Is Foreign Direct Investment to China Crowding Out the Foreign Direct Investment to other Countries?

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Abstract

We estimate a theory-based modified gravity model to analyze the effects of foreign direct investment (FDI) to China on FDI to other countries over the period 1990-2004. Our results suggest that on average, *ceteris paribus*, FDI flows to China have been complementary to FDI flows to other countries. However, these complementarities exhibit a decreasing trend over time and vary between and within country groups. Furthermore, our results suggest that while the FDI to China has encouraged both horizontal and vertical FDI to other countries, these FDI complementarities have been strongest in the case of vertical FDI.

Key words: Foreign direct investment; China; Multinational firms' location choice.

JEL classification: F21, F36, F41.

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1. Introduction

In this paper we examine whether and to what extent the surge of the foreign direct investment (FDI) in China in recent years has come about at the expense of FDI inflows into other recipient countries.

China has recently become a leading destination for FDI. In a recent survey on FDI prospects, transnational companies rank China as one of the most attractive global business locations (UNCTAD, 2007). In 2003, China overtook the US as the prime destination for FDI (Prasad and Wei, 2005). Currently, China is the largest recipient of FDI in the developing world (UNCTAD, 2011). The share of China in the world FDI inward stock increased from one percent in 1990 to 3 per cent in 2010. The success of China in attracting FDI has raised concerns that it may have been at the expense of other countries and regions. For example, over the same period, the share of developed economies in FDI inward stock has declined from 75.1 per cent to 65.3 per cent. The European Union countries – which account for the largest share of FDI inward stocks to developed countries experienced a slight decline of their share in the world FDI inward stock from 36.6 per cent in 1990 to 36.0 per cent in 2010.[1]

This surge of FDI in China has followed the opening up of its economy to the world economy, and the selective easing of capital controls, while the main motivation driving these inflows of foreign investments is the availability of a large pool of low-cost labour force (Prasad and Wei, 2005). However, in recent years there has been a shift of inward FDI in

[1] Own calculations based on data from UNCTAD (2011).

China towards high-tech industries and services (UNCTAD, 2011). Much of it focuses on the domestic market (Branstetter and Lardy, 2006).

This paper aims to provide empirical evidence to answer these concerns, focusing on the impact of FDI in China on FDI in other countries, with a special focus on the EU countries, and, in particular, of new EU countries in Central and Eastern Europe (CEE), given the role played by FDI in their efforts to modernize their economies and the similarities between CEE countries and China (Fung et al., 2008). The research questions addressed in this paper are the following: Is there a *China effect* on FDI inflows into other countries and particularly into EU countries? Is this effect positive or negative? Has it changed over time? Does it differ for horizontal and vertical FDI, and finally, does this effect differ across host countries?

Previous analyses have focused on the effects of FDI in China on developing countries, in particular the Asian countries and the Latin America and Caribbean (LAC) ones (Eichengreen and Tong, 2006a, 2006b; Cravino, Lederman and Olarreaga, 2007; García-Herrero and Santabárbara, 2007). To the best of our knowledge, this is the first in-depth analysis of the effects of FDI in China on the FDI inflows into EU countries.

Our results suggest that on average, *ceteris paribus*, FDI inflows into China have been complementary to FDI inflows into other countries. This complementary effect is less intense in the EU than in the other recipient countries; it exhibits a decreasing trend over time and varies across countries. Furthermore, our findings suggest that complementary relationships with China are more likely to occur in countries that attract high levels of vertical FDI in comparison with countries where horizontal FDI dominate.

The remainder of this paper is organized as follows. Section 2 discusses the theoretical and empirical background for our analysis. Section 3 explains our empirical strategy and the model specifications. In section 4 we describe the data set that we use. The results of our

empirical analysis are presented and discussed in Section 5. Finally, we summarize our findings and conclude in Section 6.

2. Theoretical and Empirical Background

The theoretical framework of our analysis is the theory of multinational enterprises (MNEs), which has been formalized in several seminal papers by Markusen (1984 and 1995), Helpman (1984), and Markusen and Venables (1997, 1998). The theoretical models of MNEs explain the volume of FDI as a function of characteristics of the parent and host countries such as size, relative endowments, and transaction costs.

The theoretical literature distinguishes between foreign direct investment driven by "horizontal" and "vertical" motivations. Horizontal MNEs, or "market-seeking" FDI, produce the same goods and services in multiple locations, while vertical MNEs, or "efficiency-seeking" FDI, entail the geographic fragmentation of production into stages. Models of horizontal MNEs (Markusen, 1984; Horstmann and Markusen, 1987, 1992; and Markusen and Venables, 1998, 2000) predict that MNEs will concentrate production in large countries and in countries with similar relative endowments, while models of vertical MNEs (Helpman, 1984; and Helpman and Krugman, 1985) predict that MNEs production will locate in relatively labour-abundant countries. It follows that while horizontal FDI is likely to dominate in bilateral investment flows between industrialized countries, vertical FDI is likely to dominate between developed – where headquarters are located – and developing countries, which instead host the production activity, as several empirical analyses demonstrated (Brainard, 1997; Markusen and Maskus, 2002).

An integrated treatment of horizontal and vertical FDI was developed by Markusen et al. (1996) and Markusen (1997).[2] This approach was then tested empirically by Carr et al.

[2] This integrated approach, known as the knowledge-capital model, is a combination of the horizontal and vertical models. Consequently, the effect of differences in factor endowments – proxied by labour skill

(2001) who showed that both horizontal and vertical investments are important and related to parent and host country characteristics. In particular, their findings suggest that outward FDI from a parent to a host country increases in the sum of their economic size, the relative skills abundance of the parent country and the interaction between size and relative endowment differences.

In this theoretical framework, competition among host countries for inward investments has never been considered, though the issue seems to be interesting at least from a development perspective. In order to find some conceptual considerations about FDI competition we build on the international business approach to FDI (Dunning 1973). This strand of literature formalizes the determinants of the decisions of firms to go abroad, with particular emphasis on the choice of mode of entry and of location. According to this literature, competition may arise when FDI inflows into one country divert FDI inflows from another country. Should this occur, it would not be due to resource constraints, rather because of market reasons as argued by Zhou and Lall (2005).[3] Moreover, the intensity of such a competition is likely to vary considerably according to the motivations of becoming multinational. Horizontal FDI aims at increasing market shares or exploiting specific agglomeration economies. It would therefore flow towards those countries where industrial activity and demand are higher. This implies that inflows of FDI in one country, which offers an attractive large domestic market should not preclude investments in other countries, provided that they also posses large and well developed markets. Since horizontal FDI tends to produce for local markets, country competition does not seem to be likely.

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differences – becomes ambiguos due to the interaction with country size. Empirical studies provide support to this model (Markusen and Maskus, 2002; Bloningen et al., 2003 and Braconier et al. 2005).

[3] Competition in any resource flow may obviously occur when the resource in question is available in limited amounts. However, this "zero-sum" hypothesis is difficult to justify in the case of FDI. FDI represents only 12.6% of global gross domestic capital formation (UNCTAD, 2007), and additional resources can be easily diverted from domestic resources and other international capital flows should investment opportunities arise. Moreover, multinational firms do not allocate investible funds on a geographical basis in order not to miss profitable opportunities. Finally, if one firm is not able to undertake a foreign investment because of resource constraints, there would be several other firms able to do so. See Zhou and Lall (2005) for a detailed discussion of these issues.

Vertical FDI implies the geographical fragmentation of the production chain into separate stages, according to each country's comparative advantage. This strategy enables multinational firms to exploit cost advantages where they arise. With further integration and cross-border co-operation, MNEs' activity has become more specialized and spatially fragmented, thus implying large investments within production networks. Provided that countries have distinctive advantages in different production stages, they could all benefit from large investment flows.[4] Complementarities among FDI inflows may be due to increases in demand for raw materials and intermediates, while the magnitude of the FDI creation (diversion) depends on the degree of fragmentation of the production chain.[5]

The gravity model represents a very useful empirical framework to explain bilateral FDI flows since it allows testing at the same time several theoretical frameworks by combining different explanatory variables (Eaton and Tamura, 1994; Brenton, et al., 1999; Egger and Pfaffermayr, 2004; Brainard, 1997, Ekholm, 1998; Stein and Duade, 2007).

Recent empirical analyses of multinational enterprise activity have identified other factors able to explain patterns of FDI. Thus, scholars have recently focused on the quality of institutions (Wei, 2000; Stein and Duade, 2001; Globerman and Shapiro, 2002; Benassy-Quéré et al, 2007). It has been demonstrated that good quality institutions in the parent and host countries have a positive effect on bilateral FDI flows via productivity growth and reduced uncertainty.

Existing empirical results on the effects of FDI in China on FDI in other countries are mixed. Eichengreen and Tong (2006a, 2006b) show that the emergence of China as a leading

[4] To the extent that host countries specialize in the same production stage, they become competitors, and MNEs have to make a choice among competing locations. Competition becomes negligible when production networks are organized on a regional base, as it has progressively occurred in the last two decades (Felker, 2003; Ravenhill, 1998).

[5] The degree of fragmentation of the production chain varies across sectors according to the technological intensity of the production process and the value added-weight ratio of the product. Only simple processes can be relocated to low-wage, low-skill countries, while only light, high-value products can be transported, allowing MNEs to exploit even small differences in production costs. The most fragmentable activities are those that are engineering based, such as machinery, automobiles and chemicals, while the least fragmentable are activities with continuous processes, such as food and paper processing (Zhou and Lall, 2005).

FDI destination has encouraged FDI flows to other Asian countries via supply-chain production linkages but diverted those from OECD countries. They explain this diversion effect by the negative effect of distance on supply-chain production linkages. In contrast, Mercereau (2005) shows that, on average, FDI in China has had a negative effect on FDI in other Asian countries. However, it appears that this negative effect has been driven by two countries only, namely Singapore and Myanmar, while the FDI inflows into China have not affected the other Asian countries. Also Chantasasawat et al. (2005), Zhou and Lall (2005) and Wang et al. (2007) find that FDI in China has, on average, fostered rather than diverted FDI to neighbouring countries. At country level, diversion effects have occurred in Indonesia, the Republic of Korea, Malaysia and the Taiwan Province of China. Cravino, et al. (2007), by examining the effect of foreign capital stock in China on the Latin American and Caribbean (LAC) countries, do not find any evidence for a FDI diversion from OECD countries, in particular from the US to China at the expense of the LAC countries. While the growth of capital stocks in China originating from the OECD, and especially from the US, was faster than in LAC countries over the period 1990-1997 this relative growth has slowed down since 1997. Finally, García-Herrero and Santabárbara (2007) found that while FDI to China had no significant effect on FDI to Latin America as a region, there was a significant negative effect of FDI to China on FDI to Mexico until 2001 and to Colombia after 2001.

Our paper adds to the empirical evidence on the effects of FDI in China on FDI into other countries in three ways. First, we contribute novel empirical evidence on the causal link between FDI in China and FDI in the EU countries including new EU countries in Central and Eastern Europe. Second, in contrast to most existing studies, we estimate a theory- based model derived from the theory of multinational enterprise activity. Third, we use panel data and improved econometric techniques to alleviate possible endogeneity arsing from simultaneity and omitted variable bias.

3. Empirical Methodology

Following on from the theory of multinational enterprise (Markusen, 1984, 1995; Helpman, 1984; Markusen and Venables, 1997, 1998) and related empirical evidence (Eaton and Tamura, 1994; Eckholm 1998; Brenton et al., 1999; Wei, 2000; Egger and Pfaffermayr, 2004; Stein and Duade, 2007), our baseline model shown below explains bilateral FDI flows as a function of parent and host countries characteristics:

$$\ln FDICN_{it} = a_0 + a_1 \ln MKTSIZE_{ijt-1} + a_2 \ln\left|GDPCAP_{it-1} - GDPCAP_{jt-1}\right| + a_3 INST_{jt-1} + \\ + \alpha_i + \beta_j + \tau_t + \varepsilon_{ijt} \quad (1)$$

All regressors are lagged by one year to account for the fact that the implementation of investment decisions is in practice lagged.[6] Further, lagging the regressors avoids potential endogeneity arising from the effect of FDI on some of the explanatory variables. This issue has been raised by the recent literature on FDI and growth (Borensztein et al., 1998; Rodriguez-Clare, 1996 and Zhang, 2001), according to which FDI and GDP may be simultaneously determined, and this could bias the estimates. However, this literature usually considers aggregate FDI inflows, and not bilateral flows as we do in this paper.[7]

According to model (1), FDI flows from parent country *i* to host country *j* at time *t* are a function of the following explanatory variables:

Market size ($MKTSIZE_{ijt-1}$), proxied by the product of home and host countries' GDPs at time *t-1* weighted by the distance between parent and host country. The reasoning behind the inclusion of this variable is that larger host countries have greater potential markets, which would attract more foreign firms, while larger parent countries have more firms able to operate profitably abroad. The relation is multiplicative in order to ensure that as country *i*'s (or *j*'s) GDP approaches zero, so do bilateral FDI flows, given that distance is always strictly positive. Thus, this term accounts for the potential to invest, and being based on market size

[6] See also Mercereau (2005).
[7] See also Baier and Bergstrand (2007) on this issue.

variables, it also captures potential flows of horizontal FDI. We expect to find a positive effect of market size on bilateral FDI flows.

Parent and host countries per capita income differential. Specifically, we include the absolute difference at time *t-1* of the GDP per capita in the parent ($GDPCAP_{it-1}$) and host country ($GDPCAP_{jt-1}$).[8] This variable is a proxy for differentials in factor endowments and other relevant determinants of bilateral FDI flows related to differences in the level of development of the parent and host countries. For example, countries with dissimilar levels of economic development also show differences in input prices and, mainly, in labour costs (Eichengreen and Tong, 2006b; Mercereau, 2005). Therefore, this variable captures FDI flows between developed and developing countries, which are very often of vertical type as formalized by Helpman (1984). Should this be the case, we expect to find a positive effect on FDI flows.[9]

The quality of institutions at time *t-1* in the host country ($INST_{jt-1}$). It pertains not only to societal and governmental affairs, but also includes all costs associated with the risk involved in an investment. Uncertainty, political instability and their related risks can discourage FDI inflows despite favourable economic conditions (Wei, 2000; Globerman and Shapiro, 2002). We expect a positive effect of the quality of institutions in the host country on bilateral FDI flows.

Home and host country fixed effects, (α_i, β_j) capture unobserved time-invariant factors specific to parent and destination countries which may influence bilateral FDI flows. *Time fixed effects* (τ_t) control for time-specific common shocks which may affect bilateral FDI flows (Mátyás, 1997). ε_{ijt} is the error term.

[8] As pointed out by Bloningen et al. (2003) estimating a coefficient on a difference term that takes both positive and negative values in the sample could lead to a sign reversal in the pooled (or restricted) coefficient. In order to avoid this risk, one should specify the variable in absolute values.

[9] However, it is worth noticing that when horizontal FDI dominates, dissimilarity in relative endowments may also be associated with less FDI (Markusen and Venables, 2000; Bloningen et al., 2003).

To estimate the effect of FDI flows into China on FDI flows into other host countries, we include in the baseline model (1) a measure of FDI flows into China at time *t* from each parent country *i* ($FDICN_{it}$). Unobserved global shocks can affect the attractiveness of FDI to China and other countries, simultaneously. In order to correct for this potential endogeneity, we instrument $FDICN_{it}$ with a measure for the size of the market potential available for investors from home country *i* to China, and the absolute difference between GDP per capita in the home country *i* and GDP per capita in China at time *t-1*.[10]

We estimate the following system of simultaneous equations:

$$\ln FDI_{ijt} = b_0 + b_1 \ln MKTSIZE_{ijt-1} + b_2 \ln\left|GDPCAP_{it-1} - GDPCAP_{jt-1}\right| + b_3 INST_{jt-1} + b_4 \ln FDICN_{it} + \\ + \alpha_i + \beta_j + \tau_t + \omega_{ijt}$$

$$\ln FDICN_{it} = c_0 + c_1 \ln MKTSIZE_{ijt-1} + c_2 \ln\left|GDPCAP_{it-1} - GDPCAP_{CNt-1}\right| + \varphi_{it} \qquad (2)$$

The coefficient of interest is b_4 in the primary equation: $b_4>0$ would suggest that the FDI flows to China and FDI flows to other countries were complementary, while $b_4<0$ would suggest that the FDI flows into China and FDI flows into other countries were substitutes.

We first estimate the average effects of FDI inflows to China on FDI inflows to other countries, and then we allow the coefficient for FDI inflows to China to be different for EU15, the new EU member states in Central and Eastern Europe and the rest of the countries included in the sample.[11] In addition, we allow the coefficient of FDI into China to vary also over time.

Further, to test whether the China effect varies with FDI motivations, we interact the instrumented FDI in China with the proxy for horizontal and vertical FDI, i.e. the market size

[10] These variables correspond to those previously defined for FDI flows from parent country *i* to host country *j* with $j \neq$ China.
[11] The use of these group-specific dummies should help in dealing with heterogeneity in investment behaviour.

variable and the absolute difference in GDP per capita in the parent and host countries, respectively.[12] The estimated model therefore becomes as follows:

$$\ln FDI_{ijt} = d_0 + d_1 \ln MKTSIZE_{ijt-1} + d_2 \ln\left|GDPCAP_{it-1} - GDPCAP_{jt-1}\right| + d_3 INST_{jt-1} + +d_4 \ln FDICN_{it} + \\ + d_5 \ln FDICN_{it} * \ln MKTSIZE_{ijt-1} + d_6 \ln FDICN_{it} * \ln\left|GDPCAP_{it-1} - GDPCAP_{jt-1}\right| + \\ + \alpha_i + \beta_j + \tau_t + \xi_{ijt}$$

$$\ln FDICN_{it} = e_0 + e_1 \ln MKTSIZE_{ijt-1} + e_2 \ln\left|GDPCAP_{it-1} - GDPCAP_{CNt-1}\right| + \psi_{it} \qquad (3)$$

Given the introduction of the two interacted terms into the model specification, regression coefficients reflect conditional relationships; therefore, the impact of FDI in China on other host countries is no longer constant and depends on the values taken by the two conditioning variables, as indicated by the implied derivative:

$$\frac{\delta FDI_{ijt}}{\delta FDICN_{it}} = d_4 + d_5 * \ln MKSIZE_{ijt-1} + d_6 * \ln\left|GDPCAP_{it-1} - GDPCAP_{jt-1}\right| \qquad (4)$$

Again, similar to the specifications described by model (2), we first estimate the average China effect and discuss the implied marginal effects, and then allow the coefficients of the interacted terms to differ for EU15, CEE and the other host countries. We also check whether these effects change over time.

Finally, we examine country-specific effects of the FDI to China.

4. The Data

The data on bilateral FDI flows is taken from the OECD direct foreign investment statistics and covers the period from 1990 to 2004. This period corresponds to significant market and trade liberalizations, which took place in Europe, with the fall of the Berlin Wall and the re-

[12] These interacted terms have been suggested in previous studies on bilateral FDI flows: for example, Markusen and Maskus (2002) and Eichengreen and Tong (2006a).

integration of Central and Eastern European countries into the world economy, and in China, which joined the World Trade Organization in 2001.

OECD defines FDI[13] as an international investment by a firm in one country (the parent country) with the objective of establishing a long-lasting interest in an enterprise located in another country (the host country) different from that of the investing firm. Direct investment involves either the initial transaction between the two firms or all subsequent capital transactions between them. Given our specific focus on the dynamics of the impact of FDI in China on FDI in other countries we use annual bilateral FDI flows rather than stocks.[14]

We have data for bilateral FDI flows originating in 23 OECD countries disaggregated on 35 OECD and non-OECD host countries.[15] After accounting for missing values in the original OECD data set, we end up with an unbalanced dataset with about 5,000 useful observations.

The original FDI data were obtained in current US dollars. We deflated these data by using the US price deflator for investment (2000=100) taken from the AMECO data base of the European Commission. Real GDP and GDP per capita in constant 2000 US dollars were obtained from the World Bank Development Indicators database. The distance between the parent and host countries is measured as the great circle distance between the capital cities in the parent and host countries. The source for these data was the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Our proxy for the quality of institutions (INST) is the Political Constraint Index developed by Henisz (2000). This index measures the feasibility of changes in policy, given the structure of the policy institutions and the preferences of the

[13] See, for example, OECD (2009), *OECD Benchmark Definition of Foreign Direct Investment*, 4th Edition, Paris, OECD.

[14] As pointed out in the literature, FDI stocks are less volatile than flows, since the re-direction of FDI from one country to another requires a significant amount of time.

[15] Countries included in the sample have been chosen for geographical dispersion and relevancy. Source countries are Austria, Belgium, Czech R., Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, Mexico, Netherlands, Poland, Portugal, Slovak R., Spain, Sweden, Switzerland, United Kingdom and the United States. The recipient countries include, besides the 23 OECD countries just mentioned, Brazil, Bulgaria, Cyprus, Estonia, India, Latvia, Lithuania, Malta, Romania, Russia Federation, and Slovenia.

actors operating in those institutions. It takes values from 0 (high instability) to 1 (perfect stability). Further details on the data and variables description are given in Table A1 in the Appendix.

Since we estimate log specifications, we need to deal with the cases of zero and negative values for FDI flows. In the relevant literature, three approaches have been used. A first approach used among others by Rose (2000) is to drop negative and zero values. A second approach proposed by Eichengreen and Irwin (1995) is to use as dependent variable log (1+FDI) instead of log FDI. Third, one can use a Tobit estimator instead of OLS. Stein and Duade (2007) show that results are robust to any of the three alternative techniques used. We first dropped missing values from the dataset and then estimated the model without zero and negative numbers, and then using $ln\ (1+FDI_{ijt})$ as dependent variable. Since results do not change significantly, we chose to present results obtained with strictly positive values only.[16]

5. Estimation Results

5.1 The average effect of FDI to China on FDI to other countries

Column (1) of Table 1 shows the estimates of the baseline model specification (1). The estimates are consistent with theory predictions and other empirical studies discussed in Section 2. On average, *ceteris paribus*, bilateral FDI flows were positively related to market size, similarity of relative endowments, and the quality of institutions in the host countries, though the latter is not statistically significant at the conventional levels. According to these results, bilateral FDI flows as a whole appear to be mainly market- rather than efficiency-seeking.[17]

[Table 1 about here]

[16] Estimates obtained for models (1) and (2) using zero and negative values and a Tobit estimator are shown in Table A2 in the Appendix. Additional results are available from the authors upon request.

[17] The negative sign of absolute difference in per capita incomes may be also due to the fact that differences in wage levels are not compensated by productivity and skill levels. See Globerman and Shapiro (2002) for a discussion of this issue.

Column (2) of Table 1 shows the estimates for the system of simultaneous equations (2). As discussed in Section 3, we instrumented FDI inflows to China to account for the potential correlation of FDI inflows to China and the error term due to unobserved factors that might increase simultaneously the attractiveness of China and other countries as FDI destinations.[18]

The significance and sign of the coefficients of bilateral FDI flows are similar to those obtained with our baseline regression. Moreover, in this specification also the proxy for the quality of the institutions in the recipient countries turns out to be significant with the expected sign. The coefficient of the variable of interest in this model, $ln\ FDI_{i,CN,t}$, is positive and significantly different from zero at the one percent level. It indicates that a 10 percent increase in FDI inflows to China would raise the level of FDI inflows to other recipient countries by about 4 percent. We can therefore conclude that, on average, inward FDI to China and other recipient countries were complements rather than substitutes, as suggested by the theory.

In order to analyse the potential impact of FDI inflows to China on FDI inflows to the EU15 and new EU countries in Central and Eastern Europe (CEE) we re-estimated the above model allowing the coefficient of the fitted value of Chinese FDI to vary across the two groups of countries. The estimates are shown in column (3) of Table 1. The results suggest that the setting up of production plants in China has not discouraged additional investment in EU member states. Rather, FDI in China complement FDI inflows to both EU15 and CEE countries, albeit to a lesser extent in comparison to non-EU recipient countries: a 10 percent

[18] The results of the first stage regression of FDI inflows to China are shown in Table A3 in the Appendix. The estimated model explains 91 percent of the variation of FDI inflows to China. These estimates indicate that both the GDP per capita differential and the market size were positively associated with FDI inflows to China. These results are in line with the prediction of vertical MNEs models, with their assumed geographic fragmentation of production into stages, or horizontal MNEs models. Hence, we can conclude that, over the analyzed period, China was equally attractive for both market- and efficiency-seeking FDI.

increase in FDI flows to China, would raise FDI flows to the EU15 and CEE countries of about two and one percent, respectively. [19]

At least two reasons could explain our findings. First, FDI from European countries to China is mainly market-seeking rather than efficiency-seeking. Secondly, CEE countries and China have a similar specialization within the international production chain and thus competition for FDI locations may partially offset the complementarities that usually characterize vertical FDI.

Previous results hold, on average, for the entire period considered. However, the China effect may have varied over time due to changes in international strategies of multinational firms or adaptation of foreign investors to changes in the investment climate in specific recipient countries. To account for these potential time-specific effects, we allowed the estimated coefficient for bilateral FDI flows to China to vary not only across groups of recipient countries, but also over time.

Figure 1 plots these results.[20] They indicate that the China effect on FDI to other countries weakens over time, becoming negligible in the last two years of the considered period. FDI to China affected differently EU15 and CEE countries. The effect of FDI to China on EU15 was positive and constant over time, while it decreased in CEE countries, where it became insignificant since the end of the 1990s.[21] Thus, our evidence suggests that FDI to China has not diverted FDI from other recipient countries; rather, it appears that there has been a FDI-creating effect, however decreasing over time.

[Figure 1 about here]

[19] The interpretation of the estimated coefficients in column (3) of Table 1 is as follows: the coefficients of $ln\ FDICN_{it}$ interacted with the EU15 and the CEE dummies indicate how much the slope coefficient of the average effect, that is, the coefficient of $ln\ FDICN_{it}$, differs from the slope coefficient of the FDI flows into the EU15 countries and the CEECs, respectively. The slope coefficient of the FDI effect for EU15 is 0.350-0.124= 0.226 and the effect on FDI in CEE countries is 0.350-0.232 = 0.118.

[20] Estimated coefficients and standard errors are reported in Table A4 in the Appendix.

[21] This result is similar to that by Fung et al. (2008), who found that FDI into China and FDI into CEE countries were not correlated during the 1990-2004 period.

These trends may be explained by the structural changes in the patterns of FDI to China and other recipient countries occurred in the last decades. Given the objective of this paper, two different phenomena seem to be relevant. First of all, during the considered period, China's economy expanded rapidly, with an average annual growth rate above eight percent over the period. This impressive economic growth has attracted relatively more market-seeking FDI, mainly from advanced economies (Branstetter and Lardy, 2006), thus reducing the opportunities to generate complementarities with FDI flows to other recipient countries through vertical FDI. Secondly, the geography of global production networks has changed over the past decades (Felker, 2003; Ravenhill, 1998; Ma and Van Assche, 2011). In particular, production networks have become less global and more regional in character, thus further reducing, on the one hand, complementarities in FDI flows between countries belonging to different stages of the production chain but located in different geographical areas – i.e. the EU15 and China – and, on the other hand, potential competition with countries specialized in similar production stages but belonging to different regional production networks, such as CEECs and China. However, this does not mean that China is an attractive location only for production networks centered in East Asia. Recent empirical evidence has in fact demonstrated that China's attractiveness as offshoring location does not rely only on its low labour costs but also on its geographical location. Therefore, also production networks centered in the Western hemisphere may integrate China, but with a different role with respect to the previous ones. While the former exploit China's proximity to input suppliers, the latter consider China's proximity to export markets as main determinant of their delocalisation process (Ma and Van Assche, 2011). Therefore, despite the regionalization of production networks, China remains an attractive offshoring location for European multinational firms, which considers it as an export platform for Asian markets, rather than an assembly location for products to be sold in Western markets.

Overall, these considerations suggest that the intensity of the China effect is not independent from motivations for FDI. We explore next how the effect of FDI to China may differ depending on the horizontal or vertical motivation of FDI.

5.2 The effect of FDI to China on horizontal and vertical FDI to other countries

According to the theoretical framework discussed in Section 2, complementarities in FDI flows into different recipient countries are more likely to emerge in the case of vertical rather than horizontal FDI. However, in the absence of accurate data on the motivations behind the observed FDI flows, it is rather difficult to precisely estimate the China effect on different kinds of FDI. Hence, we try to measure possible differences in the China effect on vertical and horizontal FDI by interacting the fitted FDI flows to China with the market size and our proxy for labour cost differentials (the absolute difference of GDP per capita in the source and in host countries), as shown in model (3). Estimates of this latter model are shown in Table 2.

[Table 2 about here]

Column (1) of Table 2 shows that the direct effect of FDI to China is on average negative and significant at the one percent level, while the coefficients of the interacted variables are both positive, though only the impact on vertical FDI seems to be statistically different from the direct effect at the conventional level. Since we are estimating an interaction model with two continuous variables, to interpret the intensity and the direction of the China effect we have to take into consideration the values taken by the two modifying variables, i.e. *MKTSIZE* and *GDPCAP* differentials, as illustrated by Equation (5): [22]

[22] Note that in models with multiplicative interactions, the estimated coefficients of the variables involved into the interactions reflect conditional relationships. This implies that the coefficient of the China effect variable (*ln FDICN*) may be interpreted as the impact of FDI into China on FDI flows into other recipient countries only when both the market size and GDP per capita difference variables are equal to zero.

$$\frac{\delta FDI_{ijt+1}}{\delta FDICN_{it+1}} = \quad -0.955 + 0.005 * \ln MKTSIZE_{ijt-1} + 0.089 * \ln |GDPCAP_{it-1} - GDPCAP_{jt-1}| \qquad (5)$$

The outcome of Eq. (5) may be negative, positive or equal to zero according to the values taken by the two conditioning variables. [23] In economic terms, this implies that the net China effect may be negative for very small values of market size and similar values of home and host countries' GDPs per capita. Therefore, only FDI flows directed towards less attractive host countries in terms of market size or factor cost advantages may be negatively affected by FDI inflows to China. This negative effect weakens as host countries' attractiveness improves, thus increasing investment opportunities for both horizontal and vertical FDI. Therefore, having a large relative market potential and/or being quite dissimilar from home countries may help recipient countries in developing complementarities with FDI inflows to China.

In order to solve Eq. (5) and indirectly understand whether host countries had to rely more on horizontal rather than vertical FDI in order to take advantage from FDI into China, we need to choose a specific value for at least one of the two variables included in Eq. (5). In this regard, it is useful to note that, for countries similar in terms of GDP per capita, the net China effect, as defined by Eq. (5), becomes positive for values of *MKTSIZE*>191.00. Since in our sample the maximum value the market size variable can take is 50.17, it follows that market advantages do not suffice to compensate for China's potential competition in FDI. We therefore assess the marginal effect of FDI flows to China on FDI inflows to other countries for all values of the per capita income differential variable, while setting the *MKTSIZE* variable at its maximum, average, and minimum values, respectively. The implied equations are plotted in Figure 2, which also shows China's average value of per capita income differential variable for comparison.

[23] In particular, it becomes positive when both variables assume their mean sample values.

[Figure 2 about here]

As expected, Figure 2 shows that the China effect is negative and statistically significant when host and parent countries' GDPs per capita are very similar, which suggests that FDI inflows into China are substitutes for FDI in other recipient countries regardless of their market advantages.[24] As parent and host countries become more dissimilar, the marginal effect of FDI in China becomes first less negative, and then positive, although it is statistically significant only for values of the GDP per capita difference variable higher than that assumed by the same variable concerning China.

Overall, these results suggest that an increase in FDI flows to China diverts FDI flows from countries less competitive than China, and creates additional FDI flows to countries that are more competitive than China in terms of cost efficiency but *regardless* of their market attractiveness. Therefore, it appears that the average positive effect detected in the previous sub-section is driven by vertical and not horizontal FDI, as suggested by the theory.

This general trend is present in European countries. However, the China effect on vertical FDI in European countries is stronger than in non-European countries, while the effect on horizontal FDI in European countries is weaker than in other non-European countries, as indicated by the signs of the estimated coefficients for the corresponding variables reported in column 2 of Table 2.

The China effect on horizontal and vertical FDI is constant over time, with the exception of the China effect on vertical FDI flows to EU15, which tends to halve during the considered period as indicated by the coefficients reported in Table 3. This could signal a weakening of global production networks in favour of more geographically segmented production networks (Lall and Albaladejo, 2004), with China and Western EU countries more and more involved in different geographical networks.

[24] According to the theory, horizontal FDI dominates when countries are similar in size and in relative endowments (Helpmann, Melitz and Yeaple, 2004; Markusen, et al. 1996).

(Table 3 about here)

5.3 Country-specific effects

As suggested by the previous discussions, FDI flows to China may be either related to or unrelated to FDI to other countries, with negative diversionary effects more likely to arise in countries relatively less competitive than China in terms of cost advantages. In order to investigate which destination countries enjoy complementary or diversionary effects from FDI flows to China, we calculated the net China effect for each host country. In so doing, we use Eq. (5), setting the market size variable at its average value for each host country. Figures 3-5 plot the results for EU15 countries, CEE countries and non-European countries, while Table A5 in the Appendix shows the average (positive) country–specific effects.

(Figures 3-5 about here)

Figures 3-5 show that significant variation between host country groups (EU15, CEE and non-EU countries) and within these country groups exist. Generally speaking, our findings show that diversion effects arose within EU15 countries, within CEE countries, and between CEE countries and Latin American countries, with a few marginal exceptions.[25]

In EU15, FDI inflows to China complement FDI inflows to Italy, Spain and Sweden, regardless of the source of their FDI inflows, while they substitute bilateral FDI flows among Austria, Germany, Belgium, France, The Netherlands, the United Kingdom, and between Greece and Portugal. It appears that geographical and cultural proximity are not sufficient to compensate for the lack of cost advantages. A very similar picture emerges within CEE countries, where China's FDI inflows seem to exert diversionary effects mainly on FDI flows between Baltic Republics, on the one hand, and Poland, Hungary and the Slovak Republic on the other hand. Negative diversionary effects also emerge in Hungary and the Slovak

[25] We refer here to bilateral FDI flows between Luxembourg, the United States of America, Japan and Switzerland, and between Portugal and Slovenia.

Republic, but these effects only concern FDI flows from Poland. Interestingly, FDI inflows to China do not divert FDI inflows from any of the EU15 countries,[26] but only from other CEE countries and, quite surprisingly, from Mexico, as far as Czech Republic is concerned. No negative effects are recorded in Bulgaria and Romania.

As far as non-EU countries are concerned, FDI flows to China created additional FDI flows to India, the Russian Federation, and, though to a lesser extent, the United States and Japan, regardless the country of origin, with the exception of Luxembourg, while they divert FDI flows originating in Central and Eastern Europe to Brazil and Mexico. FDI diversion also occurs in Cyprus, but it concerns only FDI flows coming from Greece, while FDI inflows to Malta seem to be positively stimulated by FDI flows to China.

Our results suggest two main conclusions. First, while diversionary effects arose within groups and between pairs of similar countries often belonging to the same geographical area, complementary effects spread out all around the world. Second, while most of the countries included in the sample show both complementary and diversionary FDI effects from China, in a small group of heterogeneous countries in terms of size, income per capita levels and geographical location, FDI flows to China exert only complementary effects on FDI inflows, regardless of the source countries. This group of countries includes seven developed large and small economies – the United States of America, Sweden, Italy, Spain, Japan, Malta and Cyprus – and four emerging countries with very different economic and geographical size, i.e. Bulgaria, Romania, India and the Russian Federation. Eight out of the 11 countries belonging to this group are located in Europe.

There are several alternative reasons for this surprising result and they should not necessarily be seen as mutually exclusive. First of all, Bulgaria, Romania and the Russian Federation are among the least developed countries in our sample. Therefore, they are not

[26] This result is consistent with Fung et al. (2008).

only quite dissimilar from the OECD source countries included in the sample, but on average more competitive than China. Secondly, India and Japan, though quite dissimilar one from each other, belong to the same regional production network and, as suggested by the literature, this increases the probability of developing complementary relationships with China.[27] Thirdly, FDI inflows in some of these countries may be motivated by different reasons with respect to FDI flows into China, thus reducing the probability to generate competition for FDI and/or increasing potentialities for developing complementary effects. For example, the USA and Japan may be interesting locations for strategic seeking FDI, i.e. foreign investments looking for advanced technology and skilled labour force, which may help MNEs, mainly those coming from less developed source countries, to strengthen their strategic assets. Therefore, they can be considered as complementary rather than competitive locations to China. Most of MNEs investing in the Russian Federation, instead, are attracted by its enormous endowments of natural resources; therefore, the positive impact exerted by FDI to China may simply reflect an increase in China's demand for raw materials.[28] Again, most of FDI in advanced countries have been undertaken by foreign enterprises involved in financial intermediations and other services, mainly business services. Therefore, it is likely that FDI flows to China, being more concentrated in the manufacturing sectors, complement rather than substitute FDI in services.[29]

6. Concluding Remarks

In this paper we have analyzed the effects of FDI to China originating from OECD countries on FDI to European Union and other countries. In particular, we have estimated a modified

[27] Several studies have shown that FDI flows to China have not diverted FDI from other Asian countries. For example, see Humphrey and Schmitz (2007), Weiss (2007), Chantasasawat et al. (2004) and Eichengreen and Tong (2006a and 2006b).
[28] A similar effect has been found by García-Herrero and Santabárbara (2007) in relation to the impact of FDI to China on FDI flows to Latin America.
[29] On the complementary relationship between FDI in manufacturing and services see Nefussi and Schwellnus (2007).

gravity model using a panel of cross-country annual data over the period 1990-2004. We first examined determinants of bilateral FDI flows and the impact of FDI to China on FDI to other countries. We then investigated whether and to what extent FDI flows to China have occurred at the expense of FDI to the EU. In particular, we distinguished between the EU countries prior to the enlargements of 2004 and 2007 (EU15) and the new EU member states from Central and Eastern Europe. Third, we have examined the variation over time of the effect of FDI to China on FDI to other countries. Fourth, we estimated the average China effects on horizontal and vertical FDI to other host countries as well as country groups-specific and country-specific effects.

Our results suggest that, over the analyzed period, bilateral FDI flows originating from OECD countries took place mainly among countries with similar factor endowments and large markets, and responded positively to high levels of institutional quality in the host countries. These results are in line with the theory of multinational enterprises and consistent with previous empirical studies. Moreover, they suggest that most of the bilateral FDI recorded in our sample responded to market rather than efficiency motivations.

We have provided empirical evidence showing that, *ceteris paribus*, FDI inflows into China rose FDI flows to other countries. However, this complementary relationship was not constant across country groups, being less strong in Europe than outside Europe. Within Europe, the most negatively affected countries were the new EU member states in Central and Eastern Europe. This result indicates that the advantage of these latter countries related to their proximity to FDI source countries was not sufficient to neutralize the attractiveness of China as a FDI destination. Our results also indicate that the China effect has decreased over time, thus suggesting the weakening of links with global production networks.

The surge of FDI to China has encouraged both horizontal and vertical FDI to the other countries in our sample. In the case of EU15, the FDI complementarity has been lower

in the case of horizontal FDI and higher in the case of vertical FDI in comparison with non-EU host countries.

We have also examined the China effect on a country basis, and found that, while on average the FDI creation effect prevailed, there were a number of cases in which FDI to China diverted FDI from other host countries. This fact mainly concerns pairs of similar countries within EU15, CEE and between some Latin American countries and some CEE countries. Most interestingly, we have found that FDI inflows to China did not crowd out FDI inflows to a small group of host countries. This group includes four mature and relatively high-income economies – USA, Sweden, Italy and Spain – four emerging relatively low-income countries, i.e. Bulgaria, Romania, Russia and India, and two small medium-level countries, such as Malta and Cyprus.

The main conclusion of our analysis is that, on average, FDI to China had no diversion effects, but significant variation between and within country groups existed. Therefore, the issue of competition for investment needs to be further explored in-depth in order to clearly identify factors driving complementary and diversionary effects. To this purpose, more disaggregated bilateral FDI data at sectoral and firm level would help to disentangle specific effects and to estimate more precisely the China effect on FDI to other countries.

In so doing, other important points should be kept in mind. First of all, the China effect depends on China's absolute attractiveness for FDI and on the types of FDI it will attract in the future. If China will maintain its present growth rates, it will become more similar to source countries, thus attracting more market-seeking FDI and less efficiency-seeking FDI. Therefore, there will be less room to develop complementarities between FDI flows to China and FDI to other countries. However, China is becoming an attractive location for more value added FDI in both manufacturing and services sectors. These structural

transformations should increase the opportunities to develop complementary relationships with FDI in other locations. Last but not least, even though the China effect will persist over time, countries gaining from it may change, since the surge of diversionary effects depends on the relative position of source and recipient countries in the global chain not only in absolute terms, but also relatively to China. Since this position usually evolves over time according to changes in the comparative advantages of the countries involved in global production processes, the China effect on FDI to other countries may change its direction.

Finally, this research could be extended in three directions. While this paper focused on aggregate bilateral FDI flows, further research could consider FDI in specific sectors, in particular FDI in R&D and high technology intensive industries, where China is gaining significant comparative advantages (Lall and Albaladejo, 2004; UNCTAD, 2011). Further, up to date little is known about the relationship between FDI to and exports from China, especially as far as European countries are concerned. Finally, subject to availability of micro data, further research could analyze how the location of multinational enterprises in China affect the location of multinational enterprises in other countries. The exploration of these issues would allow a better understanding of the role China plays in the global economy, in absolute terms and vis-à-vis the European and other developed economies.

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Table 1. Bilateral FDI flows and the impact of FDI to China on FDI to other countries

	(1)	(2)	(3)
ln $MKTSIZE_{ijt-1}$	1.034***(0.040)	1.002*** (0.043)	0.899***(0.093)
ln ABS. DIFF. $GDPCAP_{ijt-1}$	-0.158***(0.022)	-0.047*** (0.027)	-0.076***(0.027)
$INST_{jt-1}$	0.366 (0.325)	0.629* (0.355)	1.534***(0.353)
ln $FDICN_{it}$		0.395***(0.075)	0.350***(0.086)
ln $FDICN_{it}$*EU15			-0.124***(0.031)
ln $FDICN_{it}$*CEE			-0.232***(0.042)
EU15			-0.223 (0.335)
CEE			0.789** (0.327)
Home country fixed effects	F(21, 4316) = 91.73***	$\chi^2(19)$ =1081.04***	$\chi^2(19)$ =110.130***
Host country fixed effects	F(32,4316)=45.16 ***	$\chi^2(32)$=1356.86 ***	$\chi^2(30)$=148.20 ***
Time specific fixed effects	F(12,4316) = 17.21***	χ^2 (12) = 85.44***	χ^2 (12) = 84.19***
Sargan test		$\chi^2(1)$=0.09	
Obs.	4388	3687	4208
R^2	0.71	0.70	0.72

The dataset set includes FDI values strictly positive, only. Robust standard errors in parentheses. ***, **, * indicate significance at levels 1, 5, and 10 percent, respectively. Estimates for constant terms are not shown.

Table 2. The impact of FDI to China on horizontal and vertical FDI to other countries

	All countries			EU countries		
	coeff.	**S.E.**	**sig.**	**coeff.**	**S.E.**	**sig.**
ln $MKTSIZE_{ijt-1}$	1.024	0.094	***	1.057	0.095	***
ln ABS. DIFF. $GDPCAP_{ijt-1}$	-0.427	0.051	***	-0.374	0.056	***
$INST_{jt-1}$	0.332	0.445		1.138	0.513	**
ln $FDICN_{it}$	-0.955	0.355	***	-1.195	0.378	
$FDICN_{it}$*HOR	0.005	0.006		0.011	0.007	*
$FDICN_{it}$*VER	0.089	0.009	***	-0.001	0.011	
$FDICN_{it}$*HOR*EU15				-0.019	0.002	***
$FDICN_{it}$*VER*EU15				0.096	0.011	***
$FDICN_{it}$*HOR*CEE				-0.013	0.007	**
$FDICN_{it}$*VER*CEE				0.053	0.032	*
EU15				-0.214	0.361	
CEE				0.939	0.324	***
Home country fixed effects	$\chi^2(19)$ = 145.81		***	$\chi^2(19)$ = 156.56		***
Host country fixed effects	$\chi^2(32)$ = 150.81		***	$\chi^2(30)$ = 153.05		***
Time specific fixed effects	χ^2 (12) = 73.82		***	χ^2 (12) = 83.14		***
Obs.	4208			4208		
R^2	0.73			0.73		

The dataset set includes FDI values strictly positive, only. Bootstrapped standard errors in parentheses.
***, **, * indicate significance levels at 1, 5, and 10 percent, respectively. Estimates for constant terms are not shown.

Table 3: The effect of FDI to China on horizontal and vertical FDI to other countries over time

		All countries			EU15			CEECs		
		coeff.	S.E.	sig.	coeff.	S.E.	sig.	coeff.	S.E.	sig.
1991	HOR	0.060	0.011		-0.019	0.008	**	-0.159	0.075	**
	VER	0.018	0.048		0.155	0.031	***	0.778	0.348	**
1992	HOR	0.019	0.011	*	-0.013	0.007	*	0.001	0.059	
	VER	-0.051	0.053		0.123	0.018	***	0.037	0.267	
1993	HOR	0.017	0.012		-0.010	0.007		0.027	0.035	
	VER	-0.041	0.053		0.101	0.015	***	-0.73	0.161	
1994	HOR	0.010	0.011		-0.013	0.007	*	0.016	0.028	
	VER	0.001	0.047		0.103	0.017	***	-0.026	0.121	
1995	HOR	0.017	0.008	**	-0.009	0.007		0.000	0.023	
	VER	-0.035	0.028		0.08	0.015	***	0.047	0.099	
1996	HOR	0.008	0.008		-0.008	0.007		0.007	0.024	
	VER	0.003	0.031		0.077	0.016	***	0.017	0.108	
1997	HOR	0.005	0.009		-0.010	0.007		-0.008	0.027	
	VER	0.017	0.039		0.100	0.016	***	0.076	0.124	
1998	HOR	0.014	0.009		-0.009	0.007		-0.023	0.024	
	VER	-0.032	0.036		0.086	0.016	***	0.148	0.107	
1999	HOR	0.011	0.007		-0.007	0.007		-0.009	0.017	
	VER	-0.013	0.025		0.08	0.015	***	0.061	0.074	
2000	HOR	0.014	0.008	*	-0.005	0.007		-0.003	0.023	
	VER	-0.034	0.023		0.067	0.016	***	0.033	0.101	
2001	HOR	0.009	0.008		-0.007	0.007		0.003	0.015	
	VER	-0.007	0.029		0.063	0.018	***	-0.011	0.063	
2002	HOR	0.010	0.008		-0.009	0.007		0.011	0.018	
	VER	-0.022	0.026		0.076	0.014	***	-0.053	0.073	
2003	HOR	0.012	0.008		-0.010	0.007		-0.32	0.020	
	VER	-0.039	0.031		0.072	0.018	***	0.143	0.085	*
2004	HOR	0.008	0.008		-0.007	0.007		-0.000	0.018	
	VER	-0.021	0.024		0.069	0.016	***	0.007	0.076	

Bootstrapped standard errors. ***, **, * indicate significance levels at 1, 5, and 10 percent, respectively. The dataset set includes FDI values strictly positive, only.

Figure 1. The average effect of FDI to China on FDI to other countries over time

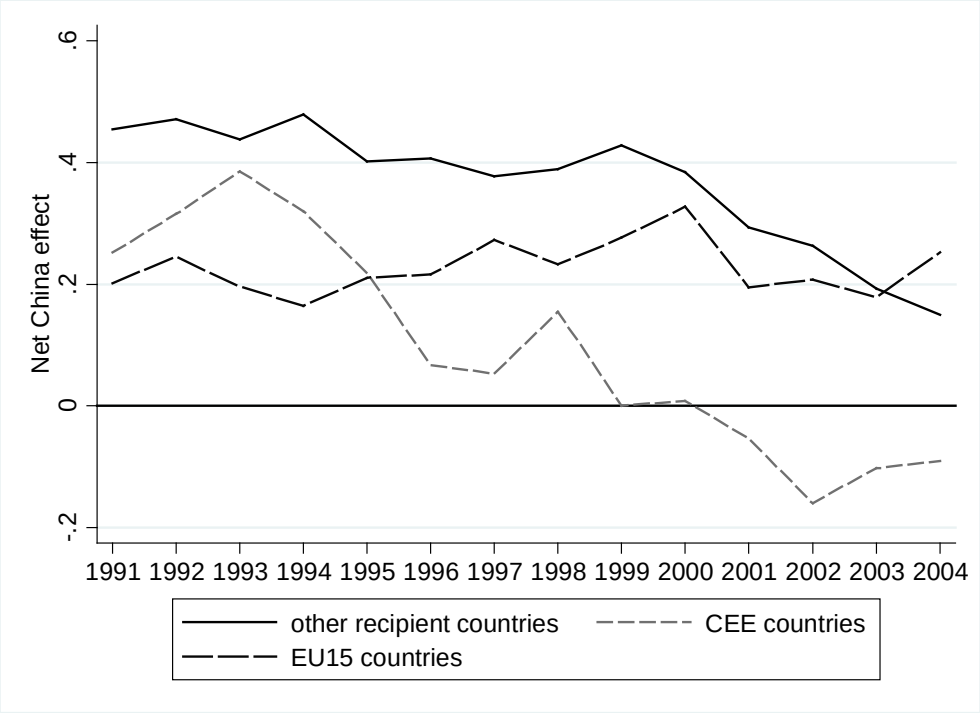
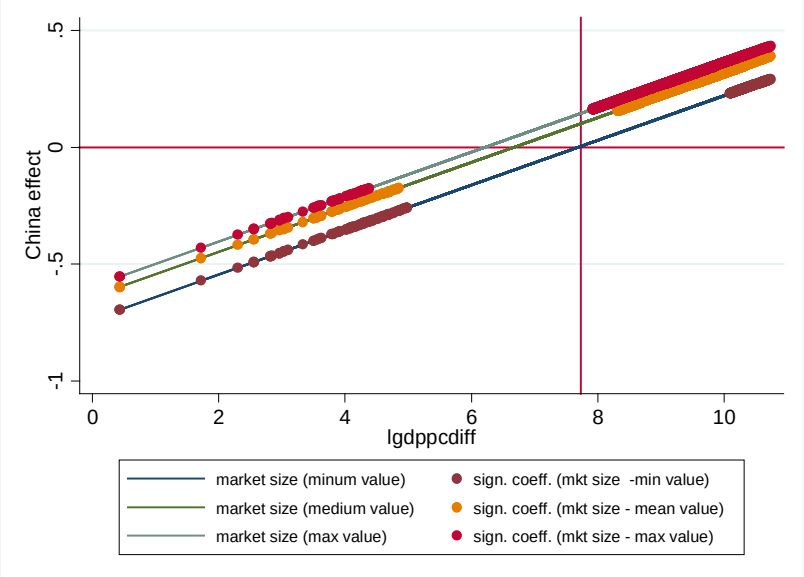


Figure 2. The impact of FDI to China on FDI to other countries: marginal effects

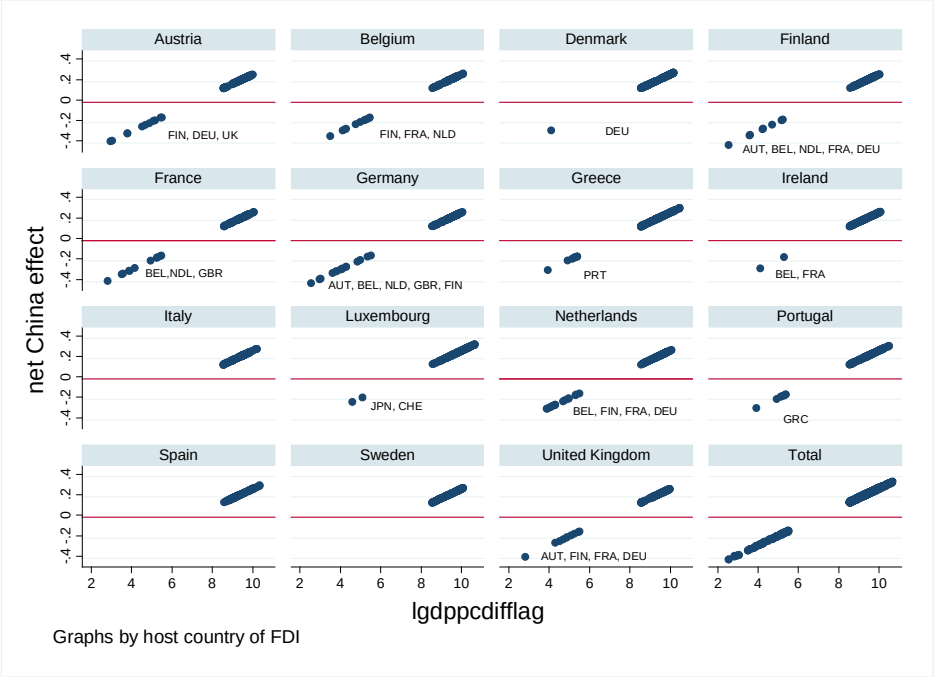


China net effect has been computed as follows:

$$\frac{\delta FDI_{ijt}}{\delta FDICN_{it}} = -0.955 + 0.005 * \ln MKTSIZE_{ijt-1} + 0.089 * \ln \left| GDPCAP_{it-1} - GDPCAP_{jt-1} \right|$$

with MKTSIZE taking its maximum, minimum and mean value.

Figure 3. The effect of FDI to China on FDI to EU15 countries: marginal effects

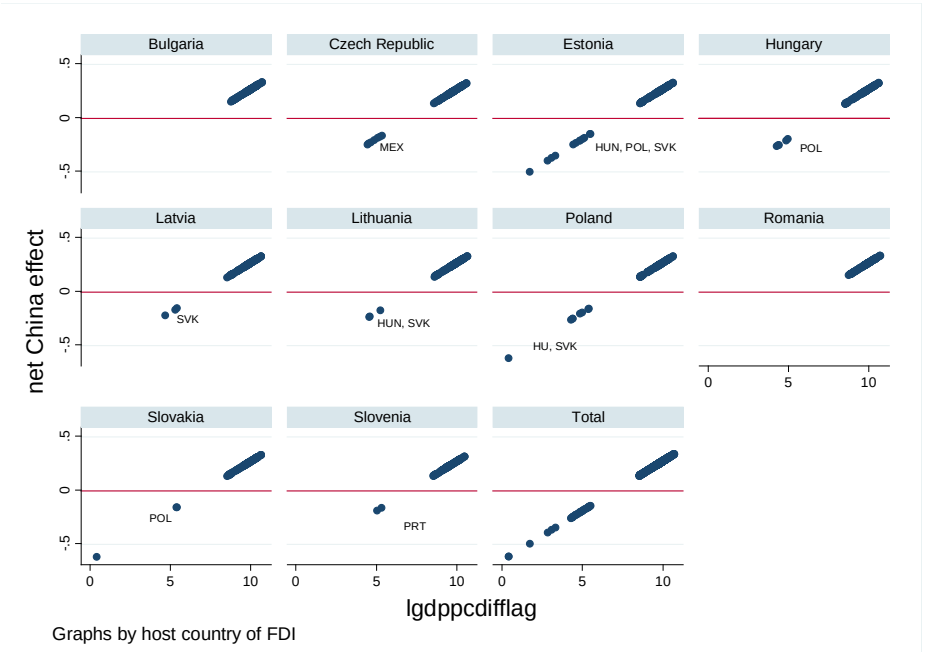


All the included marginal effects are significant at 5 percent level. Average effects are simple averages of the mean values of each recipient country. China net effect on FDI flows into each recipient country *j* has been computed as follows:

$$\frac{\delta FDI_{ijt}}{\delta FDICN_{it}} = \alpha_0 + \alpha_1 * \ln MKTSIZE_{ijt-1} + \alpha_2 * \ln |GDPCAP_{it-1} - GDPCAP_{jt-1}|$$

The corresponding estimated coefficients are those reported in Table 2 column 2.

Figure 4. The effect of FDI to China on FDI to Central and Eastern European countries: marginal effects

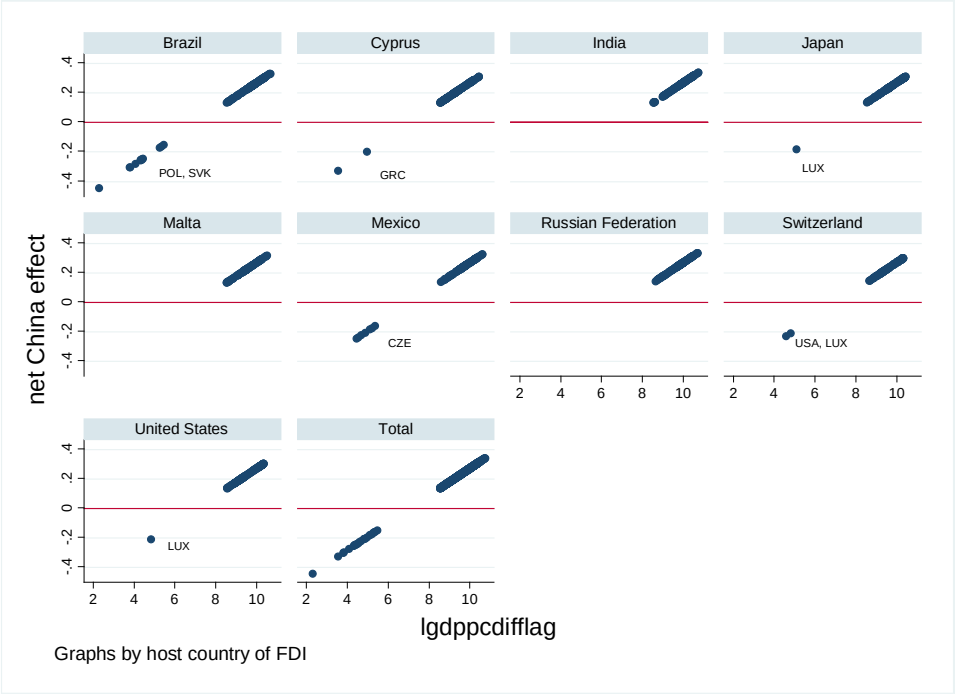


All the included marginal effects are significant at 5 percent level. Average effects are simple averages of the mean values of each country included in the corresponding groups of recipient countries. China net effect in each recipient country has been computed as follows:

$$\frac{\delta FDI_{ijt}}{\delta FDICN_{it}} = \alpha_0 + \alpha_1 * \ln MKTSIZE_{ijt-1} + \alpha_2 * \ln |GDPCAP_{it-1} - GDPCAP_{jt-1}|$$

The corresponding estimated coefficients are those reported in Table 2 column 2.

Figure 5. The effect of FDI to China to FDI in other non- EU countries: marginal effects



All the included marginal effects are significant at 5 percent level. Average effects are simple averages of the mean values of each country included in the corresponding groups of recipient countries.
China net effect in each recipient country has been computed as follows:

$$\frac{\delta FDI_{ijt}}{\delta FDICN_{it}} = \alpha_0 + \alpha_1 * \ln MKTSIZE_{ijt-1} + \alpha_2 * \ln |GDPCAP_{it-1} - GDPCAP_{jt-1}|$$

The corresponding estimated coefficients are those reported in Table 2 column 2.

Appendix

Table A1: Definitions and data sources of variables

Variable	Definition and source
FDI_{ijt}	Aggregate foreign direct investment outflows from source country *i* to host country *j* at time *t*. Data from the OECD *International Direct Investment Statistics Yearbook*
$GDP_{i(j)t}$	Gross domestic product in US dollars in country *i* (*j*) at time *t*, constant 2000 prices. World Bank, *World Development indicators*.
$GDPCAP_{i(j)t}$	Per capita gross domestic product in US dollars in country *i* (*j*) at time *t*, constant 2000 prices. World Bank, *World Development indicators*.
$INST_{jt}$	Quality of institutions in country *j* at time *t*. Political Constraint Index. This ranges from 0 (instability) to 1 (complete stability). POLCON dataset (http://www-management.wharton.upenn.edu/henisz/polcon/contactinfo.html)
$DIST_{ij}$	Great circle distance between home country *i* and host country *j*. CEPII database
α_i, β_j	Source and host country dummy variables
τ_t	Time dummy variables
$FDICN_{it}$	Aggregate bilateral foreign direct investment outflows from source country *i* to China at time *t*. Data from the OECD *International Direct Investment Statistics Yearbook*
$DISTCN_i$	Great circle distances between source country *i* and China. CEPII database
$GDPCN_t$	Gross domestic product in USD in China at time *t*, constant 2000 prices. World Bank, *World Development indicators*.
$GDPCAPCN_t$	Per capita gross domestic product in USD in China at time *t*, constant 2000 prices. World Bank, *World Development indicators*.

Table A2: Determinants of FDI: the marginality of zero and negative values (alternative estimation techniques)

	(with FDI values ≤ 0)			Tobit (with FDI values ≥ 0)		
	pooled reg.	**IV (2nd stage)**	**(IV, 2nd stage)**	**pooled reg.**	**IV (2nd stage)**	**(IV, 2nd stage)**
ln $MKTSIZE_{ijt-1}$	1.096*** (0.043)	1.095*** (0.046)	0.825*** (0.093)	1.096*** (0.043)	1.188*** (0.049)	0.981*** (0.091)
Abs diff ln $GDPCAP_{ijt-1}$	-0.210*** (0.022)	-0.171*** (0.025)	-0.076*** (0.028)	-0.209*** (0.022)	-0.122*** (0.074)	-0.086*** (0.029)
$INST_{jt-1}$	1.539*** (0.308)	1.753*** (0.350)	1.484*** (0.373)	1.540*** (0.306)	2.031*** (0.414)	1.726*** (0.428)
ln $FDICN_{it}$		0.4502*** (0.095)	0.343*** (0.074)		0.542*** (0.107)	0.281*** (0.066)
ln $FDICN_{it}$*EU15			-0.084*** (0.030)			-0.115*** (0.032)
ln $FDICN_{it}$*CEE			-0.270*** (0.036)			-0.164*** (0.039)
EU15			-2.361*** (0.556)			'-0.399 (0.039)
CEE			-0.781* (0.417)			0.396 (0.338)
Home country fixed effects	$F_{(21, 4966)}$ = 108.41***	$\chi^2(19)$ =1054.98***	$F_{(19, 4318)}$ = 5.39***	$F_{(21, 4967)}$ = 109.75***	$\chi^2(19)$ =1096.50***	$F_{(19, 4319)}$ = 7.48***
Host country fixed effects	$F_{(32,4966)}$=43.33 ***	$\chi^2(32)$=1329.41 ***	$F_{(30,4318)}$=3.93***	$F_{(32,4967)}$=43.91***	$\chi^2(32)$=1346.82 ***	$F_{(30,4319)}$=4.97***
Time specific fixed effects	$F_{(12,4966)}$ = 22.30***	χ^2 (12) = 87.02***	$F_{(12,4318)}$ = 5.36***	$F_{(12,4967)}$ = 26.15***	χ^2 (12) = 86.49***	$F_{(12,4319)}$ = 7.21***
Hansen J test		1.22 (Prob > χ2 =0.269)				
Wald test for exogeneity					19.61 (Prob > χ2 =0.000)	
Log pseudolikelihood				-9008.175	-11692.48	-7535.32
Obs.	5038	4391	4391	5038	4391	4391
R^2 / Pseudo R^2	0.7327	0.7275	0.7375	0.27	0.7275	0.28

Robust standard errors in parenthesis. *** indicates significance at 1 percent level.

Table A3. Determinants of FDI in China (Estimates from first stage IV regression)

	IV regression without zero			IV regression with zero			IV tobit regression		
	coeff.	S.E.	sig.	coeff.	S.E.	sig.	coeff.	S.E.	sig.
ln $MKTSIZE_{i,CN,t-1}$	5.325	0.484	***	3.251	0.447	***	4.33	0.428	***
ln|$GDPCAP_{it-1}$ - $GDPCAP_{CN,t-1}$|	5.289	0.433	***	4.994	0.397	***	4.475	0.374	***
ln $MKTSIZE_{ijt-1}$	0.020	0.021		0.028	0.02		0.028	0.020	
ln| $GDPCAP_{it-1}$ – $GDPCAP_{jt-1}$|	0.005	0.011		0.010	0.009		0.010	0.009	
$INST_{jt-1}$	0.011	0.163		0.018	0.141		0.017	0.139	
Obs.		3687			4391			4391	
R^2		0.92			0.93			-	
Adj R^2		0.91			0.98			-	
pseudo log likelihood		-			-			-11692.48	

Bootstrapped standard errors. *** indicates significance at 1 percent level. Estimations include home country, host country and time specific effects and a constant.

Table A4. The effect of FDI to China on FDI to other countries over time (marginal effects)

	Other countries			EU15			CEECs		
	coeff.	S.E.	sig.	coeff.	S.E.	sig.	coeff.	S.E.	sig.
1991	0.47	0.139	***	0.21	0.129	*	0.20	0.279	
1992	0.49	0.110	***	0.26	0.104	**	0.33	0.283	
1993	0.46	0.108	***	0.21	0.106	**	0.43	0.130	***
1994	0.49	0.102	***	0.17	0.112		0.40	0.129	***
1995	0.48	0.094	***	0.22	0.099	**	0.40	0.134	***
1996	0.44	0.106	***	0.22	0.101	**	0.40	0.127	***
1997	0.39	0.105	***	0.28	0.100	***	0.31	0.120	***
1998	0.38	0.113	***	0.24	0.112	**	0.33	0.128	**
1999	0.43	0.107	***	0.29	0.090	***	0.06	0.107	
2000	0.37	0.103	***	0.33	0.105	***	0.05	0.106	
2001	0.32	0.106	***	0.17	0.094	*	-0.07	0.106	
2002	0.24	0.106	**	0.21	0.096	**	-0.17	0.114	
2003	0.20	0.108	*	0.16	0.102		-0.15	0.134	
2004	0.17	0.105		0.26	0.097	***	-0.09	0.118	

Bootstrapped standard errors. ***, **, * indicate significance at 1, 5 and 10 percent level, respectively.

Table A5: The effect of FDI to China to FDI to other countries: Country-specific effects (marginal effects)

Recipient country	obs.	mean	St. dev.	Min	Max
Austria (AUT)	199	0.193	0.113	-0.382	0.271
Belgium (BEL)	196	0.197	0.105	-0.332	0.278
Brazil (BRA)	264	0.225	0.115	-0.444	0.333
Bulgaria (BUL)	252	0.258	0.040	0.157	0.336
Cyprus (CYP)	268	0.206	0.060	-0.329	0.312
Czech Republic (CZE)	233	0.236	0.086	-0.245	0.327
Denmark (DNK)	255	0.207	0.060	-0.278	0.286
Estonia (EST)	261	0.225	0.118	-0.497	0.329
Finland (FIN)	192	0.196	0.107	-0.420	0.272
France (FRA)	197	0.191	0.114	-0.396	0.277
Germany (DEU)	201	0.182	0.137	-0.420	0.276
Greece (GRC)	261	0.203	0.084	-0.293	0.314
Hungary (HUN)	251	0.236	0.081	-0.260	0.329
India (IND)	260	0.261	0.043	0.135	0.339
Ireland (IRL)	203	0.207	0.059	-0.275	0.276
Italy (ITA)	198	0.21	0.034	0.135	0.291
Japan (JPN)	279	0.251	0.049	-0.184	0.310
Latvia (LAT)	253	0.246	0.064	-0.221	0.331
Lithuania (LIT)	251	0.245	0.066	-0.232	0.331
Luxembourg (LUX)	285	0.257	0.058	-0.231	0.331
Malta (MAL)	225	0.231	0.041	0.135	0.318
Mexico (MEX)	233	0.235	0.086	-0.245	0.328
Netherlands (NLD)	200	0.183	0.127	-0.297	0.276
Poland (POL)	259	0.231	0.102	-0.617	0.330
Portugal (PRT)	253	0.206	0.084	-0.293	0.317
Romania (ROM)	252	0.257	0.041	0.154	0.336
Russian F. (RUS)	252	0.256	0.042	0.143	0.335
Slovakia (SVK)	254	0.241	0.079	-0.617	0.331
Slovenia (SLO)	225	0.227	0.055	-0.191	0.316
Spain (ESP)	260	0.203	0.038	0.138	0.303
Sweden (SWE)	191	0.221	0.040	0.135	0.277
Switzerland (CHE)	265	0.237	0.058	-0.231	0.300
United Kingdom (GBR)	197	0.197	0.103	-0.396	0.268
United States (USA)	268	0.229	0.054	-0.210	0.303
Average effects:					
all countries	8093	0.225	0.082	-0.617	0.339
EU15	3288	0.205	0.090	-0.420	0.331
CEECs	2491	0.241	0.078	-0.617	0.336
others	2314	0.237	0.067	-0.444	0.339

All the included marginal effects are significant at least at 5 percent level. Average effects are simple averages of the mean values of each country included in the corresponding groups of recipient countries.
China net effect in each recipient country has been computed as follows:

$$\frac{\delta FDI_{ijt}}{\delta FDICN_{it}} = \alpha_0 + \alpha_1 * \ln MKTSIZE_{ijt-1} + \alpha_2 * \ln | GDPCAP_{it-1} - GDPCAP_{jt-1} |$$

The corresponding estimated coefficients are those reported in Table 3 column 2.