error terms. To test the assumption, we present results from further residual tests following OLS and report Arellano-Bond (1991) test for first-order autocorrelation (AR1).[40] As evident, the null hypothesis of no serial correlation is soundly rejected suggesting use of alternative estimators instead of OLS. In columns (2) and (3), we present results of the full model estimation using OLS with PCSE and Parks-Kmenta FGLS techniques respectively.[41] In general, the results obtained from these two different estimation approaches are qualitatively very similar, with rather minor variations in the magnitudes of their respective parameter coefficients. Without further discussion we proceed to estimating the restricted version of the model and present the results in Table 2.8.

[40] In STATA 11, the test is implemented using *abar* command.

[41] Note that in STATA 11, we use the *xtpcse* and *xtgls* commands to estimate PCSE and FGLS models respectively. In addition we specify the *(AR1)* option in both models while simultaneously correcting for heteroskedasticity according to White by specifying *robust* option.

Table 2.8: Determinants of geographical concentration, restricted model

Dependent variable: log locational GINI coefficient (gross output)			
	OLS	PCSE	FGLS
Variable (L-1)	(1)	(2)	(3)
Energy	-1.434***	-0.988***	-0.968***
	[0.185]	[0.239]	[0.204]
Skills	0.025***	0.012**	0.010**
	[0.006]	[0.005]	[0.004]
Econ_scale	0.162***	0.195***	0.173***
	[0.035]	[0.038]	[0.033]
Intra_linkages	-1.819***	-0.966*	-0.863**
	[0.401]	[0.497]	[0.378]
FDI_share	1.578***	1.065**	1.271***
	[0.455]	[0.434]	[0.351]
NTB	-0.201**	-0.242**	-0.340***
	[0.083]	[0.096]	[0.078]
Policy_VA	-1.370***	-0.524	-0.470*
	[0.387]	[0.357]	[0.281]
Dummy [a]	Yes	Yes	Yes
Fixed effects (time)	Yes	Yes	Yes
R-squared	0.63	0.45	-
Wald-chi-squared	-	134.40***	226.82***
Mean VIF	1.92	-	-
Arellano Bond (AR1)	8.34***	-	-
RMSE	0.18	0.10	-
Observations	220	220	220

Note: All independent variables enter regression function in their one year lags (L-1).
Heteroskedasticity consistent standard errors in square brackets.

a) Dummy variable: industry codes DL30 and DL32.

* significant at 10%; ** significant at 5%; *** significant at 1%.

As evident from the regressions in columns (1) to (3), we confirm the robustness of the preceding results as all the variables keep their signs and significance levels. Thus, we proceed to a more detailed discussion of the underlying findings. Note that, as the OLS estimates may suffer from presence of serially correlated error terms, we base our subsequent analysis on the PCSE and FGLS estimators respectively. Starting with the factor intensities, the results in columns (2) and (3) reveal an unexpected result in terms of factor endowment *Energy*. In particular, the variable features a negative sign in addition to being statistically significant. It therefore implies that the CEEC industries that are dependent on primary input factors display a tendency towards spatial dispersion. Thus, the transition process and progressive opening up of the economies to trade and investment may have encouraged more resource dependent industries to follow those less mobile resources. In contrast, the variable *Skills* has the expected positive sign and is highly significant in all specification. Given the assumption of a lumpy distribution of the input factor, industries reliant on skilled work force show a tendency towards agglomeration. Our findings are thus in line with previous studies on the region, e.g. Hildebrandt and Woerz (2004), who find that industries characterised by higher ratios of skilled labour have been also marked by a comparatively stronger trend towards spatial agglomeration. In a similar vein, Dumais et al. (1997) have shown that manufacturing establishments in the United States have displayed higher propensity to locate near similar firms on the grounds of requiring the same type of labour.

Moreover, we find positive and statistically significant impact of economies of scale, variable *Econ_scale*, on location of manufacturing industries. Hence, all else equal, manufacturing industries reliant on internal economies of scale in the production are more geographically concentrated. Our finding lends therefore firm support to the NEG models which highlight that in the process of progressive regional integration, economies of scale intensive industries may choose a smaller number of locations from which to supply larger number of markets.

In addition, NEG models assign particular value to pecuniary externalities in explaining observed agglomeration patterns. As previously outlined, one of our proxies for industry linkages is a measure of intermediate goods flows within the same industry *(Intra_linkages)*. Contrary to our expectations, the variable *Intra_linkages* features a negative sign in front of its point estimate while being also highly significant. The result therefore suggests that stronger dependence on intra-industry linkages leads industries to locate at greater distance from each other. After all, this may not be surprising: for instance, Krugman and Elizondo (1996) show that the importance of industry linkages might be weakened by the opening up of a closed economy to international trade. When the economy is closed, firms located in industrial cores have the best access to both domestically produced inputs and the domestic market. It follows that opening up the economy weakens the linkage advantages of those core areas as it allows firms to source inputs and sell outputs abroad. This notion holds particularly well in the context of the CEEC: as domestic producers started trading higher proportions of intermediate inputs and finished goods with the rest of the world it would be rather natural to expect a weakening of both types of linkages.

The evidence on the impact of greater regional integration on spatial concentration of manufacturing industries is rather mixed. While industry trading patterns do not appear to have any significant explanatory power in the model, the role of FDI in explaining spatial concentration patterns turns out to be of immense importance. In fact, the variable *FDI_share* is positive and highly significant having also the largest magnitude on its coefficient estimate. Thus, our results hint towards presence of positive externalities associated with location of foreign investors, i.e. FDI inflows appear to trigger increased agglomeration of industrial activities in CEEC [for a similar result see, Resmini (2000); Altomonte and Resmini (2002)].

Turning to the vertical industrial policy variables, it seems that industries faced with higher non-tariff barriers, as indicated by the variable *NTB*, also chose to locate at a greater distance from each other. Hence, higher trade costs appear to discourage industries from co-locating and might therefore imply significant efficiency losses due to the presence of imposed policy barriers. It follows that, theoretical predictions from NEG models find support in our sample of CEEC transition economies. Interestingly, our exploratory proxy for likelihood of an industry being favoured by vertical industrial policies *(Policy_VA)* holds the expected sign while also being statistically significant in two out of three model specifications. Put it simply, industries characterised by higher value added appear to be locating at farther distance from each other. When taken together with the previous finding on the role of NTBs in determining location outcomes, these results may be cautiously perceived as a confirmation of the hypothesis that vertical industrial policies might indeed exercise an impact on industry location patterns in CEEC.

Finally, the consideration of a dummy for industry codes DL30 and DL32 as well as the time fixed effects prove to hold significant explanatory power in our model specification. With respect to the latter, a previous study by Hildebrandt and Woerz (2004) comes to the same conclusion. In particular, they find that spatial agglomeration of these two industries is mainly due to FDI inflows that have been biased towards only two locations in our sample, namely Hungary and Czech Republic.[42] Besides, the time fixed effect further confirm the findings from the preliminary analysis that a trend towards a continuos process of industry dispersion has accompanied CEEC transition to market-based economies.

[42] In order to ensure that our results are not affected by influential observations related to these two industries we re-estimated all equations presented in Table 2.8 by excluding DL30 and DL32 from our data set. However, this alternation does not change the overall quality of our results; hence, we do not report them here.

As a further robustness check we re-estimate the restricted specification of equation (4) using a two year lag on the right hand side variables. The results are firmly in line with those discussed above and will not be subject to further discussion at this point in time.[43]

In Table 2.9, we further scrutinise the effects of progressive regional integration with the EU and its consequences for industry location patterns. In particular, we split the entire period under consideration into two corresponding sub-periods. This split is not arbitrary but rather in line with the announcement of EU's first round of Eastern Enlargement. Specifically, in columns (1) and (3) we present the results for the pre-accession announcement period, i.e. 1995 to 2000, using PCSE and FGLS estimators respectively. The results for the post-accession announcement period, i.e. 2001 to 2005, are displayed in columns (2) and (4).

[43] They are nevertheless available upon request.

Table 2.9: Determinants of geographical concentration, prior and after EU accession announcement

Dependent variable: log locational GINI coefficient (gross output)				
	PCSE		FGLS	
	(1)	(2)	(3)	(4)
Variable (L-1)	Pre-2001	Post-2001	Pre-2001	Post-2001
Energy	-1.276***	-1.568***	-0.717***	-1.175***
	[0.387]	[0.319]	[0.238]	[0.274]
Skills	0.030***	0.004	0.028***	-0.001
	[0.009]	[0.007]	[0.006]	[0.006]
Econ_scale	0.028	0.276***	-0.039	0.174***
	[0.051]	[0.061]	[0.041]	[0.054]
Intra_linkages	-1.618**	-1.120*	-0.419	-0.878*
	[0.785]	[0.650]	[0.474]	[0.511]
FDI_share	3.220***	0.606	3.854***	1.431**
	[63.060]	[0.693]	[54.404]	[0.620]
NTB	0.065	-0.522***	-0.061	-0.619***
	[0.124]	[0.121]	[0.090]	[0.097]
Policy_VA	-1.628***	-1.978***	-1.095***	-1.422***
	[0.547]	[0.577]	[0.314]	[0.481]
Dummy [a]	Yes	Yes	Yes	Yes
R-squared	0.52	0.51	-	-
Wald-chi-squared	93.07***	173.45***	275.89***	216.63***
Observations	110	110	110	110

Note: All independent variables enter regression function in their one year lags (L-1).

Heteroskedasticity consistent standard errors in square brackets.

[a)] Dummy variable: industry codes DL30 and DL32.

* significant at 10%; ** significant at 5%; *** significant at 1%.

The findings are indeed interesting as they point towards diverging location dynamics between these two distinct time periods. Whereas factor endowments proxies retain their signs and significance levels, they nevertheless influence industry location patterns in very different ways. In particular, industries dependent on immobile resources seem to have experienced increased dispersion in the post-2001 period. Thus, natural resources induced comparative advantages seem to gain in importance in an integrating region as firms find it now easier to locate closer to sources of those advantages. At the same time, market and institutional integration make the pools of skilled labour more mobile and thus ease the pressure on firms to follow them. Another interesting finding pertains to the effect of economies of scale on the location of industrial production. In line with theoretical predictions, progressive market integration is expected to lead scale intensive industries to agglomerate as it enables an easier supply of the markets from only a few locations. This argument seems to be nicely born out in our sample as variable *Econ_scale* turns out to be positive and highly significant following the accession announcement. As previously outlined, the effect of intra-industry linkages remains negative and significant throughout the period under consideration. It therefore underlines the structural changes that have affected most of the CEEC industries. The fundamental trade re-orientation of the countries towards foreign markets is also expected to have decreased their reliance on former, mainly domestic, linkages. In line with previous findings, FDI remains a significant explanatory factor in terms of industry location even though its effect appears to somehow weaken in the post-2001 period. Thus, the announcement of the first round of enlargement might have raised investors' expectations for other parts of Eastern Europe, e.g. some of the South-East European countries, to join the EU in due course as well; thus shifting focus away from the core CEEC towards those countries at the periphery. Finally, we re-confirm the negative effect exercised by potentially implicit vertical policies as industries experiencing higher NTBs and those more likely to be attended to seem to be increasingly dispersed in the post-announcement period. We therefore find support for our stated hypothesis *(H3)* in that

industries facing higher barriers to trade and those of potentially strategic importance to policy makers tend to be also more dispersed in place.

2.5 CONCLUSION

Our analysis gives an account of changes in geographical location patterns in manufacturing industries across 10 CEEC, covering the period 1995 to 2005. The work undertaken in this chapter expands the existing stock of knowledge on a number of relevant issues that are worth highlighting.

First, our study is geared towards a better understanding of changes in spatial location patterns by considering a longer time period and more disaggregated levels of industry classification. Previous studies placed in a similar context have been confined to the early years of transition, a period that is regarded as volatile and marked by severe transitional shocks. Among others, Hildebrandt and Woerz (2004) examine the transition period 1993 to 2000, while Longhi et al. (2005) focus on the time span including the years 1990 to 1999. Besides, the relevant studies are also restricted to highly aggregate industry classifications which may have further distorted their analytical conclusions. An additional advantage of using an extended time series is that we are able to impose structural breaks on our data, thereby highlighting changes in speed of CEEC' EU integration process. To the best of our knowledge, our paper is the first to launch this type of inquiry into the subject matter. Second, most of the existing studies have used a restricted number of explanatory variables in examining spatial location patterns which limited the analytical power of their inquires. Longhi et al. (2005), for instance, focus on characteristics limited to market potential, R&D intensity and labour abundance only. Clearly, part of the issue can be attributed to the lack of reliable and comparable cross-country data. In this respect, our study makes use of a new data set that enables us to construct somewhat more elaborate measures of spatial concentration as well as proxies for various theoretical concepts that have been put forward in the literature. Third, to the

best of our knowledge this is the first study in the context of transition economies to account for the potential impact of industrial policies on geographical location. In a sense, our analysis therefore provides a basis for a new field of inquiry as we take a novel approach in providing arguments for a more formal examination of the effects of vertical policies on industry location in transition and developing countries context.

The main results coming out of the analysis can be summarised as follows. Spatial concentration of manufacturing appears to have been decreasing over the period under consideration. Additionally, we find strong evidence that industry dispersion trends have accelerated in the post-2001 period and following the announcement of the first round of EU's Eastern Enlargement. This finding is contrary to the predictions coming out of theoretical literature whereby the process of deepening market integration, and with it associated efficient division of labour, is expected to result in a more concentrated production landscape. Besides, our finding is also in contrast to some of the previous empirical research concerned with this specific region. In particular, the evidence presented by Hildebrandt and Woerz (2004) describes a landscape of increasing concentration for the period 1993 to 2000. However, in their concluding remarks the authors predict a turning point in the concentration trends due to a deepening of institutional and economic integration. In fact, by extending the time period under examination we are able to confirm their prediction in that we indeed observe a decline in industry concentration patterns.

As regards specific location determinants, and in line with existing research such as Resmini (2000) and Altomonte and Resmini (2002), we confirm the role and importance of regional integration factors such as FDI in contributing towards increased industry clustering. However, alternative regional integration proxies tentatively indicate that industries with more extensive links to international value chains might have experienced a process of spatial dispersion over the course of time. Thus, it appears that the choice of

proxies operationalised in the models has a significant impact on the results one obtains. Therefore, caution is called for when devising and interpreting such variables.

Finally, we also find some preliminary support for our hypothesis that vertical industrial policies might lead to increased spatial dispersion of productive activities. Indeed, industries facing higher trade costs also tend to locate at greater distance from each other, while those with a higher value added component in the production exhibit the same location patterns. Hence, given the assumption that CEEC policy makers have continued providing implicit support to certain industries throughout the transition process, we rate this finding as tentative evidence for adverse effects which targeted policy measures can have on industry concentration as they erode potential benefits stemming from more efficient division of labour and increased intra-industry trade.

Although informative, our present inquiry remains limited in several ways. First of all, the spatial level of analysis is highly aggregate and prevents us from reaching more nuanced conclusion on where the actual agglomerations take place within countries. As industry location is unlikely to be evenly spread across space our focus on countries as spatial units of examination has therefore left an important question unanswered: in particular, what is the effect of changes in industry concentration patterns on the ongoing process of structural change affecting CEEC regions? In other words, do changing industry location patterns increase the extent of regional divergence within the countries or do they actually contribute to regional convergence and, hence, more balanced growth? Second, our initial research highlights the relevance of certain agglomeration factors, most notably the FDI. However, given the scope of the inquiry we fail to provide a more detailed indication on what are its actual location determinants. This is an especially relevant question given the perceived importance of FDI in the context of economic transition and with it associated technological progress and economic growth. In the following two essays we make an attempt at deriving some answers to the questions raised here.

APPENDIX A

Table A2.1: The Statistical Classification of Economic Activities in the European Community, NACE Rev 1.1.[44]

NACE	DESCRIPTION
D	Manufacturing
DA	Manufacture of food products, beverages and tobacco
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
DB	Manufacture of textiles and textile products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur
DC	Manufacture of leather and leather products
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
DD	Manufacture of wood and wood products
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
DE	Manufacture of pulp, paper and paper products; publishing and printing
21	Manufacture of pulp, paper and paper products
22	Publishing, printing and reproduction of recorded media
DF	Manufacture of coke, refined petroleum products and nuclear fuel
23	Manufacture of coke, refined petroleum products and nuclear fuel
DG	Manufacture of chemicals, chemical products and man-made fibres
24	Manufacture of chemicals and chemical products
DH	Manufacture of rubber and plastic products
25	Manufacture of rubber and plastic products
DI	Manufacture of other non-metallic mineral products
26	Manufacture of other non-metallic mineral products
DJ	Manufacture of basic metals and fabricated metal products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
DK	Manufacture of machinery and equipment n.e.c.
29	Manufacture of machinery and equipment n.e.c.
DL	Manufacture of electrical and optical equipment
30	Manufacture of office machinery and computers
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
DM	Manufacture of transport equipment
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment

[44] NACE: Nomenclature statistique des activités économiques dans la Communauté européenne.

DN	Manufacturing n.e.c.
36	Manufacture of furniture; manufacturing n.e.c.
37	Recycling
G	Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
H	Hotels and restaurants
55	Hotels and restaurants
I	Transport, storage and communication
60	Land transport; transport via pipelines
61	Water transport
62	Air transport
63	Supporting and auxiliary transport activities; activities of travel agencies
64	Post and telecommunications
J	Financial intermediation
65	Financial intermediation, except insurance and pension funding
66	Insurance and pension funding, except compulsory social security
67	Activities auxiliary to financial intermediation
K	Real estate, renting and business activities
70	Real estate activities
71	Renting of machinery and equipment without operator and of personal and household goods
72	Computer and related activities
73	Research and development
74	Other business activities
Source:	http://www.fifoost.org/database/nace/nace-en_2002c.php

Chapter 3

Border Effects and the Location of Industry at the Sub-national Level

3.1 INTRODUCTION

We have concluded the preceding chapter noting that distribution of industry location is unlikely to be evenly spread across space. This notion has been previously formalised in the basic core-periphery models building on a more general observation that productive activities have a tendency to agglomerate in space, as a means to benefit from a range of positive spillovers, such as knowledge, skills, infrastructure, among others (Marshal, 1920). However, in contrast to the market-based economies the production landscape of the CEEC has been over time significantly transformed by the state apparatus. Hereby, industry location has been primarily driven by geo-political considerations resulting in a skewed distribution of production, away from unstable Western border regions towards internal and Eastern border regions.

Following the start of the transition process, the role of national borders radically changed as international mobility of goods and factors of production gained in importance. As a result of progressive integration with the EU, CEECs' Western borders effectively disappeared thereby potentially increasing the attractiveness of these regions as locations of production. At the same time, integration also implied that most of the

CEEC's Eastern regions would become EU's external frontiers, thus getting potentially even more closed than before. Policies at the national and supra-national level have been designed to tackle the structural challenges facing border regions. They were primarily aimed at raising the attractiveness of those regions for investment as a means to tackle the issue of diverging growth patterns. In view of the above, it follows that the implied asymmetry stemming from the broad based geo-political and policy changes may have had a significant impact on the spatial distribution of economic activity within the CEEC. Our aim in this chapter is therefore to investigate the implications national borders have on location of industry in the context of economic transition and progressive regional integration.

While examination of the effects of national borders on various economic outcomes has recently featured prominently in the economic literature, relatively little attention has been paid so far to examining their role in determining location outcomes.[45] In the context of transition economies, only a handful of studies exist even though confined to the analysis of only a few explanatory factors, countries and industries. This chapter therefore aims at expanding the exisiting stock of knowledge in several ways. First, we provide a comprehensive account on the changes in spatial location patterns for a large number of the CEEC manufacturing and services industries at the sub-national (regional) level of spatial aggregation. Previous studies have been confined to an analysis of a limited number of manufacturing industries only and have not considered location of services at all. Besides, the time span under consideration refers to the second half of the transition phase whereas previous studies have largely focused on the intial period, i.e. 1990s. The latter has been marked by severe transitional shocks that may have significantly affected the findings of exisiting research. Second, we empirically operationalise some of the theoretical concepts associated with different streams of relevant literature and hence allow for a more comprehensive analysis of location factors at the regional level. Previous studies have been constrained in that respect as they

[45] See, for instance, Helliwell and McCallum (1995); Engel and Rogers (1996); Nitsch (2000); Evans (2003).

focused on a very limited number of explanatory factors. Third, we take into consideration wider effects of the CEEC progressive integration into the EU. Our intention in this respect is to focus on certain characteristics of the integration process such as the application of region-specifc policies and strucutural development funds aimed at advancing the position of the CEEC's border regions in particular. The policies' primary purpose has been to upgrade the infrastructure, enable cross-border cooperation and thus positively affect regional attractiveness for investment and growth. To the best of our knowledge, this is the first paper to inquire into the effects of regional policy on location of economic activity in the context of the CEEC. Fourth, in contrast to previous studies we take into consideration the relative position of regions as well as the distance between them by calculating statistics of spatial autocorrelation in addition to standard spatial concentration measures. This is useful in that our study is not unidimensional in terms of industry concentration but also explicitly considers spatial autocorrelation among regions, thereby presenting a more robust picture of indutry location patterns.

The remainder of this chapter is organised as follows. Section 2 reviews the theoretical literature based on which we derive the hypothesis to be tested in the empirical part of the paper. Section 3 summarises some of existing empirical research that is deemed of relevance to our cause here. Section 4 introduces the data and presents some descriptive statistics. Section 5 discusses the estimation methodology and results. Section 6 concludes and highlights some policy implications.

3.2 ECONOMIC THEORY

We start the review of relevant theoretical literature with a short discussion of traditional location theory. Following, we outline some of the salient predictions associated with the international trade theory. We then proceed to a discussion of contemporary theoretical models as described by the NEG literature. Finally, we conclude this section with a brief summary of stylised facts based on which we develop hypotheses to be tested in the

empirical part of the paper. The literature review presented here is by no means exhaustive. It is nevertheless worth highlighting that Houtum (2000), Niebuhr and Stiller (2004) and more recently Brulhart (2010) provide excellent and comprehensive summaries of existing knowledge in the field.

One of the first contributions to the traditional location theory is von Thunen's (1875) original work on optimal location of (agricultural) production. Central to his theory is the concept of transportation cost which is to be incurred in moving the finished product to a central market place. The basic insight from this rather simple analytical framework is that the profits associated with the production of a good are a decreasing function of increasing distance from the centre.[46] Von Thuenen thus developed the very first type of a "core-periphery" model describing a production space in which the degree of agglomeration declines in stages, starting from the core to the periphery to total wilderness where no production is worthwhile.

In a similar fashion to von Thunen's theory, the following generation of location theorists placed the transportation costs at the forefront of their analysis. For instance, in Weber's (1922) least cost approach firms choose their location so as to minimise the cost of transportation between raw material sites and markets. Thereby, the optimum location is thought to be closer to the resource extraction sites the higher the raw material content in the final product. Still, a common issue to the first generation of location studies is that they have largely abstracted from considerations of political boundaries of space.

Giersch (1949) was one of the first to develop a model for the explicit purpose of analysing the location patterns in presence of political boundaries.[47] In the model, the

[46] He makes a number of simplifying assumptions by stating that the economy under investigation is a flat and homogeneous surface, isolated from the rest of the world. However, his subsequent thinking has been less restrictive in that it takes into consideration the transportation costs for intermediate products, differences in terrains, etc.

[47] It is nevertheless a highly stylised model described by a plain in which all incurred transportation costs can be considered as proportional to physical distance. The plain is assumed to be entirely surrounded by a desert (border) which is a synonym to a natural barrier to international trade and factor movements.

actual size of emerging market areas is a function of transportation costs and internal scale economies. It posits that lower transportation costs along with greater internal scale economies result in larger market areas which can be served by fewer firms. Consequently, the networks of markets for every product would tend to become denser in the centre than at the periphery. Thus, the emergence of agglomeration advantages in the centre of the plain would ultimately lead to a polarised distribution of economic activities in space. The resulting 'border effect' therefore implies that peripheral regions are less attractive for location of productive activities.[48]

Reversing these arguments has been the task of trade theorists. Although location aspects have received comparatively little attention in international trade theory, its contribution has nevertheless been instrumental in advancing our understanding of spatial dynamics.[49] The main insight coming out of this literature stream is related to trade liberalisation and its potential impact on the location of productive activities. In general, it is expected that the integration process lowers the costs of access to foreign markets while it increases the size of the accessible market area. It follows then that, all else equal, regions bordering foreign markets will qualify as preferred locations for investment and production.

Rauch (1991) formalises this notion in a model following a common observation that within a particular country, certain localities have a more favourable access to foreign markets than others. The outstanding feature of his model is the assumption of a specific landscape featuring an internal geography and transportation costs, the latter assuming standard iceberg structure. The results can be summarised as follows. In autarky, there is no difference in the size of the cities given the assumption of uniform internal trade costs. It is only following progressively more liberalised trade, along with the reduction in trade cost, that cities closer to the border partly specialise and engage in international trade. As

[48] For a similar argument see Hover (1963).

[49] Among the main reasons for this deficiency is the tendency of trade economists to model highly abstract spatial structures. For instance, basic trade models assume presence of a homogenous and featureless intra-national space that does not allow for a more nuanced examination of location patterns (e.g. Krugman and Helpman, 1984).

a result of favourable market access conditions, cities closer to the border will also be bigger in size. Finally, at low trade costs even the most internal cities specialise and trade; however, considering existing presence of transportation costs, city sizes continue to decrease with growing distance from the border. The implication of Rauch's model for our present analysis is easy to understand: progressive regional integration and opening of an economy to trade is associated with an implied concentration bias towards locations with more favourable access to foreign markets.

The explicit consideration of spatial heterogeneity has been one of the main features of the core-periphery type of models in the NEG literature. Alonso-Villar (1999), for instance, constructs a model that describes a home country consisting of three regions that are lined up on a straight line facing to the left and right an identical foreign trade partner. By proposing such a set up she assumes the presence of an internal and two border regions, the latter thought to benefit from less costly access to foreign markets. Thus, in presence of trade costs, the author concludes that equilibrium location of productive sectors cannot be in the internal region and therefore border regions must have a location advantage in open economies frameworks. This result holds as long as foreign markets are profitable and trade costs are non-prohibitive.

Crozet and Koenig (2004) further expand on this approach by allowing external trade costs to gradually decline. They find that theoretical frameworks based on heterogeneous structure of space cannot provide a clear cut indication on location of production in the presence of progressive market integration. At first, regional integration induces a re-location of domestic producers towards a border region due to its physical proximity to export markets. However, they also show that this process can invoke exactly the opposite effect as well by inducing re-location of domestic producers towards interior regions in their search for higher protection from outside competition. Given the locational dynamics inherited in the theoretical model, the answer as to the direction and

magnitude of industry concentration patterns in the context of progressive regional integration therefore becomes an empirical one.

The analysis so far has been mainly concerned with issues of (regional) market access. However, as Brulhart (2010) rightly notes, real-world regions differ in more aspects than access to markets. We are therefore interested in reviewing some of the theoretical concepts that highlight the role of other location factors, in particular infrastructure endowments and policy measures.

Starting with the former, the role of infrastructure has been already examined in the NEG type of models. In a seminal paper, Martin and Rogers (1995) show that regions endowed with better infrastructure have on average lower intra-regional transaction costs. This in turn reduces the production costs and contributes to the development of a cumulative causation process. In particular, a fall in relative prices of goods produced in a region with better infrastructure results in higher demand for goods produced there and thus attracts other producers to the locality. To put it differently, a lowering of transaction costs expands the effective size of the market thereby attracting more firms to it. It follows that higher industry concentration levels are to be expected in regions with better infrastructure.

The cumulative causation process might be stimulated by more endogenous factors as well. Policy instruments that focus on the creation of enabling business environment might possibly influence decision processes of firms and industries on where to locate.[50] Dupont and Martin (2006) conceptualise this in a model on subsidies (investment incentives) that builds on the "footloose capital" model developed by Martin and Rogers (1995) and further analysed in Baldwin et al. (2003). Several insights emerge from their

[50] According to Hirschman (1958), presence of development bottlenecks, e.g. lack of infrastructure, legislation, etc., needs to be tackled by policy prescriptions. He outlines two development options. First, the stakeholders can exercise political pressure on policy makers to adapt to their needs ("development via shortage"). Second, policy makers might be forward looking and play an active role in regional development by attending to stakeholders future development needs ("development via excess").

study that we only briefly summarise here. In general, it appears that subsidies as a policy instrument are a potent tool for attracting firms to poorer (peripheral) regions. Their impact is greater the higher the level of regional integration, as it is assumed that lower trade costs guide the footloose firms to locations with less competition and on average higher subsidies provision. Thus, progressive regional integration in presence of targeted policy instruments might benefit border regions in particular. However, their remain certain caveats associated with the notion of subsidies being one of the determining location factors. From the theoretical point of view, if we assume existence of sufficiently mobile firms the model predictions become more ambiguous. In particular, subsidies to firms in peripheral region will then inevitably lead to higher operating profits in all regions. As firms relocate to a border region that provides/receives the subsidies, competition becomes weaker in the central region so that profits increase there too.[51] In addition, Tavares and Young (2005) cite evidence from a number of empirical studies and conclude that investment incentives are "a crude, discriminatory and expensive tool for the attraction of inward FDI" (Tavares and Young, 2005, p.4). In view of the contrasting predictions there is no clear cut answer on the subject matter implying that it is most likely to be context specific - hence it is necessary to revert to the empirics.

3.2.1 Hypothesis

In the preceding paragraphs we have investigated how integration might affect regions located along the national borders. Location theory implies that market potential is low in border regions thus making it less likely for this type of regions to host any significant agglomerations of economic activity. However, explicit consideration of market integration may completely alter the picture. In particular, the relative geographical position of regions changes as strategically well positioned border regions transform into central locations while others remain a periphery, possibly further falling behind. Indeed,

[51] In theory, this is still a positive outcome provided that costs incurred to provide the subsidies outweigh possible negative externalities, e.g. increase in competitive pressure in peripheral region that might trigger a downsizing process in terms of employment and output.

central border regions should have a geographic advantage within an integrating bloc. Economies of scale intensive industries in particular are expected to be drawn to such locations given their strategic position within the common market. We can therefore derive our first set of hypotheses by stating that:

Hypothesis 1a: In general, progressive regional integration and openness will contribute to increased industry concentration in regions with better access to relevant foreign markets. These regions are expected to be the central border regions positioned in-between integrating partners.

Hypothesis 1b: All else equal, economies of scale intensive industries in particular will exhibit higher levels of geographical concentration and exhibit tendency to locate in the central border regions.

The importance of proximity to relevant markets remains nevertheless conditional on the assumption that a region is in a possession of suitable (transportation) infrastructure to reach the external markets. Theoretical models indicate that availability of high quality infrastructure can significantly impact the location decision of firms by expanding the market potential of a locality. This effect is expected to be further intensified in the course of economic integration. It follows then:

Hypothesis 2: Progressive regional integration and openness intensify the tendency of industries to concentrate in regions with comparatively better stock of (transportation) infrastructure.

Finally, recent theoretical inquiries attribute a decisive role to regional policy instruments in impacting industry location outcomes. Especially, economies of scale intensive industries are assumed to be influenced by targeted policy instruments as they are faced

with the choice of selecting a single production facility to supply a number of distant locations. Our final hypothesis can be stated as follows:

Hypothesis 3: Regional policy instruments, that explicitly aim at advancing a region's attractiveness for production purposes, are an effective tool for generating higher levels of industry concentration: in particular, regional policy tools are expected to have a positive effect on location of industry in the central border regions and, in particular, location of economies of scale intensive industries within this type of regions.

3.3 EMPIRICAL EVIDENCE

Despite growing number of theoretical models that aim at explaining spatial dynamics of industry location, there is still surprisingly little empirical evidence to allow for more robust conclusions on the competing theories. As initially stated, in this chapter we propose to empirically explore some of the underlying predictions of theoretical models. Following, we review a number of relevant studies that describe industry location dynamics in the context of heterogeneous geographical space. Among others, we review Hanson's (1998) seminal work on the Mexican economy in the context of deeper economic integration within NAFTA. We also examine in greater detail Resmini's (2007) analysis of industry location patterns in the CEEC following their transition to market based economies.

Hanson's (1998) seminal paper explores changes in the industry location patterns in Mexico following that country's accession to the NAFTA. Hereby, the author bases his empirical inquiry on the underlying theoretical framework rooted in the NEG literature [Krugman and Livas(1992); Venables (1996)]. The theoretical framework thereby provides a basis for an estimation of changes in regional distribution of labour demand: itself a function of changes in trade costs, existing industry concentration and a series of control variables. Broadly speaking, his findings are largely consistent with standard NEG propositions: i.e., stimulated by progressive economic integration, economic activity in Mexico tends to shift towards regions with better access to foreign markets (in particular, the United States). It follows that regions at closer distance to the target market are expected to disproportionally benefit from NAFTA. Moreover, the author presents evidence that NAFTA has accentuated the transportation-cost effect and, hence, directly contributed to a decline of urban primacy of Mexico City and its manufacturing belt. In a similar vein, Faber (2007) arrives to the same conclusion stating that sectors that have exhibited higher degrees of regional integration have tended to grow faster in border regions. He measures the trade integration of Mexican sectors by focusing on changes in

their exporting patterns (to the US) over time. The author concludes that progressive economic integration weakens the agglomeration economies related to existing demand and cost linkages, resulting in industry dispersion away from primary production centres. Faber's (2007) finding is clearly of relevance to the CEEC as it points towards spatial dynamics that might be expected in the European context of integration as well. Similar to Mexico, the CEEC have relied for a significant period of time on capital regions as their main economic centres. Transition process and opening of border to trade and investment have shifted the focus towards external markets and, in particular, the EU [see, e.g., Bruelhart and Koenig, (2006)]. Thus, increased economic activity in the formerly peripheral Western border regions of the CEEC may be indeed a realistic expectation.

Martincus and Sanguinetti (2009) do not explicitly consider the effects of trade liberalisation but chose instead to exploit cross-sectional patterns in tariff protection as a means to establish the link between trade policy and industry agglomeration in Argentina. Their working hypothesis implies that lower barriers to trade, as measured by lower industry tariffs, will increase the tendency of particularly economies of scale intensive industries to locate away from main economic centres and at closer distance to regions bordering relevant foreign markets.[52] Their estimation strategy is based on the assumption that the observed economic landscape is a result of multivariate interactions between region- and industry-specific characteristics [for a similar approach see also Midelfart-Knarvik et al. (2000)]. This 'matching' is then conducted for 125 manufacturing industries and 24 regions in the period 1985 to 1994. The principal result coming out of their analysis is that trade policy has some explanatory power as it appears to affect location patterns of manufacturing industries. In line with Hanson's (1998) findings, they find evidence of declining importance of the capital region. Besides, there

[52] In the case of Argentina, the economic centre is the capital region in and around Buenos Aires which accounted for approximately 60 per cent of national GDP over the period under examination (Sanguinetti and Martincus, 2009).

appears to be an increasing tendency of more trade dependent industries to locate at larger distance from the domestic economic core.[53]

In a similar vein, Henderson and Kuncoro (1996) examine the changes in location patterns of firms in Indonesia, following internally driven liberalisation policies in the period 1980 to 1985.[54] The value added of their study is the explicit focus on the impact of historical location patterns on those currently observed. Thus, the authors posit that path-dependency of industry location matters as it makes it more difficult for policy makers to alter the degree of agglomeration away from the core towards periphery. More precisely, location of new plants in Indonesia is biased towards regions that offer a readily available stock of assets, characterised by "local trade secrets concerning market conditions, local institutions and politics, and technology" (ibid, p.536). The authors venture beyond the Indonesian context to conclude that, all else equal, path-dependency may be a crucial factor in explaining why, on average, peripheral regions find it difficult to attract economic activity even in presence of strong policy driven support frameworks.

The case of East German regions is indicative. For instance, Engel (1999) finds that targeted policies along with the substantive institutional and economic integration did not result in an increased number of firm start-ups in East German border regions (see also Sander and Schmidt, 1998). As an explanation, he points towards persistently weak economic potential of those border regions as the main reason for their poor economic performance. Studies on the CEEC that directly examine industry location patterns on a cross-country basis and consider progressive European integration remain rare. To the best of our knowledge, there are only two such inquiries currently existing.[55]

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[53] Volpe-Martincus (2010) derives similar results for Brazil suggesting that trade liberalisation favoured locations in states closer to the largest neighbouring trading partner and that this effect increased throughout the period under examinations, i.e. 1990s.

[54] The policy changes have followed the process of economic decentralisation of the national economy.

[55] Nevertheless, there are a number of studies dealing with related issues that may provide additional insight into the topic. For instance, Egger et al. (2005) conduct an empirical inquiry into the effects of trade openness on regional disparities within 8 CEEC. They find evidence that economic integration tends to foster regional divergence in terms of wage disparities within the region.

We start with the paper by Traistaru, Nijkamp and Longhi (2002) that is geared towards explaining patterns of relative regional specialisation and geographical concentration in 5 CEEC over the period 1990 to 1999. The CEEC featured in their study include Bulgaria, Estonia, Hungary, Romania and Slovenia. Hence, with the exception of Hungary and Romania, their sample of countries differs from the one used in this paper. The authors use Krugman's (1991a) dissimilarity index, based on industry employment data, to estimate a range of country-specific empirical models. The chosen OLS estimator features a regression equation populated by the joint effects that are associated with region- and industry-specific characteristics (see Midelfart-Knarvik et al., 2000). Their obtained results indicate that progressive regional integration might have favoured industry concentration in regions bordering the EU and other accession countries. In other words, regions located at closer distance to the core European markets, all else equal, are thought to have higher market potential and might therefore have benefited from increased industry concentration. Besides, industry location appears to be at least to a certain extent determined by the availability of input factors. Thereby, labour intensive industries tend to locate in regions that can be labelled as labour abundant, while technology intensive industries seem to settle in regions with higher relative endowment of skilled work force.[56] Hence, arguments based on the concept of comparative advantage appear to have some explanatory power in terms of industry location in CEEC. We would therefore want to control for this effect in our empirical model as well.

[56] Similar conclusion is derived by Chidlow et al. (2009) who explore regional location patterns of foreign investors in particular and in the context of an individual transition economy. Using survey data from online questionnaires they find that regional characteristics indeed matter for location of production in Poland. Thus, investors that may be characterised as low-technology intensive in the production prefer to locate in regions further away from main economic centres and close to locations endowed with relatively low cost factor inputs. The opposite appears to hold true for more technology-intensive investors who on average rely more on knowledge intensive input factors and proximity to markets.

Resmini (2007) takes a similar research approach which is of little surprise given that her study uses the same database as the preceding one to answer very similar questions.[57] In particular, she places emphasis on measuring a region's accessibility in terms of its physical distance to European core markets, former Soviet Bloc countries and other accession (candidate) countries. The author posits that firm location in the context of Eastern European transition economies has been significantly affected by the incoming FDI inflows which she treats as a proxy of progressive regional integration. Thereby, it is expected that the accumulation of capital, technology and tacit knowledge which is frequently associated with the presence of multinationals, potentially also impact centrifugal and centripetal forces that determine levels of industry concentration in host countries and their regions. The time period under analysis spans over 8 years in total to include the initial period of transition, i.e. 1992 to 1999. The CEEC featured in her study include Bulgaria, Estonia, Hungary and Romania. Their respective regions are classified according to NUTS-3 classification of European regions and subsequently their geographical position, i.e. border or internal. The former is then further disaggregated into regions bordering EU (BEU), other candidate countries (BAC) and countries not presently involved in the enlargement process, also former Soviet Bloc partners (BEX). The measure of industry concentration is the location quotient (LQ), as used in this chapter and explained further below.

As regards her results, simple descriptive statistics based on the calculation of LQs for 7 manufacturing branches reveal changing patterns of industry concentration. In particular, economies of scale intensive industries seem to have expanded their presence in both Hungary and Estonia while contracting in Romania. At the same time there has been an apparent shift towards border regions, with pronounced industry concentration in BEU regions in Hungary, BEX regions in Romania and BAC regions in Estonia. Some salient features emerge from the preliminary analysis of location of FDI as well. In particular,

[57] The database REGSPEC has been generated in the framework of the PHARE ACE Programme 1998 with the financial support of the EU. It covers 5 candidate countries and includes several variables at the regional level such as employment, GDP, number of domestic and foreign firms, etc. (see the paper for further reference). To the best of our knowledge it is currently not freely accessible.

capital regions appear to be the main recipients of incoming FDI closely followed by regions bordering the core European markets. She therefore concludes that changes in industry location patterns have positively affected affected Western border regions in particular. Following a more formal inquiry and using least square dummy variable (LSDV) estimation approach, she concludes that economic integration has not been able to generate a catching up process among the CEEC regions. As a result, economic disparities between capital and Western border regions on the one side and Eastern border regions on the other have been growing over time.

Though insightful, we refrain from broad generalisation of existing studies on the CEEC due to a number of perceived limitations in their research design. First, their chosen time period under examination has been marked by severe transitional shocks that have significantly affected economic performance of the region and might have therefore been the driving force behind observed industry concentration patterns (Coricelli and Ianchovichina, 2004). Moreover, the definition of statistical regions has been subject to several revisions during that period of time; this may have further contaminated the data. Second, the studies do not consider that relative position of regions matters in determining the extent of agglomeration. Thus, by only taking into account unidimensional measures of industry concentration they neglect potential spatial autocorrelation. In other words, by doing so they neglect the fact that industry concentration, especially at the sub-national level, may span beyond borders of a particular region. Third, the high level of industry aggregation derived by pooling manufacturing sector into only 7 branches limits the interpretation of results. Specifically, it does not allow for a more nuanced examination of location determinants across different industry types. Fourth, several estimation issues remain un-tackled in both studies. In particular, the estimation equation in Resmini (2007) is to some extent restrictive in that it features a relatively narrow focus on only two determining factors: physical distances among regions and the FDI-intensity indicator. Omitted variable bias may be a potential issue here even though the author considers additive control dummy

variables in her estimation. Nonetheless, her approach of treating some of the standard location determinants as time-invariant fixed effects should be questioned and especially so in the context of economic transition whereby deep structural changes during the 1990s have significantly affected operations of national economies. Finally, both studies refrain from explicitly testing for possible issues related to endogeneity of explanatory variables despite the fact that both market potential and FDI take a leading role in their empirical model design.

In view of the above, we take the previous studies as a reference point with the intention to improve and expand on them. Specifically, we focus on a time period that starts in the early 2000s and may be regarded as economically more stable for the countries under examination. Moreover, we perform a more thorough spatial analysis by taking into consideration the level of spatial autocorrelation among regions in addition to measuring the level of industry concentration. We are therefore in a position to sketch a more complete picture of industry agglomeration patterns in transition economies. Besides, we significantly expand the set of industries under examination to include a total of 31 manufacturing and services industries in addition to considering some novel location factors, such as the policy instruments.

3.4 EXPLORATORY DATA ANALYSIS

3.4.1 Data

We proceed to explore posed research questions by applying a purely quantitative approach that makes use of industry and regional level data for 5 CEEC, namely Czech Republic, Hungary, Poland, Romania and Slovakia.[58] In order to obtain a balanced view on industry location patterns in transition economies we take into consideration developments in both secondary and tertiary sectors. The classification of industrial

[58] Other CEEC could not be considered due to lack of available data.

structures is according to the NACE classification of economic activity, while the definition of territorial units follows the NUTS classification of statistical regions.[59] More specifically, the sample features 23 manufacturing (NACE code: D) and 8 services (NACE code: G, H, K) industries that are located in a total of 43 NUTS-2 regions across 5 CEEC. The data is collected from two primary sources. First, we make use of the Eurostat's REGIO database, August 2010 version. In particular, we source industry specific data from its Structural Business Statistics (SBS) directory. Second, as a means to construct additional proxies of relevance to the econometric model we make use of a newly developed ESPON database, August 2010 version. Due to data availability and reliability issues, we limit our empirical inquiry to the period 2002 to 2007.

For the sake of comparability with existing research we chose to classify regions according to their actual geo-political position that is in line with the approach taken initially by Traistaru et al. (2002) and Resmini (2007). Thus, we take indirectly into consideration the spatial implications of the transition process triggered by the demise of the Soviet Bloc and the integration of CEEC into the EU. Accordingly, border regions (BORDER) are defined as those NUTS-2 regions that share their physical border with at least one region from a neighbouring state(s). They can be further disaggregated into three distinct sub-groups. The first two groups include regions bordering EU countries (BEU) and those bordering other accession (candidate) countries (BAC). The third group considers Eastern border regions (BEE), i.e. regions adjacent to non-EU and non-accession countries. Moreover, we take into account regions that do not share their physical borders with any foreign entity (INTERNAL). Finally, we highlight the role of

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[59] In this chapter we are focused on manufacturing and services corresponding to NACE Rev 1.1. sections: D, G, H, K. For more details see Table A2.1 in Appendix A.

NUTS (Nomenclature of Territorial Units for Statistics) is a geographical code standard for referencing the subdivisions of countries for statistical purposes. It is hierarchical classification at five levels (three regional and two local), extensively used for comparative statistics among European countries. The classification does not build only on administrative boundaries, but follows maximum and minimum population thresholds for the size of the region and analytical criteria. The threshold population levels for determining NUTS-2 regions, as used in this paper, are a minimum of 800.000 and a maximum of 3 million. They are regarded as basic regions for application of regional policies (European Commission, 2011).

capital regions (CAPITAL) irrespective of their geographical coordinates, owning to the fact that they are principal centres of economic and political influence in their respective countries (Crozet and Koenig-Soubeyran, 2002). Thus, it is reasonable to assume that any potential changes to the primacy of capital regions may have a direct impact on specialisation patterns of all the other regions. A summary of all the regions according to specified classification is provided in Table B3.1 in the Appendix B.

3.4.2 Measurement

For the purpose of subsequent analysis, we intend to measure the degree of spatial concentration of a particular industry by using a synthetic index that is able to capture the degree of that industry's deviation from an even distribution over the entire geographical space under consideration. The statistical toolbox for conducting such an exercise is varied and has grown significantly over the past couple of years. More recently, the trend has been to examine firm or plant level data directly rather than operating on higher levels of industry aggregation. Ellison-Glaeser index, for instance, has been frequently used for that purpose and is often cited in the literature [Ellison and Glaeser (1997); see also Maurel and Sedillot (1999) and Duranton and Overman (2005)]. Its main advantage is that it takes into consideration the actual number of establishments in an industry and is therefore able to correct for the actual plant size. This in turns allows one to distinguish between real industry concentration as opposed to concentration of employment in a few relatively large establishments (Dominicis et al., 2007). Though desirable, comprehensive plant level data are not available for our present set of industries and regions. Instead, we choose to follow past influential studies, such as Brulhart (2001), Holmes and Stevenson (2002), Kim (1995) and Resmini (2007), that have used the Hoover-Ballasa Index as the preferred indicator for measuring changes in spatial location of productive activities. The index is more commonly referred to as the *Location Quotient* (*LQ*). The index is calculated as follows:

$$LQ_{ij} = \frac{\frac{E_{ij}}{\sum_i E_{ij}}}{\frac{\sum_j E_{ij}}{\sum_i \sum_j E_{ij}}} \quad (5)$$

where, E_{ij} is employment in industry j in region i. The individual components read as follows:

$\sum_i E_{ij}$ equals total employment of region i

$\sum_j E_{ij}$ equals total employment in industry j

$\sum_i \sum_j E_{ij}$ equals total employment at the higher level of spatial aggregation

As evident, LQ_{ij} is a relative measure of spatial distribution that allows comparison to be made across industries. In particular, a value of $LQ_{ij} > 1$ indicates that industry j has a share of employment in location i larger than is the case in the reference area. The opposite is true when $LQ_{ij} < 1$.

Although intuitive and fairly easy to interpret, the proposed methodology poses two main issues that need to be tackled. First, *LQ* lacks a scientifically defined specification of what constitutes a significant degree of agglomeration (or clustering) in space. While values greater than unity indicate increased presence of a particular economic activity in a geographically defined area, this may still not be evidence for presence of a significant industry cluster in that locality. Several cut-off regions to define agglomeration have been proposed in the literature so far, however, all of them have been rather arbitrary in nature [see, for instance, Malmbert and Maskell (2002)]. Second, calculation of the *LQ* is unit specific and, hence, assumed to be independent of other spatial units (Feser and Sweeney,

2002). This is problematic when spatial autocorrelation is present in the underlying distribution of measured variable. In other words, interpreting the findings by solely focusing on *LQ* values does not suffice to properly delimit agglomerations of economic activity.

To overcome these drawbacks, we consider additional exploratory spatial measures and tools that may help us identify 'significant' agglomerations. First, Moran's *I* coefficients of spatial autocorrelation are obtained by using the *LQ* as the basis for computations.[60] Thereby, the statistic compares the value of a continuous variable at any location with the value of the same variable at surrounding locations (Dominicis et al., 2007). To allow comparisons between different regions, the Moran's *I* coefficients are expressed in standardised scores. They are formally derived using the following function:

$$I = \frac{N}{\sum_{i=1}^{n}\sum_{k=1}^{n} w_{ik}} \frac{\sum_{i=1}^{n}\sum_{k=1}^{n} w_{ik}(x_i - \bar{x})(x_k - \bar{x})}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \tag{6}$$

where *N* is the total number of observations, and x_i and x_k are the observed values of the *LQ* as defined in (5) for the regions *i* and *k* (and the mean $\bar{x}$). The spatial structure of the data can be more formally summarised in a spatial weight matrix *W* with generic elements w_{ik} where $i \neq k$ (Anselin, 1995). Generally, *W* can be either binary or distance-based. The former assigns a value of 1 if any two units present in the data share a geographical border while 0 indicates otherwise. The latter calculates the weights based on actual distances between units. From an applied researcher's perspective, there is no

[60] Geary's *c* (Geary, 1954) and Getis and Ord's *G* (Getis and Ord, 1992) provide alternate statistics that we do not consider at this point in time due to better analytical properties of Moran's *I* and Moran's Scatterplot (Upton and Fingleton, 1985).

standard procedure or rule in choosing a spatial weight matrix *W*. Thus, we chose to work with a distance-based matrix.[61]

Although Moran's *I* is useful as a measure of the overall spatial pattern in the sample, it is nevertheless incapable of distinguishing significant autocorrelation among different subsets of regions and heterogeneous spatial structures, e.g. high-value and low-value clustering (Zhang and Lin, 2007). LISA statistic (Local Indicators of Spatial Association) is capable of doing just that as it assesses a null hypothesis of spatial randomness by comparing the values in each specific location with values of its neighbouring regions. According to Anselin (1996), LISA can be described by any statistic as long as it satisfies two basic criteria. First, the chosen statistic needs to be able to indicate significant spatial clustering of similar values for each individual observation. Second, the sum of the statistic for all observations needs to be proportional to a global indicator of spatial association (e.g. global Moran *I*). In combination with Moran's Scatterplot, the statistic is useful in that it highlights local spatial associations such as high-value clusters, low-value clusters, and negative autocorrelations [see Zhang and Lin (2007); also Arbia (2006)]. The local Moran statistic for an observation *i* is defined as (Anselin, 1995):

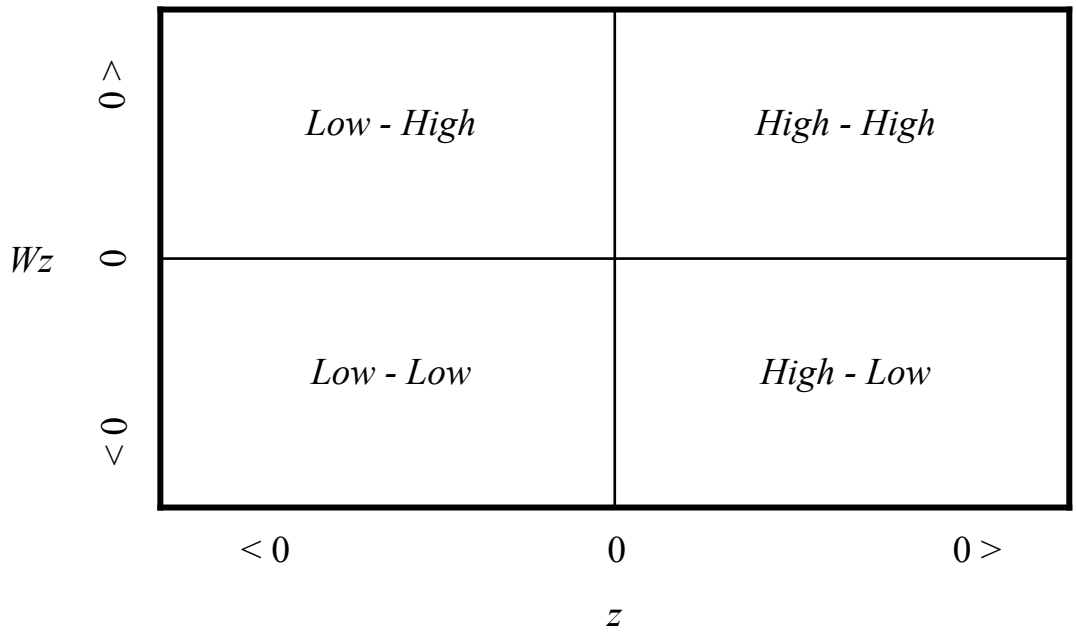
$$I_i = z_i \sum_{k \neq i} w_{ik} z_k \tag{7}$$

where z_i is the attribute value of a region in relation to mean standardised attribute values of its neighbouring regions z_k . As before, the spatial ordering is identified using a distance-based matrix while local Moran's *I* coefficients are obtained by using the *LQ* as

[61] We consider distances between regions' centroids (i.e. regional capitals or administrative centres). To determine distances, we first collect data on the exact geographical position of the centroid as implied by their geographical coordinates, i.e. longitude and latitude. Based on the minimum and maximum values present in the sample, we then calculate the greatest Euclidean distance we might measure between any two centroids present in our dataset. Each off the diagonal entries (*i*, *k*) in the matrix is then equal to 1/(distance between centroid *i* and centroid *k*). Thus, the matrix entries for pairs of centroids that are close together are higher than for pairs of centroids that are far apart. The matrix is calculated using the *spatwmat* command in STATA 11. For further references and instructions on how to calculate *W* see: http://www.ats.ucla.edu/stat/stata/faq/morans_i.htm

the basis for computations. We use both Moran Scatterplots and (cartographic) Moran Significance Maps to visualise the results. The structure of the former is presented in Figure 3.1.

Figure 3.1: Moran Scatterplot: basic structure



Source: Anselin (1996).

where *z* is the attribute value of a region in relation to mean standardised attribute values of its neighbouring regions *Wz*.

The *High-High and Low-Low* quadrants imply positive spatial autocorrelation (i.e. spatial clustering) in which regions with high (low) *LQ* values tend to be surrounded by regions with equally high (low) values respectively. By contrast, negative spatial autocorrelation (i.e. spatial dispersion) is evident when a region with high *LQ* values is surrounded by neighbouring regions featuring low values and vice versa. These can be labelled as spatial outliers. The corresponding quadrants are found in the upper left and lower right corner, *Low-High* and *High-Low* respectively. To enable an easier interpretation of the findings we transform the results from Moran Scatterplots into cartographic or Moran's

Significance maps. We will discuss both further below. In sum, and to the best of our knowledge, this is the first study on transition economies to apply such an approach in identifying spatial patterns of agglomeration.

3.4.2.1 Qualifications

Prior to proceeding, a number of qualifications related to the structure of the sample need to be highlighted as it may be anticipated that choices we make with respect to classification of industrial and regional units will invariably have an effect on our results and hence any subsequent interpretation of the same.

First, our results depend to a certain extent on the classification of industries at hand. Generally speaking, finer classification is to be preferred to more aggregate statistics as the latter tends to hide a lot of useful information under "potentially obsolete headings" (see Krugman, 1991). In view of our research design, there is currently sufficient data available only at the two-digit NACE Rev 1.1. Still, our approach remains on a much finer scale of industry aggregation when compared to existing studies on CEEC (e.g., Resmini 2007). Second, similar to most of the other macro-economic studies with micro-economic foundations, the present inquiry suffers from the Modifiable Area Unit Problem (MAUP). The problem arises as a result of trying to convert a heterogeneous continuous variable into a discrete one (Arbia, 1986). More specifically, MAUP relates to two particular issues. First, results are sensitive to the scale of aggregation of space. Second, the boundaries between the discrete spatial units may be misplaced, and hence potentially irrelevant, which presents us with the so called arbitrary boundary problem. We have to acknowledge these issues in our research design even though we are not able to tackle them directly. Following, we proceed with descriptive statistics providing some basic evidence on structural changes that have occurred in the countries under consideration.

3.4.3 Descriptive Statistics

In this section we examine temporal, sectoral and spatial aspects of industry location with the aim to derive some preliminary conclusions on the spatial dynamics in the context of economic transition and progressive regional integration. In particular, we start our discussion by examining temporal changes in employment growth patterns across the three broad sectors of an economy. For such an aggregate scale sufficient data is available to extend the time period under consideration to a total of 9 years, thus the relevant period extends from 1999 to 2007. However, it should be reiterated that we limit all successive empirical analysis to the period 2002 to 2007 due to considerable amount of missing values at lower levels of industry classification.

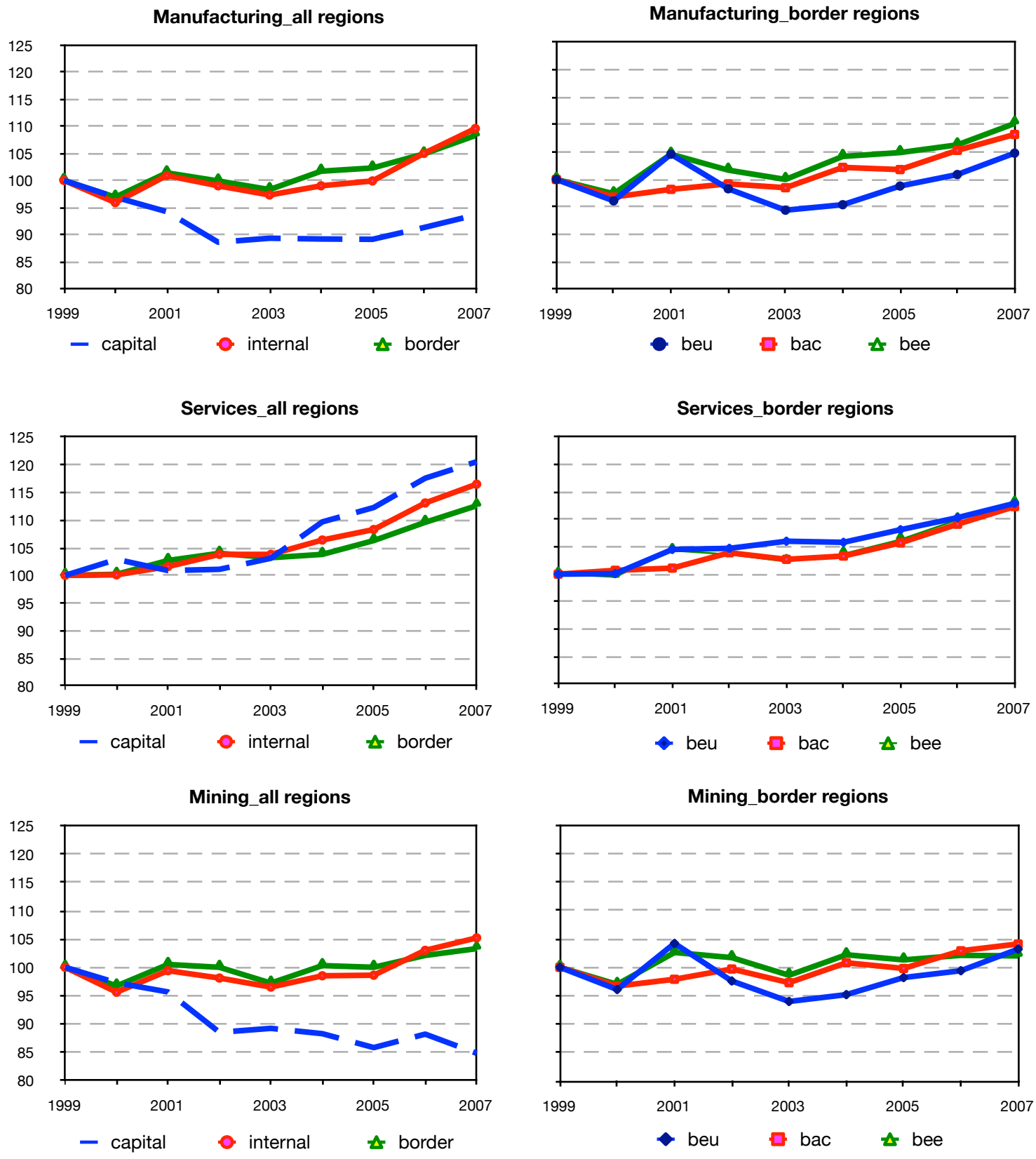
We do not regard this necessarily as a drawback. The first decade of the transition process has been marked by severe economic shocks that have affected nearly all CEEC and have led to erratic movements in many of the variables that we intend to deploy in our empirical model. Such volatile movements could therefore prevent us from detecting true relationships among chosen indicators. Moreover, statistical systems in the transition economies needed time to adapt to the new data collection methodologies put forward by the EU. Statistical methodologies used in the pre-transition periods were structured in a way to monitor social planning and were mainly concerned with aggregate measures (Botric et al., 2004). Thus, reliable regional indicators were not widely available in the initial stages in addition to being subject to subsequent revisions. Finally, the introduction of NUTS classification has been a time intensive process that included several major revisions, the last one in 2002. Taken together, these facts lend further support to our intention of focusing on a shorter, though potentially more complete and methodologically sound period of time.

3.4.3.1 Temporal Aspects

Figure 3.2 shows the evolution of employment in the mining, manufacturing and services sectors in the CEEC for the period 1999-2007 and controlling for the geo-political position of regions. It is evident that most pronounced changes in employment growth patterns have occurred in the core, i.e. capital regions. In particular, these regions have witnessed decreasing employment rates in both primary and secondary sectors over the period under consideration. However, significant increases in tertiary sector employment appear to have offset these negative developments. This finding is of little surprise, especially in view of increasing demand for services along with major FDI inflows into those regions following the transition process (Stare, 2007).

In general, it appears that non-capital regions have experienced very similar employment growth patterns over time. Regions bordering EU member states (BEU) and other accession countries (BAC) show pronounced differences in growth rates between tertiary sector on the one side and primary and secondary sectors on the other. It appears that positive employment growth rates have been present throughout the period under examination in the services sector only. Employment in the extractive and manufacturing industries picked up only following the first round of EU Eastern Enlargement process. In contrast, BEE regions experienced pronounced growth rates in both manufacturing and service sectors throughout the period although from a very low base. Overall, this simple analysis already reveals some intersting findings and hints towards preliminary evidence of an ongoing process of polarisation across production space. In particular, there appear to be underlying differences in sector location patterns between capital region on the one side and non-capital regions on the other. We intend to scrutinise these observations in the following two sections.

Figure 3.2: Changes in employment shares in Mining, Manufacturing and Services



3.4.3.2 Sectoral Aspects

Table 3.1 records the values of *LQ* for 17 industrial sectors in accordance with individual countries and regional groupings.[62] Following, we discuss the findings on a country by country basis.

Starting with the Czech Republic, its industrial landscape shows a clear tendency towards increased polarisation whereby capital region specialises in services sector while manufacturing appears to be concentrated in non-capital regions. More specifically, the manufacturing activities seem to favour border- over internal regions with a tendency towards agglomeration in regions bordering other accession countries (BAC). Labour intensive industries, such as textiles or wood products, are found there along with manufacturers of more technology intensive products, e.g. technical and optical equipment. Overall, BAC regions seem to represent a counter-pole to the primacy of the capital region being most likely endowed with a diverse array of production factors that enables them to attract such different types of industries.

A trend towards polarisation of production space can be observed in Hungary as well. Increased investments in the services sector have been driving the agglomeration process in capital region while labour intensive industries, including producers of textiles, leather and wood products have preferred to locate in regions closer to the European core markets (BEU).

[62] Note that we do not focus on extractive industries in our subsequent analysis as their location will be mainly dependent on the distribution of primary factors.

Table 3.1: Evolution of Locational Quotient over time: by country, regional grouping and industry

Country	Year	Regional group	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	G	H	K
Czech Republic	2002	capital	0.55	0.26	0.20	0.61	1.56	0.09	0.75	0.30	0.22	0.26	0.38	0.60	0.60	0.67	1.78	2.07	3.06
...	2007	capital	0.52	0.31	0.12	0.41	1.76	...	...	...	0.34	0.24	0.30	0.54	0.57	0.56	1.68	2.06	2.84
...																			
...	2002	internal	1.18	0.50	0.26	1.51	1.26	...	...	0.90	1.36	1.04	0.97	1.03	...	1.42	1.65	1.44	1.16
...	2007	internal	...	0.46	0.24	1.34	1.33	...	1.42	0.94	1.22	1.03	0.85	0.85	1.99	1.16	1.40	1.04	1.18
...																			
...	2002	border	1.06	1.41	1.34	1.79	1.09	...	...	1.23	1.26	1.38	1.20	1.13	0.93	1.27	1.37	1.37	1.17
...	2007	border	1.06	1.41	1.02	1.73	1.05	...	1.22	1.32	1.22	1.42	1.26	1.20	0.98	1.28	1.22	1.20	0.95
...																			
...	2002	beu	1.08	1.31	1.16	1.91	1.07	...	...	0.97	1.39	1.05	1.08	1.03	0.82	1.31	1.34	1.37	1.21
...	2007	beu	1.20	1.28	0.84	1.81	1.03	...	1.22	1.15	1.35	1.06	1.20	1.05	0.76	1.31	1.21	1.31	0.94
...																			
...	2002	bac	1.04	1.51	1.53	1.67	1.10	...	...	1.49	1.13	1.70	1.32	1.26	1.05	1.23	1.41	1.37	1.15
...	2007	bac	0.93	1.55	1.20	1.65	1.07	...	...	1.43	1.08	1.77	1.31	1.38	1.20	1.25	1.23	1.10	0.96
...																			
...	2002	bee	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Czech Republic	2007	bee	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hungary	2002	capital	0.60	0.57	0.25	0.67	1.49	1.15	1.31	0.83	0.54	0.70	0.72	0.86	1.06	0.97	1.56	1.33	2.37
...	2007	capital	...	0.58	...	0.56	1.38	1.39	1.28	0.62	0.66	0.57	0.59	0.95	0.85	1.02	1.48	1.25	2.37
...																			
...	2002	internal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...	2007	internal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...																			
...	2002	border	1.13	1.29	1.36	1.40	0.81	0.78	0.81	1.09	1.30	1.23	1.18	1.08	0.98	1.29	1.00	1.27	0.81
...	2007	border	1.09	1.23	1.26	1.29	0.72	0.66	0.72	1.10	1.11	1.16	1.16	0.97	0.98	1.14	0.86	1.05	0.77
...																			
...	2002	beu	1.07	1.90	1.55	1.99	0.73	0.58	0.37	1.30	1.27	0.66	1.15	1.28	1.66	1.76	0.93	1.51	0.78
...	2007	beu	0.98	1.58	2.07	2.11	0.47	0.56	0.45	1.21	1.11	0.65	1.13	1.05	1.73	1.99	0.92	1.29	0.91
...																			
...	2002	bac	1.21	1.08	1.12	1.16	0.93	0.81	1.07	1.16	1.39	1.50	1.33	1.07	0.98	1.31	1.00	1.19	0.78
...	2007	bac	1.12	1.10	1.05	1.05	0.86	0.82	0.91	1.19	1.18	1.41	1.26	0.99	0.99	1.03	0.80	1.00	0.73
...																			
...	2002	bee	0.85	1.51	2.09	1.77	0.40	0.83	0.21	0.59	0.97	0.74	0.63	0.91	0.29	0.73	1.06	1.35	0.91
Hungary	2007	bee	...	1.39	...	1.40	0.38	0.14	0.22	0.61	0.84	0.66	0.79	0.83	0.21	0.75	1.05	1.04	0.81

Table 3.1 continued

Country	Year	Regional group	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	G	H	K
Poland	2002	capital	1.39	0.63	1.36	0.66	2.83	...	2.13	1.12	0.73	0.69	0.69	2.52	0.51	0.76	2.38	2.68	3.68
...	2007	capital	0.98	0.57	...	0.45	1.93	...	1.44	0.77	0.68	0.51	0.62	1.35	0.40	0.72	1.81	1.36	2.64
...	2002	internal	1.14	1.66	1.26	1.31	1.36	0.01	0.83	1.22	1.22	1.01	1.09	1.26	1.25	1.31	1.68	1.65	1.41
...	2007	internal	1.16	1.61	0.98	1.27	1.32	0.10	0.88	1.14	1.25	0.99	1.09	1.10	1.47	1.20	1.41	1.33	1.27
...	2002	border	0.99	0.95	1.56	1.83	0.88	0.88	0.83	1.13	1.10	1.10	1.12	0.87	1.09	1.33	1.61	1.97	1.41
...	2007	border	1.02	0.81	1.25	1.59	0.81	0.71	0.83	1.03	1.12	1.06	1.15	0.90	1.14	1.17	1.28	1.52	1.21
...	2002	beu	1.06	0.96	1.65	3.28	1.29	0.11	0.96	1.10	0.83	0.79	0.66	0.99	1.23	1.32	1.74	2.75	1.43
...	2007	beu	1.04	0.93	0.42	2.51	1.21	0.32	0.95	0.90	1.04	0.83	0.71	1.65	1.58	1.36	1.39	2.35	1.20
...	2002	bac	0.91	1.09	2.01	1.06	0.96	1.26	0.98	1.04	1.43	1.81	1.47	1.23	1.01	1.67	1.80	2.26	1.79
...	2007	bac	0.88	0.87	2.08	0.95	0.86	1.20	1.04	0.97	1.29	1.67	1.52	1.26	1.03	1.28	1.43	1.66	1.64
...	2002	bee	1.04	0.80	0.45	1.88	0.60	0.89	0.55	1.24	0.91	0.54	0.99	0.47	1.09	1.00	1.36	1.30	1.03
...	2007	bee	1.15	0.68	0.42	1.78	0.56	0.42	0.56	1.14	0.98	0.55	1.02	0.35	1.00	0.95	1.07	0.96	0.78
Romania	2002	capital	1.91	1.20	1.47	0.50	3.51	0.14	1.72	2.34	1.35	1.14	1.02	4.39	0.90	1.08	2.70	1.89	5.20
...	2007	capital	1.40	0.84	1.11	0.37	3.01	1.30	1.79	1.61	1.60	0.89	1.01	2.10	0.61	0.89	2.41	1.92	4.62
...	2002	internal	...	1.52	1.64	2.08	1.02	...	1.98	1.33	2.05	1.31	2.22	0.62	1.65	1.60	1.29	1.44	0.83
...	2007	internal	1.33	1.57	1.71	2.58	1.03	0.25	1.69	0.98	1.91	1.07	1.50	0.82	1.34	1.50	1.20	1.47	0.81
...	2002	border	1.02	0.91	1.00	0.94	0.79	2.88	0.77	0.91	0.86	0.99	0.81	0.72	1.24	1.03	1.02	1.00	0.70
...	2007	border	0.89	0.97	1.02	0.89	0.73	1.64	0.76	0.99	0.85	1.07	0.96	1.04	1.10	1.02	0.89	0.91	0.60
...	2002	beu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...	2007	beu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...	2002	bac	1.02	0.85	0.91	0.79	0.86	4.32	0.94	1.10	1.06	0.86	0.83	0.58	1.58	0.97	1.00	0.81	0.61
...	2007	bac	0.89	0.93	0.95	0.78	0.79	2.11	0.99	1.12	0.98	1.02	1.00	0.75	0.89	0.94	0.86	0.83	0.56
...	2002	bee	...	0.98	1.09	1.10	0.71	...	0.60	0.73	0.66	1.25	0.78	0.93	0.89	1.08	1.04	1.18	0.79
Romania	2007	bee	0.89	1.01	1.09	1.00	0.67	1.16	0.52	0.87	0.72	1.13	0.92	1.33	1.31	1.10	0.91	0.99	0.64
Slovakia	2002	capital	0.84	0.33	0.26	0.16	1.75	...	0.67	0.79	0.75	0.33	0.52	1.27	0.44	0.55	2.17	2.14	2.61
...	2007	capital	0.50	0.12	...	0.39	1.45	...	0.52	0.49	1.07	0.21	0.48	0.96	...	...	1.55	1.63	2.38
...	2002	internal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...	2007	internal	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...	2002	border	1.03	1.14	1.09	1.29	0.88	...	1.00	0.96	1.08	1.12	1.11	0.96	0.88	1.13	0.75	0.77	0.67
...	2007	border	1.09	1.18	...	1.19	0.98	...	1.02	1.03	0.88	1.23	1.14	1.06	0.90	1.32	0.89	0.90	0.71
...	2002	beu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...	2007	beu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
...	2002	bac	1.03	1.14	1.09	1.29	0.88	...	1.00	0.96	1.08	1.12	1.11	0.96	0.88	1.13	0.75	0.77	0.67
...	2007	bac	1.09	1.18	...	1.19	0.98	...	1.02	1.03	0.88	1.23	1.14	1.06	0.90	1.32	0.89	0.90	0.71
...	2002	bee	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Slovakia	2007	bee	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Note: For a more detailed explanation of industry codes see Table 2.1 in the Appendix A.

In Poland, industry location has been concentrated in internal regions as well as BAC regions. The latter are characterised by the abundance of natural resources that has significantly contributed to the establishment of large-scale industrial complexes during the socialist regime.[63] Indeed, it appears that resource intensive industries, such as the leather, coke and basic metals manufacturers remain concentrated in those regions. In contrast, industries with a higher technological content in the production displayed a higher propensity to locate in regions bordering the EU. Besides, both manufacturing and services seem to shun BEE regions. Finally, a peculiarity in the Polish case is the fact that the primacy of the capital region is not as pronounced as in other countries. We speculate that this may be potentially due to the existence of a number of relatively large and developed urban centres with a strong industrial legacy, such as the cities of Wroclaw, Krakow or Gdansk.

In Romania, a number of interesting observations can be made. In general, the country appears to display the strongest level of polarisation in our sample with a clear core-periphery pattern of industry location. The capital region around Bucharest not only appears to be preferred location for service and technology intensive industries, but for some basic labour intensive industries as well. Border regions appear to be disadvantaged as indicated by *LQ* values below unity for most of the industries. This stands in strong contrast to comparatively higher index values for internal regions, which further emphasises the peripheral nature of Romanian border regions.

Finally, developments in the Slovakian regions closely resemble those of other CEEC economies, bar Romania. The services sector is highly concentrated in and around Bratislava with most of the manufacturing industries showing a preference to locate in non-capital regions. The magnitude of service industry concentration and, hence its importance outside the capital region, has been low and limited as evident from the *LQ*

[63] See, for instance, Gorzelak and Szul (1989).

values that are below unity. Nevertheless, as in most of the other countries, it has been gradually increasing over time.

3.4.3.3 Spatial Aspects

Table 3.2 first summarises the *LQs* of individual industries averaged and grouped into broader industry clusters according to OECD classification of technology intensity in the production (OECD, 2003). Services are considered separately.

Table 3.2: Evolution of the Locational Quotient over time: by technology-intensity in the production

		Regions			Borders		
Year	Technology	Capital	Internal	Border	BEU	BAC	BEE
2002	high	2.54	1.10	0.83	0.90	0.98	0.56
2003	high	2.16	0.99	0.87	1.03	1.00	0.61
2004	high	2.02	0.96	0.85	0.93	1.01	0.49
2005	high	1.83	1.04	0.91	0.97	1.02	0.62
2006	high	1.77	0.99	0.93	0.91	1.09	0.62
2007	high	1.60	0.91	0.94	1.10	1.07	0.68
2002	medium-high	0.90	1.23	1.04	1.14	1.16	0.77
2003	medium-high	0.88	1.27	1.04	1.16	1.14	0.79
2004	medium-high	0.80	1.38	1.02	1.12	1.11	0.80
2005	medium-high	0.77	1.36	1.03	1.13	1.12	0.79
2006	medium-high	0.73	1.37	1.05	1.25	1.11	0.81
2007	medium-high	0.72	1.31	1.07	1.24	1.14	0.80
2002	medium-low	0.75	1.07	1.17	0.85	1.44	0.80
2003	medium-low	0.75	1.06	1.18	0.87	1.47	0.75
2004	medium-low	0.71	1.09	1.13	0.86	1.37	0.76
2005	medium-low	0.70	1.00	1.08	0.83	1.35	0.83
2006	medium-low	0.67	1.00	1.06	0.81	1.33	0.82
2007	medium-low	0.73	0.97	1.05	0.83	1.32	0.77
2002	low	1.14	1.32	1.15	1.42	1.17	0.97
2003	low	1.05	1.32	1.16	1.39	1.18	0.98

2004	low	0.99	1.30	1.11	1.30	1.13	0.94
2005	low	0.96	1.27	1.09	1.29	1.10	0.94
2006	low	0.95	1.31	1.09	1.30	1.09	0.92
2007	low	0.99	1.28	1.08	1.28	1.09	0.89
2002	services	2.93	1.36	1.18	1.40	1.27	1.07
2003	services	2.76	1.36	1.17	1.37	1.30	1.00
2004	services	2.52	1.31	1.06	1.25	1.16	0.90
2005	services	2.48	1.26	1.04	1.23	1.13	0.89
2006	services	2.41	1.31	1.05	1.25	1.15	0.89
2007	services	2.44	1.23	1.02	1.22	1.11	0.87

Note: Technology intensity in the production according to the OECD classification (OECD, 2003).

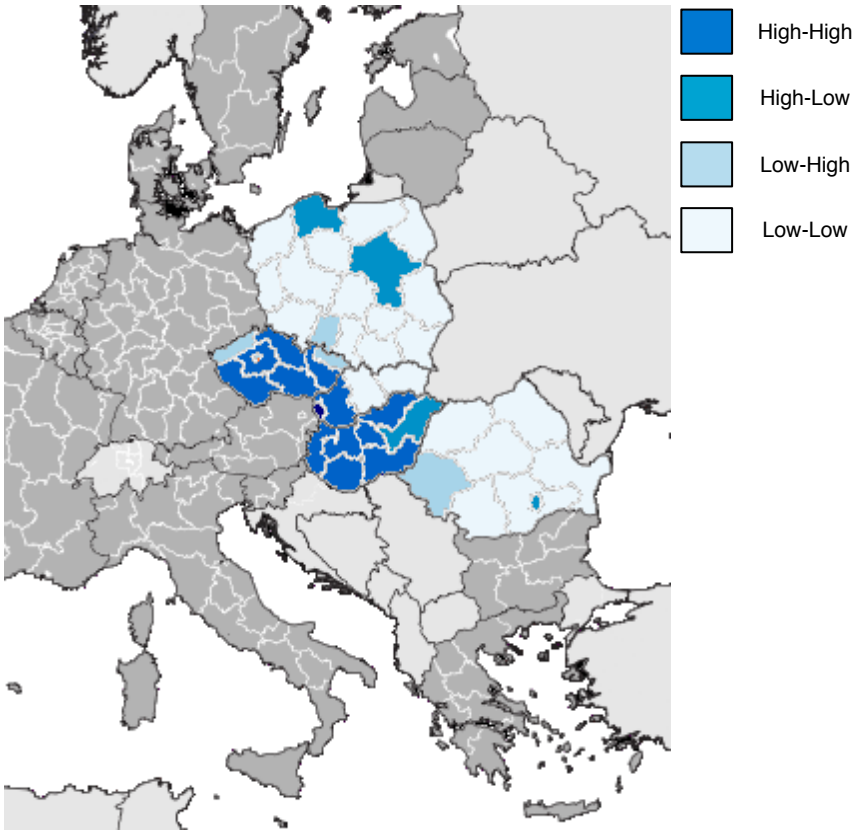
In general, capital regions remain preferred locations for services and high-technology industries. On the contrary, internal regions appear to be preferred locations for industries associated with higher labour intensity in the production. In particular, low-technology and medium-high technology industries seem to locate there. Industry location patterns associated with border regions in particular appear to be equally dynamic but somehow more complex. BEU regions show a growing tendency towards specialisation in high-technology and medium high-technology industries. In BAC regions most pronounced concentration trends are associated with medium-low technology industries. In contrast, BEE regions appear to be disadvantaged in terms of industry concentration as indicated by *LQ* values that are below unity for every industry grouping. Thus, our preliminary analysis further strengthens the assumption that industry location patterns are skewed towards regions enjoying comparatively better access to European core markets, i.e. regions forming the Western part of the CEEC.

To further examine spatial interdependencies we calculate the LISA statistic *(Moran's I)* for each of the 5 industry groupings separately.[64] As previously indicated, we present the results in corresponding Moran Significance Maps that are based on the results derived

[64] The OECD classification does not assign technology-intensity values for services sector. We calculate with a mean value to balance the diverging patterns of individual services industries.

from the Moran Scatterplots (see Appendix B).[65] We start with the Map 3.1 in which we display the results from Moran Scatterplots for high-technology intensive industries.

Map 3.1: Regional clustering of *high-technology* intensive industries



Source: own calculation.

It is immediately apparent that high-technology intensive industries exhibit strong tendency towards agglomeration as their clustering takes place in only a limited number of regions.[66] *High-High* clusters are contagious as they stretch throughout the Czech Republic, western parts of Slovakia and most of Hungary. This is in line with some of the previous studies, and further confirms the findings from the analysis conducted in chapter 2 of this thesis, highlighting the role of Czech Republic and Hungary in particular as

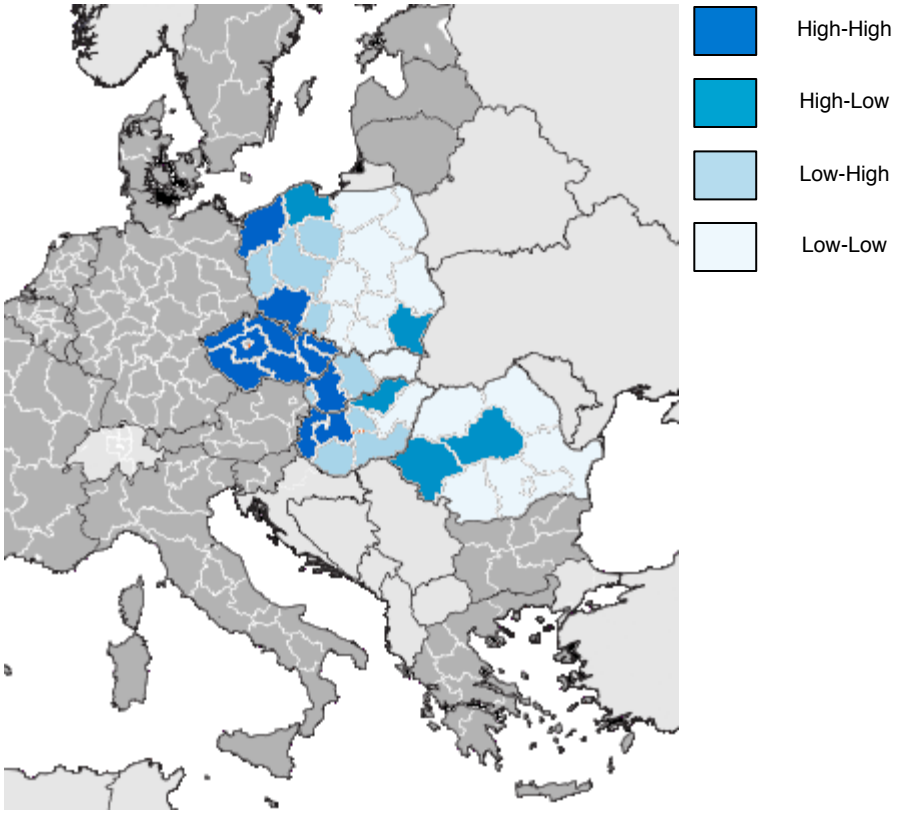
[65] The underlying map templates are based on EU classification of NUTS-2 regions and are sourced from Eurostat.

[66] The results are robust as indicated by global Moran *I* that is statistically significant at 1 percent level (see Appendix B).

major hubs for more technically sophisticated production in the CEEC. The proximity of those regions to European core markets is indicative as it implies that location patterns of high-technology industries seem to be primarily influenced by market potential considerations. In other countries, notably Poland and Romania, we observe presence of a limited number of outliers (*e.g. High-Low)* regions that signal strong agglomerations in mainly capital regions.

The results for medium-high technology intensive industries are presented in Map 3.2. Once again, there is a clear tendency for this type of industries to locate in the western part of the CEEC and closer to the EU markets. That the geographical concentration of those industries is not random may be further supported by statistically significant Moran's *I* at 1 percent level of significance (see Appendix B).

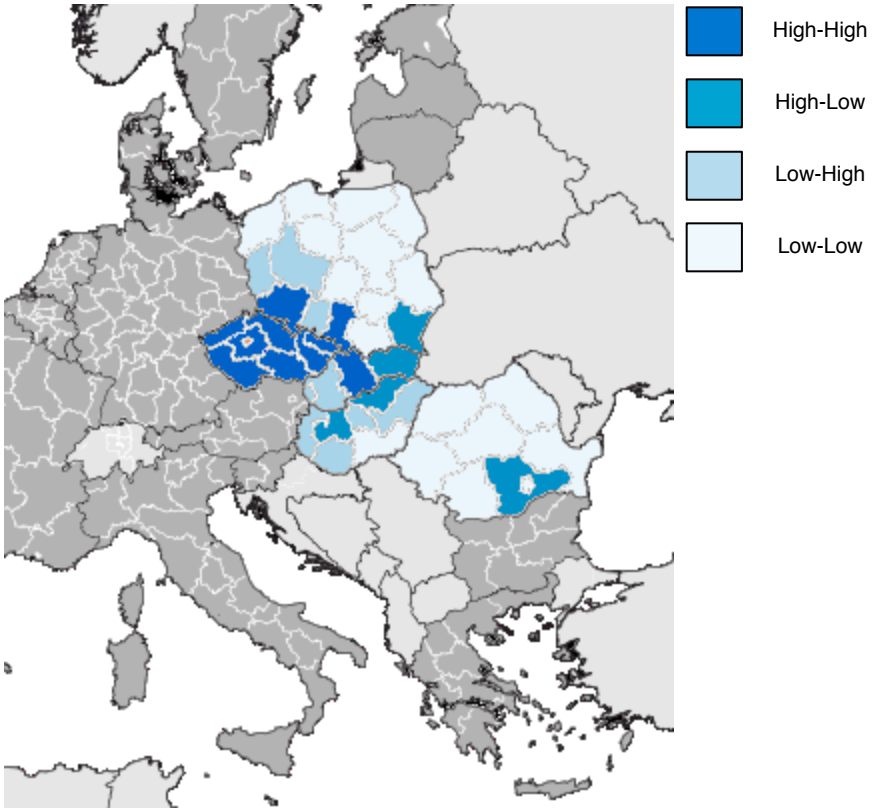
Map 3.2: Regional clustering of *medium-high technology* intensive industries



Source: own calculation.

The agglomeration effects are especially pronounced in the Czech Republic which is also the most strategically and centrally located country among the CEEC sample. A salient feature that can be distilled from the map is the apparent existence of a medium-high technology cross-border cluster that includes Czech Republic, south-western parts of Poland, as well as westerns parts of Slovakia and Hungary. The industries forming this grouping include, among others, manufacturers of *i)* chemicals and chemical products, *ii)* machinery and equipment and *iii)* motor vehicles and other transport equipment. It should be noted that these are the industries that have made significant progress in terms of integration into global value chains.[67] In Map 3.3, we further explore spatial location patterns of medium low-technology intensive industries.

Map 3.3: Regional clustering of *medium-low technology* intensive industries

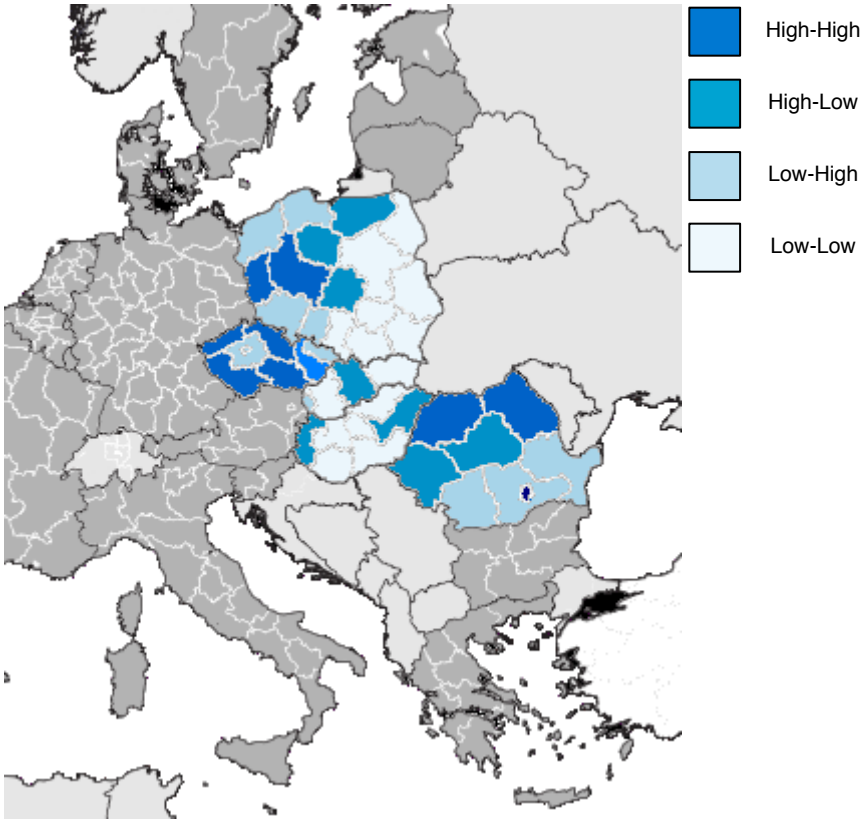


Source: own calculation.

[67] See Radosevic and Rozeik (2005) for evidence related to the automotive industry in CEEC.

In general, their location pattern appears to differ from previous two industry groupings.[68] Although spatially correlated clustering seems to be limited to the regions of the Czech Republic and some of the adjacent regions in Poland and Slovakia, there are still pockets of highly agglomerated regions (*High-Low*) spread throughout the production landscape. Interestingly, there is a slightly higher propensity for these pockets to be found in eastern parts of Poland, Hungary and Romania. Taking into consideration that industries belonging to this grouping largely depend on the availability of natural resource for production purposes we might assume that the outliers might be the once endowed with required input factors.[69] Next, we focus on examining *LQs* for industries with low-technology requirements in the production process. The results are displayed in Map 3.4.

Map 3.4: Regional clustering of *low technology* intensive industries



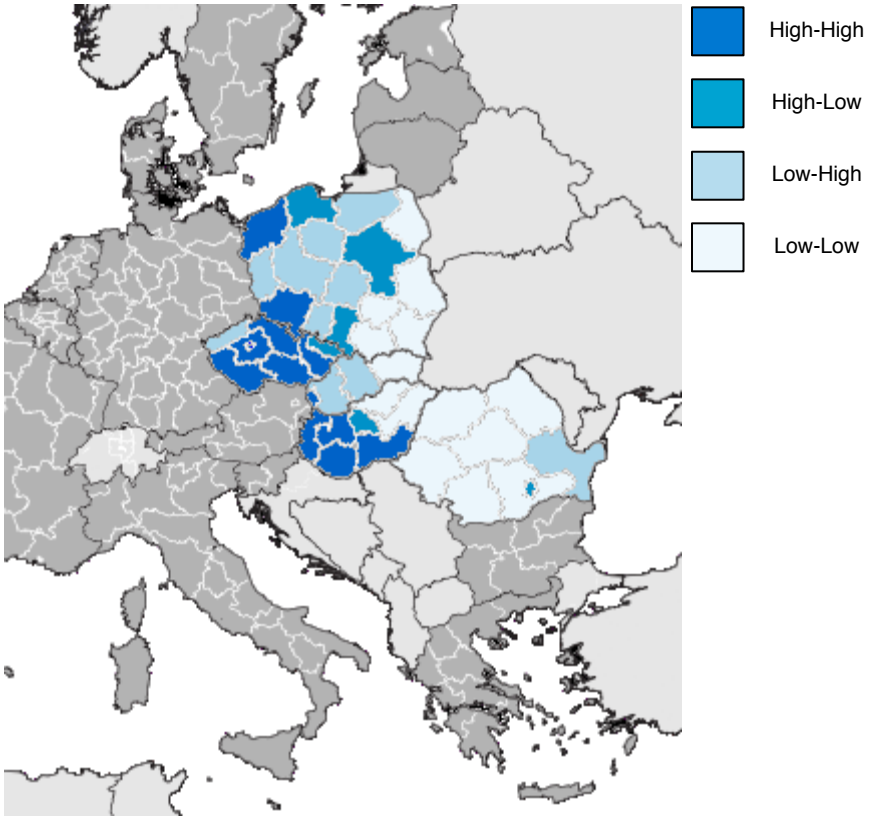
[68] It is nevertheless significant in terms of spatial autocorrelation (Moran's *I* significant at 1 percent level).

[69] Medium-low technology industries include producers of: i) coke and petroleum products, ii) rubber and plastic products, iii) non-metallic mineral products, iv) basic metals and v) fabricated metals.

Source: own calculation.

From the regional perspective, industries relying on low technology intensity in the production process appear to be dispersed in space. The test statistic is not significantly different from zero, implying that their location pattern is random and probably less influenced by the specific geographical position of a region (see Appendix B). For instance, in the Czech Republic those industries tend to locate in border regions while in Poland they appear to favour internal regions and those closer to the EU. There is no significant clustering of low technology type of production in Hungary and Slovakia. In contrast, Romania appears to be an interesting case where the *High-High* clusters seem to be contagious and skewed towards northern part of the country. In other words, its low technology manufacturers appear to prefer locations at closer distance to foreign markets. Another peculiarity in the Romanian case are the high LQ values for the capital region, Bucharest; the result being in contrast to other CEEC capital regions that do not display a tendency towards hosting low-technology intensive industries. Finally, in Map 3.5 we show the results for the services sector.

Map 3.5: Regional clustering of *services* sector



Source: own calculation.

It seems that most of the *High-High* clusters are to be found in BEU regions. Strong polarisation is especially evident in Hungary with high concentration of service providers in western part of the country. Once again, Romania is an interesting case whereby only the capital region features significant agglomeration of services activities with the rest of the country being close to a services desert. In Poland, it is the major urban centres that host significant agglomerations of services such as the capital region Warsaw, but also regions featuring other well-known cities: Gdansk, Krakow and Wroclaw.

Summarising, the transition process has produced inter-sectoral changes in employment that have also led to changes in the distribution of industrial activities across space. The industry groupings reviewed here display to some extent diverse location patterns. Thus, high-technology intensive industries seem to depend on central locations that are close to

the core markets but possibly also endowed with qualified work force. In contrast, medium-low technology intensive industries appear to be linked to regions that are endowed with natural resources. Finally, location patterns of services sector are likely to be market-seeking, i.e. proximity to the European core markets and domestic urban centres matters for the location of this type of industry. We will therefore pay close attention to industry-characteristics when analysing their location patterns.

The next section aims at uncovering some of the underlying mechanisms that have contributed to the emergence of described industry concentration patterns. Following, we first discuss the estimation model and corresponding variables.

3.5 EMPIRICAL INQUIRY

3.5.1 Model and Variables

The empirical model that we test in this section may be depicted as follows. In our baseline equation, we aim at regressing our industry-specific indicator of spatial concentration against region-specific explanatory variables that qualify as proxies for *i)* market potential and *ii)* availability of transport infrastructure. In the following step then, we also test for the role of *iii)* regional policy measures and instruments while generally controlling for *iv)* other factor endowments. In our research design we also have to consider country, industry and time fixed effects as means to account for any remaining unobserved factors.[70]

The baseline equation reads as follows:

$$LQ_{ijt} = \alpha + \beta_1(M_{it}) + \beta_2(T_{it}) + \beta_3 cnt_k + \beta_4 ind_j + \beta_5 year_t + \mu_{ijt} \quad (8)$$

where, M_{it} and T_{it} are vectors for market potential and transportation infrastructure variables of region *i* at time *t*, while cnt_k, ind_j and $year_t$ control for country, industry and time fixed-effect respectively. Sufficient data are available for 43 NUTS-2 regions and 31 industries over the period 2002 to 2007 resulting in total sample that features a maximum of 7998 observations, missing values included.[71]

Our dependent variable is the relative industry concentration index as measured by the *LQ* in equation (5). In order to avoid spurious correlations we use the normalised shares instead of absolute values (see Bruelhart and Trionfetti, 2004). We follow other related

[70] For instance, varying levels of privatisation or extent of industry linkages might affect our results. As we are not able to directly operationalise these variables in our model we therefore include fixed effects.

[71] 31 industries x 43 NUTS-2 regions x 6 years.

studies, e.g. Hanson (1998) and Resmini (2007), by building our analysis on employment data rather than production or value added figures. It is therefore explicitly assumed that changes in relative employment shares are representative of changes in relative industry location across space.

As previously outlined, our primary independent variables include measures of *i)* market potential and *ii)* regional transport infrastructure. In line with the established empirical literature we use a proxy for the market potential of a region that is loosely based on the concept initially developed by Harris (1954). He measures the market potential of a locality *i* in terms of its access to other markets, i.e. a distance-weighted sum of economic activity in all other locations:

$$MP_i = \sum_k \frac{x_k}{d_{ij}} \tag{9}$$

where x_k is a measure of economic activity in locality *k* and d_{ij} is the distance between locations *i* and *k* (see, e.g. Combes and Overman, 2003).

Our measure of a region's market potential takes into consideration its multimodal potential accessibility. The variable *Market Potential* is to be regarded as a construct of two functions: the activity function representing the activities or opportunities to be reached and the impedance function representing the effort, time, distance or cost needed to reach those (Wegener et al., 2002).[72] Higher values of the index imply higher market accessibility and hence higher market potential. All else equal, we expect to observe a

[72] The variable as used here is readily available in the ESPON data base at NUTS-3 level of regional aggregation. We therefore have to aggregate the NUTS-3 into corresponding NUTS-2 classification. For that purpose we use Eurostat correspondence tables. The calculation of the variable itself is as follows. The accessibility model uses centroids (capitals) of NUTS-3 regions as origins and destinations. It calculates the minimum paths to be travelled using multimodal transportation networks (car, rail, air), i.e. minimum travel times between the centroids of the NUTS-3 regions. For each NUTS-3 region the value of the potential accessibility indicator is calculated by summing up the population in all other regions including those outside ESPON space and then weighted by the travel time to go there (for further detail, see Spiekermann and Wegener, 1996).

positive sign in front of its estimation coefficient. However, one potential caveat remains when using this particular proxy as it confines us to a limiting assumption of the term being time-invariant. That is due to only a single year calculation featured in the original dataset (ESPON, 2010). Nevertheless, assuming that relative changes in both population and transportation infrastructure evolve rather slowly over time, we still find it to be an appropriate proxy to be include in our model. Yet, as a means to further support the robustness of our results, we consider an additional proxy for market potential. Specifically, we account for the purchasing power of a region and assume that relative GDP per capita serves as an appropriate substitute for measuring the *relative* market size of a locality, variable *Relative GDP*.[73] Here again, we expect the coefficient on the indicator variable to feature a positive sign.

Next, we turn to describing variables that relate to availability and presence of transportation infrastructure in a region. The variable *Sea connectivity* provides information on the proximity of a region to commercial seaports.[74] It is our proxy for the level of transportation costs faced in particular region. Hereby, we assume that farther distance from access points to global export markets translates into higher production and trade costs in that locality. Thus, we expect to observe a negative sign in front of the variable coefficient. Still, we acknowledge the fact that pure focus on the proximity to a seaport might limit the explanatory power of our model; even more so when considering that the bulk of the CEEC trade is expected to take place via road and railway networks. To account for this aspect, we consider two additional proxy variables. The variable *Railway networks* measures the total length of railway networks in a region as a share of

[73] We source the relevant data directly from Eurostat's database that is publicly available (http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home). The reference tables are to be found under the subsections: Regional statistics - GDP indicators ESA 95. For further reference, see Eurostat Regional Yearbooks.

[74] It is calculated in terms of time (in hours) it takes from the centroid of a NUTS-3 region to reach the next commercial seaport via road (ESPON). We aggregate the averaged data from NUTS-3 into NUTS-2 regions using NUTS correspondence tables.

total length at the national level (in kilometres).[75] Additionally, we use a dichotomous variable, labelled *Transport corridors*, to indicate whether a region is directly connected to one of the 10 Pan-European Transport Corridors.[76] We assign a value of 1 if at least one of the 10 corridors passes through a region and 0 otherwise. Hereby, we posit that more extensive railway systems and privileged connectivity to major road networks reduce costs of production and, all else equal, enhance the competitiveness of a region. We therefore expect to observe a positive signs in front of the coefficients on both variables.

Next, we augment our baseline specification in equation (8) to include two additional sets of explanatory variables. In particular, we account for the role of regional policy instruments in determining spatial location outcomes while at the same time controlling for relative factor endowments. The baseline can therefore be expanded to read as follows:

$$LQ_{ijt} = \alpha + \beta_1(M_{it}) + \beta_2(T_{it}) + \beta_4(\Pi_{it}) + \beta_3(P_{it}) + \beta_5 cnt_k + \beta_6 ind_j + \beta_7 year_t + \mu_{ijt} \quad (10)$$

where, M_{it} and T_{it} and additive dummy variables are as before, while Π_{it} and P_{it} are vectors representing relative policy measures and other resource endowments respectively.

As regards regional policy, our specific focus is towards assessing the impact of EU's Eastern Enlargement along with associated regional development funds, such as PHARE,

[75] The variable is directly sourced from Eurostat's database and available on an annual basis. The reference tables are to be found under the subsections: Regional statistics - Regional Transport Statistics. For further reference, see Eurostat Regional Yearbooks (various years).

[76] It is assumed that major transportation networks play a crucial role in achieving closer market integration. All else equal, regions hosting them should have a comparative advantage and thus are more likely to qualify as production locations. The corridors variously encompass road, rail and waterway routes though we focus here only on the road networks as defined by TEM Master Plans (Trans-European Network for Motorways). The information is taken from cartographic maps provided by United Nations Economic Commission for Europe (UNECE: http://www.unece.org/trans/main/temtermp/news.html).

SAPARD and ISPA, on the location of economic activity.[77] Those funds have predominantly targeted border regions with the intention to also prepare them to be included in the EU's INTERREG programme.[78]

The variable *Regional aid* is the percentage of total pre-accession aid, pooled across PHARE, PHARE CBS and ISPA programmes, that is received by a region on a grant basis and allocated to address issues related to its geographical position. In particular, the funds received aim at improving: *i)* business related infrastructure and *ii)* accessibility to the EU agglomerations (IRS, 2005). We posit that through allocation of the overall aid budget to a menu of possible thematic fields, policy makers also signal additional information of relevance to economic agents.[79] In other words, a higher share of budgetary spending on advancing a region's geographic position is to be regarded as a

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[77] PHARE programme started in 1997 and is one of the three pre-accession instruments financed by the EU to assist the CEEC in their preparations for joining the EU. It has as objectives the financing of projects related to institutional development and strengthening, promoting convergence with EU legislation and promoting economic and social cohesion. The Phare CBC (Cross-Border-Cooperation) was introduced in 1994 to assist border regions in the applicant countries overcome their specific development problems and integrate more closely with the European Union, with other countries of Central and Eastern Europe, and within their own national economies. The long term aim of CBC was thus to accelerate the economic convergence of applicant countries with the EU and to prepare candidate countries for future participation in the INTERREG programme.

SAPARD (Special Accession Programme for Agriculture and Rural Development) was introduced in 1999 with the aim to help the CEEC deal with the problems of the structural adjustment in their agricultural sectors and rural areas, as well as in the implementation of the acquis communautaire concerning the CAP (Common Agricultural Policy) and related legislation. It is designed to address priorities identified in the countries' Accession Partnerships.

ISPA (Instrument for Structural Policy for Pre-Accession) was launched in 2000 to assist the CEEC candidate countries in the preparation for accession. It is based on the principles that govern the Cohesion Fund and provides assistance for infrastructure projects in the EU priority fields of environment and transport. Its objectives are the following: familiarising the candidate countries with the policies, procedures and the funding principles of the EU helping, them catch up with EU environmental standards, upgrading and expanding links with the trans-European transport networks.

For more information on PHARE, SAPARD and ISPA programs consult European Commission websites: http://ec.europa.eu/regional_policy/index_en.htm

[78] The objective of INTERREG programme, that is financed through the European Regional Development Fund (ERDF), is to strengthen economic and social cohesion in the EU by promoting cross-border, transnational and interregional co-operation and balanced development of the territory (EC, 2010: http://ec.europa.eu/regional_policy/interreg3/foire/faq1_en.htm#1).

[79] The thematic fields subject to pre-accession aid include: capital-supply, environmental quality, innovation, labour market potential, urbanisation advantages, among others (ESPON, 2010).

positive externality, especially in the long-run, as the location is expected to benefit from improved market access. Yet, we have to acknowledge that the effect might not be going only in the one direction, especially so in the short run, as increased transfers may be regarded as an indirect indicator of deficient geographical position of a region. In sum, it is not possible to determine the coefficient sign a priori.

To place *Regional aid* into a broader context, we want to consider an additional factor that might influence how economic actors perceive the regional policy instrument. To do so, we have first to consider the level of regional disparities per programme between bordering regions. The variable *Regional disparities* indicates the level of those disparities on a scale between 1 and 4, with 1 being 'very low disparities' and 4 indicating 'very high disparities' between bordering regions.[80] It follows that the resulting interaction term *Regional aid*disparities* places into perspective the level of aid spending and the broader development context in which it takes place. As a thought experiment, consider higher aid spending in presence of relatively higher disparities among various types of border regions. The BEU regions bordering more developed EU border regions might have on average a location advantage over other CEEC regions. Higher economic disparities between the two sets of regions are expected to translate into lower production costs in the former. Hence, higher aid spending in view of closer proximity to core markets and the presence of lower production costs might therefore trigger the pull effect and attract production to the BEU regions at the expense of others. We intend to test for this effect further below. Finally, due to the lack of data, we have to restrict our examination related to the policy aspect to the border regions only. As our interest is dedicated to those regions in the first place we do not perceive the restriction as a limitation per se. We will therefore discuss regional policy aspects towards the end of this section.

[80] *Regional disparities* is provided at NUTS-3 level in ESPON database. As previously described, we average and aggregate the individual scores into corresponding NUTS-2 classification using NUTS correspondence tables.

Lastly, to further reduce the omitted variable bias we control for relative factor endowments. First, we take into consideration a region's relative endowment with skilled workers. The variable *Education* is calculated as the ratio of students in upper secondary and post-secondary non-tertiary education to total population.[81] It follows that a region endowed with relatively larger share of skilled workforce should also, all else equal, feature higher shares of concentration in industries in need of matching type of skills. We would therefore anticipate a positive sign on the coefficient of the variable. Still, negative signs might be expected as well, especially for those industry groupings where production functions feature a higher content of unskilled labour. They might therefore prefer to locate in regions having a smaller proportion of skilled workforce and therefore a lower wage structure. Second, we control for a region's relative endowment with natural resources. The variable *Natural resources* is an absolute measure of availability of mineral resources in a given region.[82] In line with the preceding argument, industries that intensively use raw materials in their production process are expected, all else equal, to concentrate in regions that are comparatively more endowed with required input factors.

3.5.2 Estimation Approach

As some of the variables vary across regions but not across industries, or alternatively have very little variation over time, we are therefore not in a position to fully exploit the panel structure of the dataset. Using fixed effect models would have eliminated these variables while random effect models are identical to OLS when independent variables do not vary within each group of observations (Greene, 2003). Our initial approach is therefore as follows: we consider a two sided log-linear equation that is to be estimated using two sets of estimators, namely ordinary least squares (OLS) and least-square dummy variable (LSDV) technique. Thereby, the log-transformation allows us to

[81] The shares are directly sourced from Eurostat's database (see the link above). They are available on an annual basis. The reference tables are to be found under the subsections: Regional statistics - Regional Education Statistics. For further reference, see Eurostat Regional Yearbooks.

[82] In particular, we use data provided in ESPON Database. The variable considered measures the availability of mineral resources in hectares of land for each of the NUTS-2 regions (see, ESPON).

consider potential non-linearity of all partial effects while by including additive dummy variables we explicitly assume that the chosen specification controls for any unobserved heterogeneity.

Besides, there is a possible issue of endogeneity in our specification of the model that may be due to explicit consideration of the market potential variables. As stipulated by the NEG literature, the causality flow may run from the changes in industry concentration patterns to market potential and not the other way around.[83] To address the potential endogeneity problem, we use the two-stage least squares (2SLS) estimator whereby we instrument the *Market potential* variable using the proxies: *i) Population density* and *ii) Border crossings*. As regards the former, we assume that regions more densely populated also feature higher market potential.[84] From a purely spatial perspective, and assuming all else equal, market potential is expected to be higher in better connected border regions.[85] Further below we test the validity of our chosen instruments and assume for the time being that they are correlated to our measures of market accessibility though uncorrelated to the error term. Table 3.3 summarises all the variables deployed in the model.

[83] See, e.g., Krugman (1991) on the cumulative causation process and interaction between firm location, wages and worker migration.

[84] The variable is directly sourced from Eurostat's database. The data are available on an annual basis. The reference tables are to be found under the subsections: Regional statistics - Regional Demographic Statistics. For further reference, see Eurostat Regional Yearbooks.

[85] The variable accounts for the number of road and rail crossings per 100 kilometres approximated by NUTS 3 regions. Once again we average and aggregate the results into corresponding NUTS-2 classification using NUTS correspondence tables. The data is obtained from the ESPON database.

Table 3.3: Summary of variables used in the empirical model

Variable	Definition	Type	Expected sign	Source
LQ	Location Quotient as per equation (5); based on employment data	(Dependent)		Eurostat
Market potential	Market potential as a distance-weighted sum of access to other markets	Market potential	+	ESPON
Relative GDP	Relative GDP per capita at purchasing price parities (in EUR)	Market potential	+	Eurostat
Sea connectivity	Time in hours it take to reach a commercial seaport via road	Transportation	-	ESPON
Rail networks	Length of railways at regional level as a share of total railways length (in kilometers)	Transportation	+	Eurostat
Transport corridors	Dummy: 1 if at least one Transportation Corridor passes through the region and 0 otherwise	Transportation	+	UNECE
Education	Share of pupils and students in upper secondary and post-secondary non-tertiary education (ISCED 3-4) - as % of total working population at regional level	Resource endowments	+/-	Eurostat
Natural resources	Availability of mineral resources in hectares of land	Resource endowments	+/-	ESPON
Regional aid	Share of total pre-accession aid allocated to improving geographical position of a region	Regional policy instruments	+/-	ESPON
Regional disparities	Regional disparities between border regions on a scale from 0 very low to 4 very high	Regional policy instruments	+/-	ESPON
*Regional aid*disparities*	Interaction term of Regional aid and Regional disparities	Interaction variable	+/-	
Population density	Population density	Instrumental variable		Eurostat
Border crossings	Road and rail border crossings per 100 km (approximated)	Instrumental variable		ESPON

3.5.3 Results

We start with a brief analysis of potential interdependencies among specified variables in Table 3.4. It is immediately apparent that there exists high correlation among proxies for market potential, i.e. variables *Market potential* and *Relative GDP*. In order to avoid possible issues of multicollinearity, we only consider the former in our preferred specification of the model. However, as a means of testing the robustness of obtained results we re-estimate the basic model by replacing *Market potential* with the variable *Relative GDP*. In addition, to check for the presence of potential multicollinearity among any other pair of variables we report relevant coefficients from the mean VIF following each estimation.

Table 3.4: Correlation matrix

		1	2	3	4	5	6	7	8	**VIF**
1	Market potential	1.00								2.75
2	Relative GDP	0.74	1.00							3.16
3	Sea connectivity	-0.41	-0.32	1.00						1.17
4	Rail networks	-0.29	-0.38	0.14	1.00					1.40
5	Transport corridors	0.27	0.26	-0.20	0.12	1.00				1.23
6	Education	0.34	0.54	-0.22	-0.32	0.19	1.00			1.50
7	Natural resources	-0.07	-0.18	-0.04	0.27	-0.13	-0.17	1.00		1.21
8	Regional aid	0.33	0.21	-0.07	-0.16	0.22	0.09	-0.29	1.00	1.22

Table 3.5 presents results from our basic specification of the model that focuses on market potential and transport infrastructure variables only. Equation (8) was first estimated using the OLS method in column (1). Following, in column (2) we report results after controlling for fixed-effects while in column (3) we make use of the 2SLS estimator. The latter aims at assessing the robustness of our findings and, in particular, tackles the possible issue of endogeneity that may be associated with market potential proxy. Finally, in columns (4) to (6) we take into account time-invariant nature of variable *Market potential* by replacing it with *Relative GDP*. This is to be considered as a further robustness check for our underlying results.

Starting with the baseline equation in column (1) it is evident that all coefficients turn out to be highly significant and their signs are in line with the theoretical predictions. In particular, regions with higher market potential host on average larger industry concentrations within their respective borders. Besides, availability of transportation infrastructure matters as regions endowed with a relatively more extensive rail systems and better connections to main transportation corridors host on average larger industry agglomerations. In contrast, regions at larger distance from commercial seaports are on average less marked by industry concentration, though the magnitude of the effect remains rather low. The estimation results in column (2) corroborate our initial findings. In other words, the LSDV model is fully parallel to the OLS version in terms of signs, significance levels and magnitude of the coefficients. Both specifications can be therefore assumed to control for unobserved heterogeneity to almost the same extent. Moreover, our estimations do not appear to be plagued by multicollinearity issues as indicated by the mean VIF values that are well below commonly accepted threshold level of 10.

Table 3.5: Basic specification of the model, full sample

Dependent variable: log LQ (employment)						
	OLS	LSDV	2SLS	OLS	LSDV	2SLS
Variable (log)	(1)	(2)	(3)	(4)	(5)	(6)
Market potential	0.487***	0.602***	0.382	-	-	-
	[0.038]	[0.043]	[0.286]			
Relative GDP	-	-	-	0.264***	0.568***	0.130
				[0.025]	[0.035]	[0.081]
Sea connectivity	-0.029***	-0.039***	-0.034	-0.060***	-0.067***	-0.065***
	[0.008]	[0.008]	[0.033]	[0.007]	[0.007]	[0.010]
Rail networks	0.255***	0.239***	0.198***	0.267***	0.315***	0.176***
	[0.020]	[0.019]	[0.054]	[0.021]	[0.020]	[0.034]
Transport corridors	0.121***	0.083***	0.119*	0.172***	0.092***	0.177***
	[0.019]	[0.020]	[0.066]	[0.017]	[0.018]	[0.025]
Constant	-4.019***	-4.305***	-3.181**	-2.699***	-3.579***	-1.760***
	[0.224]	[0.249]	[1.529]	[0.172]	[0.187]	[0.401]
Fixed effects*	No	Yes	No	No	Yes	No
Instruments*	No	No	Yes	No	No	Yes
Mean VIF	1.48	2.27	-	1.29	2.32	-
Hansen *J* statistic (p-val)	-	-	0.15	-	-	0.20
DWH (p-val)	-	-	0.76	-	-	0.11
F-stat	172.74	52.47	78.21	151.25	56.09	77.83
Adj. R-squared	0.06	0.20	0.05	0.06	0.20	0.05
Observations	7484	7484	7020	7484	7484	7020

*Fixed effects: country, industry and time. Instrumental variables: population density and length of border crossings.

Heteroskedasticity corrected standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

To test whether our results may be affected by potential endogeneity issues we re-estimate the baseline equation (8) using 2SLS estimator. The results are reported in column (3). We specify the Hansen *J* test as a means to examine our choice of instrumental variables, namely *Population density* and *Border crossings*. As the test statistic fails to reject the null hypothesis of instruments validity, we posit that the instruments are uncorrelated with the error term and can be included in the model. The central insight from the estimation is the fact that all coefficients remain consistent and in line with theoretical predictions, except for *Market potential* variable that keeps the sign though now appears to be insignificant. As a means to determine whether *Market potential* is indeed to be treated as endogenous in our specification of the model, we run a post-estimation test by using the Durbin-Watson-Hu statistic (DWH). The null hypothesis of the statistic states that an OLS estimator of the same equation would yield consistent estimates and is to be preferred to 2SLS (Baum, 2009). As evident, we are not able to reject the null hypothesis and conclude that OLS estimator is indeed consistent and efficient. Columns (4) to (6) report the results from estimations with an alternative proxy for market potential, *Relative GDP*. In general, OLS and LSDV estimators remain consistent and in line with those represented in columns (1) and (2).[86] We are therefore able to confirm our initial findings and find preliminary evidence that lends support to our stated hypothesis *H1a* and *H2*. It appears that industry concentration is, on average, skewed towards regions with higher market potential but also those endowed with comparatively better transportation infrastructure that guarantees easier access to relevant markets.

Next, we proceed to estimate our baseline model for internal and border regions separately. Their respective results are discussed in Table 3.6.

[86] We have also estimated corresponding models by excluding services. The results were nevertheless broadly in line with those presented here. We therefore consider services in all our subsequent estimations.

Table 3.6: Basic specification of the model, internal versus border regions

Dependent variable: log LQ (employment)						
	INTERNAL			BORDER		
	OLS	OLS	LSDV	OLS	OLS	LSDV
	(1)	(2)	(3)	(4)	(5)	(6)
Market potential	0.213***	0.358***	0.587***	0.683***	0.781***	0.730***
	[0.072]	[0.092]	[0.151]	[0.046]	[0.048]	[0.060]
Sea connectivity	0.072***	0.107***	0.092***	-0.007	0.002	-0.011
	[0.025]	[0.030]	[0.027]	[0.008]	[0.008]	[0.008]
Rail networks	0.239***	0.182***	0.088	0.317***	0.251***	0.259***
	[0.046]	[0.052]	[0.055]	[0.025]	[0.027]	[0.028]
Transport corridors	0.517***	0.562***	0.623***	0.009	0.006	-0.004
	[0.088]	[0.091]	[0.079]	[0.020]	[0.020]	[0.020]
Capital		-0.063**	-0.118***		-0.131***	-0.050
		[0.030]	[0.035]		[0.032]	[0.034]
Constant	-3.082***	-3.329***	-3.858***	-5.227***	-5.159***	-4.818***
	[0.392]	[0.403]	[0.573]	[0.277]	[0.278]	[0.296]
Fixed effects*	No	No	Yes	No	No	Yes
Mean VIF	2.6	3.54	2.99	1.47	1.89	2.5
F stat	35.28	28.63	24.55	149.56	121.59	43.19
Adj R-squared	0.10	0.10	0.36	0.08	0.08	0.22
Observations	1582	1582	1582	5716	5716	5716

* Fixed effects: country, industry and time.

Heteroskedasticity corrected standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Columns (1) and (4) report coefficients from simple OLS regression for internal and border regions separately. Starting with internal regions, the signs and significance levels on variables' coefficients are broadly in line with our previous results. Contrary to previous findings, however, is the fact that stronger effect on industry concentration is exercised by transportation rather than market potential factors. Moreover, the sign on the variable *Sea connectivity* turns from previously negative to positive, being also statistically significant. It follows that, all else equal, industry tends to concentrate in internal regions that are at larger distance from the commercial seaports. As the commercial seaports are mainly situated in the northern and eastern parts of the CEEC, our finding can be interpreted as evidence that industry location has been skewed towards internal regions at closer distance to the export markets in the continental west.[87]

The border regions feature signs in front of the estimation coefficients that are in line with theoretical predictions. Therein, market potential is the single strongest determinant of industry location. According to the OLS estimator, a 1 percent increase in the market potential of a border region has on average led to a 0.68 percent increase in industry concentration, as measured by the *LQ*. This is in rather strong contrast to the magnitude of the coefficient found for internal regions, where a 1 percent increase in the same indicator has led on average to only 0.21 percent increase in industry concentration. Besides, it is still more than double the effect recorded on the only other significant variable in column (4), i.e. *Rail networks*. The remaining two transportation variables, *Sea connectivity* and *Transport corridors*, feature the expected signs although remain insignificant.

To test to what extent our initial findings might be affected by the urban primacy of capital regions we re-estimate our baseline model after considering the inclusion of a

[87] In fact, waterways may not be the most relevant transportation mode in the context of CEEC. Instead, transportation via rail and road are expected to be the dominant forms of moving goods around, especially following CEEC's trade re-orientation towards core European markets (see, e.g., Crespo and Fontoura, 2001).

dummy variable for capital regions. The results are reported in columns (2) and (4) respectively. Explicit consideration of capital regions does not add significantly to the explanatory power of the model. The dummy variable nevertheless enters the specification with a negative sign suggesting that the agglomeration process frequently associated with capital regions has actually reversed. Thus, industry concentration appears to have decreased in capital regions during the period under examination. Finally, the estimations in columns (3) and (6) consider fixed effects in addition to the above discussed variables. The explanatory power of the model increases significantly as indicated by higher coefficient of determination R^2 . The results are nonetheless similar. In general, our findings are broadly in line with Resmini (2007) who argues that already during the 1990s, industry has moved from autarkic industry location centres, i.e. capital regions, towards new locations. In fact, the opening of formerly inward oriented economies appears to have changed the internal dynamics of industry location. In particular, progressive regional integration with the EU is expected to have further stimulated centrifugal forces that have contributed to a process of industry dispersion. We intend to examine the effect in greater detail below.

So far, we have pooled the different industries and thereby explicitly assumed the location factors to be industry-invariant. However, our preliminary conclusions from the spatial analysis in the descriptive statistics section indicate that this might not be possibly the case. As a matter of fact, industry location patterns vary greatly across industry groupings and point towards existence of industry-specific spatial clusters. To better understand the observed phenomenon we split the industries into groupings and according to their technology-intensity (OECD, 2003). Following, we estimate the baseline equation (8) and enrich it with the vector P_{it} that features the resource endowments factors. Additionally, and as a means to further explore spatial aspects of industry concentration in border regions in particular, we include border regions type

dummies BEU, BAC and BEE. We estimate augmented baseline model for each of the five industry groupings separately.[88] The results are reported in Table 3.7.

Table 3.7: Determinants of spatial concentration, by technology-intensity in the production

Dependent variable: log LQ (employment)					
Variable (log)	High	Medium-High	Medium-Low	Low	Services
	(1)	(2)	(3)	(4)	(5)
Market potential	1.625***	0.785***	0.167	-0.416***	0.582***
	[0.281]	[0.170]	[0.204]	[0.095]	[0.069]
Rail networks	0.941***	0.141**	0.261***	0.407***	0.191***
	[0.101]	[0.062]	[0.082]	[0.037]	[0.027]
Sea connectivity	0.081***	0.075***	-0.007	0.008	0.032***
	[0.031]	[0.019]	[0.024]	[0.015]	[0.008]
Transport corridors	0.070	0.177**	0.186**	0.054*	0.041
	[0.091]	[0.070]	[0.078]	[0.032]	[0.029]
Education	0.417	-0.372	-0.697***	0.285*	0.434***
	[0.386]	[0.257]	[0.265]	[0.148]	[0.115]
Natural resources	-0.103**	0.046*	0.135***	-0.025*	-0.018
	[0.042]	[0.025]	[0.031]	[0.014]	[0.012]
BEU	0.031	0.157**	0.180**	-0.002	0.090**
	[0.111]	[0.074]	[0.087]	[0.043]	[0.035]
BAC	0.065	0.222***	0.429***	-0.173***	0.037
	[0.095]	[0.065]	[0.079]	[0.034]	[0.028]
BEE	-0.101	-0.239***	-0.000	-0.393***	-0.055
	[0.131]	[0.086]	[0.109]	[0.042]	[0.038]
Capital	0.033	-0.300***	-0.167**	-0.090**	0.291***
	[0.086]	[0.063]	[0.070]	[0.038]	[0.024]
Constant	-14.755***	-3.787***	-1.346	-1.733**	-5.238***
	[2.338]	[1.427]	[1.693]	[0.780]	[0.621]
Fixed effects	Yes	Yes	Yes	Yes	Yes
Mean VIF	4.36	3.75	3.76	3.59	3.50
F-stat	19.27	13.55	14.64	18.45	103.27
Adj. R-squared	0.24	0.16	0.17	0.15	0.36
Observations	699	1164	1080	2126	2229

Fixed effects: country and time. Heteroskedasticity corrected standard errors in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

[88] We present here the LSDV version of the model with country and year fixed-effects. We have also estimated simple OLS models without fixed-effects. The results are consistent, hence, we only report the LSDV model.

When looking across columns (1) to (5) we note that coefficients on most of the explanatory variables display diverging signs and significance levels. We therefore confirm our proposition that industry location in terms of major industry characteristics is indeed idiosyncratic. Column (1) presents results related to industries that deploy sophisticated technology in their production process.[89] The most salient feature of the model is the positive and highly significant coefficient on the variable *Market potential*. Accordingly, a 1 percent increase in the market potential of a region has on average led to a 1.68 percent increase in spatial concentration of high-technology industries, as measured by the *LQ*. We therefore find support for our stated *Hypothesis 1a*: industries characterised by increasing economies of scale in the production tend to locate in regions with comparatively larger market potential. That this type of industries is primarily market-seeking is further supported by observed tendency to locate at greater distance from the Eastern regions, thus closer proximity to the European core market. Indicative evidence is provided by negative sign on the regional dummy BEE and positive signs on dummies BEU and BAC even though none of them appears to be statistically significant.

The results for medium-high technology industries are displayed in column (2) of Table 3.7.[90] As expected, they appear to be largely in line with preceding findings on high technology intensive industries. Hence, technology intensive production is market orientated as the single largest location factor appears to be associated with the market potential variable. Nevertheless, we also find support for our stated *Hypothesis 2* in that availability and proximity to relevant infrastructure are important factors for explaining industry concentration patterns. Once again, in line with the finding from the descriptive statistics, we find more formal support for this type of industries having the tendency to cluster in regions closer to the European core markets. The coefficients in front of the

[89] According to the OECD classification, the industries considered hereunder feature manufacturers of *i)* office machinery and computers, *ii)* communication equipment and *iii)* medical, precision and optical instruments. They can be also thought of as economies of scale intensive. The corresponding NACE classification codes are DL30, DL32 and DL33 respectively.

[90] The industries included under this category can still be considered as scale intensive given that they include manufacturers of *i)* chemicals and chemical products, *ii)* machinery and equipment n.e.c., *iii)* electrical machinery and apparatus, *iv)* motor vehicles and *v)* other transport equipment.

regional dummies, BEU and BAC, are positive and statistically significant at 1 percent level. At the same time, BEE but also capital regions have, on average, experienced decreasing concentration rates. In other words, geographical position of border regions matters as those closer to the European markets have been able to attract and keep production associated with economics of scale intensive industries. As previously outlined by Resmini (2007), among others, progressive integration process with the EU has potentially played a major role in this respect. Thus, we find support for our stated *Hypothesis 1b* as higher degree of regional integration and openness has apparently contributed to increased spatial concentration of primarily economies of scale intensive industries. This has been especially the case in border regions that also enjoy a better access to relevant foreign markets.

Column (3) displays the results related to medium-low technology industries.[91] *Market potential* features the expected sign though appears to be insignificant in our specification of the model. This may not be surprising after all since the above mentioned industries mostly qualify as intermediate good suppliers. Their location patterns are therefore more likely to be driven by the availability of natural resources or location decision of downstream producers. With respect to the former, the variable *Natural resources* is positive and highly significant signalling this type of industries' dependence on locating in regions endowed with natural resources. Taking into account the findings described in the descriptive statistics section, it appears that this type of industries concentrate in similar type of regions as medium-high technology industries. This especially applies to BEU and BAC regions. We therefore have a reason to suspect that intermediate input suppliers tend to locate at closer distance to final good producers, and vice versa. In contrast, the variable *Education* features a negative sign that is statistically significant at 1 percent level. This may be due to the fact that regions endowed with comparatively higher shares of educated (skilled) work force are more likely to feature higher labour-

[91] These include mainly producers of: *i)* coke and petroleum products, *ii)* rubber and plastic products, *iii)* non-metallic mineral products, *iv)* basic metals and *v)* fabricated metals.

costs. Hence, more cost driven industries will on average favour regions with higher shares of unskilled labour and, thus, lower labour-costs.

Interesting observations can also be made for low technology industries that are presented in column (4).[92] Contrary to our previous observations, there is a negative sign on the *Market potential* variable that is also statistically significant at 1 percent level. More precisely, a 1 percent increase in market potential of a region has on average led to a 0.42 percent decrease in spatial concentration of low-technology production, as measured by the *LQ*. Several forces may be at work here. By definition, the market potential of a region is to a large extent determined by its purchasing power, i.e. income. Higher disposable income tends to be associated with higher skill composition of the workforce; hence, higher production costs may adversely affect the location patterns of this type of industries.[93] In fact, there has been a significant outflow of labour-intensive production in BAC and BEE regions in particular, the latter experiencing the most pronounced changes. Lastly, an interesting observation can be made with respect to resource endowment variables. Low-technology industries seem to be attracted to locations that are relatively more endowed with skilled work force, as proxied by variable *Education*, though the effect is only weakly significant. At the same time, they appear to shun regions with higher shares of natural resources.

Finally, in column (5) we consider industry location patterns that are associated with the services sector.[94] As it would be expected, services appear to be local market-seeking in that they feature positive and significant coefficient on *Market potential* variable. In fact, the magnitude of the coefficient is the highest among all considered variables in column

[92] The industries included are: *i)* food products and beverages, *ii)* tobacco products, *iii)* textiles, *iv)* wearing apparel, *v)* leather and leather products, *vi)* wood and wood products, *vii)* pulp, paper and paper products, *viii)* publishing and printing, *ix)* furniture and manufacturing n.e.c. and *x)* recycling.

[93] As a result labour-intensive industries might relocate to other, more peripheral, domestic regions or move to other countries/continents. Relocation of labour-intensive industries to emerging economies, most notably Asian economies, is indicative here.

[94] Broadly, the services feature repair and trade of vehicles, retail trade, hotels and restaurants, real estate activities, renting of machinery and equipment, computer and related activities, R&D, other activities.

(5) implying that a a 1 percent increase in the market potential of a region has on average led to a 0.58 percent increase in spatial concentration of services industry, as measured by the *LQ*. Other salient features of the model include a positive and significant indicator associated with the availability of skilled labour. Thus, regions endowed with skilled and educated work force have on average generated more services sector employment. This would be again in line with our a priori expectations. The transportation infrastructure on the other side is only of partial importance. All else equal, more extensive rail systems result in higher *LQs* even though no statistically significant effect can be detected for regions with better access to major European transportation corridors. The proximity to commercial seaports has a similar effect on the concentration of services to the one described for scale intensive industries. Thus, services tend to locate at greater distance from eastern parts of the CEEC and seemingly favour capital regions and those bordering the EU.

As already evident from the discussion, the industry concentration patterns in CEEC are skewed towards primarily Western border regions. Once Eastern regions are taken into consideration we might argue that there is evidence of an ongoing process of spatial polarisation in the CEEC, hence also pointing towards increasing regional divergence. The latter has been a concern for policy makers for a long time. As a result, policy instruments have been put in place to address broader location issues that peripheral regions are faced with. Programmes such as PHARE CBC have focused on border regions in particular, especially addressing the issues related to their geographical position, institutional capacity building, capital supply and infrastructure, among others. We have an interest in exploring the effects such policies may have on industry concentration patterns in the context of transition economies. Hereby, our particular interest is related to assessing of the effects certain policy instruments might have on improving a region's geographical position and, more broadly, its market potential. The variable *Regional aid* aims at capturing that effect by accounting for the share of overall aid budget being allocated to measures aimed at improving a region's geographical

position. As argued previously, we also include an interaction term in our analysis so to consider the broader development context of border regions. The term *Regional aid*disparities* combines the share of budgetary allocation with the level of economic disparities between bordering regions that also participate in the programmes. The results are presented in Table 3.8 and consider Western (BEU and BAC) and Eastern (BEE) border regions respectively.[95]

Table 3.8: Determinants of spatial concentration, Western versus Eastern border regions

Dependent variable: log LQ (employment)				
Variable (log)	Western (1)	Western (2)	Eastern (3)	Eastern (4)
Market potential	0.464***	0.459***	-0.770	3.252***
	[0.052]	[0.054]	[1.199]	[0.338]
Rail network	0.327***	0.366***	0.636	-0.354**
	[0.030]	[0.034]	[0.404]	[0.143]
Sea connectivity	0.016*	0.014	-0.470	-4.546***
	[0.009]	[0.009]	[0.426]	[0.562]
Transport corridors	-0.119***	-0.055**	0.189***	0.138***
	[0.024]	[0.024]	[0.054]	[0.045]
Education	0.360***	0.241***	-0.180	0.655**
	[0.089]	[0.088]	[0.352]	[0.263]
Natural resources	0.045***	0.028***	0.193***	-0.132**
	[0.010]	[0.010]	[0.046]	[0.067]
Regional aid	0.133***	-	0.407**	-
	[0.009]		[0.161]	
Regional aid*disparities	-	0.014***	-	-0.153***
		[0.003]		[0.025]
Constant	-6.359***	-5.753***	-3.501	-6.838***
	[0.390]	[0.397]	[2.362]	[1.402]
Mean VIF	2.38	2.41	6.20	3.81
F-stat	21.67	18.61	28.15	28.42
Adj. R-squared	0.17	0.14	0.40	0.40
Observations	3803	3803	1219	1219

Fixed effects: industry and time. Heteroskedasticity corrected standard errors in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%

[95] Results pertaining to individual industry groupings may be provided upon request.

Starting with the former in columns (1) and (2), it can be noted that the results remain largely consistent with our previous findings. More specifically, the proxies for market potential and resource endowments retain their explanatory power. In terms of the latter, availability of skilled workforce appears to have a stronger effect on industry concentration when compared to the magnitude of the coefficient that serves as a proxy for availability of natural resources. This is broadly in line with our expectations as we argued that Western border regions have on average hosted more economies of scale intensive industries than labour intensive ones.

These results hold when considering the policy variable and its interaction term. In particular, the variable *Regional aid* is positive and significant even though the magnitude of its coefficient remains somewhat modest. In other words, a 1 percent increase in overall budgetary spending has on average led to a 0.13 percent increase in industry concentration. Likewise, larger economic disparities between the CEEC border regions and their EU counterparts have a positive effect on industry concentration when coupled with increased budgetary spending on improving the geographical position of those regions. Although the magnitude remains rather modest, we nevertheless find support for our stated *Hypothesis 3:* in the context of Western border regions regional policy instruments appear to be an effective tool for generating higher industry concentration.

In columns (3) and (4) we display results for Eastern border regions. Interestingly, they appear to be fundamentally different compared to their Western counterparts. Starting with the third column, it appears that *Regional aid* is the strongest location factor if we are to rank the determinants according to the magnitude of their coefficients. Thus, a 1 percent increase in the overall budgetary spending on improving the geographical position of a Eastern border region has on average led to a 0.41 percent increase in industry concentration. Besides, availability of natural resources and proximity to main transportation corridors seem to be of equal importance which may hints towards regional specialisation in extractive industries. However, more interesting results are reported in

column (4). First of all, larger economic disparities with neighbouring border regions further decrease industry concentration levels in Eastern border regions, irrespective of the share of aid spent on improving their geographic position. We seem to uncover evidence on the presence of a negative signalling effect associated with this type of border regions. This negative development is further reinforced by the distance of a region from the commercial seaports. In other words, a 1 percent increase in the travel time needed to reach the next seaport results in a 4.5 percent decrease in industry concentration, as measured by the *LQ*. The geographical position therefore matters, and it does so significantly. Still, proxies for market potential, connectivity to transport corridors and availability of skilled work force can exercise a positive effect on industry concentration in Eastern border regions which hints towards potential for active involvement of targeted policies addressing these issues. Nevertheless, the benefits associated with regional policy instruments appear to be context specific. Their positive effects may be limited in the absence of perceived strategic potential of a region which appears to be significantly determined by its geo-political position. Thus, in the context of CEEC's Eastern border regions, it appears that their fundamental deficiency remains their peripheral and isolated geographical location.

3.6 CONCLUSION

In this chapter we have probed deeper into industry location patterns by exploring a new source of industry-level data for a set of 5 CEEC and their respective NUTS-2 regions over the period 2002 to 2007. Our broader aim was to identify how transition and progressive regional integration might have affected industry agglomeration patterns across dichotomous types of regions. In order to do so, we have classified them according to their geo-political position by distinguishing between internal and border regions in particular. Especially the latter has been subject to concern of national and supra-national policy makers in view of the fact that significant changes in market operations may have come at the expense of structurally weaker border regions. As a consequence, already in the pre-accession period regional development programmes, largely funded through EU schemes, have been initiated to enhance 'locational advantages' of border regions. Thus, our intention in this chapter has been to assess, among others, the effectiveness of active policies in increasing industry concentration in different types of regions.

Our contribution to the literature is twofold. First, we extend and improve the analysis in several ways in regards to existing comparator studies. For instance, while Traistaru et al. (2002) and Resmini (2007) focus their line of inquiry on the period spanning the 1990s, our research provides complementary insights for the period thereafter. Extending the analysis to the post-2000 period is crucial in that it accounts for changes induced by CEEC's accelerated integration into the EU. In addition, by using new sources of regional data that have been previously unavailable to researchers we are able to estimate augmented panel data models that feature larger number of manufacturing and services industries along with a significantly larger number of explanatory variables. Besides, to the best of our knowledge our study is the first on transition economies to use complementary tools in measuring the true extent of spatial agglomeration. Empirical studies reviewed in the previous sections of this chapter have been confined to unidimensional industry-specific measures of spatial concentration only. Hence, by

making use of spatial autocorrelation statistics, we are more likely to reveal the true extent of industrial agglomeration along with more detailed picture on overall dynamics of industry location in the CEEC. In sum, when compared to existing research our analysis provides a fairly more comprehensive analysis of changes taking place on the ground. Second, the research presented in this chapter is pioneering in nature in that it considers the effects of active regional policies on industry location patterns. To the best of our knowledge, this is the first paper on transition economies to formalise deployment of regional policies in an empirical model of industry location. Thus, our inquiry considerably expands the existing stock of knowledge on the subject matter. The findings can be summarised as follows.

In broad terms, using Moran Scatterplots and significance maps our analysis reveals that transition and regional integration has produced inter-sectoral changes in employment that have also led to changes in the distribution of industrial activities across space. Such distributional changes are thought to have intensified regional divergence dynamics and affected development trajectories of CEEC regions. Indeed, the research points towards presence of an intensifying process of polarisation of economic space whereby industry location is increasingly skewed towards Western regions with steadily declining concentration rates in Eastern regions. It follows that the proximity to core EU markets matters for observed industry concentration patterns in the CEEC. Thus, our findings further support some of the existing comparator literature limited to the 1990s, e.g. Resmini (2007), in concluding that the proximity to the EU markets has driven and shaped industry location patterns in post-socialist CEEC. As we extend the timeline of inquiry we derive also further insights into development trajectories of regions. Specifically, we conclude that the process of spatial polarisation has gained pace in the post-2001 period despite accelerating and deepening regional integration with the EU.

In line with the commonly accepted view, we are also able to confirm empirically that industry location patterns in the CEEC are indeed industry (grouping) specific. First and

foremost, they appear to be largely influenced by individual industries' technology intensity in the production. In this respect, the research indicates that the low-technology intensive industries in particular are linked to regions that are assumed to be endowed with natural resources; in contrast, high-technology intensive industries and services appear to depend on central locations that are close to core markets while also endowed with qualified work force. This is a significant finding that is in line with the theoretical predictions stemming from the NEG family of models.

Further support for the notion is derived in subsequent estimations of panel data models. In line with the findings from the preceding chapter, regional market potential remains a significant factor determinant of the degree of industry concentration. Thus, more accessible regions appear to be characterised by a more extensive agglomeration process, especially so in technology-intensive industries and services. The paper has also provided robust evidence on the importance of availability and proximity to transportation infrastructure as a crucial factor in reducing the incurred trade costs and achieving higher level of industry concentration. As a matter of fact, transportation infrastructure seems to be of equal importance to both technology- and resource-intensive industries and thus qualifies as a potent policy tool at disposal of policy makers. To further account for policy related aspects of industry location we have significantly expanded the boundary of empirical inquiry into the subject matter by introducing policy related proxies in our empirical model. This is the first study to launch such an approach and has been only possible by sourcing information from a newly developed ESPON database. The results are nevertheless interesting in that it can be claimed that under certain circumstances policies involving higher budgetary spending on advancing regions' geographical position might help increase levels of industry concentration in border regions. However, when controlling for the extent of regional disparities between adjacent border regions, this effect remains positive only for regions being at closer distance to European core markets. In contrast, higher regional disparities between Eastern border regions and their neighbours in non-EU and non-accession countries lead to less agglomeration in the

presence of higher budgetary spending. It follows then that higher spending in the latter may be interpreted as a transfer payment to compensate for apparent deficiencies, i.e. a negative signal. In contrast, higher budgetary spending in the Western border regions is likely to be perceived as a positive spillover, hence a positive signal.

Our discussion thus raises the issue about a (regional) policy-maker's role and ability in raising industry concentration levels within a specific region. In theory, there are a number of available options. For instance, the policy makers may deploy target measures that aim at increasing the market potential of their own regions by increasing the potential of their respective neighbouring regions. But how can this be achieved? As we have shown, market size (potential) is directly affected by the size of trade costs, thus, engaging in a bold reduction of overall trade costs at national and subnational levels may be a sensible approach. In view of the different layers of policy making that directly affect regions, what appears to be a pre-requisite for lowering the trade costs is the existence of comprehensive coordination mechanisms between the various stakeholders. In our view, this is where lies the real value of elaborate and comprehensive integration agreements, such as the EU, and with it associated development policies and support frameworks. In fact, regional development funds as considered in our framework explicitly aim at inducing coordinated action among otherwise independent actors. It follows that, coordinated action of policy makers coupled with targeted investments into hard and soft infrastructure provision are crucial ingredients for a more balanced development path of peripheral regions. Nevertheless, a word of caution is deserved at this point as our approach does not capture the cost of such interventions and neglects existence of potential trade-offs when investing in infrastructure as opposed to creating direct location incentives for potential investors [see, e.g., Yamin and Sinkovics (2009)]. Besides, many elements related to such policies elude the control of policy maker and may potentially be completely exogenous. Thus, prudence is called for when deriving policy conclusions from reduced-form models such as the one estimated in this paper.

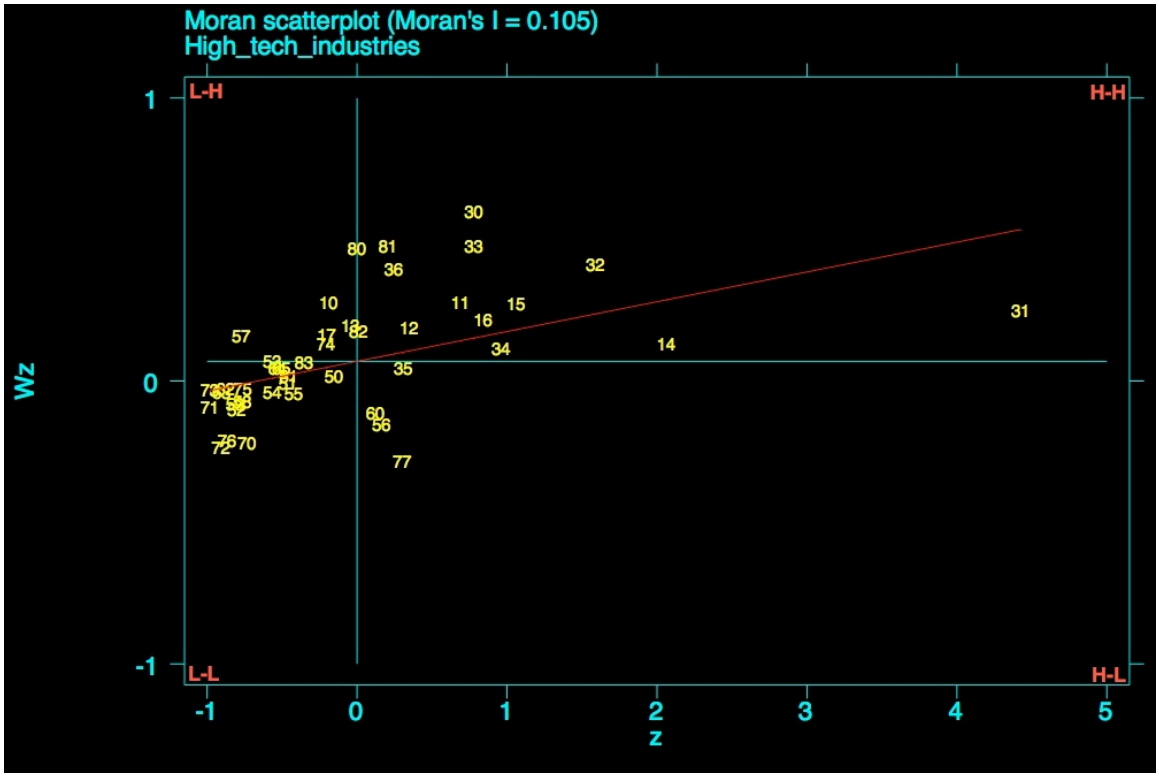
APPENDIX B

Table B3.1: Summary of NUTS-2 regions

Code	NUTS 2	Capital	Internal	BEU	BAC	BEE
10	CZ01	x				
11	CZ02		x			
12	CZ03			x		
13	CZ04			x		
14	CZ05					
15	CZ06			x		
16	CZ07				x	
17	CZ08				x	
30	HU10	x			x	
31	HU21				x	
32	HU22			x		
33	HU23					x
34	HU31				x	
35	HU32				x	
36	HU33				x	
50	PL51				x	
51	PL61		x			
52	PL31					x
53	PL43			x		
54	PL11		x			
55	PL21				x	
56	PL12	x				
57	PL52				x	
58	PL32					x
59	PL34					x
60	PL63		x			
61	PL22				x	
62	PL33		x			
63	PL62					x
64	PL41		x			
65	PL42			x		
70	RO21					x
71	RO22					x
72	RO31				x	
73	RO41				x	
74	RO42					x
75	RO11				x	
76	RO12		x			
77	RO32	x				
80	SK01	x				
81	SK02				x	
82	SK03				x	
83	SK04				x	

Note: CZ=Czech Republic; HU=Hungary; PL=Poland; RO=Romania; SK=Slovakia

Moran Scatterplot 1: Concentration of *high-tech industries* across NUTS 2 regions; LQs averaged over time



Note: For further reference on coding of regions see Table B3.1.
Source: own calculation using STATA 11.

Moran's *I*: Concentration of *high-tech industries* across NUTS 2 regions; LQs averaged over time

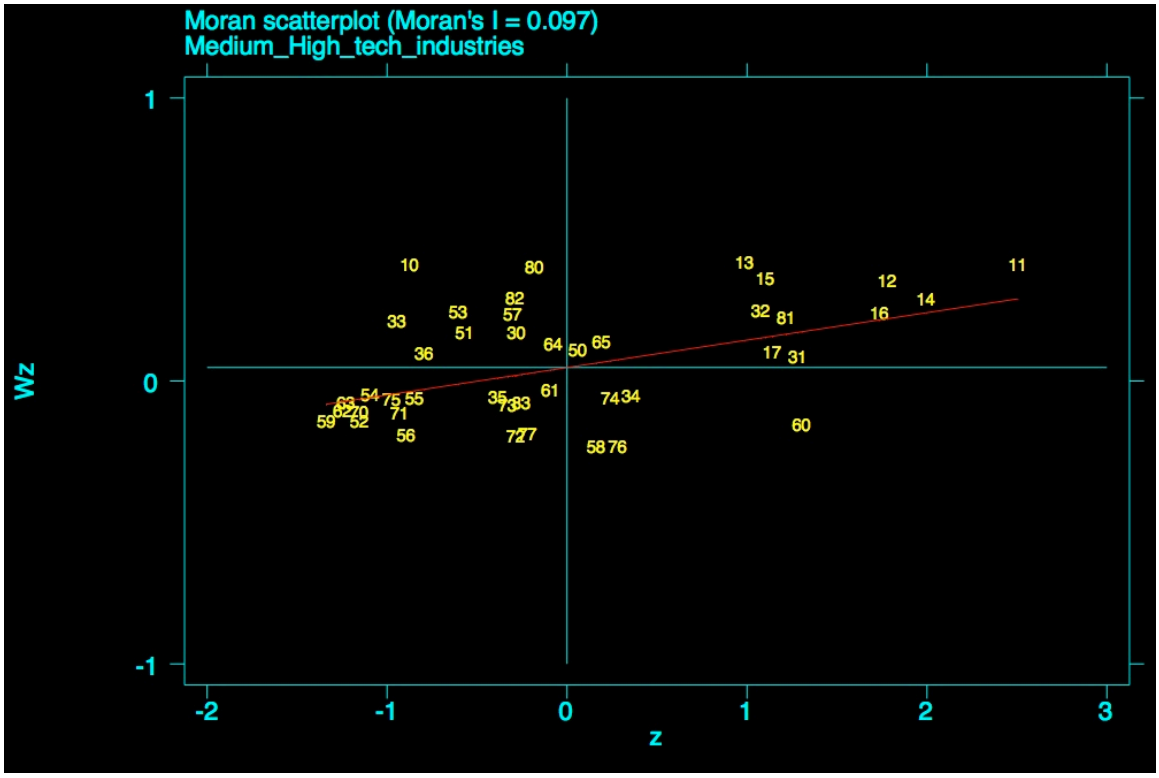
Weights matrix

Name: weights
Type: Distance-based (inverse distance)
Distance band: 0.0 < d <= 19.0
Row-standardized: Yes

Moran's I	I	E(I)	sd(I)	z	p-value*
High-tech industries	0.105	-0.024	0.023	5.693	0.000

*1-tail test

Moran Scatterplot 2: Concentration of *medium-high-tech industries* across NUTS 2 regions; LQs averaged over time



Note: For further reference on coding of regions see Table B3.1.
Source: own calculation using STATA 11.

Moran's *I*: Concentration of *medium-high-tech industries* across NUTS 2 regions; LQs averaged over time

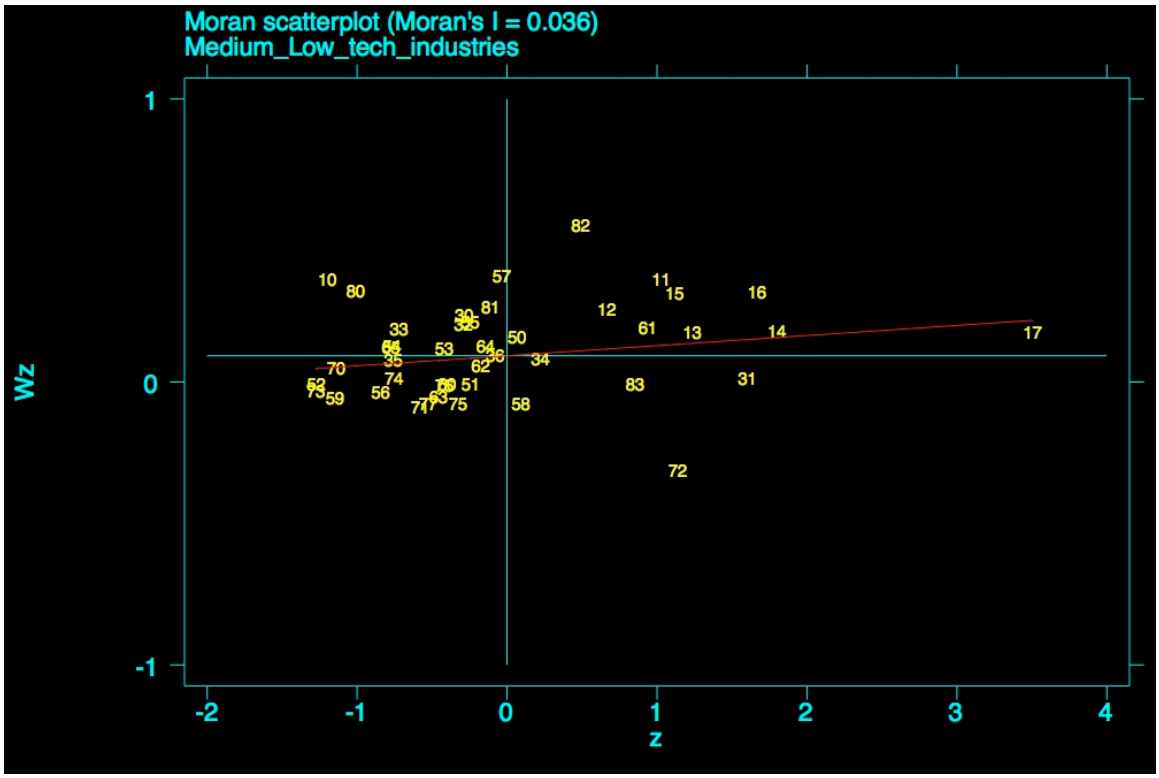
Weights matrix

Name: weights
Type: Distance-based (inverse distance)
Distance band: 0.0 < d <= 19.0
Row-standardized: Yes

Moran's I	I	E(I)	sd(I)	z	p-value*
Medium-high-tech industries	0.097	-0.024	0.025	4.787	0.000

*1-tail test

Moran Scatterplot 3: Concentration of *medium-low-tech industries* across NUTS 2 regions; LQs averaged over time



Note: For further reference on coding of regions see Table B3.1.
Source: own calculation using STATA 11.

Moran's *I*: Concentration of *medium-low-tech industries* across NUTS 2 regions; LQs averaged over time

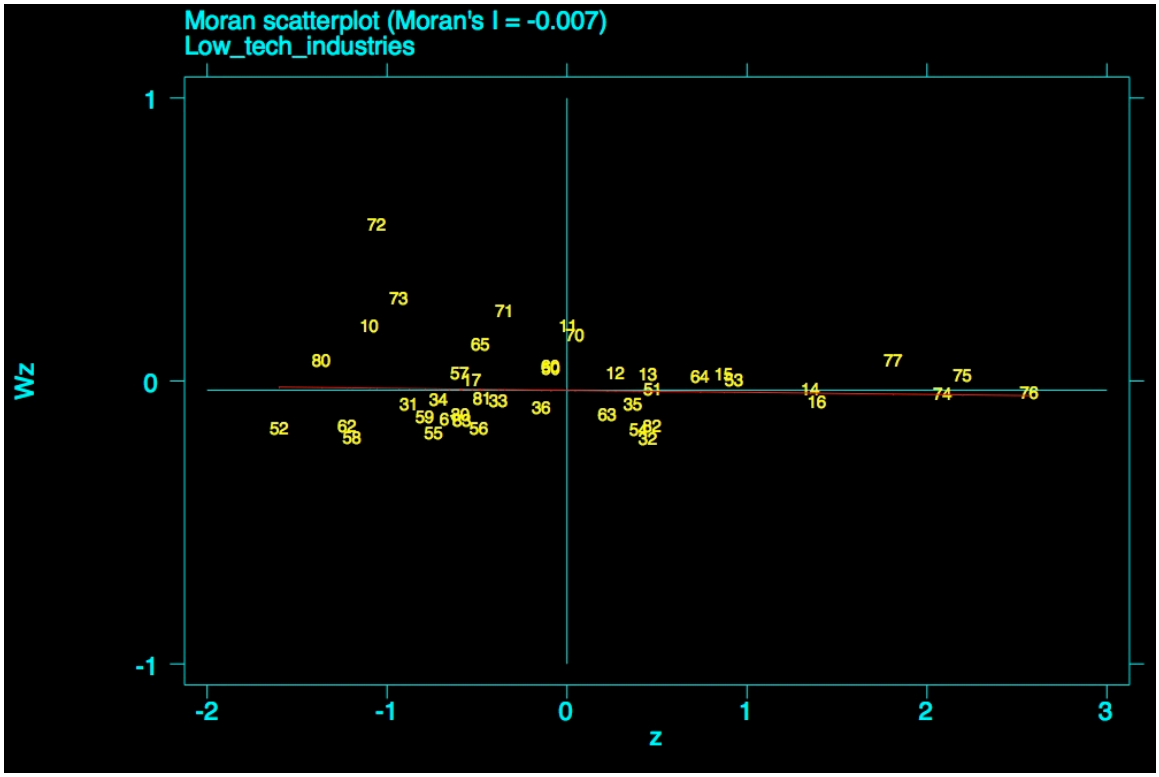
Weights matrix

Name: weights
Type: Distance-based (inverse distance)
Distance band: 0.0 < d <= 19.0
Row-standardized: Yes

Moran's I	I	E(I)	sd(I)	z	p-value*
Medium-low-tech industries	0.036	-0.024	0.024	2.428	0.008

*1-tail test

Moran Scatterplot 4: Concentration of *low-tech industries* across NUTS 2 regions; LQs averaged over time



Note: For further reference on coding of regions see Table B3.1.
Source: own calculation using STATA 11.

Moran's *I*: Concentration of *low-tech industries* across NUTS 2 regions; LQs averaged over time

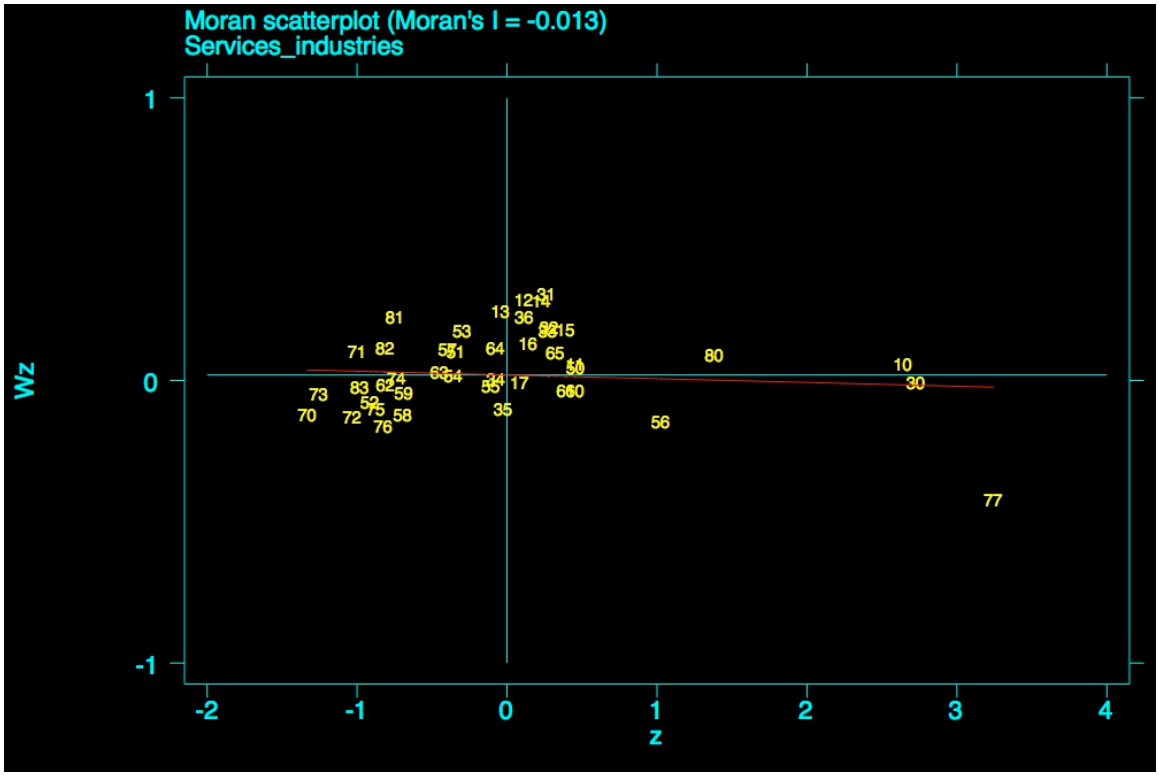
Weights matrix

Name: weights
Type: Distance-based (inverse distance)
Distance band: 0.0 < d <= 19.0
Row-standardized: Yes

Moran's I	I	E(I)	sd(I)	z	p-value*
Low-tech industries	-0.007	-0.024	0.025	0.661	0.254

*1-tail test

Moran Scatterplot 5: Concentration of *services industries* across NUTS 2 regions; LQs averaged over time



Note: For further reference on coding of regions see Table B3.1.
Source: own calculation using STATA 11.

Moran's *I*: Concentration of *services industries* across NUTS 2 regions; LQs averaged over time

Weights matrix

Name: weights

Type: Distance-based (inverse distance)
Distance band: 0.0 < d <= 19.0
Row-standardized: Yes

Moran's I	I	E(I)	sd(I)	z	p-value*
Services industries	-0.013	-0.024	0.024	0.434	0.332

*1-tail test

Chapter 4

Structural Reforms, Institutional Quality and Location of FDI

4.1 INTRODUCTION

A number of recent empirical research papers provide evidence on the role of institutions for economic development. For instance, Rodrik et al. (2004) show that institutions outweigh the one of geography and integration in explaining cross country income levels. Easterly and Levine (1997) link development of institutions and capacity to growth in Africa, while Knack and Keefer (1995) describe a positive relationship between institutional development and economic growth. For transition economies in particular, Havrylyshyn and van Rooden (2003) conclude that reforms and institutional capacity building have contributed to economic growth. In sum, a large number of papers suggest that institutional aspects are important factors in explaining cross country differences in economic performance [for a survey of the literature see, e.g., De Haan et al. (2006)].

Until recently, institutional aspects have been largely neglected in the literature on FDI (Dunning and Lundan, 2008).[96] From the theoretical point of view, location of multinational enterprises (MNEs) has been almost exclusively examined in terms of economic factor determinants. As such, the role of natural resource endowments has been framed in numerous variations of basic Heckscher-Ohlin model, while more recently economic geographers have utilised NEG models to study the effects of agglomeration and linkages on location of MNEs in particular.[97]

The empirical literature on institutions and their role in influencing FDI location patterns however remains surprisingly scarce (Globerman and Shapiro, 2002). In addition, there appears to be very little common ground on which institutional components truly matter for explaining location patterns of FDI. This lack of insight might be potentially due to a number of limiting factors that have been present in most of the empirical inquiries to date.

First and foremost, in majority of the empirical specifications the number of institutional factors considered is often limited to one or just a few rather vaguely defined indicators, such as business customs or types of governing regimes. These indicators are clearly not able to capture the institutional dynamics; in fact, most of the time they are considered in estimations as an inexpensive means to capture an additional share of the unexplained factor. Second, most of the analyses so far have been conducted at highly aggregate levels, thus explicitly assuming institutional factors to affect FDI inflows to the same

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[96] As opposed to other capital flows, FDI is an *"investment involving a long-term relationship and reflecting a lasting interest of a resident entity in one economy (direct investor) in an entity in an economy other than that of the investor"* (UNCTAD, 2004). According to the IMF, FDI is *"a category of international investment that reflects the objective of a resident in one economy (the direct investor) obtaining a lasting interest in an enterprise resident in another economy"* (IMF, 2005).

However, note that we do not distinguish between the type of investment which is a limitation of our study. This is to say, that we would expect different location determinants related to, e.g., mergers and acquisitions (M&A) as compared to greenfield investments.

[97] An excellent review of theoretical work is provided in Navaretti and Venables (2004). For empirical surveys examining primarily *economic* determinants of FDI see, Bloningen (2005) but also Chakrabarti (2001).

extent across different sectors of an economy. Yet, from existing research we know that FDI is less country but rather industry specific (Buigues and Jacquemin, 1994), while at the same time some industries appear to be more institution-sensitive than others (Levchenko, 2004). Thus, understanding how institutional reform and perceived quality affect investments in different industries and sectors is crucial in terms of advancing our knowledge of FDI factor determinants. Finally, the results appear to vary depending on chosen estimation approach and methodology. For instance, Gastanaga et al. (1998) highlight apparent differences in results derived from panel and pure cross-section analysis. Most of the existing studies consider either one or the other estimation approach. Therefore, combining them in a single analytical framework is important if we are to determine the robustness of the underlying results.

In this essay, we intend to tackle the highlighted issues by applying a more nuanced approach to analysis of institutions and their role in determining location of FDI. For that purpose we use the quasi experimental setting as provided by the context of economic transition in 10 CEEC economies.[98] In particular, our goal is to examine the role of *institutional factors*, i.e. structural reforms and institutional quality, in attracting FDI to the countries of the region.[99] We do so by clearly distinguishing those factors in *institutional efforts*, i.e. structural reforms, and *institutional outcomes*, i.e. perceived institutional quality. Our thinking is thereby stimulated by a recent contribution of Campos and Kinoshita (2008) who relate financial reform efforts and outcomes to FDI inflows for a set of Latin American and Eastern European economies. The time period chosen for our study is 1995 to 2005. Thus, we exclude early transitional shocks from the analysis while we consider almost the entire period of CEEC' EU integration process.

[98] Recall that the CEEC sample includes following countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia.

[99] Note that, whenever we refer to the term *institutional factors* in the text this is meant as a joint reference to these two otherwise distinct concepts, i.e. structural reforms and institutional quality.

Our paper makes several contributions to the relevant literature. First, by using a number of defined indicators we aim to more formally decouple structural reform process from perceived institutional quality. In other words, we aim at isolating the factors that matter for FDI, especially those related to the reforms and hence might be of direct relevance to policy makers. Second, we translate this approach into a systematic investigation of FDI determinants at the sectoral level. In other words, we are able to subject the institutional factors to sectoral dynamics associated with manufacturing and services FDI. So far, there has been very little inquiry into sectoral determinants of FDI and even less so on specific institutional components. Third, we estimate static as well as dynamic panel models while also making use of cross sectional analysis as a means to test robustness of our underlying findings. Fourth, we also consider a longer and more recent time period than most other available studies. Thus, our study explores the determinants of inward FDI to CEEC over the entire course of EU integration process. Previous studies have been limited either to initial years of transition or have considered very limited time periods. Finally, our study explicitly compares the institutional factor determinants of FDI in CEEC with an alternative sample of non-CEEC economies. This comparison adds a potentially important perspective on whether and how the basic institutional components differ between various Eastern European sub-regions.

The paper proceeds as follows. Section 2 presents a concise review of theoretical concepts and empirical literature related to FDI and institutions in particular. Section 3 introduces the variables of interest, estimation approaches and discusses the results. Section 4 presents some basic findings related to the role of institutional factors in attracting FDI across sectors and other non-CEEC transition economies. Section 5 concludes with reference to overall policy implications for transition economies.

4.2 THEORY AND EMPIRICS

As a departing point, in this section we provide a targeted summary of the existing literature on location determinants of FDI. Our survey is therefore by no means exhaustive. The sheer size of the body of theoretical and empirical literature on FDI that has accumulated over the past decades limits our efforts to a rather compact and selective review of previous works.[100] Therefore, in the first part of the section we provide a concise overview of the theoretical frameworks that forms the basis for our empirical inquiry. The second part is then devoted to a discussion of previous empirical studies, again tailored to the topic at hand.

4.2.1 Theoretical Framework

The development of theoretical thought on MNE activities occurred in three distinct stages. The initial efforts were based on Heckscher-Ohlin type of trade models, under the assumption of constant returns, which promoted the view of a polarised production space (Iversen, 1935). Accordingly, the models predicted a landscape where MNEs' HQ activities would exclusively locate in capital-abundant countries with their subsidiaries populating capital-scarce countries instead. A typical conclusion coming out of these early analytical efforts is that there is no incentive for FDI to occur between countries that exhibit equivalent levels of economic development. Yet, that view contrasted strongly with real world observations: the bulk of FDI activity occurred primarily between developed countries, especially among those with very similar levels of economic development (UNCTAD, 2007).

In the second stage, a more sophisticated range of models emerged to include increasing returns to scale and imperfect competition as standard technical tools of analysis. The new trade theory therefore allowed for a more detailed distinction of multinational

[100] For a state of the art summary of existing knowledge on FDI the interested reader may refer to Dunning and Lundan (2008).

activity. Following the pioneering work of Helpman (1984) and Helpman and Krugman (1985) the concept of *vertical* FDI was mainstreamed into the literature. Their starting point is based on a simple observation which states that the different stages of production vary in terms of requirements of different production factors. Therefore, MNEs could geographically fragment their production by shifting some, alternatively all, of their operations to a location featuring lower factor costs whereas the output could be then re-exported or sold to either home or third country destinations. Nevertheless, the authors noted that vertical FDI would be a viable option only in presence of real differences in factor endowments (factor prices) across countries. Moreover, an important assumption of the model would require the trade and transportation costs to be non-prohibitive. Thus, the predictions from the theory appeared to be of relevance especially to regional integration agreements between unequal partners, i.e. North-South agreements.

In contrast to vertical investments, the concept of *horizontal* FDI suggests that MNEs aim to replicate, as opposed to dis-integrate, their operations in the host country. In other words, foreign investors driven by horizontal investment motives are concerned with the production of the same products in several different markets, thereby foregoing the option of exporting as an alternative method of supplying the markets. The concept has been also formalised in a more sophisticated manner based on basic NEG frameworks.[101] In a nutshell, the trade offs between the transportation costs on the one side and benefits pertaining to economies of scale on the other apply to MNEs activities as well, thus giving rise to horizontal FDI. In particular, the theory states that we are likely to observe horizontal FDI where home markets are large with similarly large trade costs [for a seminal contribution, see Brainard (1993)].

In the final stage, Markusen et al. (1996) and Markusen (1997) combined the two frameworks into a unifying theoretical model, the so called “Knowledge Capital” model. It considers, in addition to horizontal and vertical FDI, exporters from the home country

[101] See, for instance, Markusen (1984); Markusen and Venables (2000); Helpman et al (2004).

which gives rise to a number of outcomes that depend, in the first instance, on the relative country characteristics. From the model, it follows that vertical FDI will prevail if the differences in terms of countries' factor endowments and prices are large enough. On the contrary, horizontal FDI type is likely to dominate the production landscape if comparatively large countries are located far away from home markets and trade costs are not insignificant (the so called 'tariff jumping motive'). As it can be anticipated, the model predicts that between both extremes, the firms' landscape remains mixed. Summarising, whereas vertical FDI is conducted between countries that substantially differ in factor endowments (prices), horizontal FDI is associated with cross border investments involving countries that are comparable in size and development levels.[102]

Although the theories allow for a clear delineation of the general concepts there is nevertheless rather little scope for clear-cut prediction as to which type of FDI will prevail in the market. To be able to do so, and purely from the empirical point of view, one would require detailed data on firm-level inputs and outputs, production and sales structures, etc. This type of empirical inquiry is far beyond the scope of this paper. Instead, given the information at hand we only aim at deriving an approximation of motives for MNEs to invest in the CEEC.

As the most detailed unit of analysis available to us is at the sectoral level, we already note that the idiosyncratic nature of services and manufacturing allows for some preliminary discussion as to which type of investors is likely to be observed in each of the sectors. Thereby, services sector FDI is expected to be on average market-seeking given the need for local adaptation and its generally non-tradable nature [Fillipaios, (2006); Riedl (2010)]. By contrast, FDI in manufacturing is thought to be more sensitive to difference in factor costs as manufactures generally tend to face stronger international price competition. Thus, in addition to market-seeking motives manufacturing sector FDI

[102] For our subsequent analysis we alternate between different terminologies so that investments that are vertical in nature are associated with resource (or efficiency) -seeking investors while FDI driven by horizontal motives can be thought of as market-seeking instead. See also Dunning and Lundan (2008) for a detailed discussion of main types of foreign investors.

may be to the same extent efficiency-seeking. Further support to these hypotheses may be provided by considering the geographical context in which FDI is taking place. As a point in case, services sector FDI might indeed be market-seeking as markets for services have been either non-existent or largely underdeveloped in the pre-transition period.[103] Therefore, economic transition is expected to have fuelled the demand for services in the region via different routes, such as domestic consumers but also other foreign investors. As regards manufacturing sector, the bulk of FDI inflows to the countries have been associated with investors from developed countries and in particular EU (Barry, 2002). Thus, taking into consideration initially large factor price differences between the regions the distinction between FDI types becomes slightly less ambiguous. Indeed, there is ample empirical evidence of the region hosting primarily vertically integrated MNEs.[104]

Clearly, investment decisions do not rely on spot markets for inputs only. Instead, there is a plethora of other production related costs that best describe the complex relationship between various location factors. While existing theoretical models are good in conceptualising the broader outcomes of interactions between FDI and aggregate location factors, their treatment of principal investment or business environment is usually confined to a single parameter 'trade costs'.[105] Neoclassical investment theory formally refers to this type of costs as adjustment or *instalment costs* borne by the investor, while new institutional economics (NIE) literature describes the existence of broader *transaction costs* characterising a particular location or activity. Sticking to the latter, the concept of transaction costs implies that economic agents incur expenditures each time they undertake business transactions, such as the cost of obtaining information or writing and enforcing contracts [Williamson (1989); Williamson (1998); Antras and Helpman

[103] Nevertheless, services sector FDI may be also efficiency-seeking depending on the particular nature of their activity. The *outsourcing* of services has been well documented in the case of CEEC as well (Stare and Rubalcaba, 2009). However, given that our inquiry is rather at the broader sectoral level we assume that, on average, services sector FDI is market-seeking.

[104] See, among others, Bevan et al. (2001); also Lankes and Venables (1996).

[105] Thereby, the chosen values for the parameter are often arbitrary in nature, yet they prove to significantly drive the outcomes. For reference, see some of the basic NEG models (e.g. Krugman, 1992).

(2004)]. Proponents of the approach stipulate that, for instance, absence of sufficiently protected property rights, burden of corruption and political hazard, all raise the level of uncertainty in economic interactions. It follows that locations characterised by higher levels of uncertainty are expected to, all else equal, have lower profitability which in turn makes them less likely to host any significant agglomerations within their respective borders. Thus, the idea of transaction costs can be used to rank the localities according to their respective levels of uncertainty. Accordingly, institutions and institutional quality in particular are the prime determinant of size and distribution of transaction costs [North (1990); also Murrell (2003)]. However, the role of institutions goes beyond pure efforts to reducing transaction costs. Thereby, institutions can also directly affect transformation or production costs in a locality and therefore may qualify as a location factor. North (1990) highlights that institutions are a technological feature of the production process in most industries, since regulative institutions are entrusted, among others, with the task of resolving the issues of variability in the quantity and quality of input factors. Institutions therefore also entail micro-economic implications for the economy given that they affect resource allocation at the firm level.[106] As a result, the demand for them is expected to be industry or sector specific [for a similar argument see also Levchenko (2004)]. We therefore conclude that institutional factors are critical in determining comparative advantage of locations hosting them as they are unevenly distributed across space with the tendency to expose a significant variation in perceived quality.[107]

This statement particularly applies to transition economies where the cost of establishing FDI has been described as generally high (Meyer, 2001).[108] At the same time, however, FDI inflows to the region have been strong throughout the past two decades.

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[106] For further theoretical insights see, among others, Henisz (2000); Henisz and Williamson (1999); Lucas (1990); Vinod (2003).

[107] For a further reference see Dunning (1998) who incorporates institutions, as an L-bound factor, neatly into his eclectic or OLI framework.

[108] A number of authors hint towards the institutional vacuum, that followed the dismantling of old Soviet-style institutional structures, as the main reason for high cost of doing business in those countries (e.g. Murrell, 2003).

Nevertheless, the potential paradox is not necessarily a real one once the progress in regional integration with the EU is taken into consideration. Namely, the CEEC demand for full EU membership resulted in a comprehensive set of reform prescriptions that had to be accepted and enacted by the countries.[109] In other words, comprehensive institutional reforms have been a prerequisite for the EU membership and are therefore assumed to be the centre point of our analysis here. Our main argument runs as follows: while the accession process created an institutional anchor that raised foreign investors' expectations for more efficient regulative environment in the medium to long term, it was the speed of the institutional convergence, i.e. progress in structural reform, that affected the distribution of FDI in the short run.[110] It follows that the speed of the reform process is crucial determinant of countries' FDI levels in as far as it entails information on the relative changes in transaction and transformation costs, thus not only approximating the size of entry and adjustment costs but also projecting expectations of future transaction costs. We aim at clarifying this hypothesis in the empirical part of the paper. Next, we survey the relevant empirical literature.

4.2.2 Empirical Literature

Until recently, the majority of empirical studies have examined location patterns of foreign investors by focusing on economic factors only. Chakrabarti (2001) reviews a larger number of articles in the field and concludes that despite the large efforts there is little consensus on which economic determinants matter the most. In particular, using extreme bound analysis he finds market size to be a robust determinant in almost all of the reviewed studies.[111] Other, less consistent determinants of FDI include the following factors in order of robustness: trade openness, labour costs, economic growth, taxes and

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[109] Recall that most of the CEEC signed the Europe Agreements in the first half of the 1990s.

[110] Note that, when speaking about the progress in reform we refer to the process of the CEEC institutional convergence to commonly observed standards of developed market economies.

[111] Market size is most often modelled in terms of GDP although other measures have been used in the past, such as total population, GDP per capita.

tariff rates. Our present inquiry, on the other hand, aims at comparing findings from empirical research that is primarily concerned with institutional factors as determinants of inward FDI. Hereby, we focus mainly on macro-level studies though acknowledge at the same time the increasing importance of micro- and meso-level contributions to the field [for a summary see, for instance, Dunning and Lundan (2008)].

The papers discussed below have been divided into three sub-sections. First, we review contributions that are mostly cross-sectional in nature and based on relatively large samples of countries, including both developed and developing economies. We label this type of studies as mixed country samples. In the second sub-section, we then discuss the evidence from transition economies in particular. Finally, we review a selected few papers that examine FDI location across different sectors of an economy.

4.2.2.1 Mixed Country Samples

One example of a study that concentrates on institutional elements and their role in explaining global FDI flows is a paper by Globerman and Shapiro (2002). Their analysis is based on a cross-sectional sample and features more than 140 developed and developing countries over the period 1995-1997. The institutional factors are summarised under the common term 'governance infrastructure' which comprises composite indices that assess quality of market-based institutions and policies. In particular, the authors use World Banks's *Governance Matters* database covering a broad range of institutional outcomes and including measures of: political stability, rule of law, graft, regulatory burden, voice and political freedom, and government effectiveness (see Kaufmann et al., 1999). In addition, factors measuring human and environmental health are also considered in the estimation equation. The results are nevertheless interesting in that they show that governance infrastructure matters and can be regarded as a strong predictor of FDI inflows; however, its importance diminishes as countries grow larger. Additionally, they argue that some governance factors matter more than others. In particular, policies

promoting *i)* competition, *ii)* open and transparent legal and regulatory regimes and *iii)* effective delivery of government services seem to be relatively more important factors than measures of political voice, stability and the rule of law. Moreover, a closer examination of the sub-samples reveals that governance infrastructure particularly matters for attracting FDI to developing and transition economies whereas no significant effects are found for the more developed sample. In sum, institutional factors appear to be important determinants of FDI, especially so in developing and transition economies.

More recently, Daude and Stein (2007) launch a further inquiry into the subject matter using the same set of institutional indicators as Globerman and Shapiro (2002). Their empirical framework closely resembles the one developed by Carr et al. (2001), which in turn is based on theoretical model of location of MNE activity developed by Markusen (1997). In contrast to the previous paper, they place greater value on testing the robustness of the underlying results. Hence, they follow Gastanaga et al. (1998) and Benassy et al. (2007) in estimating panel but also cross-section models. For that purpose, they use bilateral outward FDI stocks from 34 source to 152 host countries over the period 1982 to 2002 and derive complementary insights from dynamic regressions in addition to cross-sectional analysis.[112] From the cross-sectional analysis they obtain qualitatively similar results to Globerman and Shapiro (2002). Thus, regulatory framework and effective delivery of government services appear also in their analysis as the most sensitive institutional aspects to foreign investors. Interestingly, political instability and violence do not appear to have any significant effects on cross-border investment flows. Following a battery of robustness tests and different estimation techniques, the authors confirm the validity of their results concluding "that unpredictable policies, excessive regulatory burden, and lack of commitment on the part of the

[112] To further test the robustness of the results they consider in addition to Governance Matters indicators an additional set of institutional factors. First, they source data from the International Country Risk Guide (ICRG) that measures the political risk in a country. Second, they use World Bank's survey questionnaires conducted under the World Business Environment Survey program measuring various quality aspects of business environment (http://web.worldbank.org/WBSITE/EXTERNAL/WBI/EXTWBIGOVANTCOR/0,,contentMDK:20673879~menuPK:1742423~pagePK:64168445~piPK:64168309~theSitePK:1740530,00.html)

government seem to play a major role in deterring FDI" (Stein and Daude, 2007, p.341). It follows that predictable frameworks for economic policies and enforcement are a prerequisite for generating higher FDI inflows. Hence, their findings seems to be broadly in line with empirical growth literature in that institutions matter while FDI is to be regarded as a channel to impact countries' economic performance.

A number of papers have examined particular institutional aspects in large cross-country samples as well. For instance, Jensen (2003) finds in a comparison across 114 countries that in terms of GDP democratic governments attract as much as 70 percent more FDI than authoritative regimes. The author thereby links the effect of democracy to lower country risk as perceived by the MNEs. Interestingly, the research undertaken by Li and Resnick (2003) into the role of democratic institutions is less conclusive. Based on insights from a sample of 53 countries, they argue that in the short run higher levels of democracy in less developed countries drive foreign investors away as improved judicial system and better rule of law impose constraints on them as well as the host government. Over time, however, the consolidation of democratic governance should bring about better property rights protection, thus generally improving the prospect of receiving more FDI inflows.[113]

Maskus (2000), studying the impact of protection of intellectual property rights on FDI, finds that a 1 percent increase in degree of patent protection in host economy raises US investment stock by almost half a percent. Egger and Winner (2004) investigate forms of corruption in the context of 59 developed and developing countries for the period 1983 to 1999. They find that the 'grabbing hand corruption' is expected to impose a burden on firms while the 'helping hand corruption' is perceived as a solution to an institutional failure. Thus, the relative importance of these two aspects indicates whether the overall impact of corruption on FDI is positive or negative. Surprisingly, they find that

[113] Using panel data for 196 countries from 1965 to 2002, Biglaiser and DeRouen (2005) show that democracy has a relatively limited effect on US FDI inflows. Instead, it is mainly market size, protection of property right and economic reform (approximated by limited capital controls) that positively influence location decision of US multinationals.

corruption is not a relevant factor when considering OECD countries' investments in non-OECD economies. The authors link the observed patterns to the vertical nature of FDI in the non-OECD economies as they argue that specialisation gains from this type of investment outweigh comparatively small increases in corruption levels.

Due to various data limitations empirical studies examining the role of institutions in attracting FDI to developing countries in particular started emerging only recently.[114] Benassy-Quere et al. (2007) study institutional factors in such a context by constructing institutional performance proxies from a unique database. The Institutional Profiles (IP) database is based on a survey of French civil servants in 52 developing countries and rich in detailed information on countries' formal and informal institutions.[115] The authors estimate standard gravity model for country pairs (home and host country) with bilateral stocks of FDI as dependent variables and controlling for traditional economic factors such as market size, geographic distances, as well as dummies for contiguity and common language. The institutional variables measure the quality of institutional frameworks while also considering institutional distances, between home and host countries. The latter is defined as the absolute difference of reported institutional quality between the two sets of countries, as such a novelty in the literature. The first set of results is in line with expectations: lower levels of bureaucracy and corruption indeed appear to increase FDI inflows. A similar effect on FDI is exercised by the presence of a stronger legal system and banking sector while FDI is a decreasing function of institutional distance.[116] Interestingly, FDI inflows appear to be lower when capital is less

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[114] For a literature review see Nunnenkamp (2002).

[115] According to the authors, "a total of 330 elementary questions were asked concerning public institutions, capital markets, goods markets and labour markets. In each case, a set of questions were asked covering political institutions, public order, public governance, market freedom, investment on future, ability to reform, security of transactions and contracts, regulation, openness and social cohesion. Each question was itself decomposed into elementary, objective items ranked 0 or 1 (low level or weak enforcement) to 4 (high level)" (Benassy-Quere et al. 2007, p.768).

[116] With respect to the banking sector, Al Naser and Gomez (2009) examine the direct relationship between FDI and financial sector performance, the latter being defines as the improvement in the quantity, quality, and efficiency of the financial sector, in 15 Latin American countries for the period 1978 to 2003. They conclude that FDI is directed to countries that are more financially developed and institutionally strong.

concentrated and when labour laws are strong. The latter finding therefore points in the direction of Li and Resnicks's (2003) conclusion in that a strengthening of the institutional environment in less developed countries can have initially a negative effect on FDI inflows.

4.2.2.2 Transition Economies

The less studied aspect of FDI in transition economies centres on reforms and institutional quality as factor determinants of FDI. What is more, there is a dearth of evidence on the interplay and relative importance of institutional factors at the sectoral level. In this section we study available evidence pertaining to these two aspects in particular.[117]

We start with a concise review of an often cited paper by Bevan and Estrin (2004). They use panel data on bilateral FDI flows from individual source countries to 11 CEEC economies during the 1990s. The focus of their study is on location factors primarily relating to proximity, agglomeration, and factor costs aspects. In addition, they explicitly account for the effects of countries' progressive integration with the EU. Lastly, legal and institutional aspects of host countries are considered by making use of country credit ratings as a measure of overall country risk. The authors posit that such a measure already absorbs effects of individual institutional factors, such as capital market development, state of legal framework, etc.; thus, it reduces the incident of collinearity in the estimation. In general, their results on traditional location determinants are in line with previously described findings. In sum, FDI is related positively to both source and host country GDP while negatively associated with unit labour costs. Thus, they conclude that FDI to the region is both market- as well as efficiency-seeking. However, more

[117] Note that we examine here primarily cross-country evidence on transition economies and in relation to CEEC in particular. For studies on SEE see, e.g., Demekas et al. (2005) and Kaditi (2010); studies on CIS include among others Shiells (2003), also Beck and Laeven (2006). A number of recent studies on location determinants of FDI in single country frameworks have emerged that we do not consider at present. See, for instance, Walkenhorst (2004) for Poland; Kral (2004) for Czech Republic; Boudier-Bensenbaa (2005) for Hungary.

interesting results pertain to integration and institutional aspects. First, they find that progress in EU accession process increase FDI inflows.[118] It follows that the speed of implementation of structural reforms determines the speed of EU accession process which in turn accelerates FDI inflows, a type of virtuous circle. Interestingly, the authors do not find any evidence on the negative effect of higher perceived risk on FDI. Therefore, they conclude that perceived risks are temporary and overshadowed by investors' confidence in the accession process.[119]

In contrast to the previous study, Resmini (2000) examines location patterns of European FDI in manufacturing sector only. The scope of her study includes 10 CEEC while the period under consideration is restricted to initial years of transition, 1990 to 1995. The conclusions coming out of her analysis are insightful in that she divides the sector into four homogenous groups of industries.[120] She therefore anticipates the location factors to be industry specific in the first place. Indeed, in her model, progress in transition towards market-based standards appears to positively affect FDI in economies of scale intensive but also high-tech industries. She posits that successful transition implies stabilisation of macro-economic environment and therefore attracts investments with higher sunk costs. The role of institutions is operationalised in the model by the Operation Risk Index (ORI), which is a composite indicator approximating the state of the business climate in host countries.[121] In contrast to Bevan and Estrin (2001), she finds that the impact of institutional factors is significant and also positive when controlling for different slope parameters between industry groups. In particular, impact of ORI on FDI is especially

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[118] See also Baldwin et al. (1997) for a similar conclusion.

[119] However, Janicki and Wunnava (2004) examine bilateral FDI between EU and 8 CEEC in a cross-sectional analysis based on data for 1997. They find that, after controlling for traditional economic factors, country risk as measured by Institutional Investor Survey is a significant determinant of FDI in the region, i.e. lower risk indicates higher FDI inflows.

[120] She follows Pavitt (1984) taxonomy and classifies manufacturing industries into following groupings: economies of scale intensive, high tech, traditional, specialised producers.

[121] The indicator is compiled by a private provide Business Environment Risk Intelligence S.A. and weighs 15 different criteria, among others: policy continuity, degree of privatisation, inflation, bureaucratic delays, currency convertibility, credit conditions, foreign investor and profit attitude, enforceability of contracts, labour costs and productivity, etc. (ibid)

pronounced in industries characterised by high sunk costs of the investment, i.e. economies of scale intensive industries and high tech industries. Thus, location of FDI in this type of industries appears to be at least partially explained by advances in the reform process.

Carstensen and Toubal (2004) specify a dynamic panel data model where they assess the effects of both, economic and institutional factors, in explaining FDI into 7 CEEC. The period of examination is limited once again to the 1990s. As to the institutional variables, they focus on the level and method of privatisation as proxies for the transition status to a market economy and efficiency of the corporate governance respectively. Their approach therefore further complements previous research focusing on effects of privatisation reforms in a static framework, e.g., Lansbury et al. (1996) and Holland and Pain (1998). In general, the strong influence of institutional factors on FDI confirms their view that more traditional variables cannot fully explain FDI in the CEECs. In particular, they conclude that both the level of privatisation and the method of privatisation have significant impact on the decision to invest in CEECs. Besides that, introducing the additional variable measuring the country risk confirm the view that uncertainty linked to the legal, political and economic environment is a barrier to FDI.[122]

Campos and Kinoshita (2003, 2008) place explicit focus on examining the role of institutions and agglomeration as determinants of FDI. Their two papers come closest to our stated research interest. Specifically, in Campos and Kinoshita (2003), they highlight the importance of institutions as an important input factor in MNEs' production process. Thereby, the authors underline the differences between the soft (institutions) and hard (physical) infrastructure making a strong point for a more detailed inspection of the former in regression models aimed at explaining investment flows into transition economies. In contrast to the majority of previous papers, institutional factors feature prominently in their estimation equation with a number of business environment

[122] Information on country risk is sourced from Euromoney while information on privatisation comes from EBRD and Holland and Pain (1998).

components considered, such as efficiency of the legal system and quality of bureaucracy. Thereby, they use a panel data set covering the period 1990 to 1998 while also employing a number of different estimation techniques as a means to derive robust results. Their findings are interesting in that the primacy of soft- over hard-infrastructure is supported by the data.[123] In other words, they show that the quality of institutions appears to be a more important location determinant when compared to more traditional location factors. Besides, regional differences exist in that institutional quality, reforms and agglomeration factors matter for CEEC, while natural resources endowments and economic reforms drive the FDI inflows in CIS region.

In a more recent paper, Campos and Kinoshita (2008) examine the effects of structural reforms on FDI in a sample of 44 emerging and transition economies for the period 1989 to 2004. Their particular focus is placed on reforms related to financial sector- and trade liberalisation using World Bank and UNCTAD data.[124] In doing so, the authors make an attempt at distinguishing between reform outcomes and reform efforts. Hereby, reform indicators are sourced measuring the observed development levels (outcomes) but also government policy changes (efforts) in this respect. They are subsequently included in the model as one of three categories of FDI determinants, the other two being traditional factors, such as market size, natural resources and infrastructure, and institutional factors including risk factors according to Polity IV and ICRG data. For estimation purposes, the GMM approach according to Blundell-Bond (1998) is deployed whereby the dependent variable is measured as the ratio of FDI to GDP. While the traditional indicators remain in line with expectations and previously described literature, the results for structural reform variables deserve greater attention. The baseline regression indicates that among standardised reform variables, bank efficiency - a proxy for financial reform - is the most significant reform variable. The authors describe this finding as a “paradox of finance” in

[123] In a similar vein, Fung et al. (2005) show that soft infrastructure, i.e. institutional quality, is a more important factor of FDI than hard infrastructure for Chinese regions.

[124] See also Majocchi and Strange (2007) for firm level evidence of Italian firms investing in 7 CEEC. FDI location appears to be positively and significantly related to trade and financial liberalisation, weakly significant for market liberalisation and negatively related to openness of foreign banks.

the context of FDI, as multinationals that are not financially constrained appear to be drawn to locations in which such constraints are more relaxed. A further decomposition of financial sector reform indicates that a pre-commitment to reform process sends a positive signal to foreign investors even in the absence of sufficiently developed financial markets. This confirms the relationship running from the reform to FDI, and not the other way around.

4.2.2.3 Sectoral studies

In the third set of papers, we briefly review three recent contributions examining location patterns of foreign investors at the sectoral level. The initial two papers do not extensively consider institutional factor in their analysis and, hence, we limit our review to a short summary of their findings.

Py and Hatem (2009) investigate the location patterns of 14.000 investment projects in Europe in the period 2002 to 2006. They split the observations between those pertaining to services and manufacturing sectors while also taking into consideration the geographical location of the investments, i.e. Western versus Eastern Europe. In their descriptive analysis they detect significant differences in the location of manufacturing and services that are especially pronounced when comparing across the two geographical regions. To explain the diverging trends, they compare location factors first at the sectoral level, i.e. services versus manufacturing, followed by an examination at the functional level and distinguishing between functions such as headquarters activities, R&D, production, commercial offices, call centres, etc. As regards the results, they indicate that both sectors are sensitive to market size and to cultural proximity the latter being proxied by a dummy for shared language. However, in contrast to the manufacturing sector, countries endowed with better skilled labour force are particularly attractive for FDI in services. The results by function suggest that the market size criterion, which is important when service activities are concerned, has no effect for call centres. The labour costs

criterion is decisive only when choosing where to locate production centres, while skilled labour force is an important determinant of headquarters' location. Thus, according to the derived conclusions, FDI location not only appears to be sectors specific but also function specific.

In a similar vein, Riedl (2010) examines the location patterns of foreign investors in manufacturing and services for 8 CEEC over the period 1998 to 2004. Using FDI stock data she applies a dynamic panel design to her study that is based on the partial stock adjustment model, following Cheng and Kwan (2000). Thus, in addition to analysing determinants of FDI across sectors, she also explores foreign investments' speed of adjustment to the desired investment levels. The explanatory variables chosen are standard traditional economic factors as described in the literature on economic determinants of FDI and include variables such as the size of the GDP, extent of agglomeration, labour costs, tariffs, and exchange rates. Interestingly, she initially considers transition-specific variables, such as inflation, risk and privatisation, however drops them from the analysis as they prove to be insignificant in the baseline estimation. Her findings as regards the sectoral comparison can be summarised as follows. First, there indeed appears to be a difference in FDI location patterns between manufacturing and services sectors. While the former is significantly influenced by the size of unit labour costs, that does not seem to be the case for the latter. Moreover, agglomeration economies are found to impact equally services and manufacturing FDI while market size, as measured by absolute GDP, exhibits a significantly higher influence on services FDI. Second, services FDI seems to adjust much faster to its desired stock level, after circa 2 years, while manufacturing moves to its equilibrium level within approximately 5 years. According to the author, comparatively lower installation costs for services explain most of the variation in time.

Finally, Walsh and Yu (2010) use UNCTAD's FDI database for a sample of 27 advanced and emerging market economies, including Czech Republic, Hungary and Poland, and

investigate the explanatory power of various institutional factors on FDI inflows in primary, secondary and tertiary sectors. The institutional indicators considered in their dynamic panel data framework include labour market flexibility, infrastructure quality, judicial independence, legal system efficiency, and financial depth.[125] Besides, other traditional factors enter the estimation equation as well, whereby FDI stock is included as an additional explanatory variable to account for any clustering of foreign investors. As a result, the estimation method is according to Arellano-Bond (1991) and uses a GMM estimator that is capable of dealing with endogeneity present in lagged dependent variable models. Their findings are interesting as they highlight the differences in sectoral location patterns of FDI, and are certainly non-conventional. The relative importance of various macro economic indicators is questioned once sector fixed-effects are taken into consideration. In particular, the extent of country openness and inflation do not appear to affect location decisions in the manufacturing sector investment while appreciation of real effective exchange rates and higher labour costs seem to attract services sector FDI. With respect to the institutional factors, their importance differs across manufacturing and services FDI. The only significant factors relating to the former include labour market flexibility and financial depth. In contrast, the services sector is more reliant on presence of impartial courts and quality of infrastructure. Finally, when splitting the sample into advanced and emerging economies, the effect of institutional factors on FDI in manufacturing sector is reinforced for the emerging market economies, whereas it loses significance for the advanced once. Interestingly, services sector investments behave in a similar way in both advanced as well as emerging economies. In sum, the authors show that institutional factors matter for attracting FDI; what is more, they matter to a different extent across different sectors.

[125] The authors source them from two major data bases, the Global Investment Report produced by the World Economic Forum and the World Development Indicators (WDI) provided by the World Bank.

4.3 EMPIRICAL MODEL

4.3.1 Variables and Data

We use a balanced panel dataset including 10 CEEC for the period 1995 to 2005. The dependent variable is measured as inward FDI stocks and comes from UNCTAD's FDI database (UNCTAD, 2009). We chose FDI stocks instead of FDI flows due to their relatively higher stability over time. In other words, when tracked over time stocks are less volatile than flows as they preclude erratic behaviour that can be caused by only a few large investments (Devereux and Griffith, 2002). Still, our subsequent robustness tests also consider FDI flows in addition to another alternative measure of FDI intensity. Both, FDI stocks and FDI inflows will be discussed in greater detail below. Following, we explain the independent variables after dividing them into three groups of factor determinants: *i)* economic, *ii)* integration and *iii)* institutional. All relevant information pertaining to variables outlined below will be also neatly summarised at the end of this section.

4.3.1.1 Economic Factors

A number of different measures have been proposed in the literature to approximate the market potential of a location, such as the absolute/relative values of GDP, per capita incomes and population size (e.g. Hunya and Geishecker, 2004). For our purposes, we remain closely aligned to the notion of market potential as originally described by Harris (1954). Thus, our variable *Market Potential* can be described as relative measure of national GDP, expressed in a common currency and at purchasing price parities, that is then discounted by great circle distance between the countries' capitals. In an alternative specification of the model we also consider the total size of population as a substitute for

GDP.[126] Irrespective of the variable specification, it is expected that, on average, foreign investors will display higher propensity to locate in countries with comparatively larger market potential.

In line with new trade theory models, factor endowments need to be given due consideration in our analysis as well. Therefore, two distinct indicators are included in the model. First, FDI is presumed to be attracted to locations endowed with skilled and productive labour force. We therefore proxy for labour productivity by dividing annual gross value added of an economy by the total number of hours worked. This is nevertheless only one side of the coin. From a foreign investor's point of view, labour costs are expected to matter to the same extent. To account for labour costs we divide total employment compensation by the total hours worked.[127] Higher labour costs imply higher costs in the production; hence, all else equal, we would expect them to negatively affect FDI stocks. However, considering both variables simultaneously in the model might lead to potential issues of collinearity.[128] As a result, we construct a composite indicator, *Skilled Labour*, in that we discount labour productivity by the corresponding proxy for labour costs. The resulting variable has a straightforward interpretation: countries with higher labour productivity but relatively lower labour costs have a comparative advantage in this respect and are expected to, on average, have larger FDI stocks. Thus, a positive sign is expected in front of the variable coefficient.

Second, natural resource endowments are included in the model as well. The variable *Natural Resources* is approximated by country level exports of ores and metals as

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[126] The data is sourced from a number of sources: GDP values are obtained from World Development Indicators (WDI) database (World Bank, 2009). Distance measures are provided by the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) while population data is sourced from Eurostat (May 2009 version).

[127] Information on gross value added and employment compensation is sourced from Eurostat while total hours worked is to be found in ILO's LABOURSTA database.

[128] Indeed, the two variables are almost perfectly linear as indicated by the partial correlation coefficient equal to 0.98, which is significant at a 1 percent confidence level.

percentage of total merchandise exports.[129] Its effects on the location of FDI are a priori ambiguous. On the one side, natural resources represent a comparative advantage for entities overseeing them. That alone may result in large FDI inflows, especially in sectors dependent on inputs coming from those resources (see, e.g., Campos and Kinoshita, 2003). On the other side, larger inflows in resource-seeking FDI might come at the expense of lower inflows in manufacturing and services FDI. As Beck and Laeven (2006) show, transition economies rich in natural resources have suffered more, on average, from higher rent-seeking behaviour of entrenched elites that has resulted overall in less attractive business environment and lower economic growth in those countries. This is expected to have negatively affected overall FDI flows.

Next, we also account for factors pertaining to the macro economic environment. Real effective exchange rate, variable *REER*, is a proxy for countries' price or cost competitiveness relative to the international markets.[130] The calculation of REER is based on the assumption that changes in competitiveness not only depend on exchange rate movements but also on cost and price trends (Eurostat, 2009). In theory, a rise in the index means a loss of competitiveness and, therefore, we would expect to observe a negative sign in front of the variable. However, as Cushman (1985) shows, the effect of REER on FDI is often ambiguous and dependent on underlying firm-level financing options and trade linkages. In other words, use of aggregate data may hide these very real firm-level effects. We therefore cannot determine a priori the expected sign in front of the variable coefficient.

Previous studies have indicated that the level of taxation in the host country has an effect on FDI location. The results have been nevertheless context specific and therefore a priori

[129] World Bank - WDI database (2009).

[130] Eurostat (2009). For technical details on how it is constructed see: http://ec.europa.eu/economy_finance/db_indicators/competitiveness/documents/technical_annex_en.pdf

ambiguous.[131] To operationalise the concept of taxation we chose the level of implicit tax rate on corporations, i.e. variable *Tax Corp*, as our preferred proxy. [132] In general, higher tax rates are expected to negatively affect location decisions of foreign investors, especially those driven by desire for cost savings. However, under the assumption that they are not prohibitively high, higher tax rates might also positively affect FDI inflows. Thereby, they can be understood as proxy for existence of a range of support infrastructure and services in a location, thus implying presence of positive externalities. The net effect of taxation on location of FDI remains therefore subject to empirical testing. This conclusion holds for most of the other independent variables as well.

Finally, we account for agglomeration economies in our empirical model as well. In general, there are three sources of positive externalities that can lead to spatial clustering of foreign investors: technology spillovers, industry-specific factors and linkages (Dunning and Lundan, 2008). As we are not able to distinguish between them in the present context of the study, we simply assume FDI to be attracted to countries with a larger share of already existing foreign investments. Thus, we interpret the presence of other foreign investors as a signal of favourable country conditions and reduced uncertainty levels. To construct the indicator we borrow from the existing literature and use lagged FDI stock levels to approximate the extent of FDI agglomeration [see, e.g., Cheng and Kwan (2000); Campos and Kinoshita (2003)].[133] The resulting variable *Agglomeration* is therefore expected to feature a positive sing in front of the variable point estimate.

4.3.1.2 Factor Integration

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[131] The results may vary according to the type of taxes employed, presence of alternative/supplementary investment incentives, tax treatment regimes between country-pairs, etc. (for a review see Bloningen, 2005)

[132] Our choice is influenced by the indicator's longer and more complete time series when compared to alternatives. The values are sourced from Eurostat (2009).

[133] Note that we estimate the agglomeration effect only in the dynamic specifications of the model.

As previously outlined, the term institutional factors refers to two distinct concepts in our context, i.e. structural reforms on the one side and perceived institutional quality on the other. Both of them are intrinsically linked to the integration process of the CEEC economies with the one of the EU. Thus, we proceed first by providing the broader context in which to fit the institutional factors; following, we discuss the proxies related to institutional reform and quality aspects.

The process of progressive economic integration of the CEEC with the EU was kick-started by countries' trade re-orientation towards European single market immediately after the transition process started. Thus, already in 1993 the share of the CEEC exports to the EU was at more than 50 percent of their cumulative exports (Crespo and Fontoura, 2007). At the time EU formally announced the accession of 8 CEEC, that figure was already more than two-thirds with tendency increasing.[134] Economic integration was closely followed by institutional integration. The signing of Europe Agreements in the first half of 1990s initiated formal accession negotiations between the EU and individual countries. Above all, the integration map highlighted structural reforms and creation of functioning market-based institutions as major pillars of that process. It follows therefore that economic integration and institutional factors are interdependent and they are expected to have fundamentally reshaped existing economic and political structures in the region.

The variable *Economic Integration* measures the extent of countries' economic integration with the EU being the ratio of trade (exports plus imports) in GDP.[135] Broadly speaking, greater economic integration enlarges effective size of markets for goods and services and is therefore expected to positively influence the location decisions of foreign

[134] As previously outlined, formal commitment for granting full membership has been made by the EU in 2001 and initially included 8 CEEC, excluding Romania and Bulgaria. The latter two received their invitation in 2006 and have accessed the EU in 2007.

[135] Note that in the literature the variable is often taken as a proxy for country's degree of openness and, hence, extent of economic integration with the world economy, if not specified differently. Here, we interpret it as the extent of economic integration with the EU given the importance of the single market in CEEC' trading patterns.

investors. Moreover, it provides incentives for further institutional integration and can be therefore assumed to have an impact on the reform process and overall institutional quality. We intend to account for this effect by considering interaction variables featuring *Economic Integration* and institutional factor determinants. Following, we discuss the latter in greater detail.

4.3.1.3 Institutional Factors

Our structural reform indicators are based on information provided in the EBRD's annual Transition Report. Since 1994, these reports have been the major source of information providing a detailed assessment of progress in transition (Snoy, 2001). The assessment considers a number of core dimensions of reform that are in line with main tenants of a market-based economy and include: market operations and trade, enterprises and financial institutions. Although there are nine indicators in total we focus here only on four of them that we deem of particular relevance to foreign capital.

From the methodological point of view, the indicators are constructed based on expert views who assign to each dimension a grade on a scale between 1 to 4 + , i.e. transition has not started yet as opposed to standards and performance are typically in line with those of advanced industrial economies.[136] For the sake of simplicity, we re-standardise the values to have mean zero and a standard deviation of one in order to allow for comparison of variables according to relative importance of their coefficient estimates. In all instances larger values indicate greater progress in achieving institutional reforms. Thus they provide information on the distance and speed of adjustment between the institutional frameworks and measure therefore the institutional effect as opposed to outcome.

[136] In calculating averages, '+' and '–' ratings are treated by adding 0.33 and subtracting 0.33 from the full value.

On market operations and trade, the indicator *Competition Reform* captures primarily the effectiveness of competition policy in combating market abuses and anti-competitive practices. Hereby, it is assumed that entry of foreign capital is to a certain extent conditioned on presence of competitive forces in the market. Anti-competitive behaviour on the side of either incumbent firms or governments is assumed to raise the likelihood of rent-seeking and collusion, thus also increasing barriers to entry and transaction costs for foreign investors. On enterprises, the indicators capture the introduction of effective enterprise restructuring policies and governance, *Enterprise Reform,* but also account for the extent in progress of small- and large-scale privatisation, *Privatisation Reform*. The former can be intertwined with the establishment of a competitive business environment in that it is primarily concerned with the formation of transparent legal frameworks, such as company and bankruptcy laws, but also creation of markets for corporate control, i.e. enabling environment for mergers and acquisitions. The latter relates mainly to progress in privatisation of state owned enterprises. It is assumed that more advanced countries in this field present the foreign investors with a larger menu of tangible investment opportunities and, hence, are more likely to generate FDI. Finally, the indicator *Infrastructure Reform* measures the progress in the restructuring of physical infrastructure networks (including utilities). In particular, the establishment of independent regulatory agencies has been paramount in this respect as it is a basic requirement for the design of effective legal and regulatory systems. The foreign investors on the other hand are expected to be highly sensitive to availability of timely and efficient infrastructure, given that it is an input factor in the production process. Besides, restructuring also implies to a certain extent ongoing efforts to privatise utilities providers, thus also represents a potential acquisition target for foreign investors.

Summarising, our specified measures of structural reforms relate to differences in institutional development between transition economies and developed market countries. In particular, they provide information on the distance and speed of adjustment between these institutional frameworks. For that reason, we do not treat them as institutional outcomes per se but rather as effects that impact overall institutional quality.

To account for institutional outcomes, i.e. perceived institutional quality, we utilise two distinct composite indicators. First, we make use of the Economic Freedom of the World Index (EFW) as compiled and provided by the Fraser Institute.[137] The index has been frequently used in growth related research [for recent contributions see, e.g., Justensen (2008); Xu and Li (2008); Faria and Hugo (2009)]. In the FDI literature, some authors have employed it as a generic indicator of a country's overall attractiveness (see, e.g., Bengoa and Sanchez-Robles, 2003). Its main advantage is the detailed and comparatively large set of indicators that are mostly based on robust economic data coming from the IMF and the World Bank. In our specific context, the indicator *Economic Freedom* represent a country's overall attained score that is a joint measure of the following five components: *i)* size of government, *ii)* legal structure and security of property rights, *iii)* access to sound money, *iv)* freedom to trade internationally, *v)* regulation of credit, labour, and business. Comparatively better performance in each of the five areas is assumed to imply also a better overall institutional quality. Corresponding data is available for all 10 CEEC for the period 1995 to 2005.[138]

Second, we make use of the Government Effectiveness Index that is sourced from the World Bank's Governance Matters reports.[139] In particular, our indicator *Government Effectiveness* describes the ability of governments to implement policy and effectively deliver public services. According to the authors, our designated variable measures the quality of public service provision, the quality of the bureaucracy, the competence of public servants, and the independence of the civil service from political pressures (Kaufmann et al., 2009). As with the preceding indicator, our primary focus is once again

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[137] http://www.freetheworld.com/datasets_efw.html

[138] Before 2000, the index has been published in a five year interval only. Therefore, we use linear interpolation to account for the sub-period 1995 to 2000. Moreover, the indicator is coded on a scale 0 to10 with higher values indicating better institutional quality.

[139] The data shown here are for 1996, 1998, 2000, and annually for 2002-2008 and are available online as part of the World Bank's Governance Matters report, available at http://info.worldbank.org/governance/wgi/index.asp.

the composite indicator that is a construct of 6 governance-related indicators as presented in Governance Matters reports.[140] Thereby, the overall score is derived based on expert opinions, surveys, and robust economic data. In all cases, higher rankings imply better institutional quality. Lastly, as with the structural reform variables, we also standardise both institutional quality indicators to have a mean zero and standard deviation of one. Finally, we summarise our preceding discussion of the variables in Table 4.1 below.

[140] As with the previous indicator, linear interpolation is used, where possible, to account for missing years. Besides that, the variable is coded on a scale -2.5 to 2.5 with positive scores indicating higher government effectiveness. Due to the original scaling of the variable negative values would be dropped from the data set when taking natural logarithms. In order not to lose those observations we rescale the indicator by adding (+3.5) to each observation.

Table 4.1: Summary of the variables used in the empirical model

Variable	Definition	Type	Expected sign	Source
FDI	FDI stock	(Dependent)		UNCTAD
Market Potential	GDP at PPP discounted by distance between countries' capitals	Economic	+	World Bank and CEPII
Skilled Labour	Ratio of value added/hour discounted by labour costs/hour	Economic	+	Eurostat and ILO
Natural Resources	Exports of ores and metals in total merchandise exports	Economic	+/-	Eurostat and ILO
REER	Real effective exchange rate	Economic	-	Eurostat
Tax Corp	Implicit corporate tax rate	Economic	+/-	Eurostat
Agglomeration	One-year lagged dependent variable	Economic	+	UNCTAD
Economic Integration	Ratio of total exports and imports to GDP	Integration	+	World Bank
Competition Reform	Annual EBRD score for competition policy reform	Structural Reform	+	EBRD Transition Report
Enterprise Reform	Annual EBRD score for enterprise restructuring and governance reform	...	+	EBRD Transition Report
Privatisation Reform	Annual EBRD score for small and large scale privatisation reform	...	+	EBRD Transition Report
Infrastructure Reform	Annual EBRD score for infrastructure reform	...	+	EBRD Transition Report
EBRD Reform	Composite index based on average of the four preceding reform indicators	Structural Reform	+	EBRD Transition Report
Economic Freedom	Overall score on Economic Freedom of the World Index	Institutional Quality	+	Fraser Institute
Government Effectiveness	Composite index measuring effectiveness of bureaucracy and public services	Institutional Quality	+	World Bank

4.3.2 Model Specification

It should be noted that the estimation strategy discussed in this section relates to the country level data for 10 CEEC countries only. We discuss the estimation approach and results relating to sectoral-level data and non-CEEC transition economies in subsequent sections. This section is divided into two parts. First, we explore the static model that is to be considered as our baseline specification. In relation to that, we provide a brief summary of the sensitivity analysis to follow, including instrumental and lagged variable estimation methods. Second, we discuss the dynamic framework based on the partial stock adjustment model (Cheng and Kwan, 2000). Subsequently, we present and interpret estimation results.

4.3.2.1 Static Model

Our basic empirical model is loosely based on the gravity model as frequently described in the trade literature [Anderson (1979); Anderson and Wintcorp (2003)]. In our context, the framework postulates that FDI stocks depend positively on the product of the market size (GDP) of observed economies and negatively on the distance between them. Typically, the gravity specification in the FDI literature includes additional explanatory variables, i.e. mostly economic factors that include proxies for factor endowments, macro economic environment, etc. Thus, our proposed baseline model reads as follows:

$$y_{it} = \alpha + \beta_1(\mathrm{H}_{it}) + \upsilon_{it} \tag{11}$$

where i indicates country $i = 1, 2,...10$; and t denotes the time $t = 1,2,..11$. The dependent variable y_{it} is the FDI stock, while the vector H_{it} includes economic factor determinants as summarised in Table 4.1 with υ_{it} being the remainder disturbance term.

The double-log specification is chosen due its particularly good adjustment to the data in the empirical literature (Daude and Stein, 2001). In addition, it relaxes the assumption of strict linearity of regressors while it reduces, at the same time, the likelihood of outliers.

The estimation approach is as follows. We first estimate random- and fixed-effects specifications of the baseline model, without institutional factors. According to Hsiao (2003) both generalised least squares and fixed-effects estimators can respectively be applied for this purpose. The former operates under the assumption of absent correlation between individual level effects on the one side and regressors and the overall disturbance term on the other. This is the so called orthogonality assumption (ibid). In contrast, the fixed-effects estimator relaxes the assumption of regression function being constant over time and space and assigns instead individual-specific intercepts to each unit. However, this comes at the expense of inferences being conditional on individual levels that are sample- rather than the population-specific. Instead, the random effects estimator identifies the population parameter that describes the individual level heterogeneity. Generally speaking, random-effects is more efficient estimator and to be preferred to the fixed effects specification of the model provided that the orthogonality assumption holds. Thus, it needs to be formally tested before we can decide on the estimator to be used. To do so we use the Hausman test statistic. A rejection of the null casts doubt on suitability of the random-effects estimator and suggests use of the alternative specification of the model, i.e. fixed effects.

Following the selection of the appropriate estimator we add remaining factors to the baseline equation. The fully specified empirical model reads then as follows:

$$y_{it} = \alpha + \beta_1(\mathrm{H}_{it}) + \beta_2 z_{it} + \beta_3(\mathrm{I}_{it}) + \upsilon_{it} \qquad (12)$$

where in addition to factors described in equation (1), z_{it} indicates the extent of economic integration while I_{ii} is the vector comprising all previously described institutional factors.

To be noted at this stage is a potential issue that pertains to the exact specification of the estimation model. Harshvylyn (2004) finds that commonly used measures of institutions tend to be highly correlated. In fact, this seems to be the case here as well. For instance, the pairwise correlation coefficient between *Economic Freedom* and *Government Effectiveness* is 0.75 (see Table 4.2). In order to avoid potential issues of multicollinearity we propose the following estimation strategy. Following the baseline specification we add institutional factors into equation (12) one at a time. Thereby, we explicitly assume that such an approach does not lead to omitted variable bias. To partially relax that assumption, individual reform indicators are then grouped into a composite indicator, *Reform EBRD*, which is calculated as the simple average of 4 individual reform indicators. The variable can be thought of as indicating the overall progress in structural reform process. In a similar vein to institutional quality factors, it further contributes to the sensitivity analysis as it reduces measurement problems of the individual components.

Other potential estimation issues may nevertheless persist. First, our specification of the model may be plagued by reverse causation. For instance, it is possible that FDI boosts the market potential of the host country by means of productivity spillovers which feedback into increased levels of GDP and ultimately market potential. The issue of reverse causation might nevertheless stretch beyond market potential aspects. In particular, FDI may directly affect the extent of economies' economic integration by significantly affecting the overall trading patterns of host countries. Alternatively, foreign investors might actively demand better institution and therefore have some leverage over the reform process in the host countries (Selowski and Martin, 1997). To account for these possibilities, we first make use of the two-step least square (2SLS) procedure and explicitly assume variable *Market Potential* to be endogenous in nature. In the next step, we consider an additional regression in which all regressors are entered in their one year

lags. The resulting coefficient can be assumed reliable provided that they do not differ substantially from the previous findings. In that case, we could infer that a potential bias due to reverse causality is negligible in our specification of the model (Wooldridge, 2002). The latter estimation approach has an additional advantage as opposed to the others in that it accounts for the time lag that it takes for a foreign investor to react to changes in location factors. Thus, it appears to be more closely affiliated to the reality on the ground.

4.3.2.2 Dynamic Model

Following static estimations, we consider a dynamic specification of the model which enables us to obtain several additional insights into our topic of interest. First, using a dynamic estimator we are able to account for the role of agglomeration forces in attracting FDI. In other words, we can derive certain conclusions on the path dependency of FDI flows in the context of CEEC. Second, the partial stock adjustment model that we introduce below allows us to comment on the speed of adjustment to the desired investment level and thus carries implications for the persistence of FDI. Finally, when considering a dynamic estimator we also intend to further test the robustness of our original results. Following, we briefly describe the theoretical framework that is used as a basis for further inquiry.

In particular, we make use of the partial stock adjustment model, as proposed by Cheng and Kwan (2000).[141] Thereby, it is assumed that investment flows serve to adjust the installed (actual) FDI stock y_{t-1} to the equilibrium FDI stock y_t^* so that,

$$y_t - y_{t-1} = \Theta(y_t^* - y_{t-1}) \tag{13}$$

the equation (13) can be re-arranged to read,

[141] see also, e.g., Campos and Kinoshita (2003) and Riedl (2010) for similar approaches in the context of transition economies.

$$y_t = (1-\Theta)y_{t-1} + \Theta y_t^* \tag{14}$$

The underlying logic of the model is as follows. From an investor's perspective, the transition to the equilibrium FDI stock level y_t^* involves a payment of certain adjustment costs, indicated by the parameter Θ . Following neoclassical investment theory, the parameter can be understood as the relative shadow price of investment in that it embodies all the useful information about the operating environment [Lucas (1963); Barro and Sala-i-Martin (2003)]. It relates positively to the level of investment and hence prevents investors from raising the capital stock to the equilibrium level instantaneously. Instead, they will choose to converge (or adjust) to that level at the speed determined by the size of Θ.[142] While the speed of adjustment depends on internal adjustment costs, the distribution of the FDI stock y_t^* is assumed to be determined by relevant location factors. Summarising those factors in terms of X_t , the complete model now reads:

$$y_t = (1-\Theta)y_{t-1} + \Theta\omega X_t \tag{15}$$

Alternatively, we can adjust it to our present context so that,

$$y_{it} = \alpha + \beta_0 y_{it-1} + \beta_1(\mathrm{H}_{it}) + \beta_2 z_{it} + \beta_3(\mathrm{I}_{it}) + \upsilon_{it} \tag{16}$$

where y_{it-1} is the lagged dependent variable. The consideration of the dynamic structure invariably leads to presence of endogeneity in the model as lagged dependent variable is correlated with the error term. To derive consistent estimates we follow the literature and

[142] The parameter is constrained to any value between 0 and 1.

estimate equation (6) using Arellano and Bond (1991) GMM estimator.[143] The estimator tackles the issue of endogeneity by using lagged levels of dependent variable y_{it-s} , where $s >= 2$ and $t = 3,4,..T$, in addition to any other independent variable as instruments in the estimation equation. To test the validity of specified instruments we use and report results from the Sargan test. When the number of observations is small relative to that of parameter estimates, however, we should be concerned with small sample bias being introduced in the GMM estimation. Because the data set we employ may suffer from such a bias, we report in addition results from an identical estimation using fixed-effects estimator.

4.3.3 Results

We start this section by first inspecting our underlying data for consistency. The basic summary statistics are presented in Table C4.1 in the Appendix C. It should be noted that all the regressors are time variant, as indicated by non-zero values in terms of within variation, and can therefore be considered in both random- and fixed-effects models. Next, we test for presence of potential outliers via box plot analysis (see Graph C4.2 in the Appendix C).[144] In general the observed values appear to be within the normal range. Closer inspection of variable *REER* however reveals two potential outliers.[145] To determine their leverage on the estimation equation we use Cook's Distance measure and conclude that inclusion of the marked observations does not significantly affect the underlying regression coefficients.[146] Next, variance inflation factors (VIF) are calculated to identify potential incidence of multicollinearity. The results are reported below in

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[143] The estimator is implemented in STATA 11using *xtabond2* command (Roodman, 2006).

[144] The presence of outliers can lead to inflated error rates and substantial distortions of parameter estimates (e.g., Zimmerman, 1998).

[145] In particular, they relate to observations for Bulgaria (1995) and Lithuania (1996) and might be due to either measurement error or simply a peculiarity of the transition process.

[146] While there is no theoretical justification for dropping these observations, it would be of considerable concern if our results were completely driven by them. Therefore, we re-estimate all our model specifications excluding the outlier observations and find no significant difference to results reported below.

Table 4.2 along with the pairwise correlation coefficients. When considered jointly, there appears to be significant collinearity among institutional factors in the first place as *EBRD Reform* is dropped from estimation while *Economic Freedom* features a VIF higher than 10. Further examination of the pairwise correlation coefficients supports this notion. While the pairwise correlation coefficients for the traditional set of regressors remain on average below 0.50, those relating to reform and institutional factors appear to be rather highly correlated with each other. Our findings therefore confirm previously made observations pertaining to generally high correlation among institutional indicators (see, e.g. Harshvylyn 2004). Hence, the proposed estimation approach of including one institutional factor at a time appears to be justified. Following, we proceed to a thorough discussion of estimation results.

Table 4.2: Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	**VIF**
1	Market Potential	1.00													3.84
2	Skilled Labour	-0.04	1.00												2.46
3	Natural Resources	-0.22	0.52	1.00											2.07
4	REER	0.42	-0.07	-0.04	1.00										2.87
5	Tax Corp	0.36	-0.10	0.23	0.12	1.00									3.54
6	Economic Integration	-0.05	-0.44	-0.26	0.26	0.08	1.00								2.78
7	Competition Reform	0.51	-0.37	-0.30	0.57	0.04	0.34	1.00							3.35
8	Enterprise Reform	0.54	-0.31	-0.45	0.28	-0.13	0.42	0.66	1.00						6.50
9	Privatisation Reform	0.22	-0.43	-0.22	0.48	0.03	0.51	0.62	0.52	1.00					2.94
10	Infrastructure Reform	0.45	0.03	-0.14	0.63	-0.09	0.16	0.59	0.57	0.55	1.00				4.00
11	EBRD Reform	0.51	-0.31	-0.32	0.60	-0.05	0.42	0.85	0.81	0.82	0.84	1.00			-
12	Economic Freedom	0.28	-0.35	-0.38	0.58	-0.31	0.51	0.74	0.72	0.74	0.73	0.89	1.00		12.11
13	Gov. Effectiveness	0.40	-0.40	-0.48	0.32	-0.09	0.50	0.67	0.86	0.57	0.55	0.79	0.76	1.00	5.16

Note: EBRD Reform automatically omitted when calculating VIF due to high collinearity with other institutional variables.

4.3.3.1 Static Estimations

In columns 1 and 2 of Table 4.3, we present baseline results pertaining to estimation of equation (11) using fixed effects and random effects estimators respectively. A first interesting point to note is that both models explain a high proportion – 77 and 79 percentage points respectively – of the total variation in FDI stocks. Moreover, the magnitude of the estimation coefficients does not differ significantly across the models, implying that both generate consistent point estimates of the slope parameters. However, as random-effects is more efficient in such situations, it is to be preferred to the fixed effects estimator. More formal support for our conclusion is derived by using the Hausman test statistic. In particular, we are not able to reject the stated null hypothesis and thus confirm the validity of orthogonality assumption. The subsequent discussion of results is therefore based on coefficient estimates associated with the random effects estimator.

The observed effects of economic indicators are broadly in line with those described in the existing empirical literature (Blonigen, 2005). Specifically, variables *Market Potential* and *Skilled Labour* are significant determinants of FDI while also featuring the expected sign. Interestingly, countries that exhibit a relatively greater dependency on exports of natural resources tend to receive on average less FDI. The negative relationship is statistically significant and, hence, lends tentative support to similar findings found elsewhere in the literature on transition economies, e.g. Beck and Laeven (2006). With respect to the macro economic indicators, the apparently positive effect of *REER* on FDI stocks is puzzling at first. It suggests that foreign investors are drawn to locations characterised by a steady appreciation of the REER and, thus, faced with decreasing (cost) competitiveness over time. In the CEEC context, this could imply that in particular market seeking investors are attracted to countries with higher purchasing power. An alternative explanation is that variable *REER* is picking up some of the positive effects associated with a move away from artificially low exchange rates towards a more stable

macroeconomic environment.[147] An equally interesting finding relates to the relationship between implicit corporate tax rates, variable *Tax Corp*, and FDI. In particular, the former seems to positively influence location choice of foreign investors as it is confirmed by the statistically significant coefficient estimate. Although this can be classified as a less conventional finding, it has been nevertheless previously reported in the literature (Bloningen, 2005). As a potential explanation, it may be argued that higher tax rates reveal additional information to foreign investors, in particular about the availability of physical and social infrastructure in a location. Thereby, it can be assumed that higher taxes are used to improve the business environment and should result, all else equal, in a more favourable investment climate.[148]

[147] We have also re-estimated the equation excluding REER obtaining qualitatively same results as reported here.

[148] However, it might be also argued that our choice of proxy may be of little relevance to foreign investors. Depending on the size of the investment, investors can often negotiate applicable tax rates directly with the national counterparts. Second, transition countries have competed for FDI intensively and thus offered elaborate investment incentive packages to foreign investors that might have compensated for higher tax rates.

Table 4.3: Determinants of FDI location: fixed- and random-effects estimators

Dependent variabl log of FDI stock									
	FE	RE	RE						
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market Potential	0.740***	0.731***	0.631***	0.693***	0.685***	0.697***	0.616***	0.537***	0.660***
	[0.071]	[0.066]	[0.059]	[0.071]	[0.056]	[0.048]	[0.047]	[0.069]	[0.063]
Skilled Labour	0.310***	0.284***	0.203***	0.222***	0.211***	0.132***	0.166***	0.192***	0.231***
	[0.056]	[0.053]	[0.057]	[0.059]	[0.053]	[0.041]	[0.043]	[0.052]	[0.054]
Natural Resources	-0.071**	-0.072**	-0.055*	-0.031	-0.080**	-0.063**	-0.085**	-0.087**	-0.063
	[0.035]	[0.034]	[0.030]	[0.042]	[0.039]	[0.026]	[0.033]	[0.035]	[0.044]
REER	0.346***	0.348***	0.281***	0.324***	0.278***	0.185***	0.200***	0.235***	0.277***
	[0.027]	[0.026]	[0.026]	[0.029]	[0.028]	[0.028]	[0.026]	[0.030]	[0.027]
Tax Corp	0.120***	0.096**	0.091***	0.071*	0.044	0.012	0.040	0.115***	0.073**
	[0.045]	[0.043]	[0.034]	[0.037]	[0.035]	[0.027]	[0.029]	[0.039]	[0.032]
Econ. Integration	-	-	0.196***	0.177***	0.127***	0.130***	0.100***	0.109***	0.198***
			[0.039]	[0.044]	[0.040]	[0.033]	[0.032]	[0.038]	[0.046]
Competition Ref.			0.130***						
			[0.030]						
Enterprise Ref.				0.016					
				[0.054]					
Privatisation Ref.					0.121***				
					[0.040]				
Infrastructure Ref.						0.208***			
						[0.032]			

Table 4.3 continued

	FE	RE	RE						
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
EBRD Reform							0.263***		
							[0.029]		
Econ. Freedom								0.249***	
								[0.062]	
Gov. Effectiveness									0.135**
									[0.060]
Hausman test stat.	-	4.01	-	-	-	-	-	-	-
(p-val)	-	(0.558}	-	-	-	-	-	-	-
R-squared (within)	0.93	0.93	0.95	0.94	0.95	0.96	0.96	0.95	0.95
R-squared (between)	0.69	0.71	0.70	0.70	0.77	0.83	0.82	0.77	0.69
R-squared (overall)	0.77	0.79	0.79	0.79	0.84	0.88	0.87	0.84	0.79
RMSE	0.18	0.18	0.14	0.16	0.17	0.15	0.15	0.16	0.16
Observations	110	110	110	110	110	110	110	110	110

Notes: FE and RE represent fixed- and random effects models respectively. The time period under consideration is 1995-2005. Heteroskedasticity corrected standard errors in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

In columns 3-6, we consider the effects of economic integration and structural reforms in addition to traditional determinants.[149] As expected, progressive economic integration has a positive and statistically significant impact on FDI in all specifications. Thus, in line with the theoretical predictions, it follows that more open and economically integrated locations attract comparatively more FDI. As regards structural reform indicators, the estimates show that their actual impact depends on the specific dimension considered. In particular, advances in reforms related to competition, privatisation and infrastructure have a positive and highly significant effect on investors' location decisions. In contrast, no statistically significant effect is evident for policy changes pertaining to enterprise restructuring and governance. If we were to rank the individual reform variables according to their importance, the most pronounced effects would seem to be associated with infrastructure reforms. More specifically, a one standard deviation increase in this indicator is expected to increase FDI stocks by a factor of 1.23.[150] A comparative analysis of all point estimates in column 6 is further revealing as it suggests that infrastructural reforms rank higher than most of the other economic factors, bar *Market Potential*. This is a significant finding that further highlights the role of infrastructure in determining spatial location of production. Nevertheless, we also notice positive effects of reforms that are related to issues of competition and privatisation. For instance, a one standard deviation improvement in the latter implies an increase in FDI stocks by a factor of 1.13 and is therefore in the order of same magnitude as an increase of one standard deviation in economic integration.[151] We therefore find preliminary evidence that several dimensions of the reform process seem to qualify as significant factors explaining the location of foreign investors.

There remains, however, a potential issues in that our approach may suffer from the omitted variable bias. The likelihood of that bias is expected to be particularity high if the

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[149] Recall estimation equation (12).

[150] exp(0.208)=1.233

[151] exp(0.121)=1.127, while for *Economic Integration* exp(0.130)=1.138

location of FDI is determined by a number of reform dimensions simultaneously. Although plausible, a joint consideration of individual factors may not be desirable in our case given the extent of correlation among the reform variables. If we were to consider them jointly that could potentially lead to issues of multicollinearity. In order to address the issue we cluster individual reform variables into the composite indicator *EBRD Reform*. The corresponding results are presented in column 7 of Table 4.3. As expected, the composite indicator is positive and highly significant while its point estimates dominate those of all the other explanatory factors, bar *Market Potential*. For instance, a one standard deviation improvement in overall index would increase FDI by a factor of 1.30.[152] Thus, from our preliminary analysis of FDI determinants we can conclude that the progress in reform process is perceived by foreign investors as one of the most significant location factors.

As previously argued, structural reforms carry also implications for the perceived institutional quality. Therefore, we first consider variable *Economic Freedom* that measures five "basic economic freedoms" including: *i)* size of government: expenditures, taxes, and enterprises*, ii)* legal structure and security of property rights, *iii)* access to sound money, *iv)* freedom to trade internationally and *v)* regulation of credit, labor, and business.[153] Second, we make use of World Bank's Government Effectiveness index that has been extensively used in empirical studies (see Globerman and Shapiro, 2002; also, Daude and Stein, 2007). It is worth recalling at this stage that variable *Government Effectiveness* measures the quality of public service provision and the quality of the bureaucracy, including independence of the civil service from political pressures (Kaufman et al., 2009). We report the results in columns 8 and 9 of Table 4.3. Starting with the former, it is evident that institutional quality, as measured by *Economic Freedom*, matters and it does so significantly. The magnitude of the point estimate on the coefficient is comparable in size and ranking to the indicator of composite reforms, i.e.

[152] exp(0.263)=1.296

[153] Note that each of the areas specified is given equal weight in the final score (see Economic Freedom of the World Report 2010).

EBRD Reform. Therefore, it can be concluded that aligning the institutional frameworks to commonly accepted standards of developed economies can have a largely positive effect on FDI. Given the components of the composite indicator, our results are therefore in line with previous studies that find positive relationships between property rights and FDI (Javorcik, 2004), openness and FDI (Motta and Norman, 1996) and financial liberalisation and FDI (Kinoshita and Campos, 2008). Finally, in column 9 we report the results from regression featuring the *Government Effectiveness* indicator. As expected, there exists a positive relationship between quality of bureaucracy and FDI which lends further support to overall findings derived until now. Nevertheless, the magnitude of the variable is approximately half the size of the preceding two indicators indicating that there exist significant variation among individual institutional factors in terms of their relative importance for foreign investors [for similar conclusion see, e.g., Daude and Stein (2007)].

So far, we have presented a one-sided view of institutional factors and their respective impacts on FDI location. The view has been one sided in that we have considered those factors in isolation. However, we have argued that institutional reform and quality are expected to be significantly affected by underlying changes in the economic environment. In the case of CEEC, progressive economic integration with the EU has preceded the institutional integration; thus also determining the pace of reforms and institution building. In particular, greater trade liberalisation required the CEEC to rapidly converge to the standards and requirements of developed market-based economies. From the theoretical point of view, Markusen (2002) provides a solid framework that links FDI inflows into an economy to the degree of its integration with regional and global markets. Here, we argue that the extent and speed of economic integration further affects investors' perception of host countries' progress in institutional reform and quality. Hence, we subsequently consider the join-effect of economic integration and institutional factors on FDI location. As previously outlined, the former can be approximated by a

country's ratio of overall trade in GDP, i.e. variable *Economic Integration*.[154] We interact the variable with each of the four structural reform indicators as well as the remaining three composite indices. The results are shown in Table 4.4.[155]

[154] Spies and Marques (2006) argue that trade volume is a good indicator of country's progress in the EU Accession process. They find that in particular Europe Agreements, CEEC' 'the integration road map', have had a significant impact on economies' trade re-orientation towards EU and away from rest of world.

[155] Note that the estimation equation remains structurally the same as initially specified.

Table 4.4: Determinants of FDI location: focus on interaction terms using random-effects estimator

Dependent variable: log FDI stock							
	RE						
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Market Potential	0.632***	0.660***	0.682***	0.687***	0.644***	0.622***	0.667***
	[0.058]	[0.065]	[0.058]	[0.052]	[0.057]	[0.063]	[0.061]
Skilled Labour	0.202***	0.218***	0.220***	0.149***	0.170***	0.202***	0.227***
	[0.057]	[0.059]	[0.056]	[0.048]	[0.056]	[0.060]	[0.054]
Natural Resources	-0.054*	-0.027	-0.064*	-0.048*	-0.040	-0.044	-0.055
	[0.031]	[0.046]	[0.038]	[0.027]	[0.035]	[0.037]	[0.042]
REER	0.282***	0.318***	0.287***	0.211***	0.258***	0.288***	0.286***
	[0.026]	[0.030]	[0.025]	[0.022]	[0.021]	[0.026]	[0.025]
Tax Corp	0.090***	0.075**	0.065**	0.033	0.053*	0.085**	0.072**
	[0.034]	[0.036]	[0.033]	[0.028]	[0.030]	[0.035]	[0.033]
Econ Integ * Comp Ref	0.267***						
	[0.044]						
Econ Integ * Enterp Ref		0.201***					
		[0.055]					
Econ Integ * Privat Ref			0.228***				
			[0.048]				
Econ Integ * Infra Ref				0.272***			
				[0.034]			
Econ Integ * EBRD Ref					0.303***		
					[0.051]		
Econ Integ * Eco Freedom						0.260***	
						[0.050]	
Econ Integ * Gov. Effect.							0.269***
							[0.061]
R-squared (within)	0.95	0.94	0.95	0.96	0.95	0.95	0.94
R-squared (between)	0.70	0.72	0.74	0.78	0.71	0.70	0.69
R-squared (overall)	0.80	0.81	0.82	0.85	0.80	0.80	0.79
RMSE	0.14	0.16	0.15	0.14	0.14	0.15	0.17
Observations	110	110	110	110	110	110	110

Notes: RE represents random effects models. The time period under consideration is 1995-2005. Heteroskedasticity corrected standard errors in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

In columns 1 to 7, we present results from regressions that include one interaction variable at a time. The overall fit of the model, along with the significance levels of control variables, closely follows the results obtained in preceding tables. Moreover, the joint effects of *Economic Integration* on the one side and reform and institutional quality indicators on the other are in line with our expectations. All the variables are positive and statistically significant at 1 percent significance level. We also note that the ranking of the relative importance of individual interaction terms closely resembles the ranking of institutional factors presented in Table 4.3. In particular, it is once again infrastructural reform, now paired with economic integration, that has the strongest location effect among reform variables. Still, there are some notable differences to previously obtained results as well. First of all, the indicator *Enterprise Reform*, when considered jointly with the extent of economic integration, now becomes highly significant predictor of FDI. In terms of its magnitude, it is directly comparable to the impact that *Skilled Labour* has on investment location. More detailed comparison of the size of estimation coefficients reveals further interesting results. For instance, a simultaneous increase of one standard deviation in the interaction term, *Economic Integration * Competition Reform,* is expected to increase FDI by a factor of 1.31.[156] In comparison, *Competition Reform* when considered on its own contributes to an increase in FDI stocks by a factor of 1.14 only.[157] We obtain qualitatively the same results for our composite indicators and, hence, conclude that the significance and magnitude of the interaction terms is more profound when compared to effects of individual institutional factors. In sum, progressive economic integration along with the institutional factors seem to reinforce each other and thus have a larger impact on influencing the location of FDI. As our research shows, location decisions of foreign investors appear to be skewed towards countries with better institutional environment but also more extensive economic links with other nations.

[156] exp(0.267) = 1.306

[157] exp(0.130) = 1.138

We have previously emphasised that our model may be potentially plagued by issues of reverse causation. The relationship between FDI and the proxy for *Market Potential* in particular may be expected to be endogenous in nature. As a matter of fact, the presence of foreign investors in a location might directly affect the market potential through various spillover effects that increase location's effective size. Nevertheless, possibility of other explanatory indicators being endogenous should be considered as well. For instance, the extent of economic integration into regional and global markets could be significantly affected by trading patterns of MNEs. Moreover, incumbent foreign investors might demand better institutions and, thus, endogenously affect the process of institutional reform.

To account for presence of potential endogeneity in the model we use two different methods. First, a two stage least squares estimator (2SLS) is applied to estimation equation (12).[158] Specifically, we treat *Market Potential* as endogenous variable while assuming other regressors to be exogenous. This assumption is subsequently relaxed. In order to derive consistent coefficient estimates we must find instrumental variable(s) that satisfy two properties: *i)* the instrument(s) must be uncorrelated with the error term and *ii)* they must be highly correlated with the regressor. We instrument for variable *Market Potential* using GDP per capita in terms of purchasing price parities as well as total population size. The pairwise correlation coefficients between the regressor and instruments *GDP* and *Population* are 0.62 and 0.61 respectively. Although we cannot test the validity of the assumption directly, we can assess the adequacy of instruments using Hansen's *J* statistic of over-identifying restrictions (Baum, 2006). A rejection of the null hypothesis casts doubt on the suitability of the instrument set. We report the test statistic following each of the estimations. Moreover, we explicitly test for endogeneity of the particular regressor using the difference of two Sargan-Hansen statistics.[159] The model is

[158] We use a two-step instrumental variable estimator assuming presence of conditional heteroskedasticity and first-order autocorrelation. The estimator is implemented in STATA 11 using the *xtivreg2* command.

[159] The test is implemented in STATA 11 using *endogtest* option.

tested under the assumption of conditional heteroskedasticity and in presence of fixed effects.

Next, as a means to account for possible endogeneity of any other regressor we follow Bellak et al. (2010), among others, and re-estimate the same model whereby all independent variables enter the regression in one-year lags. It follows that corresponding point estimates will be consistent provided that the present endogenous variables do not correlate with the future realisation of the error term. In that case, we would expect to observe close similarity between previously obtained results and present ones and, thus, conclude that a potential bias due to reverse causality is negligible in our specification of the model. Finally, and as a further measure of robustness, we repeat the same exercise by considering the joint effect of interaction terms resulting from the product of *Economic Integration* and institutional factors.

The results corresponding to outlined approaches are reported in Table 4.5. For the sake of brevity, we only present results related to the composite indices of structural reform and institutional quality.[160]

[160] Note that remaining estimations pertaining to individual institutional reform variables can be obtained from the author upon request.

Table 4.5: Determinants of FDI location: 2SLS and lagged independent variable approach

Dependent variable: log FDI stock

	Two Stage Least Squares (2SLS)			RE (L-1)			RE (L-1)		
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Market Potential	0.700***	0.602***	0.728***	0.646***	0.504***	0.721***	0.712***	0.673***	0.721***
	[0.066]	[0.088]	[0.071]	[0.060]	[0.090]	[0.093]	[0.078]	[0.083]	[0.083]
Skilled Labour	0.137***	0.169***	0.211***	0.200***	0.217***	0.273***	0.200***	0.230***	0.272***
	[0.052]	[0.052]	[0.052]	[0.046]	[0.056]	[0.066]	[0.067]	[0.071]	[0.062]
Natural Resources	-0.056**	-0.090***	-0.076*	-0.129***	-0.155***	-0.108**	-0.085**	-0.091**	-0.107**
	[0.025]	[0.034]	[0.041]	[0.039]	[0.037]	[0.053]	[0.042]	[0.043]	[0.047]
REER	0.199***	0.227***	0.254***	0.127***	0.138***	0.225***	0.190***	0.222***	0.228***
	[0.026]	[0.032]	[0.031]	[0.034]	[0.032]	[0.032]	[0.029]	[0.032]	[0.032]
Tax Corp	0.043	0.075**	0.048	0.028	0.125***	0.064	0.041	0.074*	0.061
	[0.028]	[0.032]	[0.030]	[0.032]	[0.043]	[0.040]	[0.037]	[0.043]	[0.040]
Econ. Integration	0.146***	0.122***	0.174***	0.103***	0.097**	0.195***	-	-	-
	[0.045]	[0.045]	[0.046]	[0.036]	[0.043]	[0.058]			
EBRD Reform	0.210***			0.284***					
	[0.045]			[0.046]					
Econ. Freedom		0.205***			0.351***				
		[0.063]			[0.074]				
Gov. Effectiveness			0.122**			0.107			
			[0.052]			[0.084]			
Econ Integ*EBRD Ref							0.317***		
							[0.067]		
Econ Integ*Eco Freedom								0.286***	
								[0.063]	
Econ Integ*Gov. Effect.									0.256***
									[0.078]
Fixed effects	yes	yes	yes	no	no	no	no	no	no
Hansen *J* test	3.04	2.63	3.86	-	-	-	-	-	-
Hansen-Sargan test	0.89	0.02	0.26	-	-	-	-	-	-
F-stat	237.64	189.94	180.72	-	-	-	-	-	-
R-squared (within)	-	-	-	0.93	0.93	0.91	0.92	0.92	0.91
R-squared (between)	-	-	-	0.79	0.72	0.67	0.69	0.67	0.67
R-squared (overall)	-	-	-	0.84	0.79	0.74	0.76	0.76	0.74
Observations	100	100	100	100	100	100	100	100	100

Notes: RE represents random effects models. The time period under consideration is 1995-2005. All the variables in columns (4) to (9) enter in their one-year lags (L-1).

Instruments: (L-1) log of GDP per capita and (L-1) log of total Population. Heteroskedasticity corrected standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

In columns 1-3, we first present point estimates from the 2SLS instrumental variable approach. The first observation relates to validity of specified instruments. In particular, the Hansen *J* test of over-identifying restrictions indicates that we cannot reject the null hypothesis of independence of instruments and the disturbance process. In other words, the specified instrumental variables are valid. However, following the endogeneity test and corresponding Sargan-Hansen statistic, neither can we reject the null hypothesis that *Market Potential* can be treated as exogenous in our specification of the model. Thus, estimating the model via instrumental variable approach might be overly restrictive and inefficient in absence of endogeneity (Hauk and Wacziarg, 2009). A closer look at the estimation results is still informative. In general, it should be noted that the coefficient signs and significance levels remain largely in line with our preceding estimations. However, they appear to be somehow smaller in absolute size which might be due to inefficiency of the chosen estimator. As to the institutional factors, they remain a notable determinant of FDI even when accounting for presence of reverse causality. Thus, we find further support to our initial set of findings pertaining to this group of variables.

In columns 4-6, we use a heteroskedasticity consistent GLS estimator and introduce lagged independent variables into the regression. Thereby, we intend to account for presence of other potentially endogenous regressors. Once again, the results are very similar to those obtained in the initial specification of the model except for the variable *Government Effectiveness* that remains positive although loses its significance. The reasons for this could possibly be due to reduced sample size. Still, we find the results comforting and interpret them as further confirmation of absence of reverse causality in the model.

Finally, results from estimations featuring previously specified interaction terms of *Economic Integration* and composite institutional indicators are reported in columns 7-9. As before, the lagged regressors provide us with qualitatively same results as presented in columns 1 to 6 of the same table. An interesting observation can be made with respect to

the effect of natural resource endowments on FDI when controlling for the joint effect of interacted variables. Whereas their impact on FDI appears to be largely insignificant in the initial estimations, the present results suggest existence of a robust and inverse relationship between natural resources and location decisions of foreign investors. In other words, it appears that countries relying more on exports of natural resources tend to attract, all else equal, less FDI. Indeed, Beck and Laeven (2006) derive the same results for a larger set of transition economies suggesting that higher rent-seeking, associated with extractive industries, hampers the institution building process.

Overall, the results so far show that structural reforms and institutional quality have a significant and economically important effect on location of FDI. Moreover, not all dimensions of institutional frameworks appear to have the same importance to foreign investors. The importance of reforms in particular is confirmed by the significance of the composite indicator that ranks high in all our estimations; being the most important location factor, bar *Market Potential*. As previously noted, the extent and speed of structural reforms have been largely determined by the process of CEEC's institutional integration with the EU. Thus, we might interpret progress in reform as a strong signalling device that contains information for the foreign investors on the potential size of transaction and transformation costs in a location. Indeed, the joint consideration of economic integration on the one side and institutional reforms on the other points towards significant interdependency between these factors in the context of CEEC. With respect to the individual reform indicators, infrastructural reforms rank highest followed by policy changes pertaining to competition and privatisation. In contrast, reforms related to enterprise restructuring and governance remains largely insignificant. The results for indicators on institutional quality are also broadly in line with our expectations. Both basic economic freedoms, as measured by variable *Economic Freedom* and *Government Effectiveness* are good predictors of foreign investments.

4.3.3.2 Dynamic Estimations

In this section we intend to enrich our analysis in at least three different ways. First, by estimating dynamic instead of static models we further probe into the overall robustness of previously derived results. Second, based on the theoretical framework developed by Cheng and Kwan (2000) we assess the effects of agglomeration forces on FDI in addition to our standard regressors. Finally, we also make an attempt at estimating the speed (time) it takes for FDI to adjust to its equilibrium level. Thus, we are able to derive some conclusions on the persistence of FDI in transition economies. In order to do so, we estimate the partial stock adjustment model as proposed by Cheng and Kwan (2000) and as summarised in equation (16). The specification of the model is dynamic in that it includes a lagged dependent variable on the right hand side of the estimation equation. As already discussed, the most commonly used estimator for dynamic panel models is the GMM estimator by Arellano and Bond (1991). However, as we noted earlier an often mentioned weakness of GMM estimator is that its properties hold when *N* is large, although they can be severely biased in small-sample dynamic panels (Beck and Levine, 2001) and dynamic panels with a short time dimension (Nerlove, 2002). As this might be the case in our sample, we report in addition a fixed-effects model for comparison purposes. The results related to those two estimators are jointly reported in Table 4.6.[161]

[161] Note that, once again, we only present results for the composite indices relating to institutional factors. Table C4.3 in Appendix C features results based on estimations of individual institutional reform variables.

Table 4.6: Determinants of FDI location: dynamic specification of the model

Dependent variable: log FDI stock

	Arellano-Bond GMM			Fixed Effects		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
FDI (L-1)	0.523***	0.530***	0.522***	0.526***	0.554***	0.576***
	[0.061]	[0.038]	[0.056]	[0.064]	[0.045]	[0.059]
Market Potential	0.380***	0.362***	0.391***	0.351***	0.330***	0.351***
	[0.053]	[0.057]	[0.053]	[0.060]	[0.065]	[0.059]
Skilled Labour	0.086**	0.104***	0.117***	0.088*	0.106***	0.116**
	[0.034]	[0.034]	[0.038]	[0.041]	[0.032]	[0.036]
Natural Resources	-0.056**	-0.060	-0.072**	-0.058**	-0.065	-0.060
	[0.028]	[0.038]	[0.033]	[0.024]	[0.036]	[0.035]
REER	0.083***	0.090***	0.102***	0.077**	0.095**	0.098***
	[0.023]	[0.032]	[0.027]	[0.027]	[0.034]	[0.029]
Tax Corp	0.030*	0.044***	0.034***	0.041*	0.050**	0.042**
	[0.016]	[0.016]	[0.012]	[0.020]	[0.015]	[0.014]
Econ. Integration	0.025	0.019	0.035	0.028	0.016	0.025
	[0.025]	[0.024]	[0.023]	[0.033]	[0.031]	[0.031]
EBRD Reform	0.082**			0.110**		
	[0.040]			[0.036]		
Econ. Freedom		0.069*			0.060	
		[0.036]			[0.040]	
Gov. Effectiveness			0.064			0.028
			[0.042]			[0.032]
Hansen *J* test	0.01	1.78	0.09	-	-	-
AR(1)	-2.33**	-2.08**	-2.10**	-	-	-
AR(2)	-0.69	-0.69	-0.64	-	-	-
R-squared (within)	-	-	-	0.98	0.97	0.98
R-squared (between)	-	-	-	0.95	0.95	0.94
R-squared (overall)	-	-	-	0.95	0.96	0.94
Observations	90	90	90	100	100	100

Notes: The time period under consideration is 1995-2005. Heteroskedasticity corrected standard errors in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

In columns 1-3, we first present coefficient estimates using Arellano-Bond GMM estimator. In particular, we notice that there is evidence of first order autocorrelation AR (1) in the residuals, while we cannot reject the null hypothesis of no second order autocorrelation, i.e. AR(2). Thus, we confirm consistency of the estimator with respect to serial correlation. In addition, we cannot reject the null hypothesis of over-identifying restrictions. In other words, the Hansen *J* test confirms validity of specified instruments.

Next, we proceed to a more detailed discussion of derived results. Overall, we notice a rather significant drop in the magnitude of coefficient estimates once lagged dependent variable is included in the estimation. It follows that the results of static and dynamic models are not easily comparable to each other. Nonetheless, both composite indicators, *EBRD Reform* and *Economic Freedom*, retain their explanatory power and remain significant, the latter only weakly. In contrast, *Government Effectiveness* retains the sign though appears to be insignificant in the dynamic specification of the model. A closer look at the individual reform indicators is comforting (Table C4.3 in the Appendix C). All variables retain their signs while reforms pertaining to infrastructure and competition are statistically significant as well. These findings further highlight differences in importance of individual institutional factors and underline the significance of market-based policy adjustments related to factors infrastructure and competition in particular.

As regards the role of agglomeration effects, there appears to be remarkable path dependency in location decisions of foreign investors in CEEC. This is indicated by the positive and highly significant coefficient of the lagged dependent variable. Thus, past FDI stocks are a good predictor of future investments flows. Our finding is therefore in line with other studies for transition economies [see, e.g., Campos and Kinoshita (2003) and Riedl (2010)].

Lastly, we calculate the corresponding coefficient of partial adjustment factor (β_0) in equation (16). In doing so, we are able to determine the average period of adjustment to the desired investment level. For instance, the value of the coefficient estimate of the lagged dependent variable in column 1 is 0.52, indicating a coefficient of partial adjustment *alpha* of 0.48. In other words, the net investment in one year is 48 percent of the difference between the equilibrium y_t^* and current investment level y. If the steady-state level of the FDI stock does not change, it will take about 2 years for the gap between the equilibrium and the current FDI stock to close. This finding is in contrast to those derived by Kinoshita and Campos (2003) for 25 transition economies as well as Riedl (2010) for 8 CEEC. While the former authors estimate the time gap to be in the range of approximately 5 years (lag coefficient 0.81), the estimated lag parameter in Riedl's study is even higher (ranging from 0.85 to 0.87). Both studies therefore point towards higher persistency of FDI.[162]

In columns 4-6, we present the results from fixed effects model. In terms of indicator signs and magnitude they are almost identical to those obtained by the GMM estimator and, thus, we do not discuss them at large. Overall, the fact that very little variation is found between GMM and fixed-effects estimator indicates that the gains coming from the former might be minimal in a small sample setting such as the one here.

[162] Nevertheless, the differences might potentially be explained in terms of considered time periods and sample sizes. Campos and Kinoshita (2003) focus on the early period of transition, 1990 to 1998. Especially the first half of the 1990s has been marked by transitional shocks which may have distortive effects on their results. Riedl (2010) on the other hand focuses on a more stable period, 1998-2004, however sources data from only 20 manufacturing and services industries to construct a panel that is significantly larger in size when compared to ours (overall 1085 observations).

4.4. SECTORAL AND NON-CEEC FDI DETERMINANTS

4.4.1 Sectoral Determinants

So far, our inquiry into FDI location factors has been based on the assumption of equal slope parameters between different sectors of an economy. However, recent empirical evidence suggests that FDI location factors might be to a certain extent sector dependent [see, e.g., Pusterla and Resmini (2005); also Resmini (2007)]. Moreover, we have exclusively focused on FDI stocks without taking into consideration other measures of FDI intensity. To further probe into the role of institutional factors in attracting foreign investments, we estimate an equation that allows for different slope parameters between manufacturing and services sectors. Additionally, as a means to further test the robustness of our results we employ an alternative indicator of FDI intensity that is discussed further below. The empirical model reads therefore as follows:

$$Ln\left(\frac{y_{is}}{1-y_{is}}\right) = \alpha + \beta_1(\mathrm{H}_{is}) + \beta_2 z_{is} + \beta_3(\mathrm{I}_{is}) + \upsilon_{is} \qquad (17)$$

where i signals country and s = 1,2 indicates the sector.

Our dependent variable now measures the share of foreign enterprises in total population of enterprises at the two-digit level of NACE Rev. 1.1 classification of industries.[163] Note that, since the dependent variable has values ranging between 0 and 1 we might be faced with the truncated variable problem. To avoid that issue we perform logistic transformation of the variable, as indicated above. Overall, data for 23 manufacturing and

[163] Hereby, an estimation of the model in terms of relative shares of foreign enterprises, instead of absolute FDI stocks, serves us as an additional robustness check. We have made an attempt at obtaining sector specific information on FDI stocks, however, they were not available free of charge at the time of this research. Riedl (2010), for instance, uses sector specific data on FDI stocks for a number of manufacturing and services industries in 8 CEEC.

17 services industries are available for the years 2003 and 2004.[164] Our subsequent analysis is based on the mean values of those two years. In total, we have a cross sectional sample with a total of 400 observations (40 industries*10 countries), missing values included. In the best possible case our explanatory variables would be sector specific. Due to data limitations, this is not feasible and we therefore restrict the control variables to existing measures that we deem most relevant for the proposed estimation approach.[165] In particular, we consider market potential and factor endowments variables while also taking into consideration certain economic policy aspects, e.g. taxation. In order to capture the effects of progressive integration on institutional factors we discuss here below results from regressions featuring previously specified interaction terms. We also run regression without interaction terms; the results for individual composite institutional factors are analogous to those presented below and therefore will not be further discussed at this point.[166] Finally, country dummies are also considered to capture any systematic differences between host economies.

The model is first estimated using standard OLS estimator following White's (1980) procedure to obtain heteroskedasticity consistent standard errors. As a means to reduce potential issues of endogeneity we introduce a time lag into the equation whereby reported values on the dependent variable relate to the period 2003/2004, and those related to the independent variables relate to 2001. Still, the bias due to endogeneity of some of the regressors might be persistent in our data. As previously mentioned, FDI may directly affect the market potential of a location. Besides, previous empirical research has shown that it can also have a direct effect on labour productivity and costs of the host location via various forms of positive and negative spillovers [see, e.g., Aitken and Harrison (1999); Smarzynska (2002); Barry et al. (2001)]. For robustness purposes we

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[164] Data source: Eurostat, Structural Business Statistics (2010). The complete list of two-digit industry codes is provided in Table A2.1 in the Appendix A.

[165] In particular, we do not consider variable *REER* as it can be argued that the competitiveness component at the sectoral level is much better captured by indicator *Labour Productivity.* We use REER nevertheless as an instrumental variable when using 2SLS estimator.

[166] They are available upon request.

therefore re-estimate equation (17) using instrumental variables. Our choice of instruments for the indicator *Market Potential* includes, as previously, total population and GDP per capita at purchasing price parities. As regards *Labour Productivity,* the first instrument features a measure of unemployment rates among working population with upper secondary and post-secondary education. It is assumed that higher educational attainments are associated with higher productivity levels while higher rates of unemployment are assumed to, on average, result in lower wages. Second, we also consider R&D expenditures as percentage of GDP as more abstract indicator of knowledge base and, hence, productivity levels of the host country. For similar reasons as outlined previously, we decide to introduce the institutional factors into equation (17) one at a time and chose to work with the log specification of the model.[167] For the sake of brevity, in Table 4.7 we only report the estimates of the interaction terms of variable *Economic Integration* and composite indicators pertaining to institutional factors.[168]

[167] Besides that, all variables enter the equation recoded such that they feature mean zero and unit standard deviation. This is to enable an easier comparison across regressors and their respective point estimates.

[168] As before, detailed results on remaining interaction terms are neatly summarised in Table C4.4 in the Appendix C.

Table 4.7: Determinants of FDI location at the sectoral level: cross-section OLS estimates

Dependent variable: log share of foreign invested firms

	Manufacturing			**Services**		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Market Potential	0.152	0.143	0.170**	0.502***	0.531***	0.447***
	[0.094]	[0.102]	[0.080]	[0.177]	[0.187]	[0.160]
Skilled Labour	-0.735***	-0.730***	-0.705***	-0.209	-0.224	-0.301**
	[0.111]	[0.109]	[0.100]	[0.146]	[0.142]	[0.126]
Natural Resources	0.961***	0.945***	0.931***	0.948***	0.995***	1.040***
	[0.172]	[0.174]	[0.178]	[0.263]	[0.269]	[0.276]
Tax Corp	-0.415*	-0.418*	-0.419*	-1.497***	-1.489***	-1.484***
	[0.250]	[0.250]	[0.249]	[0.391]	[0.390]	[0.389]
Econ Integ * EBRD Ref	-0.152			0.464**		
	[0.122]			[0.193]		
Econ Integ * Eco Freedom		-0.130			0.397**	
		[0.104]			[0.165]	
Econ Integ * Gov. Effect.			-0.118			0.360**
			[0.095]			[0.150]
Dummy variables	yes	yes	yes	yes	yes	yes
F-test (p-val)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
R-squared	0.33	0.33	0.34	0.28	0.28	0.29
Observations	219	219	219	159	159	159

Notes: OLS estimates. The dependent variable corresponds to 2003/2004 while independent ones to 2001. All regressions include country dummy variables. Heteroskedasticity corrected standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

In columns 1-3, we first present OLS results for the manufacturing sector. These can be directly contrasted to the findings for the services sector in columns 4-6. A first point to note is that the goodness of fit for both regression models is acceptable, as indicated by the coefficient of determination R^2. Moreover, the individual country effects are jointly significant, thus suggesting that they should be included in the proper specification of the model. With respect to the estimation results, we notice significant differences in location patterns of FDI when allowing for different slope parameters across sectors. Interestingly, the dominant effect of *Market Potential* that we have previously observed somewhat disappears for the manufacturing in the post-2001 period. Although the indicator retains the expected sign it remains nevertheless insignificant in majority of specifications. At first surprising, the observed phenomenon can be potentially explained by referring to similar findings in Lankes and Venables (1996). In particular, they argue that especially in the initial stages of transition, FDI in manufacturing sector is market seeking. However, as the region becomes more integrated and domestic industries become parts of international value chains the FDI becomes more export-oriented, i.e. resource-seeking. Indeed, a closer look at the positive and highly significant indicator of natural resource endowments may imply just that. Services sector on the contrary appear to be market-seeking and, hence, more sensitive to changes in variable *Market Potential*.

Surprisingly, foreign investors seem to shun locations endowed with comparatively more efficient labour force as indicated by the negative sign in front of variable *Skilled Labour*. The negative effect is especially pronounced in the manufacturing sector, however, depending on the specification of the model it also applies to services sector. While this is contrary to our expectations, we might argue that the dynamics leading to such an observation extend beyond the CEEC. In particular, the rise of emerging markets, and especially China following its accession to the WTO in 2001, has made it difficult for transition economies at large to produce manufacturing goods at globally competitive price levels. Therefore, our indicator might be picking up some of the global trends in FDI as well. In addition, progressive economic and institutional integration with the EU

also implies price convergence, at least in the long-run, which might deter efficiency seeking investors from making long-term commitments in the region.

In contrast, comparatively larger abundance in natural resources is positively and significantly related to presence of foreign firms in the CEEC. In fact, it is the most significant location factor for manufacturing indicating that FDI in this sector might be primarily driven by resource-seeking motives. More surprisingly, however, is the finding that the same pattern applies to services sector. This is indeed counter-intuitive. However, as recent studies have shown there might be significant interdependencies between manufacturing and services when choosing investment locations. For instance, Nefussi and Schwellnus (2010) compare the location determinants of French foreign investors and find no fundamental difference between the location factors of these two sectors. Moreover, they demonstrate that the location of business services is dependent on downstream demand generated by manufacturing affiliates. In a similar vein, Defever (2006) examines the location determinants of services and manufacturing, finding evidence of complementarities at the firm level especially between the location of R&D and production. As sophisticated markets for services in pre-transition period were non-existent in most of the region, it is plausible to assume that FDI in services has potentially also followed the demand generated by FDI in manufacturing.

As regards the taxation variable, we detect a uniform negative effect on both sectors although with largely diverging coefficient estimates. Services sector in particular appears to be sensitive to changes in implicit corporate tax rates as indicated by a rather large size of the coefficient estimates. Accordingly, a one standard deviation increase in corporate tax rate would decrease the share of foreign investors by a factor of 3.6 in services, that being in rather strong contrast to the recorder factor of 1.6 for manufacturing.

The most interesting results relate nevertheless to the role of economic integration and institutions. A comparison of coefficient signs and magnitudes in columns 1-3 and 4-6 is indicative. The joint effect of economic integration on the one side and institutional factors on the other has positive and significant implications for services sector, while the opposite holds true for manufacturing. For instance, a one standard deviation increase in the interaction term while controlling for *EBRD Reform* increases the share of foreign investors in services by a factor of approximately 1.5. The effect is almost comparable in size to the one exercised by variable *Market Potential* and therefore highlights the importance of economic integration and reforms in attracting services sector FDI in particular. Indeed, the progress in achieving conformity with rules and regulations governing the common market is expected to especially affect location choices of services. This is mainly due to their higher dependency on coherent institutional frameworks that assure effective use of mostly intangible assets. Besides, we notice variation in importance of different reform dimensions for the location of FDI in services. In particular, infrastructural reforms seem to be most significant drivers followed by reforms pertaining to privatisation, competition and enterprise restructuring and governance respectively (Table C4.4 in the Appendix C).[169] The composite indicators of overall institutional matter as well, indicating that entry of foreign investors in this particular sector can be encouraged by a deepening of integration and effective provision of soft input factors.

In contrast, manufacturing appears to be less affected by the extent of economic integration and institutional factors. In fact, the sign in front of the coefficient estimates is negative in all specification, even though it remains statistically insignificant. In our view, the most plausible explanation for observed patterns goes back to the examination of motives why foreign investors chose one location over another. In the preceding paragraphs we have shown that manufacturing FDI in the CEEC has been largely driven

[169] Interestingly, the highest shares of foreign investors in CEEC in the year 2004 relates to transportation and communication services, in particular: Air transport (NACE code: I61), Water transport (I62) and Post and telecommunications (I64).

by resource-seeking motives. As Spar (1999) argues, this type of FDI depends in the first place on the availability of raw materials and, thus, choices are relatively limited when choosing between alternative investment sites. It follows that resource-seeking investors are relatively resistant to changes in the economic environment, such as the extent of economic integration or institutional quality, as choices between different supply modes of foreign markets do not apply in their context.

To test the validity of our arguments we finally re-estimate the model using 2SLS estimator under the consideration of previously specified instrumental variables. The results are reported in Table 4.8 while being structured in the same way as in the preceding discussion.

In general, we notice that in terms of signs and significance, the results presented here broadly resemble those using OLS. In particular, the diverging patterns between manufacturing and services with respect to various FDI location factors are once again confirmed, albeit with certain caveats. In particular, we highlight the loss of significance on the coefficient estimates relating to institutional factors for services sector FDI. Still, the tendency as approximated by the indicator signs remains nevertheless intact and as previously described. Additionally, there is a rather significant decrease in the size of estimated coefficients across the range of independent variables. This might potentially hint towards measurement error associated with certain instruments that could render the estimator less efficient.

Table 4.8: Determinants of FDI location at the sectoral level: cross-section 2SLS estimates

Dependent variable: log share of foreign invested firms

	Manufacturing			**Services**		
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Market Potential	0.062	0.035	0.050	0.439**	0.476**	0.449**
	[0.105]	[0.117]	[0.096]	[0.193]	[0.205]	[0.178]
Skilled Labour	-0.281***	-0.308***	-0.286***	-0.025	-0.026	-0.046
	[0.095]	[0.101]	[0.096]	[0.113]	[0.121]	[0.113]
Natural Resources	0.297***	0.292***	0.276***	0.431***	0.472***	0.469***
	[0.092]	[0.095]	[0.093]	[0.161]	[0.161]	[0.157]
Tax Corp	-0.232***	-0.230***	-0.229***	-0.368***	-0.382***	-0.376***
	[0.069]	[0.069]	[0.067]	[0.135]	[0.130]	[0.125]
Econ Integ * EBRD Ref	-0.101			0.054		
	[0.094]			[0.149]		
Econ Integ * Eco Freedom		-0.112			0.103	
		[0.091]			[0.145]	
Econ Integ * Gov. Effect.			-0.126			0.094
			[0.085]			[0.136]
Wald chi-squared	35.24***	35.65***	35.16***	13.76***	14.01***	14.20***
Observations	219	219	219	159	159	159

Notes: 2SLS estimates. The dependent variable corresponds to 2003/2004 while independent ones to 2001. Instruments: Unemployment rate, R&D expenditures
Heteroskedasticity corrected standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Summarising, in this section we have explored the determinants of FDI at the sectoral level in the post-2001 period. Overall, we observe to a certain extent a diverging pattern of FDI location between the two sectors. Whereas services appear to be primarily market-seeking the same motive may be only secondary for investors in the manufacturing sector. Instead, they appear to be drawn to location that are comparatively more endowed with primary input factors; thus their motives might be mainly resource-seeking. Additionally, we only partially confirm the role of institutions as significant location factor. While institutional aspects appear to be of importance for services sector FDI, no direct effect is evident for manufacturing. Although the significance of our results is less pronounced in the alternative estimation of the model, we still conclude that due consideration should be given to sectoral differences when analysing role of institutional factors in determining location of FDI.

4.4.2 The Case of Non-CEEC Transition Economies

In this sub-section, we venture beyond the CEEC to consider an additional set of transition economies. Thereby, our focus shifts to transition economies of Commonwealth of Independent States (CIS) and South-East Europe Countries (SEEC) respectively.[170] Over the past two decades most of these countries have experienced similar economic conditions to those described for the CEEC. This is of little surprise as their pre-transition market structures have been modelled and governed by very similar market principles. Thus, at the outset of the transition process, they were faced with much the same structural problems as the CEEC including, among others, falling income levels, obsolete production technologies and absence of market institutions [for an excellent and extensive review see, among others, Aslund (2002)]. In contrast to the CEEC, most of those countries only gradually embraced trade and FDI as the driving forces of market-based economic integration and technological change. Their reform process has been

[170] CIS economies included: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
SEEC feature: Albania, Bosnia and Herzegovina, Croatia, Macedonia FYR, Moldova. Note that Serbia and Montenegro have been excluded from the sample due to unavailability of data.

significantly slower due to more profound transitional shocks and generally higher levels of political uncertainty and instability.[171] Still, given the commonalities that they share with the CEEC, including initial conditions and inherited institutional frameworks, we regard these two regions as legitimate comparator groups for further robustness testing with respect to the role of institutional factors in attracting FDI.

Thus, our dataset covers FDI inflows to 15 non-CEEC transition economies over the period 1998-2005. Note that we use FDI inflows instead of stocks due to data limitations.[172] The relevant information has been sourced from the World Development Indicators database provided by the World Bank. With respect to the control variables, we restrict our inquiry to the following two variables due to limited availability of comparable data. First, we approximate countries' *Market Size* by the measure of national GDP expressed in a common currency at constant prices and purchasing price parities.[173] Second, the extent of *Economic Integration* with the rest of the world is measured as the share of overall trade (export plus imports) in GDP.[174] We also introduce a lagged dependent variable to account for potential agglomeration effects. As to the institutional reform indicators, they are defined as before and have been extracted for each of the countries in the sample from the same source, EBRD's Transitions Reports. Furthermore, definition of the variable *Government Effectiveness* remains as previously. In contrast, most of the SEE and CIS countries are not captured in the Economic Freedom Index of the World database. As a result, we make use of a closely related Index of Economic Freedom compiled by the Heritage Foundation that contains information on all

[171] Svejnar (2002) places the declines in GDP at 13-25% in Eastern Europe, 40 percent in the Baltics, and 45-65% in the Commonwealth of Independent States (CIS). Besides that, the majority of the countries also lacked real prospects for full EU membership. This was particularly the case for all SEE countries throughout the 1990s while it still applies to CIS economies.

[172] In fact, we regard this as an advantage as it enables us to employ yet another measure of FDI intensity. This further strengthens our empirical inquiry into the robustness of underlying results.

[173] Note that we do not discount the GDP by the any measure of distance. Hence, the resulting variable is not to be directly set equal to *Market Potential* as previously described.

[174] The relevant data source for constructing both control variables is the WDI database, World Bank.

economies in our sample.[175] Thus, we note that *Economic Freedom (Heritage)* can be only tentatively compared to previously derived results. In sum, the estimation equation reads as follows:

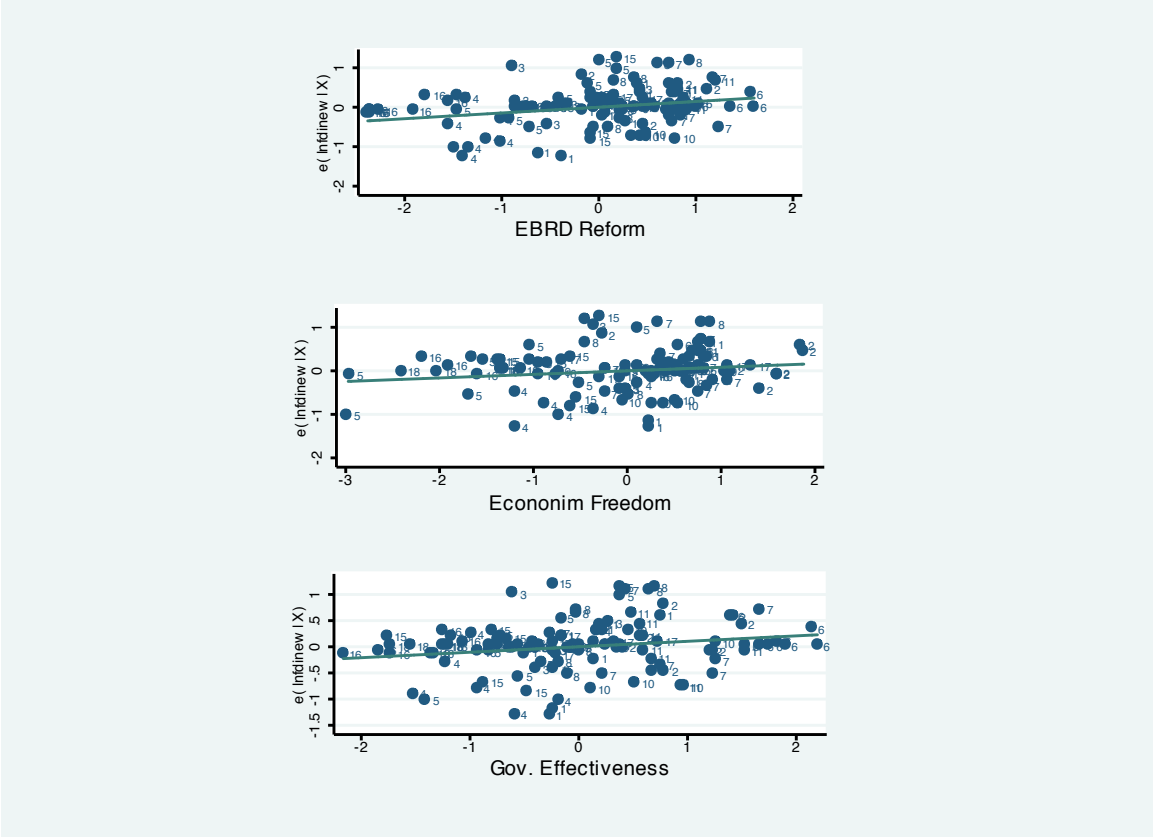
$$y_{it} = \alpha + \beta_0 y_{it-1} + \beta_1 \mathrm{M}_{it} + \beta_2 z_{it} + \beta_3 (\mathrm{I}_{it}) + \upsilon_{it} \quad (18)$$

where y_{it} is the dependent variable as measured by the FDI inflows in country *i* at time *t*. y_{it-1} is the lagged dependent variable, M_{it} is the market size of previously described control variables while I_{it} is the vector including institutional factors and υ_{it} is the remainder disturbance term.

In Figure 4.1, we first examine the relationship between FDI inflows and aggregate institutional factors after controlling for *Market Size* and extent of *Economic Integration*.

[175] The index measures ten components of economic freedom including aspects of trade, investments, government spending, property right and corruption, among others. We use the overall, averaged, score of all ten categories on a scale ranging from 0 to 100, the latter implying maximum freedom. For missing values, we use linear interpolation where possible.

Figure 4.1: Partial correlations between FDI inflows and institutional factors



As evident from the added-variable plots, there appears to exist a positive relationship between composite indicators of institutional reform and quality on the one side, and FDI on the other. In other words, higher FDI inflows into non-CEEC transition economies are more likely to be associated with countries that exhibit a stronger progress in implementation of structural reforms and that are endowed with better quality institutions. A more formal examination of the relationship is presented in Table 4.9.

Table 4.9: Determinants of FDI location in non-CEEC transition economies: dynamic specification of the model

Dependent variable: log FDI inflows							
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FDI (L-1)	0.089	0.092	0.091	0.073	0.052	0.115	0.153*
	[0.095]	[0.095]	[0.106]	[0.092]	[0.090]	[0.103]	[0.087]
Market Size	0.673***	0.766***	0.629***	0.446**	0.658***	0.505*	0.684***
	[0.210]	[0.198]	[0.204]	[0.210]	[0.240]	[0.323]	[0.191]
Econ. Integration	0.292**	0.278**	0.272**	0.292**	0.252*	0.310**	0.243**
	[0.134]	[0.135]	[0.130]	[0.147]	[0.144]	[0.136]	[0.107]
Competition Reform	0.127						
	[0.141]						
Enterprise Reform		0.168*					
		[0.086]					
Privatisation Reform			0.273**				
			[0.131]				
Infrastructure Reform				0.254*			
				[0.144]			
EBRD Reform					0.361**		
					[0.140]		
Econ. Freedom						0.086	
						[0.112]	
Gov. Effectiveness							0.148
							[0.093]
Hansen *J* test	*8.10*	*10.02*	*10.39*	*7.83*	*11.05*	*9.90*	*7.16*
AR(1)	*-2.13***	*-2.10***	*-2.00***	*-2.04***	*-2.11***	*-2.07***	*-2.63****
AR(2)	*-1.417*	*-1.550*	*-1.521*	*-1.481*	*-1.450*	*-1.568*	*-1.268*
Wald chi-squared	40.09***	32.80***	37.44***	39.96***	34.07***	33.89***	30.77***
Observations	117	117	117	117	117	117	116

Notes: Arellano-Bond GMM estimates. The time period under consideration: 1997-2005.

Heteroskedasticity corrected standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

In columns 1-7, the results following Arellano-Bond GMM approach are presented. To be noted is that the Hansen *J* test of over-identifying restrictions accepts the null hypothesis of valid instruments. Moreover, Arellano-Bond test indicates absence of second order serial correlation (AR2); we are therefore able to proceed to the discussion of estimation results.

In particular, we notice that both control variables, *Market Potential* and *Economic Integration,* have on average positive and significant impact on FDI inflows. The magnitude of the estimated coefficients is comparable in size to those presented in the baseline estimations for the CEEC. In other words, aggregate FDI flows to SEE and CIS countries display similar patterns to those observed for FDI stocks in the CEEC, i.e. on average FDI seems to be attracted to larger and more integrated (open) economies. Interestingly, past FDI flows do feature the expected sign although fail the significance test in all specification bar one.

Turning to our main indicators of interest, a first notable observation to be made is that the structural reforms and institutional quality indicators withstand the robustness test. They all feature the expected sign in front of the coefficient estimates with majority of them also being significant. Specifically, we find that various dimensions of progress in institutional reform contain sufficient power to explain FDI flows to the regions. The results are interesting when compared to those for the CEEC, as from investors' point of view they hint towards non-uniform reform priorities. For instance, the most significant reform dimension in the context of SEE and CIS countries is *Privatisation Reform*, while *Enterprise Reform* appears to be significant as well, though only weakly. The latter is in contrast to observations made in the context of the CEEC where it was largely insignificant in most of the specifications. It follows that, foreign investors prefer to invest in countries that are relatively more advanced in the privatisation and restructuring process of state-owned enterprises. This finding may therefore highlight once again the difference in stages of transition across Eastern Europe.

Finally, both indicators of institutional quality remain positive with the magnitude of coefficient *Government Effectiveness* being comparable in size to the one obtained in baseline specification for the CEEC. Nevertheless, both indicators appear to be insignificant. This might be due to a number of reasons including, among others, the parsimonious specification of the model, the nature of the dependent variable or discrepancies in measurement of *Economic Freedom* indicators. It may also potentially imply that institutional quality becomes an important location factor only once institutional reforms have generated visible effects. Still, based on our analysis we are confident that the underlying results obtained in this section provide further support for our hypothesis that institutional factors, and in particular structural reforms, are important determinants of FDI in the context of economic transition.

4.5 CONCLUSION

In this final essay we use a quasi experimental setting as provided by the context of economic transition in 10 CEEC economies, to examine the role of institutional factors in determining location of FDI. Our particular focus is dedicated to a better understanding of differences among institutional factors, namely structural reforms and perceived institutional quality, in terms of their underlying impact on FDI location patterns and in the specific context of transition economies. The specified time series includes the period 1995 to 2005, and thus enables us to consider almost the entire period of CEEC' EU integration process. We start our investigation by estimating static and dynamic panel models followed by cross-sectional analysis of location factors at the sectoral level. Finally, for comparison purposes, we examine the effects of institutional factors on FDI inflows in non-CEEC transition economies, including CIS and SEE countries. Prior to highlighting the research findings we briefly summarise our contributions to the relevant body of literature on this topic.

First, our inquiry considers a longer and more recent time period than most other available studies related to the CEEC economies. As outlined in the review of empirical literature on transition economies, the vast majority of previous studies have been limited either to purely cross sectional inquiry or only the initial years of transition. By focusing on almost the entire period of transition affecting the CEEC we are therefore able to account for determinants of inward FDI in a more extensive or complete manner, hence offering a more robust analysis on the subject matter. Second, following the recent work of Campos and Kinoshita (2008), we apply a novel approach to examination of institutional factors by decomposing institutional aspects into structural reforms and perceived institutional quality. Such an approach is beneficial in that it allows us to account for a country's speed of convergence towards commonly accepted institutional standards, while at the same time, taking into consideration perceived quality of existing institutional frameworks. To the best of our knowledge our paper is the first to consider as many different institutional factors and rank them according to their importance to foreign investors. By doing so we have the intention not only to distinguish between institutional efforts and outcomes but also to flag those factors that truly matter for FDI location. Third, a further novelty in the context of transition economies in particular is that we translate our approach into a systematic investigation of FDI determinants at the sectoral level. In other words, we subject the institutional factors to sectoral dynamics associated with FDI in manufacturing and services respectively. So far, there has been relatively little inquiry into sectoral determinants of FDI and even less so on the cross-sectoral comparison of the same. Fourth, in contrast to the majority of existing empirical studies in this field we estimate both static and dynamic panel models while also making use of cross sectional analysis as a means to test robustness of our underlying findings. Finally, our study explicitly compares the institutional factor determinants of FDI in the CEEC with an alternative sample of non-CEEC economies. This comparison adds a potentially important perspective on whether and, if so, how the institutional factors impact FDI location patterns when controlling for variation in stages of transition and

regional integration that are being observed across East European transition economies. Following, we provide a concise summary of our results.

In general, we find firm evidence on existence of a positive and robust relationship going from better institutional environment to increased FDI. Our analysis therefore provides further support to the empirical growth literature linking institutions to economic outcomes (for instance, Acemoglu et al. 2001). More specifically, however, our research efforts further strengthen the nascent FDI literature focused on a more thorough understanding of institutional factors affecting location decisions of foreign investors (see Campos and Kinoshita, 2008). In this respect, the analysis conducted here reveals the particular importance of institutional *reforms* for FDI location. The significance of various proxy variables is confirmed in nearly all specifications of the models and appears to be reinforced when considered jointly with the process of economic integration with the EU. Hence, we show that in the context of transition economies the EU integration process is to be understood as the driver of the process of institutional convergence and as such a major determinant of FDI inflows into the CEEC. Nevertheless, it is worth highlighting that foreign investors assign different values to individual reform factors in terms of their respective importance. Accordingly, from foreign investors' perspective, infrastructural reforms rank highest followed by policy changes pertaining to competition and privatisation. In contrast, reforms related to enterprise restructuring and governance remain positive though mostly insignificant. From the above, it follows that foreign investors are placing a certain premium on presence of efficient hard infrastructure in a locality which, according to the conclusions in the preceding essays, is thought to be a major factor in deepening of cross-border market integration and expanding of the market potential of a locality. In a similar vein, Campos and Kinoshita (2008) find a robust empirical relationship going from structural reforms to FDI. They focus thereby on examining structural reforms related to financial and trade liberalisation as well as privatisation efforts. While our line of inquiry goes in parallel with their recent contribution, our paper is complementary in nature in that it

focuses on a different set of reform factors that have not been previously examined and as such provides a significant contribution to the literature.

Another important contribution to the literature stems from the sector specific estimations of the underlying econometric model. To the best of our knowledge, our paper is the first on transition economies to launch a detailed inquiry into institutional factor determinants of FDI at the sectoral level. The results are indeed interesting as we detect diverging pattern in terms of FDI determinants when controlling for different sectors of an economy: whereas services FDI appear to be primarily market-seeking, the same motive may be less relevant for foreign investors in the manufacturing sector. In fact, in our estimations the latter appears to be drawn to locations that are comparatively more endowed with primary input factors; thus we conclude that in the context of the CEEC manufacturing, FDI may be primarily resource-seeking. More interestingly, however, we detect significant differences in terms of the role of institutional factors in determining FDI location patterns across sectors. In particular, while institutional factors appear to be of importance for services sector FDI, no direct effect is evident for location of manufacturing FDI. We posit that such a finding may be explained by underlying sector-specific characteristics, such as services sector reliance on mostly intangible assets that rely on efficient institutional frameworks to enforce and protect intellectual property rights. We therefore conclude that due consideration should be given to sectoral differences when analysing role of institutional factors in determining location of FDI.

Finally, a comparison with other transition regions of Eastern Europe, namely SEE and CIS countries, reconfirms the importance of institutional factors with progress in implementation of reforms being a particularly important aspect for FDI in these regions as well. In contrast to the CEEC, firm-level reforms such as privatisation and restructuring appear to be especially relevant for foreign investors. This is a reassuring finding in that it formally highlights the distinct phases of transition across distinct East European regional groupings. Nevertheless, a conclusion common to all of them is that

faster adjustment of commonly accepted institutional frameworks and standards has a positive effect on location of foreign investors. In view of the above, our research contains direct policy implications. In particular, countries that are rapidly integrating into larger and *deep* RIAs are well advised to invest into their institutional frameworks, especially by assuring supply and smooth operations of (hard) infrastructure; as we have shown in our research, infrastructure appears to serve as a crucial market integration factor for both, manufacturing and services sectors. Alternatively, countries excluded from membership aspirations are well advised to engage into a deepening of existing *flat* RIAs. Hence, by providing a more reliable and predictable institutional framework modelled after existing elaborate integration agreements, such as the EU, the countries engage into positive signalling of potentially reduced transaction costs and increased attractiveness of their respective localities for investment purposes. Given the experience of the CEEC, our research strongly suggests that reform and institutional quality improvements have a strong effect on location patterns of FDI in transition economies, thus directly affecting the economic growth of these economies.

APPENDIX C

Appendix C4.1 : Summary statistics

Variable		Mean	Std. Dev.	Min	Max	Observations	
Market Potential	overall	368.40	306.24	45.40	1447.03	N =	110
	between		283.33	90.94	919.24	n =	10
	within		144.47	110.47	896.19	T =	11
Skilled Labour	overall	2.13	0.24	1.54	2.65	N =	110
	between		0.24	1.67	2.48	n =	10
	within		0.10	1.90	2.37	T =	11
Natural Resources	overall	4.09	2.64	0.94	14.25	N =	110
	between		2.54	2.08	10.80	n =	10
	within		1.05	1.53	7.54	T =	11
REER	overall	104.37	14.10	71.47	146.38	N =	110
	between		4.94	97.66	114.25	n =	10
	within		13.29	73.14	136.50	T =	11
Tax Corp	overall	16.42	6.02	3.40	32.30	N =	110
	between		5.75	8.12	22.73	n =	10
	within		2.48	10.69	25.99	T =	11
Economic Integration	overall	90.10	25.17	37.20	138.30	N =	110
	between		23.26	50.02	116.21	n =	10
	within		11.92	56.14	116.49	T =	11
Competition Reform	overall	2.62	0.45	1.00	3.30	N =	110
	between		0.33	2.06	3.05	n =	10
	within		0.32	1.56	3.29	T =	11
Enterprise Reform	overall	2.86	0.45	2.00	3.67	N =	110
	between		0.41	2.03	3.27	n =	10
	within		0.22	2.10	3.44	T =	11
Privatisation Reform	overall	3.47	0.54	2.00	4.00	N =	110
	between		0.43	2.95	4.00	n =	10
	within		0.35	2.22	4.22	T =	11
Infrastructure Reform	overall	2.74	0.59	1.00	3.70	N =	110
	between		0.36	2.25	3.47	n =	10
	within		0.48	1.22	3.52	T =	11
EBRD Reform	overall	2.92	0.42	1.50	3.67	N =	110
	between		0.32	2.41	3.45	n =	10
	within		0.29	2.02	3.42	T =	11
Economic Freedom	overall	6.14	0.85	3.98	7.85	N =	110
	between		0.62	5.06	7.04	n =	10
	within		0.62	4.65	7.56	T =	11
Gov. Effectiveness	overall	3.00	0.44	1.82	3.61	N =	110
	between		0.41	2.21	3.37	n =	10
	within		0.21	2.37	3.42	T =	11

Graph C4.2: Box plot analysis

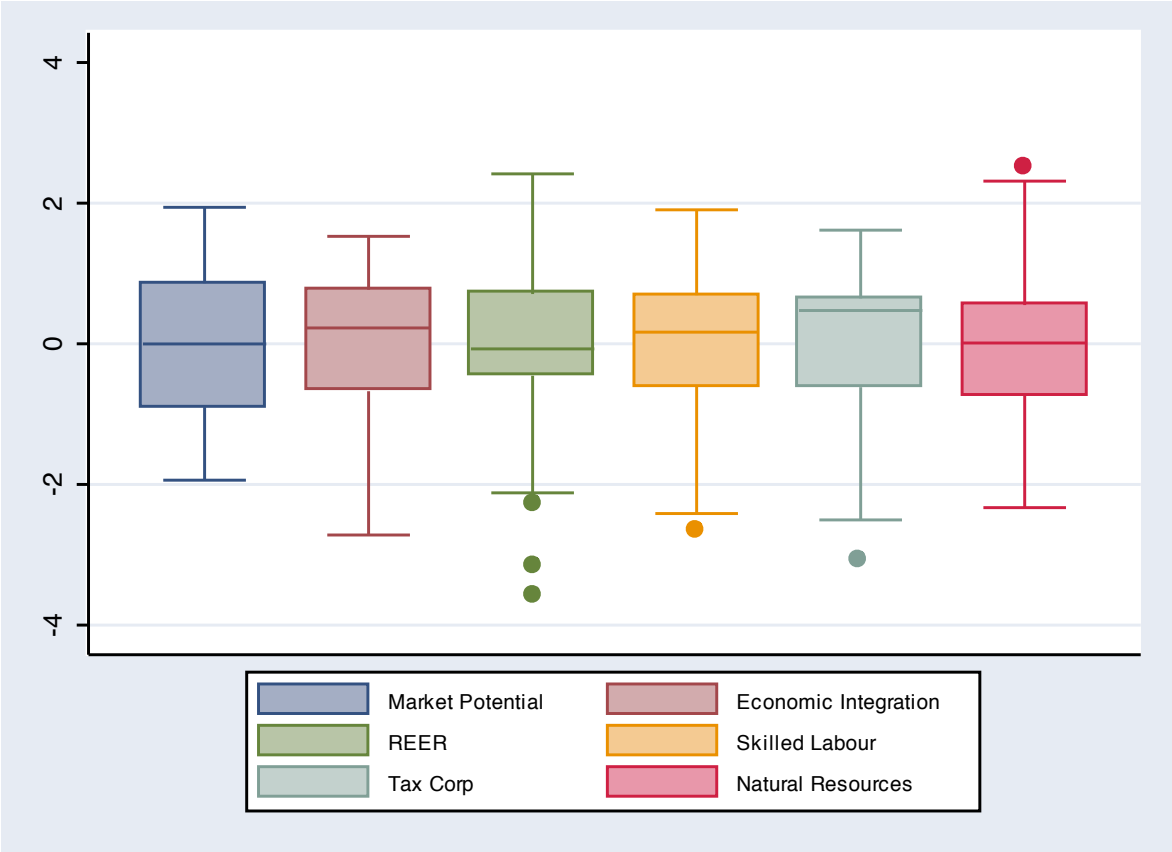


Table C4.3: Determinants of FDI location: dynamic specification of the model (individual reform factors)

Dependent variable: log FDI stock

	Arellano-Bond GMM				Fixed Effects			
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FDI (L-1)	0.525***	0.592***	0.575***	0.518***	0.551***	0.589***	0.583***	0.534***
	[0.063]	[0.052]	[0.045]	[0.052]	[0.064]	[0.055]	[0.054]	[0.059]
Market Potential	0.391***	0.367***	0.369***	0.422***	0.356***	0.321***	0.353***	0.392***
	[0.052]	[0.055]	[0.055]	[0.056]	[0.060]	[0.053]	[0.061]	[0.060]
Skilled Labour	0.099***	0.105**	0.103***	0.079**	0.102**	0.097*	0.114***	0.086**
	[0.037]	[0.042]	[0.032]	[0.035]	[0.033]	[0.047]	[0.035]	[0.036]
Natural Resources	-0.054*	-0.063*	-0.070**	-0.050	-0.058*	-0.040	-0.056	-0.059*
	[0.028]	[0.032]	[0.029]	[0.032]	[0.029]	[0.033]	[0.032]	[0.028]
REER	0.097***	0.092***	0.095***	0.061**	0.101***	0.100***	0.099**	0.066*
	[0.025]	[0.030]	[0.027]	[0.027]	[0.027]	[0.030]	[0.032]	[0.033]
Tax Corp	0.044**	0.028**	0.026**	0.024*	0.049**	0.037*	0.042**	0.034*
	[0.019]	[0.014]	[0.013]	[0.013]	[0.018]	[0.018]	[0.015]	[0.016]
Econ. Integration	0.040	0.013	0.012	0.025	0.034	0.020	0.017	0.021
	[0.026]	[0.022]	[0.023]	[0.027]	[0.033]	[0.032]	[0.030]	[0.033]
Competition Reform	0.055**				0.045			
	[0.023]				[0.031]			
Enterprise Reform		0.005				0.053		
		[0.059]				[0.066]		
Privatisation Reform			0.022				0.017	
			[0.024]				[0.023]	
Infrastructure Reform				0.084***				0.082**
				[0.021]				[0.027]
Hansen *J* test	0.12	0.13	2.19	0.01	-	-	-	-
AR(1)	-2.18***	-2.12***	-2.17***	-2.43***	-	-	-	-
AR(2)	-1.18	-0.59	-0.53	-0.31	-	-	-	-
R-squared (within)	-	-	-	-	0.98	0.97	0.98	0.97
R-squared (between)	-	-	-	-	0.93	0.95	0.94	0.94
R-squared (overall)	-	-	-	-	0.94	0.96	0.95	0.95
Observations	90	90	90	90	100	100	100	100

Notes: The time period under consideration relates to 1995-2005. Heteroskedasticity corrected standard errors in square brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%.

Table C4.4: Determinants of FDI location at the sectoral level: cross-section 2SLS estimates (individual reform factors)

Dependent variable: log share of foreign invested firms

	Manufacturing				Services			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Potential	0.099	0.172**	0.139	0.195***	0.664***	0.443***	0.543***	0.373***
	[0.137]	[0.079]	[0.105]	[0.062]	[0.234]	[0.158]	[0.191]	[0.139]
Skilled Labour	-0.788***	-0.744***	-0.690***	-0.705***	-0.048	-0.182	-0.347***	-0.300**
	[0.139]	[0.115]	[0.096]	[0.100]	[0.194]	[0.153]	[0.120]	[0.126]
Natural Resources	1.005***	0.957***	0.918***	0.951***	0.813***	0.961***	1.078***	0.980***
	[0.169]	[0.172]	[0.181]	[0.173]	[0.254]	[0.265]	[0.282]	[0.267]
Tax Corp	-0.440*	-0.404	-0.315	-0.464*	-1.421***	-1.532***	-1.802***	-1.349***
	[0.246]	[0.253]	[0.283]	[0.242]	[0.379]	[0.397]	[0.459]	[0.370]
*Econ Integ * Privatisation Ref*	-0.176				0.534**			
	[0.140]				[0.222]			
*Econ Integ * Competition Ref*		-0.149				0.453**		
		[0.119]				[0.189]		
*Econ Integ * Infrastructure Ref*			-0.215				0.655**	
			[0.172]				[0.273]	
*Econ Integ * Enterprise Ref*				-0.118				0.360**
				[0.095]				[0.150]
R-squared	0.32	0.33	0.32	0.33	0.28	0.28	0.29	0.28
Observations	219	219	219	219	159	159	159	159

Notes: OLS estimates. The dependent variable corresponds to 2003/2004 while the independent ones to 2001. All regression include country dummy variables.

Heteroskedasticity corrected standard errors in square brackets. * significant at 10%; ** significant at 5%; *** significant at 1%.

Chapter 5

Conclusion

5.1 CONTRIBUTIONS AND SUMMARY OF FINDINGS

The purpose of here conducted research was to advance our understanding of the link between a range of factor determinants and industry location patterns in the context of economic transition and progressive regional integration. The CEEC region was deemed to be especially suitable for this type of inquiry as it provides a quasi natural experiment type of setting. In the course of transition, market forces replaced government planners while democracy and regional integration substituted for oppressive and inward-looking regimes. Based on these underlying changes in the socio-economic environment of the CEEC, our inquiry has been guided by three main objectives. First, we aimed at providing a comprehensive picture of changes in industry location patterns over the course of transition and integration process. Second, we have launched an attempt at explaining those underlying changes by not only focusing on (traditional) economic determinants of industry location. Instead, we haven also accounted for the application of a variety of policy approaches and instruments and their possible effects on spatial dynamics of industry location at both national and regional levels. Finally, given the importance of FDI as a market integration and economic growth factor, we have attempted to make explicit the link between the levels of institutional development and FDI location patterns across countries and sectors.

In Chapter 2 of the thesis we provided an account of the geographical location patterns at the national level for 23 manufacturing industries across 10 CEEC, covering the period 1995 to 2005. Using novel sources of industry-level data our particular focus centred around a comprehensive assessment of changes in patterns of manufacturing concentration and dispersion over time and across space. Moreover, we have made a significant effort explaining those underlying changes by estimating a number of empirical models; the hypothesis being rooted in established theoretical models and including traditional and new trade theories, as well as NEG. In general, we make a number of valid contributions to this particular stream of literature. In contrast to existing research the rich panel dataset that we deploy allows us to track developments in a larger number of industries over almost the entire transition period. Thus, the empirical inquiry into the subject matter is unique in that our study is the first to impose structural breaks in the estimation models with the aim to examine changes in manufacturing location as a result of changes in structural and industrial policies affecting market integration. As regards the results, we provide evidence that manufacturing industries have been increasingly dispersed in space over time and that the observed patterns may, at least to some extent, be explained by the use of highlighted policies. Interestingly, our research shows that the trend towards industry dispersion gained pace following the announcement of the first round of EU's Eastern Enlargement in 2001, and potentially has further affected the development trajectories of individual CEEC economies.

To assess whether industry re-location has indeed affected development prospects of individual CEEC, we have then launched a more detailed inquiry into regional aspects of industry location in Chapter 3 of the thesis. In particular, our aim was to identify how the process of transition and regional integration might have affected agglomeration patterns of industries across dichotomous types of internal and border regions. Once again, this research has benefited from a new source of regional data that in this particular case consisted of 43 NUTS-2 regions located in 5 CEEC for the period 1999 to 2007. While exploiting the insights from a novel data set can already be seen as a contribution to the

existing literature in itself, we have advanced the stock of knowledge pertaining to the topic at hand in a number of additional ways. Specifically, in contrast to the existing research, we have used complementary tools such as spatial autocorrelation statistics as a means to measure the true extent of industry agglomeration across regions. More importantly, our study has been the first on transition economies to formalise in an empirical model deployment of targeted regional assistance programmes that are aimed at enhancing geographical position of recipient regions. Broadly speaking, the analysis conducted using spatial autocorrelation statistics suggested existence of an ongoing process of spatial polarisation among the CEEC regions whereby industry location became more skewed over time towards Western border regions; that being most likely at the expense of lower industry agglomeration in Eastern border regions. We have therefore provided some preliminary evidence that proximity to the core EU markets matters for observed industry concentration patterns in the CEEC. However, the research has also shown that industry location patterns in the CEEC are indeed industry specific. First and foremost, they appeared to be largely influenced by individual industries' technology intensity in the production as, on average, low-technology intensive industries appeared to be linked to regions endowed with natural resources; in contrast, location of high-technology intensive industries and services appeared to be rather dependent on regions' proximity to the core EU markets.

Building on those insights, we have launched an econometric analysis into determining industry location factors that matter in the context of transition economies. A salient conclusion coming out of our inquiry is that more accessible regions appear to be, all else equal, characterised by a more extensive agglomeration process within their respective borders. At the same time, we have provided further robust evidence on the role of transportation infrastructure as a crucial factor in reducing the incurred trade costs and thus achieving higher levels of industry concentration. As a matter of fact, our empirical findings corroborate two major propositions from NEG literature in that market potential along with the availability of hard infrastructure represent significant drivers of industry

concentration, also at the regional level. As regards the policy aspect, the research conducted here has delivered a novel insight into the subject matter by including policy relevant proxy variables into our empirical model. Hereby, we have produced evidence on the existence of a potential signalling effect that active policy interventions might have with respect to advancing the position of border regions in particular. More specifically, we have found a positive effect associated with higher spending to advance geographical position of Western border regions, while there appears to exist a corresponding negative effect associated with higher spending in Eastern border regions. In sum, our analysis of development trajectories of the CEEC regions as proxied by industry location patterns presented evidence of an ongoing process of regional divergence despite progressive regional integration and implementation of regional development policies.

Regional divergence not only poses a serious threat to domestic economies but can be equally detrimental to comprehensive regional integration agreements. Thus, provision of regional structural and development funds has been one of the tools at disposal of national and supranational policy makers to offset the negative effects stemming from diverging growth patterns. In case of the CEEC, national policy makers have regarded the inflow of FDI in particular as a potent (regional) development tool able to advance the position of industry and host regions by levering on the technology know-how and managerial skill of foreign investors. Thus, attracting FDI inflows and raising existing FDI stocks has been a paramount task for most governments in the CEEC.

In chapter 4 of the thesis we have assumed that FDI is indeed beneficial for recipient countries with the intention to explore factor determinants of FDI location. In particular, we focused our analysis on examining the link between institutional factors and location decision of foreign investors across sectors, countries and time. Institution building has been a remarkable feature of the transition process; as such, both its speed and perceived quality are assumed to be a crucial location factor and, as such, subject to policy specific measures. Thus, our contribution is of particular relevance to the nascent FDI literature focused on a more detailed understanding of endogenous institutional factors that may

affect location patterns of foreign investors in particular. Specifically, we follow a novel approach in that we base the analytical framework on recent empirical work that examines institutional aspects of FDI location by decomposing them into structural reforms (efforts) and perceived institutional quality (outcomes) (see, Campos and Kinoshita, 2008). What we have found is a positive and robust relationship going from institutional factors to FDI. Hereby, the importance of structural reforms is confirmed and appears to be reinforced when considered jointly with the process of economic integration with the EU. Hence, we show that in the context of transition economies the EU integration process is to be understood as the driver of the process of institutional convergence and as such a major determinant of FDI inflows into the CEEC. Nevertheless, it is worth highlighting that foreign investors assign different values to individual reform factors in terms of their respective importance. Accordingly, from foreign investors' perspective, infrastructural reforms rank highest followed by policy changes pertaining to competition and privatisation. In contrast, reforms related to enterprise restructuring and governance remain positive though mostly insignificant. From the above, it follows that foreign investors are placing a certain premium on presence of efficient hard infrastructure in a locality which, according to the conclusions in the preceding chapters, is thought to be a major factor in deepening of cross-border market integration and expanding of the market potential of a locality.

In addition, we conclude that due consideration should be given to sectoral differences when analysing determinants of FDI. The results are indeed interesting as we detect diverging pattern in terms of FDI determinants when controlling for different sectors of an economy: whereas services FDI appear to be primarily market-seeking, the same motive may be less relevant for foreign investors in the manufacturing sector. In fact, in our estimations the latter appears to be drawn to locations that are comparatively more endowed with primary input factors; thus we conclude that in the context of CEEC manufacturing, FDI may be primarily resource-seeking. More interestingly, however, we detect significant differences in terms of the role of institutional factors in affecting FDI

location decisions across sectors. In particular, while institutional factors appear to be of importance for services sector FDI, no direct effect is evident for location of manufacturing FDI. We posit that such a finding may be explained by underlying sector-specific characteristics, such as services sector reliance on mostly intangible assets that rely on efficient institutional frameworks to enforce and protect intellectual property rights. Overall, our analysis implies that due consideration should be given to sectoral differences when analysing role of institutional factors in determining location of FDI.

In a final step, a comparison across different Eastern European sub-regions re-confirms the importance of institutional factors for FDI location whereby progress in the reform process has considerable explanatory power in all specifications of estimated models. A conclusion common to all Eastern European sub-groupings is that faster adjustment of commonly accepted institutional frameworks and standards has had a positive effect on location of foreign investors.

In sum, the research presented throughout this thesis strongly suggests that (industrial) policy aspects indeed have a strong effect on location patterns of industry in transition economies. A direct policy implications coming out of it is that countries and their regions, especially those that are rapidly integrating into larger and more elaborate trading blocs, are well advised to invest into their institutional and policy frameworks. Our research shows that provision of hard infrastructure, targeted use of structural development programmes such as the ERDF, and predictable and efficient institutional frameworks are indeed suitable means for reducing trade and transaction costs for both foreign and domestic producers (investors), thus directly affecting economic development of transition economies.

5.2 LIMITATIONS AND FUTURE RESEARCH

Common to all intellectual exercise are the limitations a researcher is faced with when devising and exploring new ideas. The research conducted in this thesis is not much different in that respect. Subsequently, we outline some of the perceived limitations of our research while simultaneously also suggesting future research topics.

In particular, in Chapter 2 we have examined changes in location patterns at a relatively high level of spatial and industry aggregation. While this allowed for an analysis of broad changes affecting both countries and industries, it also limited the analysis to a certain extent. In other words, country-level analysis prevented us from delimiting the true extent of industry clustering as typically described in the corresponding literature (e.g., Porter, 1990). Sufficiently disaggregated and comparable data across space and sectors is only slowly emerging and as such remains a major constraint at present. Nevertheless, the work currently conducted within the various EU frameworks, such as EU KLEMS and ESPON, makes us confident that in the near future a more detailed approach to analysing spatial issues will be possible also for the Eastern European countries. Moreover, our efforts to account for the extent to which vertical industrial policies affect industry location need to be further substantiated, while more precise policy variables will have to be introduced in empirical models. Future research will therefore aim at conducting more detailed, micro level studies that may allow for a more nuanced approach to linking integration, policy and industry location. In that respect, an interesting line of research could examine the emergence of cross-border clusters that are assumed to be especially affected by deepening market integration and policy efforts.

An interesting extension of work conducted in Chapter 3 may include a more specific analysis of policy contributions to further improvements in regional infrastructure, particularly with the intention to quantify its effects on, for instance, new investments and entrepreneurship. Policies aimed at advancing geographical position of border regions in

particular deserve greater scrutiny. In our present approach we have not considered the dynamics of changing location patterns on the side of other integrating partner, i.e. EU. Thus, an interesting extension of the present research would be to consider the contribution of cross-border development programmes on both sides of the border simultaneously.

Finally, given the data limitations in Chapter 4 we were not able to distinguish between the various types of FDI. It is rather obvious to think that, for instance, location factors of M&A type of investments will differ from those of green-field FDI. Thus, future research will be more targeted in this respect by making an attempt at acquiring firm-level datasets that allow for a clear delineation of FDI. As an additional advantage, use of firm-level data would allow us to simultaneously consider some of the previously raised scale issues. Finally, we find that a more pronounced inquiry into location determinants of services sector in particular deserves greater attention in the context of economic transition. As services sector has been almost completely absent in the pre-transition era, further targeted analysis of its location aspects would provide us with yet another quasi natural experiment worth further exploration.

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“I firmly believe that any man's finest hour, the greatest fulfillment of all that he holds dear, is that moment when he has worked his heart out in a good cause and lies exhausted on the field of battle - victorious.”

Vince Lombardi