Riccardo Crescenzi, Carlo Pietrobelli and Roberta Rabellotti

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Riccardo Crescenzi*

Department of Geography and Environment
London School of Economics
United Kingdom
Tel. +44-207955-6720
r.crescenzi@lse.ac.uk

Carlo Pietrobelli

Inter-American Development Bank

Tel.+1-202-623-2423
carlop@iadb.org

Roberta Rabellotti

Dipartimento di Scienze Politiche e Sociali
Università di Pavia,
Italy
Tel. +39-0382 984038
roberta.rabellotti@unipv.it

**Corresponding author*

Abstract

This paper investigates the geography of multinational corporations' investments in the EU regions. The 'traditional' sources of location advantages (i.e. agglomeration economies, market access and labour market conditions) are considered together with innovation and socio-institutional drivers of investments, captured by means of regional 'social filter' conditions. This makes it possible to empirically assess the different role played by such advantages in the location decision of investments at different stages of the value chain and disentangle the differential role of national vs. regional factors. The empirical analysis covers the EU-25 regions and suggests that regional socio-economic conditions are crucially important for the location decisions of investments in the most sophisticated knowledge-intensive stages of the value chain.

JEL Classification: F21, F23, O33, R12, R58

Keywords: Innovation, Multinationals, Systems of Innovation, Value Chains, Regions, European Union

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1. Introduction

In 2010 Multinational Corporations (MNCs) - both in their home countries and abroad - generated value added for approximately US$16 trillion, accounting for more than a quarter of world GDP (UNCTAD, 2011). Consequently, it is hard to overstate the central and growing role that these companies play in global, national and regional economies.

In virtually all countries policy makers make use of a variety of incentives and supporting schemes to attract foreign direct investments (FDI), considered sources of high-value employment, know-how and innovation capabilities (Mudambi and Mudambi, 2005; McCann and Mudambi, 2004). However, a wide body of empirical literature casts doubts on the positive contribution of MNCs towards their host economies: there is always the risk of a 'branch plant' syndrome whereby subsidiaries not embedded in the host economy develop limited local linkages and pursue subordinated manufacturing functions (Hood and Young, 2000; Phelps et al., 2003; Phelps and Waley, 2004). In addition, the benefits of FDI and international technology transfer for the development of the host economies "*...can only be delivered with parallel indigenous innovation efforts and the presence of modern institutional and governance structures and conducive innovation systems."* (Fu et al., 2011: 1210).

If the synergies between host economies and foreign investments are crucially important for both MNCs and local actors, the literature has recently suggested that firms are following new modes of international expansion that are not necessarily equity- or production-related (for example in the form of "value chains" as in Gereffi et al., 2005; Pietrobelli and Rabellotti, 2007) and that different functions delocalised by MNCs intrinsically involve different degrees of local embeddedness and linkages (Dimitratos et al. 2009; Jordaan, 2009; Rugman et al., 2011). The delocalisation of progressively more complex functions has dramatically changed the attention that MNCs are paying to the characteristics of host economies. While in the 1990s MNCs would principally relocate outside their home countries less knowledge-intensive activities (Dunning, 1996), this pattern has changed significantly in recent years. For instance, MNCs have moved away from single, self-contained in-house R&D centres in favour of more geographically dispersed and horizontally organized architectures of innovation activities: R&D units in foreign subsidiaries have progressively increased their competences also including high value research (Massini and Miozzo, 2010; OECD 2011; Schmitz and Strambach, 2009).

In this rapidly changing scenario, the analysis of the location determinants of MNCs investments should be broadened in order to account for a wider set of attraction factors and for their changing role in the location of investments at different stages of the value chain. For example, low labour costs may attract manufacturing plants while more sophisticated activities (such as R&D) might be more responsive to 'soft' socio-institutional factors. Consequently, the preferences of MNCs for the location of their foreign activities are increasingly likely to vary according to the value chain stages that are being re-located outside their home countries.

The empirical literature has recently devoted substantial efforts in this direction and in fact there are a few quantitative analyses aimed at shedding light on how the drivers traditionally identified in the

literature – namely agglomeration economies, market access and labour market conditions - influence the location of the different functions composing MNCs' value chains (Alegria, 2007; Basile et al., 2008; Canals and Noguer, 2008; Defever, 2006 and 2010). Nevertheless, these analyses focus on a narrow set of functions and location drivers, largely overlooking the emerging importance of knowledge and innovation factors. 'Soft' factors related to the innovation capacities of the host regions, as drivers of MNCs location decisions, have instead become the focus of in-depth case studies, failing to ensure the same degree of generality achieved by more formal quantitative research (Cantwell and Iammarino, 2003).

This paper aims to fill this gap by means of a quantitative empirical analysis of the location determinants of different value chain stages, taking into account not only 'traditional' location advantage factors but also localised knowledge, innovation dynamics and well-functioning systems of innovation (Crescenzi and Rodríguez-Pose, 2011; Pietrobelli and Rabellotti, 2011). The model of empirical analysis looks at the location determinants of 19,444 investment projects in the EU-25 regions over the 2003-2008 period. The disaggregation of investments in different value chain stages relies upon the classification of business functions proposed by Sturgeon (2008) that can be consistently applied across different sectors. Each investment project is classified according to a taxonomy based on five value chain stages, making it possible to assess the relevance of different drivers for each typology of investment. Socio-institutional drivers of investments location are proxied by means of a dedicated composite indicator that captures different regional 'social filters': a set of economic and social, structural features, making some regions 'prone' and others 'averse' to innovation (Crescenzi et al. 2007 and 2012; Crescenzi and Rodríguez-Pose 2011) and, as a consequence, more attractive for foreign investments by MNCs.

With a Nested Logit (NL) framework the decisions of MNCs to invest in different locations at different stages of their value chains are modelled upon the interaction between firm-specific and location-specific conditions, after controlling for traditional location factors. In particular, the empirical approach singles out the role of local innovative dynamism and socio-institutional conditions as drivers of new investments at different stages of the value chain. In addition, the analysis aims to shed light on the differential role of national and regional characteristics in driving MNCs location decisions. By testing the nested structure of the location decision processes, the model also tests for the importance of the national vs. regional economic and innovation characteristics.

The results provide strong support for the importance of 'soft' factors and fine-sliced value chain stages in the analysis of the location decisions of multinational corporations. When considering the organization of the value chain and the role of MNCs subsidiaries (Rugman et al., 2011), the national and the regional levels play different roles depending on the stage of the investment. The balance between 'traditional' location factors vis-à-vis socio-institutional conditions also evolves in the different value chain stages.

The paper is organised as follows. In the next section, the relevant background literature is reviewed and the importance of socio-institutional drivers and value chains discussed with reference to the

location decisions of MNCs. Section 3 introduces the model and the variables included in the empirical analysis. The database and some descriptive statistics are presented in Section 4. Section 5 discusses the empirical findings. Section 6 concludes with some policy implications.

2. The drivers of MNC investments

2.1 Traditional drivers

According to the Ownership-Location-Internationalisation (OLI) framework developed by Dunning (1977), the decision of a firm to undertake foreign activities and become a MNC is the result of the interaction of three different sets of advantages: firm-specific advantages stemming from resources owned (or controlled) by the firm (Ownership), the abatement of transaction costs associated with market interactions across countries (Internationalisation) and the availability of resources, networks and institutional structures in the host country (Location).

Following this very influential analytical framework MNC location decisions are largely based upon the hierarchical ordering of their activities: headquarters and strategic activities tend to take place in the home-country whereas mature, standardised and routine functions are relocated abroad. However, as emphasized by McCann and Mudambi (2005) and Iammarino and McCann (2013), in this perspective the (increasing) importance of geographical sub-national factors (i.e. agglomeration processes, urbanisation, diversification/specialisation patterns) is not taken into consideration and regional (or sub-regional) locations within individual countries are almost completely overlooked. In response to this gap, the locational analysis of MNCs has become increasingly important for many scholars in the international business (IB) literature (Mucchielli and Mayer, 2004), as well as for regional economists and economic geographers (Head et al., 1995; Phelps, 1997).

In the regional economics literature the spatial perspective has become the centre of the analysis, although the conceptualisation of MNCs' strategies remains necessarily more stylised than in the IB literature. Head et al. (1995) opened up the way to a number of empirical analyses aimed at understanding the location determinants of MNCs. With an econometric model they test if industry-level agglomeration is a key driver of the location decisions of Japanese manufacturing investments in the US. Their results highlight the cumulative nature of location decisions of MNCs: previous investments in the same sector and/or from the same country of origin increase the probability of similar investments in the same area. This process of concentration is explained by inter-firm technological spillovers, the existence of a specialised labour market and the availability of intermediate inputs that are highly valued sources of competitive advantages according to (foreign) investors.

As predicted by the New Economic Geography, the agglomeration of firms also generates increased competition therefore favouring dispersion. Nevertheless, most of the empirical studies on the location choices by foreign investors support the dominance of agglomeration over dispersion forces. Devereux and Griffith (1998) establish this conclusion at the national level, while Head et al. (1995, 1999), Guimarães et al. (2000), and Crozet et al. (2004) find the same result at the sub-

national level. Finally, Mayer and Mucchielli (1999) observe similar trends in the location decisions of Japanese firms in Europe at both a national and regional level.

Demand concentration is also a factor of attraction for MNCs: foreign firms tend not only to replicate the same location decisions of similar firms but also to be concentrated where local demand is higher, as shown by the analysis of the location decision of Japanese firms in the European regions (Head and Mayer 2004).

Labour market conditions are comprised among the determinants of MNC locational choices through the inclusion of wage levels and unemployment in empirical estimations. However, existing evidence on these factors is somewhat inconclusive. Some studies find a positive correlation between labour costs and FDI (e.g. Head et al. (1999) on Japanese investments in the US and Guimarães et al. (2000) on Portugal), while others find no significant relationship (Woodward, 1992; Head and Mayer, 2004). In fact, wages may also reflect the availability of skilled workers and therefore higher wages may encourage the location of MNCs in higher value added functions. As concerns unemployment, this also has either a positive or a negative influence on the location choices of MNCs: a high unemployment rate may signal the existence of a large available workforce but also the lack of suitable workers and/or the existence of labour rigidities.

These analyses of MNCs location decisions, focusing on agglomeration, market potential and labour market conditions, have been enhanced by some contributions with a regional focus. Crozet et al. (2004) look at the determinants of French MNCs and find that market size, agglomeration forces and labour costs play a significant role, while investment incentives and EUstructural funds have little impact. Conversely, Basile et al. (2008) suggest that structural funds and cohesion policy play a significant role in attracting MNCs towards EU peripheral regions. Moreover, their analysis confirms the role of agglomeration economies as a major determinant of MNCs' location decisions for all investors.

Another recent stream of literature extends the analysis of the determinants of MNCs location by taking into account the increasing fragmentation of value chains. Location decisions of MNCs are no longer confined to production plants but they also increasingly involve service functions, extending from technology sourcing and R&D, to distribution and marketing. In order to shed some light on the determinants of the location of different stages of firms' value chains, Defever (2006) introduced a distinction between two forms of agglomeration: the sectoral agglomeration of activities belonging to the same sector and the functional agglomeration of activities belonging to the same function but not to the same sector. In his empirical analysis of non-European MNCs in EU countries, the author finds that functional aspects have more influence upon the location of service activities than sectoral aspects. Moreover, Defever concludes that firms locate different stages of their value chain near to each other in order to save on coordination costs and benefit from complementarities. Related activities concentrate in the same country and this is the case of R&D activities and production plants, which favour to co-location strategies. In more recent work, Defever (2010) undertakes an econometric test of firms' location decisions of different activities at the regional level and finds that they are largely dependant on the geography of prior investments

because firms tend to reinvest in the same region as before. However, nearby production plants are only important for the location of new production plants. For service activities, the physical distance to other functions, including production plants, does not seem to play any significant role.

A regional level analysis - at the level of NUTS3 areas - for the UK is presented in Alegria (2007), who studies the determinants of MNCs location choices and finds that functional agglomeration is a relevant factor in explaining the location decisions of foreign investments. Moreover the relevance and significance of the same location determinants vary depending on the characteristics of the investment, as suggested by Jordaan (2008) in the case of Mexico and by Chidlow et al. (2009) in their analysis of Polish regions. Basile et al. (2008) add the analysis of the different functions to the study of the location determinants of MNCs and test a negative binomial additive model to analyse FDIs in NUTS2 European regions, highlighting a 'spatial multiplier effect' in manufacturing FDIs. Investments in production plants are attracted to a region not only by its market size but also by the market potential of all neighbouring regions, which decreases with distance. On the contrary, FDIs in business activities services are exclusively affected by the market conditions of the regions where they are located.

In this paper, we contribute towards this expanding stream of literature with an empirical analysis of the regional and national location determinants of MNCs in the European Union, by including socio-institutional factors among the drivers of MNCs' investments and by introducing a functional disaggregation derived from value chain analysis.

2.2. The location of different value chain stages and the differentiated importance of local socio-institutional factors

The concept of value chain captures a sequence of related and interdependent activities that are needed to bring a product or a service from conception through the different phases of production and delivery to final consumers and after-sales services, and finally to disposal or recycling. Thus, value chains are complex entities where manufacturing is only one of several value-added links in the chain (Gereffi, 1999). The focus of value chain analysis is on the value added at each stage and on the ongoing relationships between the various actors involved in the chain. MNCs represent one of the different possible patterns of governance envisaged in value chain literature: the case of the integration of the differentiated networks of value chain stages within the boundaries of the same firm (Rugman et al., 2011).

In addition to the MNC-lead governance of value chains, Gereffi et al. (2005) develop a typology that includes various forms of relational governance: modular, networks and captive. The most efficient modes of governance are chosen depending on the complexity of information and knowledge transfer required to undertake specific activities, the extent to which information and knowledge can be codified and the skills and local capabilities required. In value chains governed by MNCs the key question is what activities and capabilities should be kept at the headquarters and where the other sets of activities should be relocated taking due account of the differences represented by the factors mentioned above.

A quantitative analysis of the determinants of MNCs' location choices for investments at different stages of their value chain requires a classification of the business functions of the subsidiaries in relation to their position in the value chain. The classification proposed by Sturgeon (2008), based on a list of value chain stages and their definitions (adapted from a similar list developed for the Mass Layoff Survey conducted by the US Bureau of Labor Statistics) offers a parsimonious yet comprehensive list of generic functions that all business establishments must either do, or have done elsewhere. Given that these functions are generic, they can be applied to any workplace or firm, whether or not their main output is a physical good or a service. The stages identified differentiate between core stages, which include the five functions of strategic management, product development, marketing and sales, operations, procurement, logistics and distribution, on the one hand, and support stages, which include corporate governance, human resource management, technology and process development, firms infrastructure, customer and after-sale service, on the other. The classification developed by Sturgeon is flexible enough to be applied to MNC activities located across industries and countries. In Section 4, we explain in detail how Sturgeon's classification can be practically applied to reclassify the investment activities provided by the *fDi Markets* database used in the empirical analysis.

The different characteristics of the value chain stages influence the location decision of MNCs' investments in a specific country or region. It can be expected that the 'traditional' location drivers identified by the existing literature will play a very different role in different value chain stages. For example, investments in the manufacturing stage may be attracted by the availability of low-paid unskilled labour, while investments in the R&D stage require highly qualified people.

Conversely, 'soft' location drivers - such as the characteristics of the innovation system and the existence of different forms of institutional supports (Fuller 2005), which are rarely taken into account in most empirical quantitative analyses – can be expected to play a major role in the location of more sophisticated functions such as R&D, headquarters or business services (Alcacer and Chung 2007; Chidlow et al. 2009; OECD 2011). In other words, as stated by Fuller and Phelps: "*Foreign-based establishments are viewed as having different value chain 'roles' and, therefore, possess distinct firm-specific 'competencies' within complex corporate value chains and are embedded in local socio-institutional conditions, including sources of technology, (tacit) knowledge and learning*" (2004: 786)

The operational translation of the concepts of national and regional socio-institutional conditions, all potentially relevant for MNC location decisions, is a difficult task and existing empirical analyses have been fundamentally qualitative because the territorially embedded networks, the social economic structures and the institutions are intrinsically unique and thus hard to compare across different systems (Cantwell and Iammarino, 2003).

However, if these concepts have to be assessed as drivers for MNC location decisions, their operationalisation needs to be relatively homogenous across territories, in the same way as MNCs compare the features of various alternative locations. This process is significantly constrained by data availability: in particular when looking at large cross-sections of countries (such as the EU25)

or/and at sub national units (such as EU NUTS2 regions) comparable statistical information for a sufficiently long time-span is hard to come by. As a consequence, in a cross-country and cross-regional comparative perspective the differences between the various national and regional socio-institutional arrangements and their performance (Fuller and Phelps, 2004) are captured by means of the so-called 'social filter', translated into a set of quantitative indicators (Crescenzi et al., 2007 and 2012).

For this purpose, our analysis considers the set of conditions that render some courses of actions easier than others (Morgan, 2004), making *innovation prone* interactions and institutions more likely in certain localities than in others. Regions show differentiated capabilities to translate indigenous innovative activity into innovation and economic growth depending on the existence of different 'social filters': the interaction of a complex set of economic, social, political and institutional features that makes some regions *prone* and others *averse* to innovation (Crescenzi and Rodríguez-Pose, 2009). In other words, through the 'social filter' concept we aim at capturing and including in the empirical analysis of MNCs' choices to locate different value chain stages, the combination "*of innovative and conservative components, that is, elements that favour or deter the development of successful regional innovation systems*" (Rodríguez-Pose, 1999: 82) in every space. This set of structural conditions proxy the socio-economic pre-conditions for the development of an environment favourable to innovation and knowledge circulation. The empirical definition of the features that make a region *prone* to innovation is very complex due to the inherently dynamic nature of the innovation system and of the socio-institutional arrangements. However, a growing body of empirical literature has shown that the structural pre-conditions proxied by the 'social filter' do act as key predictors of regional innovative performance (Crescenzi et al. 2007, Rodríguez-Pose and Crescenzi 2008). The regions where the optimal combination of the 'social filter' components is in place show not only a remarkably higher potential to translate their innovative efforts (as proxied by R&D expenditure) into new knowledge but also a better absorptive capacity of knowledge spillovers. 'Social filter' conditions - as proxies for the system of innovation conditions – are therefore likely to be fundamental sources of locational advantages for MNC, attracting their investments, and they are therefore incorporated in the following empirical analysis.

3. The empirical strategy

3.1. The model

In most empirical literature on the location decisions of multinational corporations the choice between multiple location alternatives is modelled by means of Conditional Logit Models (CLM). However, the CLM crucially relies on the assumption of Independence of Irrelevant Alternatives (IIA), i.e. adding another alternative or changing the characteristics of one of the alternatives does not affect the relative odds for any other two alternatives (Cameron and Trivedi, 1998 & 2005). This assumption is clearly unrealistic when dealing with the location choice of MNCs among different regions, given that country level characteristics may also play an important role in this

process, making the regions belonging to one specific country intrinsically more 'appealing' than those located in another country. Therefore, the Nested Logit Model (NLM) (McFadden 1984), which relaxes the IIA assumption and adopts a hierarchical structure, specifies a more realistic analytical framework for the location decision of MNCs.

In the NLM, the homoschedasticity assumption of the CLM is relaxed by grouping the alternatives (in this paper the EU NUTS1/2 regions) into subgroups (their respective countries), therefore allowing the variance to differ across groups while maintaining the IIA within the groups (Green 2003). In other words, the choice process can be conceived as involving two simultaneous decisions: choosing a country *i* among I (1…,i,…n_i) – i.e. the set of possible countries - and selecting a specific region J (1…,j,…n_i) in the chosen *i* country. Although simultaneous, these decisions are based on a heterogeneous set of characteristics: given their dissimilar national characteristics (from tax systems to institutional conditions) regions in different countries cannot be considered – ceteris paribus in terms of their local conditions –perfect substitutes.

An investment located in region *j* belonging to country *i* yields a profit:

$$\pi_{ij} = V_{ij} + \varepsilon_{ij} \qquad [1]$$

Where V_{ij} is a function of the observable characteristics of location *J*:

$$V_{ij} = \beta X_{ij} + \gamma Y_i \qquad [2]$$

Some location characteristics vary across both countries and regions (X_{ij}), while other characteristics only vary across countries (Y_i). β and γ are the coefficients to be estimated and ε_{ij} is the unobservable component of the location advantage of region j.

From this expression for the potential profitability of each location, McFadden (1984) shows that if the distribution of ε_{it} is given by a multivariate extreme value with parameter σ, then the probability of choosing region *j* is:

$$P_{ij} = P_{j/i} P_i \qquad [3]$$

where P_i is the probability of choosing country *i* depending on the characteristics of the country and on those of all its regions:

$$P_i = \frac{e^{\gamma Y_i + \sigma_i I_i}}{\sum_{m=1}^{I} e^{\gamma Y_m + \sigma_m I_m}} \qquad [4]$$

with $I_i = \ln(\sum_{ki} e^{\beta x_{ik}})$ which is the 'inclusive value' for country *i* (i.e. the maximum utility expected from choosing country *i* depending on the characteristics of all its regions).

While $P_{j/i}$ is the probability of choosing region *j* conditioned by the choice of country *i*. This depends on the characteristics of the n_i regions belonging to country *i*:

$$P_{j/i} = \frac{e^{\beta X_{ij}}}{e^{\sum_{k=1}^{n_i} e^{\beta X_{ik}}}} \qquad [5]$$

As a result from [3],[4] and [5]:

$$P_{ij} = P_{j/i} P_i = \frac{e^{\beta X_{ij}}}{e^{I_i}} \left(\frac{e^{\gamma Y_i + \sigma_i I_i}}{\sum_{m=1}^{l} e^{\gamma Y_m + \sigma_m I_m}} \right) \qquad [6]$$

The coefficient of the inclusive value σ measures the strength of the nested structure of the location process of the investments. When σ=1 the NLM collapses into a CLM (i.e. regions are all equivalent options for MNCs, irrespective of the country they belong to, suggesting complete independence in the location decisions with no nested structure). If instead, σ=0 the upper nest (the country level decision) is the only relevant decision in the location choice, as all regions within the destination country are all perfect substitutes. As a consequence, by testing the nested structure of the investment decision we are able to shed light on the relative importance of national vs. regional conditions for MNCs choices.

The model of empirical analysis is specified in Equation [6] and expresses the probability of a certain region being chosen as a destination of a foreign investment (dependent variable) as a function of a set of regional characteristics that remain the same for all investments, such as for example the regional unemployment rate, and region-investment specific characteristics, i.e. regional characteristics that vary with the specific investment under analysis, such as the number of regional investments in the same sector as the new investment. All country-level observable and unobservable characteristics (from corporate tax policies to business climate and institutional conditions[1]) are controlled for by the national 'nested' structure of the model. Conversely, the regional 'drivers' for MNCs' investments (explanatory variables) are explicitly 'modelled' and are described in details in the next section.

3.2. Explanatory variables

The explanatory variables included in the econometric model belong to the following categories (Table A.1 in the Appendix provides detailed information about variable definitions and data sources):

[1] Quantitative information on all these potentially relevant dimensions is not available at the regional level. In addition, within the European Union, the degree of national level heterogeneity that can be captured with quantitative indicators remains very limited. Qualitative differences in terms of national-level attractiveness are prevalent and better captured when explicitly treated – as in this paper – as unobservable factors common to all the regions belonging to the same country (conceptually equivalent to 'country' fixed effects in location choices).

a) *Market size and labour market indicators*. A first set of explanatory variables makes reference to the 'standard' proxies for market size and labour market conditions that are customary in the literature on the location decisions of MNCs, as seen in Section 2.1. The existing literature points out that location decisions are very sensitive to market size, as proxied by local *GDP* (Head and Mayer 2004; Py and Hatem 2009) and 'favourable' labour market conditions in terms of the excess of labour supply over demand (or 'degree of saturation of labour market'), as proxied by local *unemployment rate* (Py and Hatem 2009). Unfortunately, due to data availability constraints, the regional-level focus of the present empirical analysis precludes a direct control on the 'labour costs/wages' differential across regions, although in EU countries a large part of these differences is accounted for by the 'national' fixed effect included in our specification.[2] Besides, to control for the quality of the local supply of labour we introduce a proxy for *human capital accumulation* (% of people with tertiary education attainment).

b) Regional agglomeration of foreign investments. In order to capture the impact of the agglomeration of foreign investments in the regional economy and their different nature, the final specification of the model includes a number of proxies aimed at catching the tendency of foreign investments to 'cluster' in a limited set of locations (in line with Mariotti and Piscitello 1995; Guimaraes et al. 2000; Head and Mayer 2004). The impact of pre-existing investments on the location of MNCs is captured by means of the *total number of pre-existing foreign investments in the region*. However, substantial qualitative and quantitative evidence suggests that the location choices of MNCs tend to be influenced by specific characteristics of pre-existing investments. In particular, given the objectives of this paper, the model aims at disentangling the 'attractiveness' of the total number of pre-existing investments (a proxy for the 'general' attractiveness of the area to MNCs) from the impact of those in the same sector as the new investment, that is captured by the *number of investments in the same sector of activity as the new investment'* and/or at the same stage of the value chain (*number of investments at the same VC stage*). These characteristics are associated with the region-investment pair and are complemented by additional proxies following the same logic and aimed at better disentangling the sectoral from the VC stage agglomeration effects (*number of regional investments in the same VC stage BUT in a different sector* and *number of regional investment in the same SECTOR but at a different VC stage*). It should be added that the agglomeration effects might matter differently in different sectors and contexts. Thus, new entrants may prefer to avoid existing FDI locations to escape rigidities and excessive competition in the labour market, as it is sometimes the case for Japanese FDI into UK and the US.[3] The empirical analysis will shed new light on this hypothesis.

c) *Indicators of innovation*. This paper aims at capturing the impact of location drivers that have a direct impact upon the spatial organisation of different value chain stages after controlling for the factors driving the 'general' location behaviour of MNCs. As a consequence the model includes two proxies for the innovative dynamism of the local economy (*R&D investments as a share of regional*

[2] Similarly, in the European Union social charges and corporate tax rates tend to be regulated by central governments, thus they are also captured by country-level effects in our empirical analysis.

[3] We thank an anonymous referee for arising this point.

GDP and *Patent Intensity*) aimed at capturing the extent to which MNCs can benefit from localised knowledge spillovers from indigenous firms (Mariotti et al. 2010; McCann and Mudambi 2005). These proxies are particularly important in order to test for the potentially differentiated responsiveness of VC stages to local conditions: do the innovative activities of local firms attract external investments on top of 'traditional' industrial agglomeration forces? Is this effect homogeneous across value chain stages or is this relevant only for the most sophisticated functions? And more importantly: are more sophisticated investments attracted by an innovative local context or do MNCs tend to avoid co-location with knowledge-generation activities of potential rivals (Cantwell and Santagelo 1999).

d) *Socio-Economic Conditions: the 'Social Filter' Index and its components*. As discussed in the previous section, local innovative dynamism can exert a potentially ambiguous effect on the location decisions of MNCs, depending on the extent to which foreign subsidiaries are embedded in local systems of innovation (Cantwell and Iammarino 2003; Fuller and Phelps 2004). This additional set of explanatory variables is aimed at testing whether favourable systemic conditions (irrespective of the magnitude of local innovative dynamism) can play a more direct role in the location of the most 'sophisticated' stages of the value chain by shaping the receptiveness of the local environment. Our empirical analysis relies on the 'Social Filter' Index (Crescenzi et al. 2007 and 2012; Crescenzi and Rodríguez-Pose 2011), which is an indicator based on a number of characteristics of the local economy selected as proxies for the 'structural pre-conditions', to establish fully functional regional systems of innovation (Rodríguez-Pose and Crescenzi 2008) and socio-institutional conditions favourable to the embeddedness of MNCs activities. Under the constraint of limited availability of regional data for the entire European Union, in the case of the EU 25 the 'social filter' includes two major domains: educational achievements (Crescenzi 2005; Malecki 1997; Marrocu et al. 2013) and productive employment of human resources (Fagerberg *et al.* 1997; Gordon 2001).[4]

The first dimension of the 'social filter' – educational achievements – corresponds to human capital accumulation both in the regional population and among employed people. The availability of skills in the regional population is a crucial asset for regional competiveness in the EU (Crescenzi, 2005; Marrocu and Paci, 2012 and Carlino and Hunt 2009 for the US). However, the presence of skilled people in the region is not *per se* sufficient to generate a dynamic regional environment because the local supply of skills should also match the demand by local firms with a high percentage of skilled individuals among those currently in employment (Storper and Scott 2009). In the case of EU regions this is not always the case and therefore including in the 'social filter' both the percentage of employed people and the percentage of population with tertiary education – although correlated – brings complementary information to the analysis of regional conditions. In fact, the Principal

[4] When focusing only on the 'old' member states of the EU15, the demographic dynamism of the various regions is also an important component of the 'social filter' but including the 'new' member states in the sample, this particular component loses its power to differentiate innovation 'prone' and 'averse' socio-institutional conditions (Crescenzi and Rodríguez-Pose, 2011).

Component Analysis (PCA) assigns to both indicators a positive and relatively large coefficient, suggesting that both bring non-redundant information for the classification of the EU-25 regions.

The second domain - productive use of resources - is measured by the percentage of the labor force employed in agriculture and the long-term component of unemployment. With the progressive development of urban systems and the simultaneous modernization of the sector, agriculture normally takes a declining share of local employment (Federico, 2005). However, in areas where social resistance to economic change is stronger, this process is often slower and agricultural employment becomes synonymous of 'hidden unemployment'.[5] Some peripheral regions in the EU represent a case in point. Finally, the long-term component of unemployment is an indicator of labour-market rigidity and, indirectly, an additional indication of the presence of individuals with inadequate skills and/or reduced capabilities to adjust to economic change (Gordon, 2001).

The components of these two domains, when assessed simultaneously, generate a unique socioeconomic 'profile' that fosters or hinders the innovative capacity of each region. One component in isolation is not *per se* sufficient to form the pre-conditions for a socio-economic context supportive to innovation. For example, if the region does not show an adequate productive structure or a labor market capable of assimilating talent, the human capital may not be able to contribute to innovation, potentially resulting in greater outmigration and brain drain. Conversely, where the clustering of human capital is associated to the capability of the territory to make productive use of this potential, a long run virtuous circle is more likely to take place.

We deal with problems of multicollinearity by means of principal component analysis. PCA allows us to merge the variables discussed above into a single indicator (called 'Social Filter' Index) that preserves as much as possible the variability of the source data, assigning them coefficients that emphasize the 'incremental' informative contribution of each components, minimising redundant (collinear) information. In other words, the use of the 'Social Filter' Index makes it possible to capture the simultaneous combination of such factors in a parsimonious way for regional 'profiling', identifying broad regularities in 'innovation-prone' regions across a large number of alternative possible locations for MNCs' investments (Crescenzi and Rodríguez-Pose 2009).

The structural variables for each dimension (Table A-1) are combined by means of Principal Component Analysis on the basis of the scores presented in Table A-2.1 in Appendix. The Eigen analysis of the correlation matrix shows that the first principal component alone is able to account for around 58 % of the total variance. The first principal component scores are computed from the standardised value of the original variables by using the coefficients listed under PC1 in Table A-2.2. These coefficients assign a large weight to both educational achievement indicators, suggesting that both dimensions (skills in the population and in the labour force) are major components of the socio-economic tissue of the regions. A negative weight is assigned, as expected, to the long-run

[5] Unemployment is 'hidden' in the fabric of very small farm holdings in many EU peripheral areas (Caselli and Coleman 2001). Agricultural workers also show low levels of formal education, scarce mobility, and tend to be aged.

component of unemployment and to the percentage of agricultural labour. This first Principal Component (PC1) constitutes what we call the 'Social Filter' Index, introduced into the regression analysis as an aggregate proxy for the socio-economic conditions of each region.

4. Data on MNCs' investments

Data on FDI come from *fDi Markets*, an online database maintained by *fDi Intelligence*, a specialist division of the Financial Times, which monitors cross border greenfield investments covering all sectors and countries worldwide since 2003. Each entry is a project, i.e. the investment has not been completed yet, but the database is carefully updated each year in order to check whether projects have been 'completed' or not, and, if not, they are deleted from the database. In the period 2003-2008, the database included around 72,000 worldwide projects creating new jobs and investments with no minimum investment amount required. Our empirical analysis is based on the 19,444 projects undertaken by MNCs from the entire world into the EU25 countries.

The accuracy and robustness of the information reported in *fDi Markets* has been checked using different methodologies. The flows of investments reported in this database have been compared with UNCTAD information on FDI flows at the country level, showing a correlation of 54% over the time-span considered in the analysis. In addition, in order to test the robustness of the distribution of new investments across regions, the information reported in *fDi Markets* has been compared with data on new investments reported by the *Euromonitor* database, which provides information about FDI in Europe. The comparison between the two independently collected and organised databases shows a 75% correlation in the number of investments reported at the NUTS2 level and this correlation is robust enough for the inclusion of year dummy variables and regional fixed effects. These crosschecks, based on the different independent data sources, confirm the reliability of the *fDi Markets* database on the spatial distribution of FDI.

Table 1 presents the distribution of the investment projects by country of destination showing that the top four countries in Europe are the UK, France, Germany and Spain followed by some Eastern European countries which recently joined the EU: Poland, Hungary and Czech Republic. For each project the database contains detailed information on the investor (name and state/country of origin), the destination area (country, state and city), and other relevant information such as the value of the investment, the year and the number of jobs created. Additionally, information is available on the sector and on the main activity undertaken.

In order to exploit the information available about the destination area of each investment, the dataset has been geocoded with three different geolocators: the ESRI ArcGis embedded geolocator tool (based on a world gazetteer sourced by CIESIN), the Yahoo! geocoder and the Google geocoder. On the basis of the coordinates obtained, each investment has been allocated to a European NUTS region by spatially matching (a spatial join tool in ESRI ArcGis) the geographical point originating from the geocoding process with the shape file of NUTS2 regions provided by

Eurostat-GISCO. The interest of the paper lies in the spatial units that can better 'self-contain' the functional interactions between MNC subsidiaries and the 'local' economy. The regional analysis is based on a mix of NUTS1 and NUTS2 regions, selected in order to maximise their homogeneity in terms of the relevant socio-institutional structure and also considering data availability. In each country we adopt the unit of analysis with the greatest relevance in terms of the institutions to influence investment decisions of MNCs. Consequently, the analysis uses NUTS1 regions for Belgium, Germany and the United Kingdom and NUTS2 for all other countries (Austria, Czech Republic, Finland, France, Greece, Hungary, Italy, the Netherlands, Poland, Portugal, Slovakia, Spain). Countries without equivalent sub-national regions (Cyprus, Estonia, Denmark, Ireland, Latvia, Lithuania, Luxembourg and Malta) are necessarily excluded from the econometric analysis.[6]

According to the value chain classification proposed by Sturgeon (2008) and discussed in Section 2.2, all the projects included in the database have been reclassified in 5 stages: Headquarters (HQ), Innovative Activities (INNO), Commercial Activities (SALES), Manufacturing Activities (MAN), Logistic and Distribution (LOG&DIST). Table 2 presents a detailed description of the classification used in the paper relating it with that developed by Sturgeon on the basis of 'generic functions'. The first two columns present Sturgeon's classification with the distinction between 'core' and 'support' VC stages, which is helpful in order to improve the accuracy of the matching with fDi Markets classification, shown in Column 3. Column 4 presents the simplified classification in 5 stages adopted in the empirical analysis, which aggregates core and support functions, taking into account the number of observations available for each 'stage'. Table 3 reports the frequency of the 5 categories in which the investments have been classified in the paper. In the empirical analysis disaggregated by VC stages, the dependent variable is the number of inward projects of investment in each of the 5 stages in the region *j* belonging to the country *i* in the year *t*.

Table 1 - Number of Investments in the EU27 by Countries of Destination

Country of Destination	Number of new investments	% of total
UK	3312	15.06
France	2459	11.18
Germany	1887	8.58
Spain	1492	6.78
Poland	1358	6.17
Hungary	1250	5.68
Czech Republic	915	4.16
Ireland	880	4.00

[6] Sweden is also excluded from the analysis due to the lack of regional data for some of its regions. Although Table 1 reports data on investments in all EU25 countries in order to provide an overall picture of investments flows, the regional-level analysis for these countries is not possible. A total of 16,433 investments targeting 179 potential destination regions are covered by the econometric analysis. The first year covered by the dataset (2003) is used as the basis for the calculation of the (lagged) cumulative number of investments and is therefore not used for the location analysis. In the value chain analysis two years have been used for this purpose in order build a more reliable proxy at the regional-value chain stage level. This reduces the number of observations directly used in the location analysis and reported in the observation (investment X choices) count. The nested logit procedure only takes into account regions chosen at least once as investment destinations (Spies, 2010).

Italy	766	3.48
Belgium	750	3.41
Netherlands	633	2.88
Sweden	623	2.83
Slovakia	582	2.65
Austria	480	2.18
Latvia	346	1.57
Denmark	344	1.56
Lithuania	293	1.33
Portugal	275	1.25
Estonia	261	1.19
Greece	172	0.78
Slovenia	136	0.62
Finland	102	0.46
Luxembourg	59	0.27
Cyprus	56	0.25
Malta	13	0.06
Total EU-25	***19444***	***88.39***
Romania	1647	7.49
Bulgaria	906	4.12
Total EU-27	**21997**	**100.00**

Source: Authors' elaboration on fDi Markets data, 2003-2008.

Table 2 – Definitions of the Value Chain Stages

Sturgeon's classification (2008)		***fDi Markets* classification**	**Classification adopted in the paper**
Classification	**Description**		
Core VC stages			
Headquarters	Strategic activities	Headquarters	**HQ**
R&D	Activities associated with bringing a new product or service to market, including research, design and engineering.	R&D; Design, Development and Testing	**INNO**
Sales and Marketing	Including activities to inform buyers including promotion, advertising, telemarketing, selling, and retail management.	Sales, Marketing and Supports; Retail	**SALES**
Manufacturing	Activities that transform inputs into final output, either goods or services.	Manufacturing; Construction; Extraction	**MAN**
Logistic and Distribution	Activities associated with obtaining and storing inputs, storing and transporting finished products to customers.	Logistic, Distribution and Transportation	**LOG&DIST**
Support VC stages			
Business Services	Including legal, finance, public affairs and government relations, accounting..	Business Services and Shared Service Centres	**HQ**
Human Resource Management	Including recruiting, hiring, training, compensating and dismissing personnel.	Education & Training	**INNO**
Technical Services	Activities related to maintenance, automation, design/redesign of equipment, hardware, software, procedures and technical knowledge.	Technical Support Centres; Maintenance and Servicing	**SALES**
Firm Infrastructure	Activities related to IT systems and electricity.	Electricity; ICT & Internet Infrastructures	**MAN**
Customer and After-Sale Services	Including support services to customers; after sale services.	Customer Contact Centres; Recycling.	**SALES**

Source: adapted from Sturgeon (2008)

Table 3 – Value Chain Stages: Frequency

	No. of investments	**%**
HQ	3407	17.5
INNO (R&D)	1161 (473)	6.0 (2.4)
SALES	7004	36.0
MAN	6124	31.5
LOG & DIST	1748	9.0
TOTAL	19444	100

Source: Authors' elaboration on fDi Markets data, 2003-2008

5. Empirical results

This section presents the results of the estimation of the Nested Logit model outlined in Section 3.1. The first sub-section (5.1) includes the base-line results: we assess the role of the 'traditional' drivers of MNCs investments, knowledge assets and, in a first approximation, of some of the 'social

filter' components, developing a first broad picture of the complementary explanations for the observed geography of foreign investments in the EU regions to be benchmarked with the existing literature. Three sets of proxies are progressively included into the model: a) 'traditional' economic factors (i.e. level of economic development and labour market conditions); b) agglomeration economies (i.e. total pre-existing investments and sectoral clustering of investments); c) knowledge assets and some 'social filter' components (i.e. regional patent intensity, R&D efforts, human capital endowment and 'social filter' proxies). In the following sub-section (5.2), the importance of regional level drivers is assessed in comparison with national level factors. Then (in 5.3), we introduce the 'Social Filter' Index - our comprehensive proxy for regional socio-institutional conditions - and the disaggregation by value chain stage into the analysis in order to assess the impact of other foreign investments at the same VC stage, after controlling for all other relevant drivers. Finally in 5.4, the 'social filter' conditions are re-assessed to shed new light on their relative importance for investments in the different stages of the value chain. Following Spies (2010), all the explanatory variables are introduced in the regressions with a one-year lag in order to minimise the impact of simultaneity between the investment decision and the local economic conditions. In addition, in order to resolve the problem of different accounting units, explanatory variables are generally expressed for each region as a percentage of the respective GDP or population. When interpreting the results it is important to bear in mind that this is an exploratory analysis of the geography of MNC investments. As a consequence, the focus is mainly on the sign and significance of coefficients, rather than on the size of specific point estimates. In addition the results should not be interpreted in terms of causality relations. The value of the Log-Likelihood is reported at the bottom of each regression table together with the LR test statistic for the significance of the nested structure, confirming the validity of the proposed specification. The 'country-level' nest structure is also particularly important in order to control for the 'unobserved' factors that regions belonging to the same country have in common, such as 'macro' institutional framework, rule of law, tax rates, fiscal regimes.

5.1 'Traditional' economic factors, agglomeration and 'social filter' conditions as drivers of MNCs investment decisions.

Table 4 shows the results of the impact of 'traditional' economic factors, agglomeration, knowledge assets and some selected 'social filter' components on the regional probability of attracting MNCs investments. Here our attention focuses on the regional level parameters (reported in the upper part of the table) while Inclusive Value (IV) parameters (in the lower part of the table) are discussed in the next sub-section.

[INSERT TABLE 4 HERE]

In the first equation (Column 1) the role of traditional drivers is assessed. The results for this 'base-line' specification are largely in line with the existing literature on the determinants of MNCs investments. MNCs prefer more developed 'core' regions (i.e. those with relatively higher GDP per capita as in Head and Mayer 2004), but not necessarily those where the supply of labour is

relatively more abundant and potentially cheaper (i.e. those with a higher level of unemployment). In fact, the level of regional unemployment has a negative but statistically non-significant impact on the probability of choosing a region as destination of new foreign investments (in line with Disdier and Mayer 2004[7]).

Two agglomeration proxies exert a strong influence on the location of investments, as shown by their positive and highly significant coefficient: a) the absolute size of the local economy (proxied by the total regional GDP as in Crescenzi et al. 2007) and b) the cumulative number of pre-existing foreign investments in the region. This confirms the expected role of agglomeration economies and the cumulative nature of investment location choices (Guimaraes et al. 2000; Head and Mayer, 2004; Spies, 2010).

The sectoral dimension of agglomeration economies is explored in Column 2 where the cumulative number of pre-existing investments in one sector attracts further investments in the same sector (the coefficient is positive and highly significant), even after controlling for the impact of total foreign investments in all sectors.[8] This evidence is in line with the results of Guimaraes et al. (2000) and both terms remain positive and significant in all the subsequent specifications of the model.

In Column 3 the robustness of the results for the specification with regional economic conditions and agglomeration is tested by dropping 'Total regional GDP', which may affect the estimation of some coefficients due to multicollinearity with both 'economic conditions' and 'agglomeration of investments' proxies. After dropping this variable, the estimated coefficients remain unchanged except for the unemployment rate that becomes positive and significant at 5% level. This suggests that, after controlling for other characteristics, MNCs prefer areas where the labour supply is stronger than demand with in principle lower salaries, confirming a potential multicollinearity problem. Consequently, the robustness of the previous results is generally confirmed and 'Total Regional GDP' is not included in subsequent regressions.

In Column 4 we introduce some knowledge indicators. The distance from the technological frontier (proxied by the patent intensity as customary in the technological catch-up literature as in Fagerberg 1994) is an important predictor of MNCs investments: the closer the regional technological infrastructure to the frontier the higher the attractiveness of the regional economy for foreign investments. In this sense, agglomeration and knowledge assets indicators point in the same direction: by choosing technologically stronger areas, foreign investments tend to reinforce existing technological advantages rather than contributing to 'catching-up' in weaker peripheral regions. However, Column 5 shows that the regional innovative efforts (proxied by the percentage of Regional GDP devoted to R&D expenditure) can open new windows of opportunity for foreign investments, in line with the existing literature on regional innovation (Pike et al. 2006 and 2007).

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[7] "*A high unemployment rate might be a deterrent to FDI if it signals imperfections in the labour market, but it could also attract investors if it means that a large pool of workers is available locally*." (Disdier and Mayer 2004, p.290)

[8] We have also estimated the equation replacing 'Total investments in the region' with 'Total investments in all other sectors in the region' (i.e. excluding from the computation of the indicator the number of the investments in the same sector of the investment whose location is being modelled), obtaining very similar results.

Ceteris paribus, higher investments in R&D increase the probability of attracting MNCs into the local economy (the coefficient is highly statistically significant and positive).

Given that the regional capability to counterbalance the pre-existing patterns of technological accumulation does not only depend on local R&D efforts, we also include in the empirical analysis other aspects contributing to the regional innovation system such as some of the proxies included in the 'Social Filter' Index. Due to the problem of multicollinearity that makes it impossible to include all 'social filter' components in the same regression, at this stage we can only focus our attention on one of the two human capital indicators after controlling for agricultural employment. However our results remain qualitatively unchanged with or without this additional control. In the subsequent specifications all the structural pre-conditions for a well functioning regional system of innovation are summarized by means of the 'Social Filter Index' in order to minimise potential multicollinearity between individual indicators and capture the socio-economic feature of each region in a more comprehensive fashion.[9] The percentage of employed people with tertiary education - our proxy for human capital endowment as customary in the literature and the most important component of the 'social filter' - exerts a positive and highly significant impact on the probability to attract new investments. Conversely, the share of agricultural employment – our proxy for under-utilised resources and outdated skills – remains non-significant. The use of the 'Social Filter' Index will provide us with a more accurate picture of the combination of the different dimensions of the socio-economic realm of the EU regions taking into account additional complementary proxies, as discussed in section 3.2.

5.2 Regional vs. national-level drivers

Turning to the analysis of the Inclusive Value (IV), or dissimilarity parameters (in the lower part of Table 4), which gauges the level of independence of the alternatives in each nest/country with respect to the unobserved portions of utility, we find that a higher parameter suggests greater independence (less correlation) as between the alternatives (regions) in the same nest (country). This implies a stronger role for the regional drivers as opposed to the national common factors. As discussed in Section 3.1, these national common factors account for the impact of different institutional conditions, business climate, political factors at the country level that remain hard to capture explicitly by means of quantitative indicators. The Random Utility model restricts dissimilarity parameters to a range between 0 and 1 and values outside this range mean that while the model is mathematically correct, the fitted model is inconsistent with the random-utility theory (Cameron and Trivedi 2009). In the case of our results, the fitted model in general behaves well, with dissimilarity parameters mostly within the 0-1 ranges in the large majority of the specifications. The LR test statistic firmly rejects the null hypothesis that all the inclusive values are equal to 1 (i.e. the Nested Logit model reduces to the Conditional Logit Model), confirming the validity of the proposed nested structure.

[9] See section 3.2 above for technical details on the computation procedure of the 'Social Filter' Index.

In general, regions belonging to the same country are closer substitutes for foreign investors than regions of other countries, confirming the general relevance of the country level in investment decisions, notwithstanding the undergoing process of economic and political integration within the EU. Nevertheless, it is important to point out that the relevance of the country level varies significantly depending on the different factors included in the second-level (regional) equation, as shown by the different values of the dissimilarity parameters in the different specifications of the model. By looking at these parameters in Columns 1 and 2 where, in addition to the traditional economic factors (that are included in all specifications) the importance of the agglomeration economies is controlled for by means of the absolute size of the regional economy, it appears that – with a few exceptions – dissimilarity parameters tend to be close to 1. Even if national characteristics are certainly relevant (Basile et al. 2009), regions in the same country are not 'good' substitutes when MNCs search for 'absolute' market size. This pattern is particularly strong in those countries where the concentration of economic activities in few regions is stronger (i.e. Spain, France and the 'new' members of the EU). Conversely, when controlling only for the agglomeration of pre-existing foreign investments as in Column 3, country-level 'similarities' between regions belonging to the same country become stronger. The same is true for the distance from the technological frontier and for R&D efforts (knowledge assets indicators): *ceteris paribus* regions in the same country are closer substitutes than regions with similar characteristics in a different country, suggesting that country common factors exert a significant influence on the location decision.

The picture changes again when human capital is introduced into the model (Column 6): the dissimilarity parameters for all countries increase significantly suggesting that human capital is concentrated in specific 'hotspots' in the EU and that country level considerations are less relevant in this regard.

5.3 Value chain stages and agglomeration economies

The previous sub-sections have shown that the agglomeration of pre-existing foreign investments is an important predictor of new additional investments. Both the total number of foreign investments and their concentration in the same sector of the new investment exert a positive influence on the probability of MNCs choosing the same investment location. In Table 5, we include in our empirical analysis a further dimension in order to take into account how the location decision of MNCs subsidiaries is influenced by an agglomeration effect at the level of VC stages. Therefore, we address the following question: do foreign investments at a certain VC stage attract other investments at a similar stage, irrespective of their sector and after controlling for other relevant local characteristics both in terms of 'traditional' investment drivers and 'social filter' conditions?

[INSERT TABLE 5 HERE]

In order to answer this question and disentangle the impact of VC agglomeration economies from sectoral agglomeration factors, two sets of explanatory variables are introduced into the model: (i)

the cumulative number of pre-existing investments in the same sector but at a different VC stage as well as at the same VC stage but in a different sector (Column 1) and (ii) the total number of investments in the same sector and at the same VC stage respectively (Column 2). In both columns 'traditional' location factors are controlled for while the 'Social Filter' Index proxies an overall innovation-prone regional profile. The interaction between value chains and 'social filter' conditions will be further explored in the next subsection.

The two sets of indicators point to the same direction: both sectoral and VC agglomeration are relevant drivers for MNCs investment decisions, making the total number of pre-existing investments not significant. This result indicates that the location decisions are driven by at least two reasons: (i) the search for 'vertical' interactions when investments are attracted by the presence of other investments in the same sector but in other VC stages and (ii) 'horizontal' spillovers, such as labour market specialization and supply of specialised services and infrastructures, when they agglomerate on the basis of the same VC stage notwithstanding the sector.

5.4 Value chains and 'social filter' conditions

What local characteristics affect different stages of the investments? In Table 6 the complete specification of the model developed so far is re-estimated separately for investments at each different VC stage. As in the previous sub-sections, the model includes proxies for 'traditional' economic location factors (GDP per capita and unemployment rate), knowledge assets (patent intensity) and the 'Social Filter' Index. Agglomeration economies are proxied by means of three different indicators: the stock of pre-existing investments, the number of investments in the same sector and the number of pre-existing investments at the same VC stage.

[INSERT TABLE 6 HERE]

Column 1 shows the estimation results for all investments and is used as a benchmark for comparison with the results disaggregated by VC stage (Table 5) and presented in the subsequent columns from Headquarters in Column 2 to Logistics and Distribution in Column 7. In the general model in Column 1, foreign investments are not very sensitive to local economic conditions and in fact local labour market conditions are not robust drivers for investment location while the level of economic development is also generally a weak predictor after controlling for the agglomeration processes. Headquarters are the only VC stage 'attracted', ceteris paribus, by high regional GDP per capita levels (Column 2). In fact, the specific functions pursued at this stage of the value chain require concentration in wealthy core urban areas that offer high accessibility through both 'hard' and 'soft' infrastructures, availability of human capital and those amenities that some literature has shown to be of crucial importance for higher-level managerial staff (Florida 2002; Rossi-Hansberg et al. 2009). The selection of very specific 'core' locations is further accentuated by the strong path-dependency of investment decisions in terms of both VC stages and sectors. What matters for the location of headquarters is not the clustering of other foreign investments *per se* but the concentration of investments at the same stage of the VC and/or in the same sector of activity. These are the most relevant drivers for this VC stage with the only addition of patent intensity, as

patents are often filed at the HQ level, while 'social filter' conditions are not significant. Finally, the analysis of the dissimilarity parameters in the lower part of the Table (Column 2) reveals that the location of headquarters follows mainly a country-level logic (parameters close to zero for all countries) with a strongly hierarchical spatial structure.

A partially different story concerns investments in innovative functions associated with bringing new products or services to the market (Column 3). When looking at these investments, two patterns are immediately apparent. First, the only relevant drivers are agglomeration forces in terms of sector and VC stage with a – not highly significant – negative impact of 'generalised' clustering of foreign investments. Innovative activities are strongly attracted by the 'local buzz' (Storper and Venables 2004) generated by the concentration of other similar activities but may suffer from congestion effects due to general clustering dynamics. Second, the sharp increase in the dissimilarity parameters clearly shows that the regional-level is crucially important for activities at this stage of the value chain. Therefore, the location decision of innovative foreign investments is mainly based on localized regional assets and processes.

However, given the complexity of the functions pursued at this stage of the value chain, the model is re-estimated for R&D investments as a sub-set of the investments included in the INNO category (Column 4), in order to separate their location behaviours from that of all other innovative activities (in line with the approach of OECD 2011). Agglomeration patterns remain unchanged as for other innovative activities. However, what clearly emerges is the role also played by the 'social filter' conditions and not only by localised (market and non-market mediated) knowledge flows (Mariotti et al. 2010; Jaffe 1989; Zucker et al. 1998), as proxied by the innovative output (patent intensity) that of course matters for R&D activities. Thus, R&D foreign investments are highly responsive to a favourable regional system of innovation conditions. The 'social filter' conditions selectively attract investments at this specific stage of the value chain (Crescenzi et al. 2007; Chidlow et al. 2009). The dissimilarity parameters for all countries (and the decrease in the value of the LR test statistic) again confirm the importance of regional-level dynamics for investments in R&D.

The location selection of Sales and Marketing investments (Column 5) reflects a logic that is somehow in-between the two preceding stages: it shares with HQ and INNO investments the sensitivity to both VC and sectoral agglomeration patterns; with HQ it shares the importance of patent intensity and the non-responsiveness to 'social filter' conditions. However - as in INNO and differently from HQ – SALES investments are not influenced by regional GDP per capita. Sales and marketing activities need to remain linked to both innovative activities (positive impact of local patenting) due to the complex feedback mechanisms that link product and process innovation to business functions directly interacting with final consumer and with other firms pursuing similar functions (positive impact of the number of pre-existing firms) with an increasing externalised component of *ad hoc* services pursued by specialised companies. These inter-firm dynamics seem to prevail over local demand conditions, with GDP per capita not significant for this function. Sales and Marketing units can serve distant markets but do need localised interactions with other firms in the same function and sector. The low values of the dissimilarity parameters for all countries

suggest that this VC stage seems to be organised with a national-level business logic, similar to that applied for Headquarters.

Instead, the drivers of 'Manufacturing' investments are very different (MAN – Column 6). When compared to foreign investments in general (Column 1), the rate of unemployment exerts a positive and significant impact on their location. Notwithstanding the rigidity of the EU salary structure (in particular at the regional level), labour market conditions become relevant only for this specific VC stage: comparatively higher unemployment with potentially lower salaries and less competition on the demand side of the labour market – *ceteris paribus* –attract manufacturing investments. Foreign investments in manufacturing seem to respond to 'traditional' cost-advantage factors unlike other VC stages, suggesting that policies aimed at facilitating these investments should be carefully designed in order to avoid a 'race to the bottom' outcome and/or zero-sum territorial competition between regions (Cheshire and Gordon, 1998). This is particularly important if we consider that for this VC stage, regional factors play a significant role: as revealed by the dissimilarity parameters their influence is less significant *vis à vis* 'innovation' and 'R&D' investments (both showing higher parameters) but localised factors still play a significantly more relevant role than they do for Headquarters or Sales and Marketing. Thus, the location decisions of 'Manufacturing' investments appear to be the result of a complex interaction between regional and national factors.

Finally, Logistic and Distribution investments (Column 7) follow a co-location logic driven by the intrinsic technical factors of these activities: logistic and distribution facilities pursue a 'service' role with respect to other business functions (and in particular manufacturing) in the same sector of activity with an in-depth integration with their operations and a consequently positive impact of the number of pre-existing investments in the same sector. In addition, several logistic and distribution firms tend to 'cluster' in the same national 'hubs' (positive impact of other investments in the same VC stage). These dynamics might also explain why the total agglomeration of investments does not exert a negative influence on the location probability at this VC stage, while at the same time VC and sectoral agglomeration forces are particularly important.

6. Conclusions

The location strategies of multinational corporations investing in the EU are influenced by local socio-institutional features and by the organization of their value chains across different countries (Crescenzi and Rodríguez-Pose, 2011; Pietrobelli and Rabellotti, 2011). The 'traditional' sources of location advantage (i.e. market size and labour market characteristics) have only a limited effect upon these decisions but they do complement the search for other factors such as innovation dynamism, skilled labour and generally favourable socio-institutional conditions (Iammarino and McCann 2013). However, the relative importance of these latter factors depends upon the value chain stage of each investment.

The empirical analysis presented in this paper offers some original findings for the understanding of the geography of Multinational Firms. First, the results confirm the importance of a disaggregated

analysis of MNCs location choices in terms of value chain stages (Rugman et al., 2011). Second, socio-institutional conditions (proxied by the 'Social Filter' Index) have emerged as important components of MNCs' location decisions, especially as concerns the most sophisticated stages of their value chains. Third, in the discussion as to whether national or sub-national characteristics can better explain MNCs' location decisions, the analysis reveals that common country-level factors exert a significant influence on the location decision of MNCs in Europe, although regional factors become significantly more important when human capital is introduced into the model. Consequently, regions with a strong human capital endowment (proxied by the percentage of employed people with tertiary education) are highly attractive for foreign investments. Fourth, when considering the different VC stages, the national and the regional levels play different roles: the regional level investment drivers are stronger for manufacturing and R&D and weaker for Headquarters.

This seems to suggest that local governments should cease trying to attract headquarters, as decisions on their location depend on national-level features and dynamics as well as on the pre-existing concentration of wealth and economic activities. On the contrary, regional features can influence investments in all innovative functions associated with bringing new products or services to the market: regional/local policies may play a role stronger than macro-national policies in this particular area. Similarly, investments in the location of R&D functions are influenced by the existence of adequate local conditions in terms of human capital and innovation-prone circumstances. This suggests that active regional-level policies aimed at attracting investments in this value chain stage should focus on reinforcing general regional socio-economic conditions (Crescenzi, 2009). In short, regions are likely to attract more sophisticated stages of the value chains, insofar as they are able to contribute towards MNCs' value generation by means of their local knowledge assets and socio-institutional environment. In general, when regional development strategies target MNCs (and their attraction), a fundamental pre-condition for their success and long-term economic sustainability is their tailoring "*to both local economic and social reality*" (Hood and Young 2000: 407).

These results have to be taken with caution for a variety of reasons. Even if regional characteristics are introduced in the empirical analysis with a one-year-lag to minimise the impact of the potential simultaneity between local conditions and foreign investments[10], the results should be interpreted as descriptive of the geography of MNCs' investments in Europe, without any presumption of causality (i.e. in terms of the potential causal impact of the change of local conditions on MNCs attraction). In addition the investment dataset - although robust *vis à vis* other similar datasets - is limited to greenfield investments with no information on other typologies of foreign direct investments (e.g. mergers and acquisitions). Moreover, the information included in the dataset makes it difficult to include any 'parent company' controls for repeated investments by a given parent company in different locations. Investments by the same parent company are certainly not independent but, given the complex ownership structure of MNCs, it is hard to capture these

[10] FDI are influenced by local characteristics, but in turn they impact upon these conditions.

linkages. Finally, the role of active policies for the attraction of FDI towards specific countries and regions is only indirectly captured by the number of pre-existing foreign investments in the same region: the lack of systematic multi-country data on these policies prevents their inclusion in any EU-level analysis. The possibility to address (at least some of) these limitations remains in our agenda for future research. Future research will also explore the extent to which the results presented in this paper are specific to the European case and check whether similar dynamics can be identified in other regions of the world. More recent histories of repeated investments by MNCs and lesser specialisation might (or might not) imply a different balance between 'traditional' market access/infrastructural factors vs. socio-institutional conditions. The conceptual and empirical approach developed in this paper will be extended to other regions of the world by taking into account the country (and region) of origin of each MNC and devoting special attention to MNCs from emerging countries in order to detect potential differences in the location strategies of investments from regions at different stages of development.

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APPENDIX

Table A-1 – Variables definitions and sources

Dependent Variable		**Source(s)**
Location decisions of greenfield investments in the regions		FDi Markets
Explanatory variables		
Choice attributes (characteristics of the host region)		
Indicators of innovative activity		
Patent applications	EPO patent applications per capita	EUROSTAT
R&D	Total intramural R&D expenditure (all sectors) as % of GDP	EUROSTAT
Socio-Economic Conditions: 'Social Filter' Index and its components		
Education Employed People	% Employed People with Tertiary Education Level (Isced 79 79 levels 5-7)	EUROSTAT
Education Population	% Population with Tertiary Education Level (Isced 79 levels 5-7)	EUROSTAT
Agricultural Labour Force	Agricultural employment as % of total employment	EUROSTAT
Long Term Unemployment	Long term unemployed as % of total unemployment.	EUROSTAT
'Social Filter' Index	The index combines, by means of Principal Component Analysis (Appendix A-2), the variables describing the socio-economic realm of the region (listed above)	EUROSTAT
'Traditional' Drivers for FDI (Specific of each region)		
Market Size	Regional GDP	EUROSTAT
	Regional GDP per capita	EUROSTAT
Labour Market	Regional Unemployment Rate	EUROSTAT
'Agglomeration' Indicators (Specific of each region/investment pair)		
	Cumulative Number of TOTAL Foreign Investments in the Region (all sectors all VC stages)	fDi Markets
	Cumulative Number of Foreign Investments in the Region in the SAME SECTOR as the investment under analysis	fDi Markets
	Cumulative Number of Foreign Investments in the Region in the SAME VC stage as the investment under analysis	fDi Markets
	Cumulative Number of Foreign Investments in SAME VC stage as the investment under analysis but in DIFFERENT SECTOR	fDi Markets
	Cumulative Number of Foreign Investment in the SAME SECTOR as the investment under analysis but in DIFFERENT VC stage	fDi Markets
Characteristics of the investment		
VC stage	See Table 2 for detailed classification	fDi markets
Sector	Investments are classified in 39 standard sectors by fDi markets[11]	fDi markets

[11]Aerospace; Alternative/Renewable energy; Automotive Components; Automotive OEM; Beverages; Biotechnology; Building & Construction Materials; Business Machines & Equipment; Business Services; Ceramics & Glass; Chemicals; Coal, Oil and Natural Gas; Communications; Consumer Electronics; Consumer Products; Electronic Components; Engines & Turbines; Financial Services; Food & Tobacco; Healthcare; Hotels & Tourism; Industrial Machinery, Equipment & Tools; Leisure & Entertainment; Medical Devices; Metals; Minerals; Non-Automotive Transport OEM; Paper, Printing & Packaging; Pharmaceuticals; Plastics; Real Estate; Rubber; Semiconductors; Software & IT services; Space & Defence; Textiles; Transportation; Warehousing & Storage; Wood Products

Table A-2 – 'Social Filter' Index – Results of the Principal Components Analysis (PCA)

Table A-2.1- PCA Eigen Analysis of the Correlation Matrix

EU 25				
Comp1	2.30323	1.3384	0.5758	0.5758
Comp2	0.964829	0.250263	0.2412	0.817
Comp3	0.714565	0.697188	0.1786	0.9957
Comp4	0.0173775	.	0.0043	1

Table A-2.2 - PCA: Principal Components' Coefficients

EU 25				
Agricultural Labor Force	-0.4009	0.3471	0.8478	0.0046
Long Term Unemployment	-0.2662	0.8389	-0.4697	0.0686
Education Population	0.6271	0.2478	0.1912	0.7133
Education Employed People	0.6125	0.3381	0.1549	-0.6975

Table 4 - 'Traditional' location factors

Dependent Variable: Location Choice

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
GDP per Capita	3.22e-05***	3.09e-05***	4.45e-06***	8.85e-07***	6.02e-07*	5.67e-07
	(1.39e-06)	(1.31e-06)	(4.72e-07)	(3.03e-07)	(3.26e-07)	(1.32e-06)
Unemployment	-0.00476	-0.00145	0.00140**	0.000255	0.00227***	0.0307***
	(0.00327)	(0.00298)	(0.000627)	(0.000435)	(0.000518)	(0.00321)
Total Regional GDP (Abs.)	1.13e-07***	9.93e-08***				
	(2.92e-09)	(2.78e-09)				
Total Investment in the Region	0.00225***	0.000303***	0.00171***	0.00101***	0.00108***	0.00189***
	(9.20e-05)	(0.000110)	(6.75e-05)	(5.21e-05)	(9.66e-05)	(8.94e-05)
Number of Investments SAME Sector		0.0109***	0.00890***	0.00924***	0.00943***	0.00990***
		(0.000332)	(0.000226)	(0.000210)	(0.000218)	(0.000304)
Patent Intensity				0.000157***	0.000159***	0.000491***
				(1.99e-05)	(2.69e-05)	(6.00e-05)
% Total R&D Expenditure					0.0372***	
					(0.00516)	
Agricultural Share						-7.155
						(6.315)
% Tertiary Education (Employed people)						0.586***
						(0.161)
IV Parameters						
Austria	0.517***	0.415***	0.0857***	0.0535***	0.0852***	0.372***
	(0.0421)	(0.0408)	(0.00501)	(0.00387)	(0.00806)	(0.0256)
Belgium	1.192***	1.116***	0.209***	0.156***	0.150***	0.661***
	(0.0479)	(0.0440)	(0.0185)	(0.0160)	(0.0168)	(0.0517)
CzechRep	1.218***	1.109***	0.140***	0.0856***	0.115***	0.602***
	(0.0333)	(0.0324)	(0.0112)	(0.00573)	(0.0141)	(0.0312)
Germany	0.768***	0.702***	0.248***	0.216***	0.213***	0.578***
	(0.0143)	(0.0137)	(0.0162)	(0.0171)	(0.0175)	(0.0188)
Spain	0.885***	0.846***	0.170***	0.139***	0.153***	0.731***
	(0.0215)	(0.0201)	(0.00673)	(0.00652)	(0.0107)	(0.0231)
Finland	0.332***	0.170***	0.0674***	0.0417***	0.0521***	0.264***
	(0.0401)	(0.0135)	(0.00844)	(0.00516)	(0.00749)	(0.0237)
France	0.908***	0.832***	0.422***	0.397***	0.398***	0.720***
	(0.0151)	(0.0143)	(0.0109)	(0.0105)	(0.0139)	(0.0155)
Greece	0.350***	0.231***	0.0561***	0.0356***	0.0389***	0.513***
	(0.0350)	(0.0176)	(0.00555)	(0.00394)	(0.00503)	(0.0314)
Hungary	1.221***	1.112***	0.163***	0.0942***	0.101***	0.585***
	(0.0439)	(0.0425)	(0.0168)	(0.00758)	(0.0109)	(0.0409)
Italy	0.581***	0.386***	0.130***	0.108***	0.104***	0.341***
	(0.0218)	(0.0142)	(0.00594)	(0.00585)	(0.00691)	(0.0208)
Netherlands	0.516***	0.401***	0.116***	0.0923***	0.105***	0.216***
	(0.0402)	(0.0401)	(0.00666)	(0.00574)	(0.00795)	(0.0157)
Poland	1.103***	1.017***	0.310***	0.103***	0.145***	1.067***
	(0.0224)	(0.0213)	(0.0276)	(0.00597)	(0.0387)	(0.0266)
Portugal	0.923***	0.795***	0.0527***	-0.469***	-0.357***	0.771***
	(0.0596)	(0.0590)	(0.00393)	(0.0406)	(0.0324)	(0.0353)
Slovakia	1.618***	1.576***	0.140***	0.0739***	0.0734***	0.748***
	(0.067)	(0.005)	(0.0298)	(0.00798)	(0.00781)	(0.0487)
UK	0.981***	0.954***	0.628***	0.595***	0.603***	0.881***
	(0.0171)	(0.0159)	(0.00998)	(0.00946)	(0.0119)	(0.0169)
Log likelihood	-48887.128	-48322.447	-48664.52	-48483.138	-48479.428	-48624.8
LR test (IIA)	1781.99***	1898.32***	2797.66***	3011.95***	2682.01***	1321.24***
Observations	1527635	1527635	1527635	1527635	1527635	1527635

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5 - Sector vs. Value Chain agglomeration processes

	Dependent Variable: Location Choice	
Variables	**(1)**	**(2)**
Patent Intensity	0.000225	0.000187***
	(0.000160)	*(3.13e-05)*
Social Filter	0.151***	0.00948**
	(0.0229)	*(0.00474)*
Unemployment	-0.000263	0.00105
	(0.00506)	*(0.000881)*
GDP per Capita	3.69e-06	-7.36e-07
	(3.51e-06)	*(6.75e-07)*
Number of Investments SAME sector DIFFERENT VC stage	0.0179***	
	(0.00134)	
Number of Investments SAME VC stage DIFFERENT Sector	0.0127***	
	(0.000620)	
Number of Investments SAME VC stage		0.00577***
		(0.000357)
Number of Investments SAME Sector		0.0141***
		(0.000546)
Total Investment in the Region	-0.000709	-0.000303*
	(0.000540)	(0.000171)
IV Parameters		
Austria	0.812***	0.0725***
	(0.0599)	*(0.00802)*
Belgium	1.244***	0.128***
	(0.0854)	*(0.0145)*
CzechRep	1.146***	0.116***
	(0.0516)	*(0.0116)*
Germany	0.803***	0.254***
	(0.0258)	*(0.0365)*
Spain	0.784***	0.158***
	(0.0351)	*(0.0112)*
Finland	0.222***	0.0440***
	(0.0417)	*(0.00820)*
France	0.873***	0.388***
	(0.0271)	*(0.0173)*
Greece	0.483***	0.0561***
	(0.0859)	*(0.00777)*
Hungary	1.135***	0.196***
	(0.0654)	*(0.0181)*
Italy	0.795***	0.163***
	(0.0519)	*(0.0120)*
Netherlands	0.614***	0.110***
	(0.0565)	*(0.0105)*
Poland	1.045***	0.139***
	(0.0348)	*(0.0129)*
Portugal	0.870***	0.0831***
	(0.0887)	*(0.0116)*
Slovakia	1.473***	0.116***
	(0.0291)	*(0.0133)*
UK	1.000***	0.667***
	(0.0270)	*(0.0148)*
Log likelihood	-20912.061	-20571.733
LR test (IIA)	576.96***	1221.16***

Observations	640589	640589
Standard errors in parentheses	*** p<0.01, ** p<0.05, * p<0.1	

Table 6 - Innovation, Socio-economic and 'traditional' location factors by Value Chain Stage

Dependent Variable: Location Choice

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Value Chain Stage	ALL	HQ	INNO	R&D	SALES	MAN	LOG & DIST
Variables							
Patent Intensity	0.000187***	0.000415***	0.000166	0.00647**	0.000227***	0.000159	8.25e-05
	(3.13e-05)	*(0.000104)*	*(0.000845)*	*(0.00323)*	*(5.02e-05)*	*(9.74e-05)*	*(0.000272)*
Social Filter	0.00948**	-0.00287	-0.0682	1.099**	0.0109	-0.00830	-0.0270
	(0.00474)	*(0.0202)*	*(0.0766)*	*(0.536)*	*(0.00804)*	*(0.0169)*	*(0.0415)*
Unemployment	0.00105	-0.00502	-0.0363	-0.0311	0.000125	0.00502*	-0.0103
	(0.000881)	*(0.00760)*	*(0.0251)*	*(0.0904)*	*(0.00151)*	*(0.00274)*	*(0.00803)*
GDP per Capita	-7.36e-07	1.59e-05***	1.48e-05	-0.000175*	-6.68e-07	1.70e-09	-3.67e-06
	(6.75e-07)	*(4.92e-06)*	*(1.19e-05)*	*(9.31e-05)*	*(1.10e-06)*	*(2.49e-06)*	*(4.15e-06)*
Number of Investments SAME VC stage	0.00577***	0.00718***	0.132***	0.400***	0.00765***	0.0172***	0.0591***
	(0.000357)	*(0.00203)*	*(0.0211)*	*(0.119)*	*(0.000510)*	*(0.00156)*	*(0.0154)*
Number of Investments SAME Sector	0.0141***	0.00864***	0.0178***	0.0652***	0.00852***	0.0881***	0.0202***
	(0.000546)	*(0.00160)*	*(0.00439)*	*(0.0200)*	*(0.000707)*	*(0.00562)*	*(0.00408)*
Total Investment in the Region	-0.000303*	0.000716	-0.00658**	-0.0296***	-0.00161***	-0.00604***	-0.00193
	(0.000171)	(0.00109)	(0.00275)	(0.0109)	(0.000347)	(0.000830)	(0.00126)
IV Parameters							
Austria	0.0725***	0.0996***	0.332***	2.972**	0.0985***	0.121***	0.149**
	(0.00802)	*(0.0258)*	*(0.101)*	*(1.197)*	*(0.0147)*	*(0.0199)*	*(0.0689)*
Belgium	0.128***	0.359***	1.303***	4.814***	0.104***	0.418***	0.879***
	(0.0145)	*(0.105)*	*(0.374)*	*(1.547)*	*(0.0199)*	*(0.0589)*	*(0.230)*
CzechRep	0.116***	0.109***	0.852***	2.688**	0.0852***	0.521***	0.362***
	(0.0116)	*(0.0326)*	*(0.302)*	*(1.244)*	*(0.0121)*	*(0.0491)*	*(0.103)*
Germany	0.254***	0.363***	0.737***	1.913***	0.213***	0.392***	0.603***
	(0.0365)	*(0.101)*	*(0.109)*	*(0.620)*	*(0.0312)*	*(0.0561)*	*(0.191)*
Spain	0.158***	0.109***	0.588***	1.372***	0.193***	0.356***	0.517***
	(0.0112)	*(0.0267)*	*(0.111)*	*(0.465)*	*(0.0182)*	*(0.0379)*	*(0.148)*
Finland	0.0440***	0.143***	0.561	1.589	0.0496***	0.0279*	0.00333
	(0.00820)	*(0.0529)*	*(0.377)*	*(1.515)*	*(0.0150)*	*(0.0150)*	*(0)*
France	0.388***	0.363***	0.842***	2.491***	0.388***	0.547***	0.599***
	(0.0173)	*(0.0393)*	*(0.127)*	*(0.741)*	*(0.0212)*	*(0.0372)*	*(0.162)*
Greece	0.0561***	0.145***	-2.557	0.288	0.0635***	0.0846***	-1.291*
	(0.00777)	*(0.0516)*	*(2.879)*	*(6.242)*	*(0.0117)*	*(0.0271)*	*(0.691)*
Hungary	0.196***	0.0563	-3.586	-0.359	0.0433***	0.536***	0.0891***
	(0.0181)	*(0.0427)*	*(9.878)*	*(29.13)*	*(0.0117)*	*(0.0434)*	*(0.0332)*
Italy	0.163***	0.231***	0.318	3.589***	0.185***	0.150***	0.127***
	(0.0120)	*(0.0586)*	*(0.234)*	*(1.334)*	*(0.0187)*	*(0.0263)*	*(0.0480)*
Netherlands	0.110***	0.139***	0.0909	2.143**	0.109***	0.164***	0.502**
	(0.0105)	*(0.0312)*	*(0.210)*	*(0.887)*	*(0.0151)*	*(0.0309)*	*(0.222)*
Poland	0.139***	0.0514***	0.812***	2.450**	0.0675***	0.544***	0.530***
	(0.0129)	*(0.0168)*	*(0.269)*	*(0.996)*	*(0.00823)*	*(0.0361)*	*(0.202)*
Portugal	0.0831***	0.0631***	0.714*	3.669**	-0.452***	0.154***	0.220*
	(0.0116)	*(0.0221)*	*(0.427)*	*(1.769)*	*(0.0945)*	*(0.0339)*	*(0.133)*
Slovakia	0.116***	0.0971**	0.971	3.499*	0.0927***	0.477***	0.259
	(0.0133)	*(0.0429)*	*(0.856)*	*(1.808)*	*(0.0231)*	*(0.0571)*	*(1.092)*
UK	0.667***	0.775***	0.993***	2.079***	0.696***	0.601***	0.815***
	(0.0148)	*(0.0352)*	*(0.132)*	*(0.665)*	*(0.0215)*	*(0.0433)*	*(0.151)*
Log likelihood	-20571.733	-2336.694	-1103.301	-534.9055	-6920.7265	-7152.058	-2271.0157
LR test (IIA)	1221.16***	222.09***	79.34***	43.74***	506.68***	283.31***	71.74***
Observations	640589	84888	36058	18123	229559	220575	69509

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1