Rev World Econ (2010) 146:469–494
DOI 10.1007/s10290-010-0059-5

ORIGINAL PAPER

Structural funds, EU enlargement, and the redistribution of FDI in Europe

Fritz Breuss · Peter Egger · Michael Pfaffermayr

Published online: 20 June 2010

Abstract The EU enlargements of 2004 led to a redirection of Structural and Cohesion Funds expenditures from EU-15 to new EU members as did those of 2007. This redistribution of funds makes the accession countries even more attractive as a location of FDI. Using a logistic regressions approach, this paper shows that a reallocation of structural funds as outlined in Agenda (For a stronger and wider union, COM(97) 2000 final, 2000) and successive revisions of the financial perspectives for an enlarged union leads to a redistribution of FDI by approximately 4−8 percentage points from the current EU members to the accession countries (2004 scenario) and 7−10 percentage points (2007 scenario), respectively.

F. Breuss
Europe Institute at the Vienna University of Economics and Business Administration, Althanstrasse 39-45, 1090 Vienna, Austria
e-mail: Fritz.Breuss@wifo.ac.at

P. Egger (✉)
ETH Zürich, WEH E6, Weinbergstrasse 35, 8092 Zürich, Switzerland
e-mail: egger@kof.ethz.ch

P. Egger
Centre of Economic Policy Research, 53-56 Great Sutton Street, London EC1V 0DG, UK

P. Egger
CESifo and ifo, Poschingerstrasse 5, 81679 Munich, Germany

M. Pfaffermayr
Department of Economic Theory, Economic Policy and Economic History, University of Innsbruck, Universtaetsstrasse 15, 6020 Innsbruck, Austria
e-mail: Michael.Pfaffermayr@uibk.ac.at

F. Breuss · P. Egger · M. Pfaffermayr
Austrian Institute of Economic Research, Arsenal, Objekt 20, P.O. Box 91, 1030 Vienna, Austria

Keywords FDI · Structural funds · European integration · Spatial econometrics

JEL classification C33 · F14 · F15

1 Introduction

The fifth and largest enlargement of the EU by ten countries took place on May 1, 2004. According to the Agenda 2000, the decisions by the European Council at the Copenhagen meeting in December 2002 and the budgetary plans by the European Commission for the enlarged Union for the period 2007–2013, this EU enlargement has been financed mainly by a redirection of Structural and Cohesion Funds (SCF) expenditures from the EU-15 to the new EU member states. By preserving current overall expenditure levels in the enlarged EU, the redistribution of SCF aims at promoting the catching up process of the ten new members—eight of which are Central and Eastern European countries (CEEC)—and at closing the still considerable gaps in infrastructure and capital endowments as a legacy of these formerly planned economies. This redistribution of funds is expected to increase foreign direct investment (FDI) into the accession countries in relative terms at the expense of FDI into the EU-15 member states. The aim of this paper is to project the magnitude of the redistribution of FDI from the old to the new EU member states.

The reallocation of SCF expenditures should affect the inward FDI position of incumbent EU countries relative to the entrant economies. The theory of multinational enterprises (MNEs) suggests that SCF expenditures may reduce the plant set-up costs and, in this way, change the trade-off between exporting and setting up foreign affiliates in favor of MNE activity (Breuss et al. 2001). On the other hand, they may also improve the infrastructure of a country such as its transportation network. The latter effect reduces transportation costs and favors trade. The overall impact of SCF expenditures on the allocation of FDI remains an empirical question, which is best analyzed in a logistic regressions framework, accounting for spatial dependence. This approach allows analyzing the determinants of a country's share in FDI, originating from a 'typical' parent country, as the dependent variable. Further, one is able to explicitly account for external effects of changes in SCF expenditures on FDI across borders. Finally, a spatial econometric framework explicitly takes into account that investment decisions across host markets for a given parent company are interdependent. With such a model it is possible to simulate the hypothetical impact of a reallocation of SCF as formulated in Agenda 2000 and the updated cost calculations of EU enlargement on the distribution of FDI across old and new member countries in the past.[1]

We study two enlargement scenarios: the 2004 scenario with eight CEECs plus Cyprus and Malta, and the 2007 scenario with the accession of Bulgaria and Romania. Both scenarios take into account the financial agreements of the decisions made by the European Council in December 2002 and the financial perspectives for

[1] Note that, due to the publication lag in foreign direct investment statistics and the ongoing budgetary period, it is only possible to investigate the corresponding response in FDI by means of simulations.

the programming period 2007–2013. Based on these scenarios and a consistent and robust estimate of the corresponding share-multiplier, we can then project the consequences of the reallocation of SCF expenditures across old and new EU host countries.

The paper is organized as follows: The next section reports the main features of the structural policy reform in the EU. Section 3 draws on the MNE literature in international economics and formulates the most important hypotheses concerning the impact of SCF expenditures on the distribution of inward FDI. Section 4 introduces the logistic bilateral FDI regression framework, which accounts for spatial dependence. Section 5 reports both the estimation and the simulation results. The last section summarizes the main findings.

2 Agenda 2000 and structural policy reform in the EU

At their historic European Council meeting in Copenhagen on December 12–13, 2002, the heads of governments of the EU member countries, decided to enlarge the EU by ten new countries (eight CEECs plus Cyprus and Malta). In July 1997, the European Commission issued a communication "Agenda 2000: For a Stronger and Wider Union", which dealt with the reform of the common agricultural policy, the future of economic and social cohesion policy, the establishment of a pre-accession strategy, the consequences of future enlargement and the financing of the Community. The necessary reform of the EU institutions (Council, Commission, European Parliament) in an enlarged union was laid out in the Nice Treaty, which came into force on February 1, 2003.

The Agenda 2000 tried to strengthen Community policies and to provide a new financial framework for the period 2000–2006 in view of the enlargement. It was launched in 1999 and focused inter alia on the increase in the effectiveness of SCF expenditures by a better thematic and geographic concentration of projects on specific objectives and geographical areas; on the reduction of the number of objectives from seven to three (Objective 1—regions with a per capita GDP below 75% EU-15 average; Objective 2—regions undergoing restructuring; Objective 3—human resources) and on the adoption of a new financial framework for the period 2000–2006 in order to enable the European Union to cope with an enlargement by a maximum of six countries within this period, while ensuring budgetary discipline. Due to the changed date of both enlargements (2004, whereas the Agenda 2000 assumed the accession by 2002) and the number of entrants (not six but ten countries), the European Commission issued a revised cost calculation for the period 2004–2006 in January 2002, which was accepted with a few adjustments by the Copenhagen Council meeting in December 2002. Accordingly, EU enlargement by ten new members led to additional financial burdens for the EU budget over the period 2004–2006 by around 37 bn. euro (at 1999 prices) plus a special cash-flow facility by over 3 bn. euro. The major part of the cost of enlargement was due to structural actions (i.e., SCF expenditures). Two additional countries (Bulgaria and Romania) joined the EU in 2007 and the ramifications of SCF expenditures across all EU members for the budgeting period 2007–2013 are determined in the financial perspectives for that period (see the European Commission 2004a). In principal, the

financial perspectives for 2007–2013 aim at modernizing structural policy. The funding proposals provide a total budget of 336.3 bn. euros, or 0.41% of EU gross national income (0.46% before the transfers to instruments for rural development and fisheries). Funding is spread across the three main objectives in the following way (see European Commission 2004b):

(i) Convergence: 78% of the funding should be allocated to the new Objective 1, to sustain growth and job creation in the poorest countries and regions. The money should be channeled via the Cohesion Fund to countries with a national GDP below 90% of the EU-25 average and via the Regional Development Fund and the Social Fund to regions with a GDP <75% of the EU-25 average. Four key areas are targeted: modernizing the economic structure; extending and upgrading basic infrastructure and the protection of the environment; enhancing human capital and tackling social exclusion (which benefits all industries in a country simultaneously); improving administrative capacity.
(ii) Regional competitiveness and employment: the new Objective 2 replaced Objectives 2 and 3 of the previous budgetary period and accounts for 18% of the funding. It will ensure that the richer countries continue to receive structural aid for education and training and combating social exclusion, support for the knowledge society and innovation, protection of the environment and risk prevention, and improved access to services of general economic interest.
(iii) European territorial cooperation: 4% of the funding is aimed at securing the prolongation of the Interreg programs to encourage territorial cooperation.

The basic principles of financing the EU enlargement were already fixed at the Berlin European Council. There, the heads of governments or states decided that financing the EU enlargement must be realized without changing its own resources ceiling of 1.27% of gross national income of the EU-15 between 2000 and 2006 and of 1.24% of GNI of the EU-25 for the new financial period 2007–2013 (see European Commission 2004a, p. 27). The additional costs of enlargement envisaged in the financial perspective for 2000–2006 had to be covered by reducing transfers to the EU-15 members—mainly in the area of Structural Funds Operations. To maintain economic and social cohesion as one of the Union's main objectives, the Interinstitutional Agreement between the European Parliament, the Council and the Commission of May 6, 1999 (OJ. No. C172/1, of June 18, 1999) on budgetary discipline and improvement of the budget procedure for the 2000–2006 financial perspective maintained the funding for economic and social cohesion at 0.46% of the enlarged union's GNP over the period 2000–2006 (as was already the case in the period 1993–1999). Since the 0.46% ceiling covered 25 EU countries at the end of the last programming period, the EU-15 economies were confronted with a (relative) reduction as compared to the programming period 1993–1999.

In the 2004 enlargement scenario (ten new member states) the redistribution of SCF transfers led to the largest reduction in the so-called cohesion countries. Compared with 1995/96, Ireland and Portugal lost transfers by 1.5 percentage points of GDP in 2004, whereas Greece and Spain only lost 0.3 percentage points. In contrast, the new member states gained 1−2 percentage points of SCF transfers in terms of their GDP (Slovenia 0.5 percentage points). In the 2007 enlargement

scenario (Bulgaria and Romania) the redistribution will continue (see Table 3 for details). From the other EU-15 member countries, only Belgium–Luxembourg, Finland, the UK, Italy and Denmark face minor reductions in transfers out of the SCF program of the EU.

3 Theoretical background

About two and a half decades ago, the international economics literature successfully started to implement MNEs into the now standard, economies-of-scale-based, new trade theory model. Since the early stage, researchers have distinguished between vertical and horizontal MNE activity. Vertical MNEs are characterized by the complete unbundling of skill-intensive headquarters services, located in the skill-abundant parent country, and low-skill-intensive production in the low-skilled labor-abundant host (Helpman 1984). These firms engage in trade and export to consumers in their parent country. Horizontal MNEs also concentrate their headquarters services in the skill-abundant parent country, but they avoid trade costs by serving consumers locally in each market (Markusen 1984; Markusen 1995; Markusen and Venables 2000; Egger and Pfaffermayr 2005).

At the beginning of the new century, these two types of models were integrated into the so-called knowledge-capital model of MNEs, with horizontal and vertical MNEs arising endogenously depending on factor endowments and the proximity-concentration trade-off (Carr et al. 2001; Markusen 2002; Markusen and Maskus 2002). Whereas vertical MNEs come into existence, if differences in factor endowments (hence, production cost) are large and trade costs are low, horizontal MNEs most likely arise between skill-abundant economies of similar size and relative factor endowments and at high trade costs. All these models share the feature that a ceteris paribus decrease in fixed foreign plant set-up costs is associated with more MNE activity.

The theoretical literature suggests including the following determinants in empirical models of FDI and MNE activity. First both bilateral market size and similarity in size between the parent and the host foster bilateral multinational activity (see Markusen et. al. 1996; Markusen and Maskus 2001, 2002). Second, differences in relative factor endowments stimulate vertical FDI. The parent to host country's physical capital to low-skilled labor ratio as well as the relative high-skilled to low-skilled labor ratio should exert a positive impact on bilateral outward FDI. A relatively better endowment with physical capital implies a comparative advantage in capital-intensive activities (such as setting up plants abroad), and a better endowment with skilled labor (human capital) represents a comparative advantage in inventing new varieties and setting up firms irrespective of whether they are multinationals or domestic ones (see Breuss et al. 2001; Egger and Pfaffermayr 2005, for more details). Third, the knowledge-capital model of MNEs motivates interaction terms between the relative skilled-to-unskilled endowment ratio with relative size and with trade costs (Carr et al. 2001; Markusen and Maskus 2002; Egger and Pfaffermayr 2004). In this way, it is possible to account for the differential impact of size and endowment differences on horizontal and vertical MNE activity. We would expect a negative

impact of trade costs on FDI only if vertical MNEs are dominant (i.e., at different skilled-to-unskilled labor ratios between countries). An increase in the difference in skilled-to-unskilled labor ratio in the parent and the host should exert a negative impact on FDI, especially, if the parent is small (i.e., countries are of dissimilar size given that the parent is smaller). A reduction of foreign plant set-up costs enables a country to attract more FDI, while a reduction in trade costs discourages horizontal FDI, but encourages vertical FDI.

Recently, these models have been extended to account for "hybrid" MNEs. Specifically, the assumption of two countries has been relaxed in favor of three economies (Yeaple 2003; Egger et al. 2004; Grossman et al. 2006; Ekholm et al. 2007). In a world of more than two countries, new possibilities arise for modelling MNEs. "Hybrid" MNEs produce locally, but also engage in trade in one or the other way. One important type of activity associated with "hybrid" MNEs is export-platform FDI, where a third market is served through exports in final goods from a foreign affiliate (Helpman et al. 2004; Baltagi et al. 2007; Ekholm et al. 2007). A second important type is one, where each of the MNEs' affiliates produces an intermediate good which serves this MNEs' production in all affiliates. In this case, intermediate goods are shipped to all plants of the MNE (Grossman et al. 2006).

With pure horizontal or vertical FDI, bilateral and third-country FDI from a given parent are substitutive with respect to bilateral changes in foreign investment costs. If foreign plant set-up costs in Host A rise, FDI to Host B rises at the expense of FDI to A (competition effect). Also "hybrid" MNEs are negatively affected by an increase in additional foreign plant set-up costs in the foreign market where they produce. However, in addition to the general equilibrium effects associated with purely horizontal or vertical firms, changes in investment costs in a particular host under "hybrid" MNEs generate direct third-country effects. An increase in investment costs in Host A may exert two different kinds of positive effects on FDI to Host B (externality effect). First, without intra-firm trade in intermediate goods and given the resource constraint of the parent country and the level of investment costs in Host B, the parent economy will partly reallocate its FDI from A to B to fully employ its resources (this general equilibrium effect also arises with pure horizontal and vertical MNEs). Second, if MNEs fragment their production across borders within the firm and engage in intra-firm intermediate goods trade (Grossman et al. 2006), an additional dependency arises. For instance, assume that MNEs assemble their final goods in the parent economy, where also research is undertaken. Let them produce one down-stream component in A, entering a further production stage in B. With vertical intra-firm integration across borders changes in investment costs in a particular host, say A, will affect FDI in another host in the same way. If vertical integration involves trade in visible components, the complementarity among host markets with respect to changes in bilateral foreign plant set-up costs will decrease in bilateral trade costs and, hence, distance. See Baltagi et al. (2007) for a theoretical and empirical treatment.

Structural expenditures are designed to stimulate infrastructure investments used by all industries. We maintain that these investments are negatively correlated with foreign plant set-up costs (see Kellenberg 2007, for a theoretical exposition). Then, structural expenditures change the proximity-concentration trade-off and, thereby,

the international allocation of FDI (see Breuss et al. 2001). Hence, an increase in structural expenditures in a given European host increases FDI there. However, under hybrid FDI other European economies might be affected as well. These third country effects are positive, if vertical integration within firms is dominant. Then, the strongest positive effects of infrastructure investments are likely to occur in the given host and the closest economies. Given a positive correlation between trade costs and distance, the positive impact on FDI to other countries should decline with distance. However, also a negative effect is possible, if FDI into a country is reduced by increasing FDI in third countries. This motivates host country SCF expenditures and distance-weighted third-market SCF expenditures as two separate determinants of a given parent's FDI to a particular host.

All other third-market effects on bilateral FDI may be subsumed under the parent's distance-weighted FDI to third countries. Also for this variable we expect a complementary relationship between bilateral and third-market FDI if hybrid vertical FDI with intra-firm trade in intermediates is dominant. In this case, an increase in a parent's distance-weighted FDI to third countries will foster bilateral FDI.

4 A logistic bilateral FDI regression model

We set up a logistic regression model, which accounts for the impact of SCF expenditures on the *distribution* of each home country's stock of outward FDI among the host countries.[2] The overall *aggregate level* of outward FDI stocks of a sending country and also its net FDI position remains unexplained in the logistic regression approach. Further, spatial effects as motivated in the preceding section are accounted for in three ways: (i) FDI into a country may be affected by the spatially weighted average of SCF expenditures of the competing countries. (ii) FDI into the competing countries enters as an endogenous spatially weighted average. Given the bilateral explanatory variables, FDI in a particular host either decreases (competition effect) or increases in the neighboring countries' inward FDI. Since this variable is endogenous, we apply a proper set of instruments as suggested by Kelejian and Prucha (1998), namely all explanatory variables with second and third order spatial lag. (iii) We also test for the possibility of spatially correlated stochastic shocks.

We envisage a parent country $i = 1, \ldots, N$, which allocates its stocks of FDI measured in logs to EU-15 and new EU host countries $j = 1, \ldots, J$ at time $t = 1, \ldots, T$. Hence, we look at a 'typical' OECD country and its allocation of real outward FDI stocks among the EU-15 and the CEEC countries, disregarding other alternative investment possibilities.[3] For this, let us denote the corresponding log bilateral real outward stocks of FDI by $O_{itj} = log(F_{itj})$, where F_{itj} is the share of country i's FDI stocks in country j in year t in all host countries in the sample

[2] See Belderbos (1992) for a similar approach in a different context.

[3] We use FDI stocks because flow data are too volatile. Also, in a fixed effects framework such as ours, one exploits information from the change in data over time. Whereas the change in FDI stocks corresponds to a net flow, hypotheses for the change in flows cannot be derived from the theoretical models discussed above. For bilateral FDI data, the use of stocks and panel econometric methods is highly recommended also by other authors (see Blonigen and Davies 2004).

(including Spain). For convenience, we will stack the observations for each parent country and year into the $J_{\mathrm{it}} \times 1$ vector $\mathbf{O}_{it}$. We will generally adhere to the convention of denoting vectors and matrices by bold letters. For the logistic transformation, we choose Spain as the home country base, because it reveals the lowest number of missing values. Accordingly, let us denote i's log stock of FDI in Spain in that year by $O_{it,Spain} = log(F_{it,Spain})$, where $F_{it,Spain}$ is the share of country i's outward FDI in year t in all covered host countries into Spain. Again, we may generate a $J_{\mathrm{it}} \times 1$ vector of observations with typical elements $O_{it,Spain}$ for parent country i and year t, $\mathbf{O}_{it,Spain}$. Obviously, all elements of $\mathbf{O}_{it,Spain}$ are identical.[4] The logistically transformed dependent variable is $O_{itj} - O_{it,Spain}$ or, in vector form, $\mathbf{O}_{itj} - \mathbf{O}_{it,Spain}$.[5] The data are generally sorted first by home country (i) and time (t) and then by hosts (j).

We are primarily interested in the role of three determinants of normalized FDI shares, $O_{itj} - O_{it,Spain}$. First, we want to allow for "spaceyness" of FDI across host countries as in Baltagi et al. (2007) and Blonigen et al. (2007), but in a logistic framework. Spaceyness across host countries relates to the interdependence of FDI across host countries in a given year and is typically modeled as an inverse-distance-weighted function of (real stocks of) bilateral FDI for the same parent country and year in other host countries. Define $e^{-cln(d_{jk})}$ as the inverse distance measure between two countries j and k and $w_{it,jk} = e^{-cln(d_{jk})}\%/\sum_{k=1}^{J_{it}} e^{-ln(d_{jk})}$ as the so-called row-normalized spatial weight given to host country k for host country j, parent country i and year t. In the baseline estimates c takes the value of 1. To check the robustness of the estimates, we alternatively assume $c = 0.5$ and $c = 1.5$. $w_{\mathrm{it},jk}$ is referred to as a spatial weight since it is a function of (inverse) distance: the further k is away from j the lower is the corresponding weight attributed to country k for j. $w_{\mathrm{it},jk}$ is called a row-normalized spatial weight since $\sum_{k=1}^{J} w_{it,jk} = 1$. $w_{\mathrm{it},jk} = 0$ is generally assumed for all $j = k$. Now, let us collect the elements $w_{\mathrm{it},jk}$ into the $J_{\mathrm{it}} \times J_{\mathrm{it}}$ matrix $\mathbf{W}_{it}$. Notice that $\mathbf{W}_{it}$ exhibits zero diagonal elements and all elements in a row sum up to unity. Spaceyness of logistically transformed real stocks of FDI across host countries may then be captured by the vector $\mathbf{W}_{it}(\mathbf{O}_{itj} - \mathbf{O}_{it,Spain})$ whose jth element is $\sum_{k=1}^{J}[w_{it,jk}(O_{itk} - O_{it,Spain})]$. $\mathbf{W}_{it}(\mathbf{O}_{itj} - \mathbf{O}_{it,Spain})$ is employed as an endogenous right-hand-side variable in our empirical model. If the corresponding parameter estimate is positive (it has to be smaller than unity in absolute value for consistency), we may conclude that there are positive spillovers on FDI in a particular host country from FDI by the same parent economy and in the same year to adjacent host countries.

The two regressors of primary interest here relate to direct effects and to spillover effects from SCF expenditures in host countries on FDI, there. Let us denote host country j's SCF expenditure to GDP ratio in year t by s_{tj}, and let us refer to Spain's ratio by $s_{t,\mathrm{Spain}}$. Analogous to $\mathbf{O}_{it}$, we can collect units of s_{tj} and $s_{t,\mathrm{Spain}}$ parent country i and year t into $J_{\mathrm{it}} \times 1$ vectors to obtain the logistically transformed regressor $(\mathbf{s}_{it} - \mathbf{s}_{it,Spain})$. The parameter of $(\mathbf{s}_{it} - \mathbf{s}_{it,Spain})$ captures direct effects of

[4] If $O_{it,Spain}$ were missing in a particular year, all observations of the logistically transformed variable would be lost for this parent country and year. Principally, any home country can serve as the base, since the logistic transformation is invariant in this respect.

[5] Of course, the regressions below exclude Spain both as a parent and as a host country in every year, since $O_{it,Spain}$ is zero. Nevertheless, Spain is and has to be part of the simulations conducted later on.

structural expenditures on the allocation of real FDI stocks for the typical parent country and year. Spillover effects of SCF expenditures across host countries may then be captured by $\mathbf{W}_{it}(\mathbf{s}_{it} - \mathbf{s}_{it,Spain})$, whose typical elements are $\sum_{k=1}^{J}[w_{it,jk}(s_{tk} - s_{t,Spain})]$. A positive parameter of the latter would suggest that there are positive spillovers from SCF expenditures in adjacent countries on FDI by parent country i in host j and year t.

In line with previous research, we include a number of further control variables which are similarly constructed. For instance, we employ two variables which reflect the joint and relative sizes of markets i and j in year t (see Egger and Pfaffermayr 2004; Baltagi et al. 2007). In particular, G_{itj} is the log of the bilateral sum of real GDP of countries i and j in year t, and S_{itj} denotes the log of the bilateral similarity index in terms of real GDP with $\log(0) \leq S_{itj} \leq \log(0.5)$ (see Helpman 1987). Using the same normalization and notation as before, the two corresponding logistically transformed regressors are $(G_{itj} - G_{it,Spain})$ and $(S_{itj} - S_{it,Spain})$ or, in vector form, $(\mathbf{G}_{itj} - \mathbf{G}_{it,Spain})$ and $(\mathbf{S}_{itj} - \mathbf{S}_{it,Spain})$, respectively. Then, we include a regressor referred to as $(k_{itj} - k_{it,Spain})$ or, in vector form $(\mathbf{k}_{itj} - \mathbf{k}_{it,Spain})$, which reflects the role of differences in capital labor ratios between parent i and the host countries in a given year t. Notice that k_{itj} is defined as the absolute difference between log parent country i's real per capita income in year t and log host country j's real per capita income in that year (see Helpman 1987; Egger and Pfaffermayr 2004), and similarly for $k_{it,Spain}$.

Furthermore, we include three variables capturing the general investment and political climate across host countries. In particular, we include a regressor $(R_{tj} - R_{t,\text{Spain}})$ which is based on the investment risk indicator contained in the International Country Risk Guide.[6] A higher index value R_{tj} reflects a greater investment risk in country j and year t. Then, we employ the Polity IV index as available from the Polity IV Project through $(P_{tj} - P_{t,\text{Spain}})$ as a measure of the political climate in a country. A higher index value of P_{tj} reflects a better political climate in country j and year t. Moreover, we use regime durability from the Polity IV Project through $(D_{tj} - D_{t,\text{Spain}})$ to allow for a specific impact of political stability (irrespective of other elements of the political climate). A larger index value of D_{tj} implies that the political regime is already in place for a longer time in host country j and year t. Again, the corresponding variables may be written in vector form for parent country i and year t as $(\mathbf{R}_{itj} - \mathbf{R}_{it,Spain})$, $(\mathbf{P}_{itj} - \mathbf{P}_{it,Spain})$, and $(\mathbf{D}_{itj} - \mathbf{D}_{it,Spain})$, respectively.[7]

Finally, we employ fixed time effects λ_t and fixed country-pair effects μ_{ij}. Whereas the former capture effects on bilateral real FDI relative to Spain which are common to all country pairs (e.g., common cycle effects), the latter capture unobserved, time-invariant influences on bilateral FDI stocks (e.g., distance, common language, common borders, etc.). The inclusion of fixed country-pair and time effects implies that we analyze deviations from the corresponding means, similar to first-difference analysis. In this panel econometric setting, we are able to

[6] Admittedly, there are other measures of the investment climate such as financial liberalization. To address this point, we replace $(R_{tj} - R_{t,\text{Spain}})$ by a variable $(m_{tj} - m_{t,\text{Spain}})$ in the sensitivity analysis, where m_{tj} reflects the share of stocks traded as a fraction of GDP. A higher value of m_{tj} should then be interpreted as to reflect a greater degree of liberalization of the stock market in country j and year t.

[7] In analogy, we may refer to the financial market liberalization employed in the sensitivity analysis in vector form by $(\mathbf{m}_{itj} - \mathbf{m}_{it,Spain})$.

control for a large variety of observed and unobserved influences so that the effects credited to SCF expenditures are unlikely to pick up other unobserved effects.

Descriptive statistics of the (logistically transformed) dependent and independent variables are summarized in Table 1. Notice that Spain is a relatively important recipient of FDI by the average parent country and in the average year. Therefore, the average value of $O_{itj} - O_{it,Spain}$ and of $\sum_{k=1}^{J}[w_{it,jk}(O_{itk} - O_{it,Spain})]$ is negative. Similar arguments apply for $(G_{itj} - G_{it,Spain})$ and $(S_{itj} - S_{it,Spain})$: Spain is relatively large so that the average parent-plus-host country size is smaller than that of the average parent country plus Spain; since the average parent country is economically larger than the average host country, it is also more similar to Spain than to other host countries in the sample. Spain is a major recipient of SCF expenditures, and this is why $s_{tj} - s_{t,\text{Spain}}$ is negative on average. Notice that $\mathbf{W}_{it}(\mathbf{s}_{it} - \mathbf{s}_{it,Spain})$ averages $s_{tj} - s_{t,\text{Spain}}$ for each host country so that it is not surprising that neither the average nor even the maximum value of $\sum_{k=1}^{J}[w_{it},jk(s_{tk} - s_{t,Spain})]$ is positive. We suppress a discussion of further descriptive statistics here for brevity. Details on the data sources are given in the Appendix.

The corresponding empirical model reads

$$\begin{aligned}\mathbf{O}_{it} - \mathbf{O}_{it,Spain} = {} & \beta_0 + \rho_1 \mathbf{W}_{it}(\mathbf{O}_{it} - \mathbf{O}_{it,Spain}) \\ & + \beta_1(\mathbf{s}_{it} - \mathbf{s}_{it,Spain}) + \rho_2 \mathbf{W}_{it}(\mathbf{s}_{it} - \mathbf{s}_{it,Spain}) \\ & + \beta_2(\mathbf{G}_{it} - \mathbf{G}_{it,Spain}) + \beta_3(\mathbf{S}_{it} - \mathbf{S}_{it,Spain}) + \beta_4(\mathbf{k}_{it} - \mathbf{k}_{it,Spain}) \\ & + \beta_5(\mathbf{R}_{it} - \mathbf{R}_{it,Spain}) + \beta_6(\mathbf{P}_{it} - \mathbf{P}_{it,Spain}) \\ & + \beta_7(\mathbf{D}_{it} - \mathbf{D}_{it,Spain}) + \mathbf{u}_{it} \end{aligned} \quad (1)$$

Table 1 Descriptive statistics

Variables	Mean	SD	Min	Max
Log real FDI stocks: $(\mathbf{O}_{it}-\mathbf{O}_{it,Spain})$	−0.83	2.49	−8.59	5.54
Inverse-distance-weighted log FDI: $\mathbf{W}_{it}(\mathbf{O}_{it}-\mathbf{O}_{it,Spain})$	−0.80	1.50	−4.43	3.16
Structural funds expenditures as a fraction of GDP: $(\mathbf{s}_{it}-\mathbf{s}_{it,Spain})$	−0.01	0.01	−0.02	0.02
Inverse-distance-weighted structural funds expenditures: $\mathbf{W}_{it}(\mathbf{s}_{t}-\mathbf{s}_{it,Spain})$	−0.01	0.00	−0.02	0.00
Log sum of bilateral real GDP: $(\mathbf{G}_{it}-\mathbf{G}_{it,Spaini})$	−0.31	0.63	−1.87	1.19
Log similarity in real bilateral GDP: $(\mathbf{S}_{it}-\mathbf{S}_{it,Spain})$	−0.88	1.03	−4.20	0.77
Absolute difference in log parent-to-host capital-labor ratios: $(\mathbf{k}_{it}-\mathbf{k}_{it,Spain})$	0.24	0.88	−0.79	2.52
Investment risk: $(\mathbf{R}_{it}-\mathbf{R}_{it,Spain})$	−0.84	1.46	−5.05	5.13
Political climate: $(\mathbf{P}_{it}-\mathbf{P}_{it,Spain})$	−0.43	0.71	−5.23	0.00
Political regime durability: $(\mathbf{D}_{it}-\mathbf{D}_{it,Spain})$	22.23	33.34	−18.06	106.26
Financial market liberalization (stocks traded in % of GDP): $(\mathbf{m}_{it}-\mathbf{m}_{it,Spain})$	−92.73	72.71	−229.11	98.24

All figures are relative to Spain. The figures are based on 2,037 observations

where $\mathbf{u}_{it}$ is a $J_{it} \times 1$ vector of disturbances which is determined as $\mathbf{u}_{it} = (\mathbf{I}_{it} - \rho_3 \mathbf{W}_{it})^{-1} \boldsymbol{\varepsilon}_{it}$. ε_{it} is a $J_{it} \times 1$ vector with elements $\varepsilon_{itj} = \mu_{ij} + \lambda_t + \nu_{itj}$ where ν_{itj} is identically and independently distributed with zero mean and variance σ_ν^2. The country-pair effects μ_{ij} as well as the time effects λ_t are treated as fixed.

5 Estimation results

The panel covers outward FDI from a large set of OECD countries into the EU-15 and the CEECs over the period 1993 to 2003, and is unbalanced. Table 6 in the Appendix provides information about the coverage of parent and host countries in the sample, and Table 7 in the Appendix illustrates that the set of parent countries covered accounts for the lion's share of FDI stocks in the host countries and years at stake. Altogether, we can exploit information from 2,037 observations in the regression analysis, covering 246 bilateral relations.[8]

We estimate (1) using the GMM estimator proposed by Kelejian and Prucha 1998, 1999), which is computationally much less demanding than maximum likelihood estimation (Anselin 1988) and applicable with fixed effects (see Mutl and Pfaffermayr 2008). Table 2 presents the estimation results of the preferred specification. Model 3 refers to the full spatial model, accounting for all three types of spatial correlations (SCF expenditures, spatially lagged FDI shares, and a spatially lagged error term), Model 2 restricts the spatial autocorrelation of the error term to zero, while Model 1 only considers spatial dependence of SCF expenditures. All three versions of the model in Table 2 fit well, and the parameter estimates are relatively similar.

Based on the Moran I test on zero spatial correlation of the error term (Kelejian and Prucha 2001) and on the t-test for $\rho_1 = 0$, we reject Models 1 and 2 in favor of Model 3. Hence, we concentrate our subsequent calculations and our interpretation of the estimation results on Model 3. Notice that the role of country size in terms of $(\mathbf{G}_{it} - \mathbf{G}_{it,Spain})$ is negligible, which points to a relatively homogeneous pattern of FDI across all country pairs within a year in the sample. Such common patterns are captured by the time effects. The coefficients of $(\mathbf{S}_{it} - \mathbf{S}_{it,Spain})$ and $(\mathbf{k}_{it} - \mathbf{k}_{it,Spain})$ are negative and significantly different from zero as expected from models such as the ones in Markusen (2002); see also Carr et al. (2001), Markusen and Maskus (2002), and Egger and Pfaffermayr (2004). Among the other control variables, only $(\mathbf{P}_{it} - \mathbf{P}_{it,Spain})$ enters in a statistically significant way, and the positive point estimate of its parameter indicates that parent countries prefer investments in host countries with a favorable political climate. Notice that we should not conclude from the insignificant parameters of $(\mathbf{R}_{it} - \mathbf{R}_{it,Spain})$ and $(\mathbf{D}_{it} - \mathbf{D}_{it,Spain})$ that investment risk and political regime durability are irrelevant for a parent country's allocation of FDI stocks across host countries. Yet, investment risk and regime

[8] Notice that the potential number of country pairs with positive FDI relationships is 291. Of those, only 246 actually display an FDI relationship in at least one year. Hence, of the 3,201 possible observations, 495 are missing because there is no positive FDI stock in any of the years. Another 669 observations are missing because there was no FDI at the beginning of the sample period.

Table 2 Regression results

Explanatory variables	Model 1		Model 2		Model 3	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Inverse-distance-weighted log FDI: $\mathbf{W}_{it}(\mathbf{O}_{it}-\mathbf{O}_{it,Spain})$	–	–	0.12	0.05**	0.18	0.04***
Structural funds expenditures as a fraction of GDP: $(\mathbf{s}_{it}-\mathbf{s}_{it,Spain})$	15.02	8.58*	13.79	7.93*	14.50	8.15*
Inverse-distance-weighted structural funds expenditures: $\mathbf{W}_{it}(\mathbf{s}_t-\mathbf{s}_{it,Spain})$	85.96	25.43***	64.26	25.10**	52.41	21.48**
Log sum of bilateral real GDP: $(\mathbf{G}_{it}-\mathbf{G}_{it,Spain})$	−0.66	0.96	−0.83	0.89	−1.38	0.88
Log similarity in real bilateral GDP: $(\mathbf{S}_{it}-\mathbf{S}_{it,Spain})$	−1.14	0.46**	−1.17	0.42***	−1.21	0.42***
Absolute difference in log parent-to-host capital-labor ratios: $(\mathbf{k}_{it}-\mathbf{k}_{it,Spain})$	−2.21	0.40***	−2.30	0.37***	−2.45	0.36***
Investment risk: $\mathbf{R}_{it}-\mathbf{R}_{it,Spain}$	0.01	0.02	0.00	0.01	0.00	0.01
Political climate: $\mathbf{P}_{it}-\mathbf{P}_{it,Spain}$	0.26	0.05***	0.25	0.05***	0.25	0.05***
Political regime durability: $\mathbf{D}_{it}-\mathbf{D}_{it,Spain}$	−0.03	0.04	−0.04	0.04	−0.04	0.04
Observations	2,037		2,037		2,037	
Cross-sections (country pairs)	246		246		246	
R^2	0.95		0.96		0.96	
r_e	–		–		0.49	
s_e	0.52		0.47		−0.30	
Tests						
Joint impact of $(\mathbf{s}_{it}\text{-}\mathbf{s}_{it,Spain})$ and $\mathbf{W}_{it}(\mathbf{s}_{it}\text{-}\mathbf{s}_{it,Spain})$ (F-statistic)	6.90 (2, 1773)***		8.92 (2)**		8.75 (2)**	
Time effects are jointly different from zero (F-statistic)	6.347 (10, 1773)**		59.29 (11)***		78.65 (11)**	
Country-pair effects are jointly different from zero (F-statistic)	160.515 (245, 1773)**		11181.12 (245)***		10838.19 (245)	
Moran I test: $N(0,1)$			−2.50**			

The dependent variable is logistcally transformed real outward FDI using Spain as base host country. Also all explanatory variables are defined as deviations form the base.Degrees of freedom are given in parentheses. If the degrees of freedom comprise two numbers the corresponding tests are F-tests. One number indicates a χ^2 test

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

durability do not change enough over time and are too collinear with political climate to discern their impact from the one of the latter variable and the ones of fixed time effects and fixed country-pair effects. Fortunately, there is enough variation in SCF expenditures to estimate their impact quite precisely. The latter is partly due to the variation in the degree of exploitation of the allotted SCF.

We find a significant positive impact of both own and spatially weighted foreign SCF expenditures on inward stocks of FDI. The latter implies that positive external effects of SCF expenditures are at work. Also, the positive coefficient of spatially lagged FDI indicates that direct investment in a particular European country is not simply at the expense of inward FDI in the neighboring economies. That is, the competition effect is outweighed by complementarity among the hosts as already found in Baltagi et al. (2007) and Blonigen et al. (2007) in different models. For example, forward and backward linkages within MNEs across host countries, and the exploitation of specialization gains due to cross-border fragmentation of production could generate such an effect as mentioned in Sect. 3.

Table 3 reports the results from a sensitivity analysis, concerning the parameters of interest. First, we estimate a parsimonious model, skipping all variables whose parameter estimates exhibit a p-value below 15% (i.e., $|t| > 1.44$) in Model 3 of Table 2 (#2). Second, we use an alternative spatial weighting scheme setting the decay parameter to $c = 0.5$ (#3) and $c = 1.5$ (#4), respectively. The former implies a flatter spatial decay so that more distant third host countries matter relatively more than in Table 2. The latter gives a lower weight to more distant host countries. Finally, we use an alternative measure of financial liberalization, namely market capitalization $(\mathbf{m}_{itj} - \mathbf{m}_{it,Spain})$ as discussed in Footnote 6 instead of the investment risk index $(\mathbf{R}_{itj} - \mathbf{R}_{it,Spain})$ employed in Table 2 (#5).

In general, the results are qualitatively robust across the experiments. For instance, in none of the sensitivity checks (#2)-(#5) does the point estimate of any of the variables of interest – $\mathbf{W}_{it}(\mathbf{O}_{it} - \mathbf{O}_{it,Spain})$, $(\mathbf{s}_{it} - \mathbf{s}_{it,Spain})$, and $\mathbf{W}_{it}(\mathbf{s}_{it} - \mathbf{s}_{it,Spain})$ – change its sign. Moreover, the point estimates for any of the three variables across

Table 3 Robustness of Eq. 3 results

Label	Model	Distance-weighted log FDI		Distance-weighted structural expenditures		Structural expenditures	
		Coeff.	SD	Coeff.	SD	Coeff.	SD
#1	Basic model as reference	0.18	0.04***	52.41	21.48**	14.50	8.15*
#2	Parsimonious model (excl. variabes with $\|t\| > 1.44$)	0.17	0.04***	51.69	21.45**	13.80	8.12*
#3	Alternative spatial weighting scheme, $c = 0.5$	0.19	0.04***	32.52	14.92**	14.54	8.55*
#4	Alternative spatial weighting scheme, $c = 1.5$	0.11	0.04***	83.41	27.26***	14.37	8.03*
#5	Financial market integration	0.09	0.06**	43.69	20.70***	17.23	8.70*

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

the sensitivity checks are too similar to each other to be statistically distinguishable, given the estimated standard errors (i.e., the corresponding confidence intervals are overlapping at conventional levels of significance).

From the results in Tables 3, we conclude that our findings appear robust enough to use them for an evaluation of the consequences of SCF expenditures for the reallocation of major parent countries' FDI across EU member countries. Note that while the econometric models applied here do not directly support an evaluation of the consequences for the volume of FDI as such, they may be used to study the consequences for the allocation of a given FDI stock into the EU-15 and the covered new member countries, since the logistic model is designed to explain distributional effects at a given volume.

To quantify the SCF expenditures' impact on FDI shares, we use a simple approximation, which is described in detail in the Appendix (see Hosmer and Lemeshow (2000), for a model without spatial correlation). In the logistic model, the impact depends positively on the FDI share a country initially holds[9] (as long as the FDI share is smaller than 50%), and on the spatial magnification effect as captured by the parameter ρ_1. As shown in Table 4, an increase in the SCF expenditures to GDP ratio by 1 percentage point[10] on average raises the FDI share into EU-15 from all covered parent countries by 1.0 percentage point. However, the marginal impact evaluated at the mean varies between 2.54 percentage points for the Netherlands, which holds the largest FDI share in our data, and (approximately) 0.11 percentage points for Bulgaria with an initial FDI share of 0.07%. The overall impact of the redistribution can only be inferred, when looking at the predicted shares before and after a change in SCF expenditures. The reason is that we have to include the external spatial effects of such a change, which are not fully reflected by the reported estimates of the marginal effect.

Below, we use the parameter estimate of spatially weighted FDI ($\widehat{\rho}_1 = 0.18$) and the two estimated SCF parameters ($\widehat{\beta}_1 = 14.50$; $\widehat{\rho}_2 = 52.41$) of Model 3 in Table 2, to undertake two thought experiments. The first one looks at the predicted effect of the EU membership of the Czech Republic, Hungary, Poland, and Slovenia[11] in 2004 through its SCF-expenditure-related impact on FDI in the EU, assuming the actual SCF expenditure distribution of 2004 (see Sect. 2). The second thought experiment considers the effect of EU membership of Bulgaria, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, and Slovenia,[12] and the SCF expenditure allocation corresponds to our 2007 projection for the programming period 2007–2013. In both experiments, we set all other explanatory variables to their 1995/96 average values without loss of generality so that we can isolate the

[9] This is a well-known characteristic of logistic models, which ensures that the predicted shares are restricted to the [0, 1] interval.

[10] In many cases, this would imply that the structural funds to GDP ratio more than doubles.

[11] We exclude the Baltic countries due to missing FDI data and Cyprus as well as Malta due to their remote location.

[12] Again, we exclude the Baltic countries due to missing FDI data and Cyprus as well as Malta due to their remote location.

Table 4 Simulating the impact of the reallocation of structural funds on stocks of FDI into the EU

	Reference period 1995/1996			2004 scenario versus 1995/1996		2007 scenario versus 1995/1996	
	Percentage points			Percentage point change[a]			
	Structural funds to GDP ratio	FDI share in all reported countries	Marginal impact of structural expenditures on the FDI share	Structural funds to GDP ratio	FDI share in all reported countries	Structural funds to GDP ratio	FDI share in all reported countries
Austria	0.12	1.71	0.33	−0.03	1.03***	−0.06	1.63***
Belgium–Luxembourg	0.16	18.37	2.38	−0.10	−2.47***	−0.11	−3.03***
Denmark	0.08	1.65	0.39	−0.06	0.80***	−0.05	0.86***
Finland	0.17	1.39	0.33	−0.11	0.65***	−0.05	0.71***
France	0.13	7.44	1.22	−0.04	−0.19**	−0.04	−0.40***
Germany	0.15	7.45	1.14	0.01	0.12	−0.03	0.32
Great Britain	0.17	20.19	2.53	−0.10	−3.80***	−0.07	−4.46***
Greece	2.23	0.35	0.15	−0.28	0.63***	−0.61	0.67**
Ireland	2.08	4.89	0.88	−1.56	−0.39	−1.78	−0.57
Italy	0.27	3.58	0.62	−0.07	0.33**	−0.05	0.53***
Netherlands	0.08	20.25	2.54	−0.03	−2.82***	−0.02	−3.32***
Portugal	3.17	0.70	0.25	−1.62	0.70***	−1.41	0.67***
Spain	1.34	3.49	0.63	−0.30	−0.38	−0.55	−0.94**
Sweden	0.07	4.08	0.69	−0.02	0.24***	0.00	0.35***
Bulgaria	0.00	0.07	0.11	0.00	0.62***	1.11	0.66***
Czech Republic	0.00	0.91	0.25	1.14	0.90***	1.88	1.10***
Hungary	0.00	1.20	0.26	1.39	0.91***	2.23	1.38***
Poland	0.00	1.61	0.34	1.73	1.00***	2.75	1.46***
Romania	0.00	0.16	0.12	0.00	0.62***	1.53	0.69***

Table 4 continued

	Reference period 1995/1996			2004 scenario versus 1995/1996		2007 scenario versus 1995/1996	
	Percentage points			Percentage point change[a]			
	Structural funds to GDP ratio	FDI share in all reported countries	Marginal impact of structural expenditures on the FDI share	Structural funds to GDP ratio	FDI share in all reported countries	Structural funds to GDP ratio	FDI share in all reported countries
Slovak Republic	0.00	0.39	0.15	2.12	0.73***	3.47	0.89***
Slovenia	0.00	0.11	0.13	0.50	0.78***	0.81	0.82***
EU-15	0.73	95.55	1.01	−0.31	−5.56	−0.35	−6.99
CEEC (new EU members)	0.00	4.45	0.19	0.98	5.56	1.97	6.99
Total	0.73	100.00	0.74		0.00		0.00

[a] Impact of a 1 percentage point change of the structural expenditures to GDP ratio. Standard errors and confidence intervals of the effects are estimated by Monte Carlo simulations with 10,000 repetitions using the respective parameters and the (asymptotically normal) variance-covariance matrix of Eq. 3 in Table 2.

*** Significant at 1%; ** Significant at 5%

impact of SCF expenditures on the allocation of FDI from other determinants of FDI.

These thought experiments are subject to several qualifications. First, we use the EU Commission's forecasts on each country's GDP and the (partly vague) information on the volume of SCF (ceiling of 1.27% of EU GNP) to calculate the expected distribution of SCF across the EU-15 and the new member countries. Second, to obtain SCF *expenditure* figures (i.e., the exploitation of funds, which inter alia depends on domestic cofinancing), we have to assume that, on average, each member country exploits the available funds as in the years 1995/96, and the new members of 2004 exhaust them as observed in 2004/06, while the new members of 2007 will exhaust them as earlier members did in the past. Since we are interested in a simulation experiment rather than a forecast per se, we use the obtained figures to redistribute the SCF expenditures as of 1995/96 according to the two scenarios and derive the implied counterfactual distributions of the real stocks of outward FDI in this base period, without loss of generality.[13] Consequently, the results are widely independent of the overall *volume* (rather than the *distribution*) of SCF expenditures and also of the remaining variables. The significance levels of the projections are calculated by Monte Carlo simulations based on the estimated parameters and variance-covariance matrix in Model 3.[14] The results of the simulation analysis are presented in Table 4. Note that almost all estimated effects are significantly different from zero; i.e., a zero effect on FDI is not included in the 1−99% simulated confidence interval (***) or in the 5−95% simulated confidence interval (**), respectively.

In the 2004 scenario the average SCF expenditure to GDP ratio in the EU-15 changes marginally as compared to 1995/96 (it declines by 0.31 percentage points), but it increases from zero to roughly 1 percentage point in the average CEEC accession country. This results in a redistribution of the 1995/96 stocks of outward FDI by about 5.6 percentage points from the EU-15 to all seven CEEC accession countries in Scenario I. Compared to the EU-15 as whole, the CEEC in 1995/96 only hold 4.5% of the inward FDI from the covered parent countries and, from their point of view, this redistribution is quantitatively important. Although the redistribution of SCF expenditures is mainly at the expense of Portugal and Ireland in relative terms, it is Great Britain, the Netherlands, and Belgium–Luxembourg that face the strongest reductions in inward FDI in response to the change in SCF expenditures. There are even countries with declining SCF to GDP ratios whose inward FDI shares rise (e.g., Austria, Finland, Greece, or Italy). There are two reasons for this outcome: (i) the complex reaction of FDI due to distance-weighted cross-border spillover effects of SCF expenditures on FDI,[15] and (ii) the property of

[13] Notice that the choice of the base year for the simulations is of minor importance, here.

[14] More precisely, we assume that these are the true parameters of the asymptotic distribution of the empirical model.

[15] Note that in a model with positive spatial externalities, there may be positive effects even in countries that are not major receivers of structural funds. In the presence of spatial multiplier effects (in our case, the significant positive impact of distance-weighted FDI), all explanatory variables exert a non-linear effect with a spatial decay. Such spatial multiplier effects on FDI are also found by Baltagi et al. (2007) and Blonigen et al. (2007), focusing on bilateral FDI of the US.

Table 5 Robustness of the simulated impact on European FDI (percentage point changes)

	2004 scenario versus 1995/1996			2007 scenario versus 1995/1996		
	Reference (Table 3)	Minimum structural expenditure coeff. (#3 in Table 3)	Minimum spat. lagged struct. expenditure coeff. (#5 in Table 3)	Reference (Table 3)	Minimum structural expenditure coeff. (#3 in Table 3)	Minimum spat. lagged struct. expenditure coeff. (#5 in Table 3)
Austria	1.03***	1.01***	0.65***	1.63***	1.60***	0.76***
Belgium–Luxembourg	−2.47***	−2.43**	−2.63***	−3.03***	−2.96***	−2.80***
Denmark	0.80***	0.79***	0.73***	0.86***	0.85***	0.74***
Finland	0.65***	0.64***	0.68***	0.71***	0.70***	0.70***
France	−0.19**	−0.18**	−0.33***	−0.40***	−0.39***	−0.39***
Germany	0.12	0.12	−0.28**	0.32	0.33	−0.24
Great Britain	−3.80***	−3.73***	−3.34***	−4.46***	−4.38***	−3.50***
Greece	0.63***	0.62***	0.78***	0.67**	0.66***	0.79***
Ireland	−0.39	−0.36	−0.54***	−0.57	−0.54	-0.66***
Italy	0.33**	0.33***	0.25***	0.53***	0.53***	0.31***
Netherlands	−2.82***	−2.77***	−2.90***	−3.32***	−3.26***	−3.03***
Portugal	0.70***	0.69***	0.75***	0.67***	0.66***	0.76***
Spain	−0.38	−0.37	−0.16	−0.94**	−0.93**	−0.60**
Sweden	0.24***	0.24***	0.20***	0.35***	0.35***	0.24***
Bulgaria	0.62***	0.61***	0.81***	0.66***	0.64***	0.83***
Czech Republic	0.90***	0.88***	0.91***	1.10***	1.07***	1.03***
Hungary	0.91***	0.89***	0.87***	1.38***	1.33***	1.08***
Poland	1.00***	0.97**	0.97***	1.46***	1.40***	1.27***

Table 5 continued

	2004 scenario versus 1995/1996			2007 scenario versus 1995/1996		
	Reference (Table 3)	Minimum structural expenditure coeff. (#3 in Table 3)	Minimum spat. lagged struct. expenditure coeff. (#5 in Table 3)	Reference (Table 3)	Minimum structural expenditure coeff. (#3 in Table 3)	Minimum spat. lagged struct. expenditure coeff. (#5 in Table 3)
Romania	0.62***	0.61***	0.80***	0.69***	0.67***	0.84***
Slovak Republic	0.73***	0.71***	0.87***	0.89***	0.86***	0.98***
Slovenia	0.78***	0.76***	0.89***	0.82***	0.80***	0.90***
EU-15	−5.56	−5.42	−6.13	−6.99	−6.79	−6.93
CEEC (new EU members)	5.56	5.42	6.13	6.99	6.79	6.93

Standard errors and confidence intervals of the effects are estimated by Monte Carlo simulations with 10,000 repetitions using the respective parameters and the (asymptotically normal) variance-covariance matrix of Eq. 3 in Table 2.

*** Significant at 1%; ** Significant at 5%

the logistic model that larger countries react more sensitively to a change than smaller ones (see Anderson and van Wincoop (2003), for a theoretical illustration of the size-related impact of changing trade frictions in a pure trade model).

Accordingly, a country such as Great Britain loses FDI shares for three reasons. First, its own SCF expenditures to GDP ratio declines. Second, the SCF expenditures in the neighboring countries (Belgium–Luxembourg, France, Denmark, Ireland, and the Netherlands) decline. Third, it is a large economy and therefore reacts more sensitively to a change in SCF expenditures than a small country.

In contrast, a country such as Austria gains FDI shares in spite of its loss in the SCF expenditures to GDP ratio, since in four of its neighbors in the sample (Germany and three CEEC: the Czech Republic, Hungary and the Slovak Republic) the SCF to GDP ratio rises. In this case, the external (spillover) effect of SCF expenditures outweighs the negative own effect.

In the four covered accession economies of 2004, the positive impact of SCF expenditures on FDI shares is relatively large. They gain a lot because of the rise in their domestic and the adjacent CEEC economies' SCF expenditures. However, since their FDI share is relatively small in 1995/96, the marginal impact of structural policy is also small as compared to the average EU country.[16]

In the 2007 scenario, the predicted effects on the FDI distribution are somewhat stronger, since SCF expenditures are now shared by all seven accession countries in our sample. Again, the impact on the average EU-15 economy's SCF expenditures to GDP ratio is about −0.35 percentage points. However, the average CEEC's ratio rises from zero (in 1995/96) to about 2 percentage points in this counterfactual scenario. The result is a redistribution of the 1995/96 FDI stocks from the EU-15 to the CEEC accession countries by about 7 percentage points. For the same reasons as above, this is again mostly at the expense of Great Britain's, the Netherlands', and Belgium–Luxembourg's inward FDI stocks and mostly in favor of Austria's, Poland's, Hungary's, and the Czech Republic's inward FDI, although one also observes considerable gains of the remaining accession countries. According to the simulation results, only 6 out of the 14 EU economies (recall that Belgium–Luxembourg is treated as a single country) lose FDI shares due to the structural policy reform planned for the 2007–2013 programming period.

From Table 3, we are aware of lower bound estimates of the two SCF expenditure parameters (sensitivity analyses #2 and #3). Therefore, we additionally report the changes in the share of inward FDI stocks associated with the parameter estimates in Table 3. The latter is summarized in Table 5. The results do not change much and estimated effects are very similar in size both to each other and to the benchmark results in Table 4.

[16] Accordingly, using data of, say 2002/03, we would infer a somewhat stronger positive effect on the CEEC since their stocks of inward FDI were higher then than in 1995/96.

6 Conclusions

According to Agenda 2000, the EU-enlargement leads to a reallocation of Structural and Cohesion Funds. This follows from the consensus to preserve the current overall expenditure levels and to finance the New Structural Operations in the Central and Eastern European economies by a redistribution from the incumbent to the entrant countries. Hence, it can be expected that the direct investments into Western Europe and the CEEC are reallocated from the former to the latter, independent of whether the overall volume rises or not.

Based on the knowledge-capital model of multinational firms and trade, this paper formulates a bilateral FDI distribution model to estimate the impact of the Structural and Cohesion Funds reallocation on the distribution of FDI from OECD economies into the EU-15 and those CEEC economies that joined the EU in 2004 or in 2007. Furthermore, we allow for neighborhood effects of Structural and Cohesion Funds expenditures and for spatial autocorrelation in inward FDI stocks across European host countries in general. Our estimates imply that an increase in the Structural and Cohesion Funds expenditures to GDP ratio by 1 percentage point raises the average country share in real stocks of FDI by 1.0 percentage points in the average European economy.

We conduct two experiments of thought, which look at the hypothetical impact of the Structural and Cohesion Funds reallocation as outlined in Agenda 2000 on the FDI allocation in 1995/1996. The first experiment (the 2004 scenario) considers the accession of four covered CEEC countries, namely Hungary, Poland, the Czech Republic and Slovenia, predicting an increase in FDI shares in Central and Eastern Europe altogether by about 5.5 percentage points. This is mostly at the expense of FDI into Great Britain, the Netherlands, Belgium–Luxembourg and France and in favor of FDI in Austria, Hungary, the Czech Republic and Poland. In the second experiment (the 2007 scenario), which includes seven covered accession countries, the effects are somewhat larger, raising the average CEEC's Structural Funds to GDP ratio from zero (in 1995/96) to about 2.0% and their share in FDI stocks by about 7.0 percentage points as compared to the corresponding 1995/96 share.

The simulations suggest the following general results. First, there are pronounced cross-border spillover effects of Structural and Cohesion Funds expenditures. Neighbors of Structural and Cohesion Funds expenditure losers (such as Great Britain) tend to face a decline in inward FDI shares while neighbors of winners (such as Austria) gain in FDI as well. Second, large economies in terms of FDI shares (such as Great Britain or the Netherlands) react more sensitively to changes in Structural and Cohesion Funds expenditures than small ones (such as the CEEC).

Of course, our findings do not imply that Structural and Cohesion Funds expenditures are the only important determinant of the FDI redistribution in Europe. Other determinants such as growth in market size or convergence in factor prices may well induce even bigger effects than those related to Structural and Cohesion Funds expenditures. However, our tentative simulations illustrate that a ceteris paribus change in these expenditures is likely to be of importance for the future

enlargement-related change in the distribution of inward FDI among EU economies, being of potential relevance for economic policy.

Acknowledgments The authors gratefully acknowledge the comments by an anonymous referee and suggestions made by participants at research seminars at the universities of Innsbruck and Munich, and by conference participants at ETSG and ECOMOD annual conferences. Egger acknowledges financial support from the Austria Science Fund through grant no. P17713-G05.

Appendix

Data sources

We use the following data sources:

Outward Stocks of FDI: UNCTAD and Vienna Institute of Comparative Studies (WIIW), in US $. We imputed missing values in the Unctad database using the corresponding inward FDI stocks reported by UNCTAD and outward FDI into the Eastern European countries provided by the WIIW-database.
Structural Funds: European Commission, in US $.
GDP, GDP Deflators and GDP per capita: World Bank, World Development Indicators.
Investment risk: International Country Risk Guide.
Political climate, regime durability: Polity IV Project.
Financial market integration: Share of stocks traded in percent of GDP, World Bank, World Development Indicators.

Real FDI stock figures are approximated in the following way. Similar to previous studies, we assume that the available book values of foreign assets approximate the depreciated nominal figures of outward stocks of FDI. We use the GDP deflators to convert them to real figures.

Country and FDI coverage

Our analysis employs stocks of outward FDI from 15 European and non-European parent countries into 21 economies, of which Spain serves as the base. Table 6 provides information about the composition of the sample with regard to parent and host countries. All economies enter the sample from 1993 onwards. Yet, of the 291 possible bilateral relationships covered in the regressions (i.e., excluding Spain as a host country), 45 are not used and display zero stocks of FDI throughout the sample period.

Table 7 indicates the coverage of FDI stocks for all parent and host countries across all years between 1993 and 2003. According to that table, the 15 parent countries hold between 21 and about 84% of their outward stocks of FDI in the 22 host countries (including the reference host country Spain). FDI stocks from the covered parent countries account for more than 84% and up to 99.5% of host countries' total inward stocks of FDI.

Table 6 Country coverage

Country	Included as	
	Parent country	Host country
Austria	Yes	Yes
Belgium–Luxembourg	Yes	Yes
Bulgaria	No	Yes
Canada	Yes	No
Czech Republic	No	Yes
Denmark	Yes	Yes
Finland	Yes	Yes
France	Yes	Yes
Germany	Yes	Yes
Great Britain	Yes	Yes
Greece	No	Yes
Hungary	No	Yes
Ireland	No	Yes
Italy	Yes	Yes
Japan	Yes	No
Netherlands	Yes	Yes
Norway	Yes	No
Poland	No	Yes
Portugal	No	Yes
Romania	No	Yes
Slovak Republic	No	Yes
Slovenia	No	Yes
Spain	No	Yes
Sweden	Yes	Yes
Switzerland	Yes	No
United States	Yes	No

All countries appear in the data from 1993 onwards

The approximation of the impact of changes in the SCP-expenditures on FDI shares

The approximated impact of a ceteris paribus change in the structural funds to GDP ratio of country j, ΔS_{jt}, on its own FDI share in all OECD economies' outward FDI into Europe in year t, F_{itj}, is given by the jth row of $\Delta \mathbf{F}_{it}\beta_1(\mathbf{I}-\rho_1\mathbf{W}_{it})^{-1}\Phi_{it}$, where the elements Φ_{itj} as defined as $F_{itj}(1 - F_{itj})\Delta s_{tj}$. The external effect on country $k \neq j$ is given by the kth row of $\Delta \mathbf{F}_{it}\rho_2(\mathbf{I}-\rho_1\mathbf{W}_{it})^{-1}\mathbf{W}_{it}\Phi_{it}$. Here, we only consider the case, where $\Delta s_{tk} = 0$, if $k \neq j$.

We calculate the predicted values of the basic and the counterfactual model as follows. First, denote the true model prediction of Eq. 1 by $(\mathbf{I}_{it} - \rho_1\mathbf{W}_{it})^{-1}\mathbf{Z}_{it}$, where $\mathbf{I}_{it}$ is a $J_{it} \times J_{it}$ identity matrix. Then, let us denote the $J_{it} \times 1$ vector of changes in the predictions of $\mathbf{O}_{it} - \mathbf{O}_{it,Spain}$ due to a redistribution of structural funds

Table 7 Share of outward and inward stocks of FDI in the sample in countries' total outward and inward FDI stocks (reported figures are averages for 1993–2003 in percent)

Country	Share of in-sample outward FDI in total outward FDI	Share of in-sample inward FDI intotal inward FDI
Austria	75.92	95.12
Belgium–Luxembourg	84.16	98.84
Bulgaria	–	84.56
Canada	22.65	–
Czech Republic	–	97.13
Denmark	58.14	97.35
Finland	71.14	97.32
France	58.08	98.57
Germany	50.07	94.97
Great Britain	49.36	91.20
Greece	–	98.47
Hungary	–	97.58
Ireland	–	99.26
Italy	73.32	97.86
Japan	21.01	–
Netherlands	53.23	95.92
Norway	71.42	–
Poland	–	95.98
Portugal	–	87.00
Romania	–	87.70
Slovak Republic	–	89.64
Slovenia	–	91.71
Spain	–	95.13
Sweden	62.73	99.50
Switzerland	54.79	–
United States	46.73	–

Total stocks of outward and inward FDI per country are from UNCTAD's World Investment Reports for the years 1993–2006

at time t only as $\Delta \mathbf{Z}_{it} = (\beta_1 \mathbf{I}_{it} + \rho_2 \mathbf{W}_{it})\left(\Delta \mathbf{s}_{it} - \Delta \mathbf{s}_{it}^{Spain}\right)$. In the following, we focus on a typical parent country and skip the index of parent i for simplicity. Defining the dependent variable $(O_{tj} - O_{t,Spain}) = \log\left(\frac{F_{tj}}{F_{t,Spain}}\right)$, $j = 1, \ldots, J_t$, we have in matrix form

$$\begin{aligned} \mathbf{O}_t - \mathbf{O}_{t,Spain} &= \rho_1 \mathbf{W}_t(\mathbf{O}_t - \mathbf{O}_{t,Spain}) + \mathbf{Z}_t \\ &= (\mathbf{I}_t - \rho_1 \mathbf{W}_t)^{-1}\mathbf{Z}_t. \end{aligned} \tag{2}$$

Now, take the difference of $\mathbf{Z}_t$ before and after the redistribution of structural funds to obtain the $J_t \times 1$ vector

$$\Delta(\mathbf{O}_t - \mathbf{O}_{t,Spain}) = (\mathbf{I}_t - \rho_1 \mathbf{W}_t)^{-1}\Delta \mathbf{Z}_t, \tag{3}$$

which has typical element $\Delta(O_{tj} - O_{t,\text{Spain}})$. Now, define the jth element of $(\mathbf{I}_t - \rho_1 \mathbf{W}_t)^{-1}\mathbf{Z}_t$ as $\widetilde{Z}_{tj}$ to define $F_{tj} = \frac{e^{\widetilde{Z}_{tj}}}{\sum_{j=1}^{J} e^{\widetilde{Z}_{tj}}}$. Similarly, define the jth element of $(\mathbf{I}_t - \rho_1 \mathbf{W}_t)^{-1}\Delta\mathbf{Z}_t$ as $\Delta\widetilde{Z}_{tj}$ to obtain

$$
\begin{aligned}
O'_{tj} - O_{tj} = \log\frac{F'_{tj}}{F'_{t,Spain}} - \log\frac{F_{tj}}{F_{t,Spain}} = \Delta\widetilde{Z}_{tj} \Rightarrow \\
\frac{F'_{tj}}{F'_{t,Spain}} = \frac{F_{tj}}{F_{t,Spain}} e^{\Delta\widetilde{Z}_{tj}} \\
\sum_{j\neq Spain} F'_{tj} = \frac{F'_{t,Spain}}{F_{t,Spain}} \sum_{j\neq Spain} F_{tj} e^{\Delta\widetilde{Z}_{tj}} = 1 - F'_{t,Spain} \Rightarrow \\
F'_{t,Spain} = \frac{F_{t,Spain}}{F_{t,Spain} + \sum_{j\neq Spain} F_{tj} e^{\Delta\widetilde{Z}_{tj}}} \\
F'_{tj} = \frac{F'_{t,Spain}}{F_{t,Spain}} F_{tj} e^{\Delta\widetilde{Z}_{tj}}.
\end{aligned}
\tag{4}
$$

Equations 2 and 4 are used to derive the counterfactual estimates in Tables 4 and 5. Since the standard errors of this non-linear effect cannot be derived analytically, we take the estimated preferred model as the true one and use Monte Carlo simulations to assess the significance of the effects. For this, we use the point estimates of Model 3 in Table 4 as the unbiased means which are distributed according to the corresponding estimated (asymptotically normal) variance-covariance matrix. We randomly draw 10,000 coefficients from the multivariate normal with means $\widehat{\rho}_1$, $\widehat{\rho}_2$, and $\widehat{\beta}_1$ and the variance-covariance matrix as estimated in Model 3 to produce the significance levels in Table 4.

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