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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

Robust determinants of OECD FDI in developing countries: Insights from Bayesian model averaging

Nikolaos Antonakakis^{1,2,3,4*} and Gabriele Tondl¹

Abstract: In this paper, we examine the determinants of outward FDI from four major OECD investors, namely, the US, Germany, France, and the Netherlands, to 129 developing countries classified under five regions over the period 1995–2008. Our goal is to distinguish whether the motivation for FDI differs among these investors in developing countries. Rather than relying on specific theories of FDI determinants, we examine them all simultaneously by employing Bayesian model averaging (BMA). This approach permits us to select the most appropriate model (or combination of models) that governs FDI allocation and to distinguish robust FDI determinants. We find that no single theory governs the decision of OECD FDI in developing countries but a combination of theories. In particular, OECD investors search for destinations with whom they have established intensive trade relations and that offer a qualified labor force. Low wages and attractive tax rates are robust investment criteria too, and a considerable share of FDI is still resource-driven. Overall, investors show fairly similar strategies in the five developing regions.

Subjects: Econometrics; Finance; International Economics; Macroeconomics

Keywords: FDI determinants; Bayesian model averaging; OECD; developing countries; the US; Germany; France; the Netherlands

AMS Subject Classifications: C11; F0; F21

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PUBLIC INTEREST STATEMENT

The purpose of this study is to shed more light on the determinants of foreign direct investments (FDI) originating from major investors (namely, the US, Germany, France, and the Netherlands) in developing countries (DC) classified under five geographical regions over the period 1995–2008. To achieve that, we employ an approach that is able to identify the most robust determinants among a set of 30 potential determinants, which can be clustered into market size and market dynamics, market development (including labor costs and human capital), resources, openness, bilateral trade relations, geographical and cultural proximity, macroeconomic factors, institutional factors, and infrastructure. Our main findings reveal that: (1) Established bilateral trade relations, market size, high skilled labor force, low wages, and low corporate tax rate are the most robust FDI determinants in DC. (2) No single theory governs the decision of FDI in developing countries, but a combination of theories.



Nikolaos Antonakakis

1. Introduction

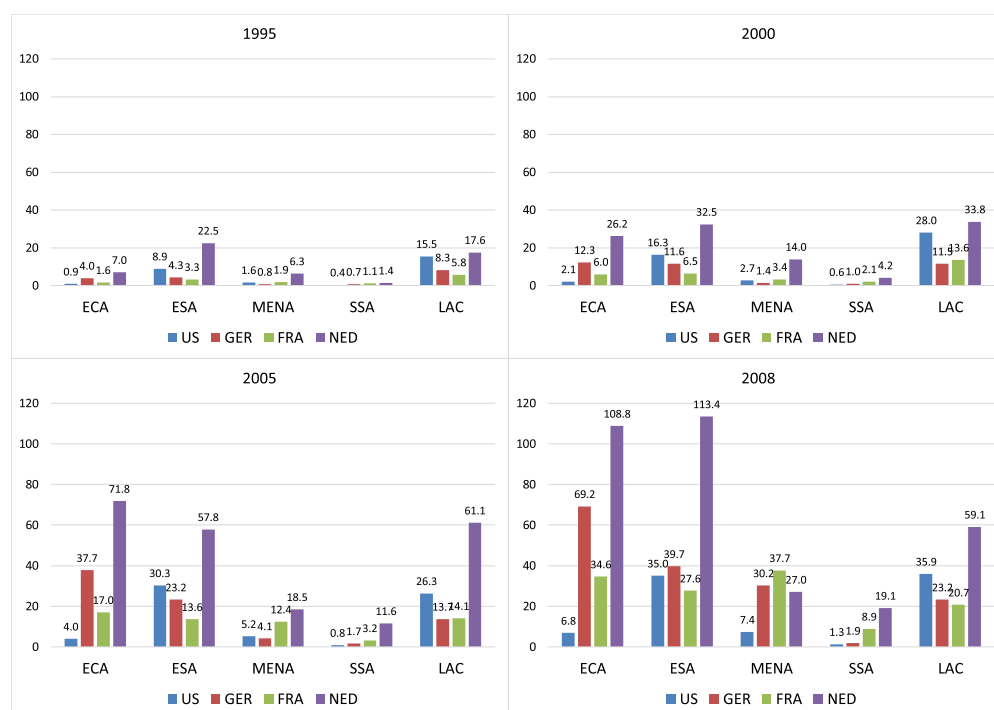
Since the mid 1990s OECD countries have begun placing an increasing share of their FDI into developing countries (DC), specifically, in Eastern Europe and Central Asia (ECA), East and South Asia (ESA), Latin America and Caribbean (LAC), Middle East and North Africa (MENA), and in Sub-Saharan Africa (SSA).

Concentrating among the major OECD investors, namely, the US, Germany, France, and the Netherlands, we see that their presence, in the regions mentioned above, varied substantially.¹ As an indicator for FDI commitment in a country, we consider the amount of outward foreign direct investment stocks in that destination per inhabitant of the investor country. Figure 1 shows the trend of FDI positions of the regarded OECD investors in 1995, 2000, 2005, and 2008. In 1995, the Netherlands had by far the most intensive FDI activity in DC, ahead of other European countries and the US. Both the Netherlands and the US invested primarily in ESA and LAC. Germany engaged mostly in LAC, while its commitment in ECA and ESA was only half as high. For France, a similar picture emerged, although its internationalization was even lower than that of Germany. SSA and MENA were virtually neglected by all OECD investors.

In 2000, 2005 through 2008, the internationalization via FDI in DC has increased dramatically for all aforementioned OECD investors, especially the European ones. The Netherlands has propelled its commitment also in ECA by 2008, becoming equally high internationalized in ESA and ECA, followed by LAC. Germany has shifted its focus to ECA, ESA, and MENA. A similar tendency is observed with France. European OECD investors had not only discovered ECA in that period, but also ESA and MENA as FDI fields. For the US, LAC remains the first FDI destination although ESA has become almost equally important. In contrast to the European investors, ECA and MENA are subordinate for the US investors. SSA still hardly attracts OECD FDI.

These facts raise several important questions: (1) What determines FDI from high income OECD countries to different developing regions? (2) Do different OECD investors have different motives for different location factors in these regions? (3) What are the prospects of these regions for further FDI? Which factors must DC improve to become attractive FDI locations? (4) Given the abundance of FDI determinants considered in the literature, which are indeed the most crucial ones?

Figure 1. OECD countries' FDI per inhabitant (in US\$) position by region of destination.



A bulk of literature investigating the determinants of FDI has emerged aiming primarily to pinpoint which factors FDI recipients have to provide to secure FDI inflows (for a review see Blonigen, 2005; Faeth, 2009). In most of the studies, the key determinants of FDI considered are: market potential and labor costs as well as distance. Others emphasize the role of certain types of FDI determinants such as taxation, human capital, infrastructure, macroeconomic factors, institutional factors, and trade liberalization.

Several studies also investigate the determining factors for specific regions (e.g. Bellak & Leibrecht, 2008, for Eastern Europe; Hattari & Rajan, 2009, for Asia; Trevino, Thomas, & Cullen, 2008, for LAC; Mohamed & Sidiropoulos, 2010, for MENA; and Asiedu, 2006, for Africa). In contrast, there are a few studies that look at the motives of the investor countries (see, e.g. Nasser, 2007, for the US; Toubal, Kleinert & Buch, 2005, for Germany; Pfister & Deffains, 2005, for France), and according to our knowledge there are no studies that compare and contrast FDI determinants in developing countries of several geographical regions simultaneously.

The most closely related studies to ours is that of Blonigen and Piger (2014) and Eicher, Helfman, and Lenkoski (2012). Blonigen and Piger (2014) employ a Bayesian model averaging (BMA) approach on bilateral FDI stocks and 56 potential determinants of FDI. Their results indicate that the traditional gravity variables, cultural distance factors, relative labor endowments, and trade agreements are the most robust determinants, while little support is found for multilateral trade openness, most host-country business costs, host-country infrastructure, and host-country institutions. Eicher et al. (2012) use bilateral FDI outflow data and 55 regressors over the period 1988–2000 for 46 countries (of which 21 non-OECD), and utilize also a BMA approach so as to resolve the model uncertainty that surrounds the validity of the competing FDI theories. Eicher et al. (2012) show that more than half of the previously suggested FDI determinants are not robust and highlight theories that do receive robust support from the data. Unlike, the aforementioned studies, we focus on bilateral FDI stocks of major OECD investor in 129 developing countries classified under five geographical regions over the period 1995–2008. This is the major contribution of this study.

Given the variety of investment patterns of OECD investors described above, and the scarce literature in this field, it is imperative to further explore how the motives of these investors differ, and whether these motives differ between certain host regions. Answers to such questions are of great importance. They would permit OECD investors and their governments to elaborate on their internationalization strategy and to advance a specific international economic dialogue that would support it. Moreover, they would indicate to DC which conditions must be improved in order to attract more or specific investors.

The second major contribution of this study is to shed more light on the robustness of OECD FDI determinants in developing countries. Although the literature has emphasized particular groups of determinants, there is a limited number of studies (see e.g. Blonigen & Piger, 2014; Eicher et al., 2012) that looks at a rich set of determinants in an attempt to distinguish the most crucial ones. In our study, we exploit a large set of 35 potential determinants including, among others, market size and market dynamics, labor costs, human capital, infrastructure, trade relations, macroeconomic factors, and institutional factors. We employ a BMA technique, which was originally employed in cross country growth regressions by Fernandez, Ley, and Steel (2001b), to identify robust model(s) explaining the FDI patterns of our investors to different developing regions.

The results of our empirical analysis reveal that there is no single theory that governs the decision of OECD FDI in developing countries but a combination of theories. In particular, major OECD investors prefer: (1) FDI destinations with whom they have already established intensive trade relations, and search for advanced DC with skilled labor force. (2) Low wages and attractive tax rates are robust investment criteria too, and (3) a considerable share of their FDI is still resource-driven. We do not find that macroeconomic and institutional factors are robust FDI determinants. Our investors reveal fairly similar strategies in the various FDI destinations, although, certain particularities

appear, like the absence of resource-oriented German FDI and its request for efficient government authorities. Since many developing countries score poorly with respect to point (1) they are not attractive for OECD investors.

The remainder of the paper is organized as follows: Section 2 discusses the determinants of FDI and the hypotheses regarding our investor countries. Section 3 describes the model specification and the data. Section 4 discusses the BMA methodology. Section 5 presents the empirical results and, finally, Section 6 concludes.

2. Motives and determinants of FDI

In this section, we briefly discuss the theoretical and empirical evidence on the determinants of FDI, and posit the hypotheses concerning our investors. We group the determinants under the following areas: market size, market development (income, human capital, and infrastructure), cost factors, resources, openness and bilateral relations, macroeconomic factors, and finally institutional factors.

Market size is considered as one of the key determinants in Dunning's OLI paradigm (Dunning, 1993) and the most tested hypothesis in empirical studies (see e.g. Barrell & Pain, 1999; Busse & Hefeker, 2007; Campos & Kinoshita, 2010; Wheeler & Mody, 1992). Thus we are interested to test whether market size and market dynamics are among the prime determinants of our investor countries which would be considered as strong evidence for market-seeking FDI.² We conjecture that geographical distance, common language, and former colonial links may promote this type of FDI.

While market-seeking FDI in ordinary consumer goods will be less sensitive to the development level of the host country, market-seeking FDI with technologically advanced products, as they are typical for our OECD investors, will be constrained to destinations with advanced development manifesting itself in *higher income* level, *well educated workforce*, and *developed infrastructure* (e.g. see, Nunnenkamp & Spatz, 2003).³

Noorbakhsh, Paloni, and Youssef (2001) proposes that human capital explains why FDI has reached only a limited number of developing countries. Azémar and Desbordes (2010) and Suliman and Mollick (2009) conclude that relatively low FDI flows into Sub-Saharan Africa are partly explained by poor human capital and illiteracy. We propose that market-seeking FDI of OECD countries, producing higher quality products and services, is linked to the availability of human capital. As an indicator for human capital we consider labor productivity, as we found it to provide a better proxy of the educational level in DC than primary and secondary school enrollment; the only education indicator available for our large set of DC.

Similarly, the manufacture of advanced products and services entails a need for communication with high technology media and thus requires a well functioning telecommunication and internet network. Globerman and Shapiro (2003) argues that the US firms invest only in countries with a threshold level of infrastructure. Bénassy-Quéré, Goyalraja, and Trannoy (2007), and Bellak and Leibrecht (2009) found that infrastructure in Eastern Europe promotes FDI. More specifically, Campos and Kinoshita (2010) showed that telecommunication is important for FDI in Eastern Europe and LAC. We hypothesize that telecommunication technologies are important determinants of FDI and test, in particular, whether investors search destinations with a high rate of internet accessibility and a high rate of fixed and mobile telephone lines.

Investment in developing countries often arises from the motivation to save costs and, thus, to dislocate a part of (vertical FDI) or the entire production to *low wage* countries or countries with attractive *tax rates* (efficiency-seeking FDI).⁴ We are interested in examining to which extent *efficiency-seeking FDI* is the prime motive for investors and thus consider the wage gap between the destination and the sender country. Braconier, Norback, and Urban (2005) found that about 20% of the US multinational sales are based on low wages of skilled labor and Konings and Murphy (2006)

concluded that in the post-1992 period the US FDI in the EU periphery was discouraged in places with high labor costs. Bellak and Leibrecht (2008) estimated that increasing labor costs had a negative effect on FDI inflows into the CEECs. In addition, tax rates are important determinants for FDI inflows, according to recent studies, such that of Bénassy-Quéré et al. (2007) and Bellak and Leibrecht (2009) who found that FDI inflows have become very sensitive to tax rates in Eastern Europe. Both propose that the tax elasticity of FDI is higher than that of infrastructure.

Since the beginning of the 2000s, *resource-seeking FDI*, geared by increasing demand and rising commodity prices, has once again boomed. Investment in extractive industries involves large-scale investment, and investors can often act as monopolists. A good relationship with governments is essential. Autocratic regimes and corruptive systems may facilitate the operation of businesses. However, political instability and the risk of expropriation can potentially lead to high costs and losses (Buckley, 2008; WIR, 2007). In some regions, such as Africa, resource abundance seems to be a major reason for FDI inflows (Asiedu, 2006). Consequently, we are interested in knowing to which extent resources are important for OECD investors and which conditions destinations have to offer to investors in extractive industries.

Another aspect related to FDI inflows is the degree of *openness* of the host country to international trade, established *bilateral trade relations* and bilateral *free trade agreements* (FTA). First, open economies—openness being indicated by exports plus imports as a share of GDP—have liberal trade regimes, long established international economic relations and are competitive on the world market. This should provide a positive setting for investors. FDI would benefit from the liberal trade regime which would facilitate to use the affiliate as export base. For different world regions, Campos and Kinoshita (2010), Trevino et al. (2008), de Boyrie (2010), and Sekkat and Veganzones-Varoudakis (2007) found that openness of the host country is an important factor explaining FDI inflows. Second, we posit that investors will have a stronger propensity to put their FDI into countries with whom external relations have already been established. In particular, we consider the position of the host country in the home country's total trade over the past five years. Third, we postulate that FTAs encourage FDI, notably efficiency-seeking FDI. Bilateral trade agreements provide opportunities to dislocate productions in lower cost countries and to import the product without trade barriers. There is evidence that FTAs of the US with Central America have generated important FDI flows into this region (Waldkirch, 2010). The same applies for FTAs between the EU and Eastern Europe (Baltagi, Egger, & Pfaffermayr, 2008). The perspective of vertical and efficiency-seeking FDI under FTAs will increase with the wage gap of the host country, as argued in Kim (2007).

Since the early 1990s, the number of *Double Taxation Treaties* (DTTs) and *Bilateral Investment Treaties* (BITs) has grown substantially. BITs contain provisions for investor-state dispute settlement with international institutions and reduce the uncertainty of expropriation (WIR, 2005). The impact of these treaties on FDI is ambiguous. For instance, Desbordes and Vicard (2009) investigated the impact of BITs on FDI and found that it depends on the political relationship between the signatory countries. Only in case of tense relationship, BITs would promote FDI flows.

Macroeconomic stability has been stressed in numerous empirical studies as an important determinant of FDI (e.g. Asiedu, 2006; Campos & Kinoshita, 2010; Lansbury, Pain, & Smidkova, 1996). Macroeconomic stability is proxied by low inflation rate, stable currency, and low external debt. There are several examples suggesting that increasing external debt will worsen the creditworthiness of countries, generate solvency problems and lead to currency devaluations. Under these conditions, the value of the investment can fall substantially. Currency devaluations and highly volatile exchange rates can also result from current account deficits and other risk factors. High and volatile inflation leads to increased uncertainty and, consequently, to higher investment risk. Thus, FDI will be discouraged under such conditions. Busse and Hefeker (2007), Asiedu (2006), Campos and Kinoshita (2010) as well as Trevino et al. (2008) showed that the level of inflation is an important factor for FDI inflows in DC. Servén (2003) documented that exchange rate uncertainty, i.e. volatility, discourages private investment into DC. Clark and Kassimatis (2009) found that default risk leads to

lower FDI in Latin America. Therefore, we will examine below the impact of the exchange rate and inflation rate, their volatility, as well as the impact of external debt on FDI in developing countries in order to find out to which of the aforementioned factors are highly robust.

Given the differentiated degree of FDI flows on Eastern Europe and LAC, and the low FDI record of Africa, international bodies, such as the World Bank, have recently stressed the importance of *institutions* as an attempt to attract additional FDI. Poor institutions that discourage FDI include: (1) Political instability characterized by violence, civil war, or simply weak governments. (2) Countries with a poorly developed democracy/political accountability.⁵ (3) Poor legal protection of assets that increases the chance of expropriation of firms' assets. (4) Poor quality of institutions that are necessary for well-functioning markets (and/or corruption) increasing the cost of doing business (Meyer, 2001).

A number of studies have documented the importance of the aforementioned factors for FDI in large worldwide samples (e.g. Busse & Hefeker, 2007; Campos & Kinoshita, 2010; Wernick, Haar, & Singh, 2009), or specific regions (e.g. Asiedu, 2006; Naudand & Krugell, 2007, for Africa; Barrell & Pain, 1999, for Eastern Europe; and Trevino et al., 2008, for LAC). We are thus interested in examining whether institutions are identified as robust determinants of FDI in the various developing countries under the BMA approach.

3. Model specification and data

In order to examine the main determinants of FDI in developing countries originating from major OECD investors, namely, the US, Germany, France, and the Netherlands, we collect bilateral FDI stocks data over the period 1995–2008 in 129 recipient developing countries classified (according to the World Bank classification) under the following five regions: Eastern Europe and Central Asia (ECA, 28 countries), East and South Asia (ESA, 22 countries), Latin American Countries (LAC, 20 countries), Middle East and North Africa (MENA, 18 countries), and Sub-Saharan Africa (SSA, 41 countries) (see Table 1).

We then estimate the following model:

$$\begin{aligned}
 FDI_{ijt} = & \alpha_{ij} + \beta_1 MARKERSIZE_{jt} + \beta_2 MARKET DYNAMIC_{jt} \\
 & + \beta_3 DEVELOPMENT_{jt} + \beta_4 RESOURCES_{jt} \\
 & + \beta_5 OPEN_{jt} + \beta_6 ECONOMIC RELATIONS_{ijt} + \beta_7 MACRO STABILITY_{jt} \\
 & + \beta_8 INFRASTRUCTURE_{jt} + \beta_9 INSTITUTIONS_{ijt} \\
 & + \beta_{10} CULTURAL TIES_{ijt} + \beta_{11} MARKET PROXIMITY_{jt} + \epsilon_{ijt},
 \end{aligned} \tag{1}$$

where FDI_{ijt} is the FDI position of OECD investor i in country j at time t per inhabitant of country i . Equation (1) includes the following matrices:

- $MARKERSIZE_{jt}$ & $MARKET DYNAMIC_{jt}$: including the variables GDP_{jt} and GDP growth, $GROWTH_{jt}$.
- $DEVELOPMENT_{jt}$: including GDP per capita, $GDPPC_{jt}$, labor productivity, $LPROD_{jt}$, wage differential, $WAGE_{ijt}$, and an interaction term of $WAGE$ and $LPROD$, $WAGE_LPROD_{ijt}$.
- $RESOURCES_{jt}$: including per capita production of oil and gas (OIL_{jt} , GAS_{jt}), and the share of minerals and ores in exports $MINORES_{jt}$.
- $OPEN_{jt}$ & $ECONOMIC RELATIONS_{ijt}$: including the share of the host country in investor's total trade, $BTRADE_{ijt}$, trade openness of the host country, $OPEN_{jt}$, existence of bilateral free trade agreement, FTA_{ijt} , bilateral investment treaty, BIT_{ijt} , and double taxation treaty, DTT_{ijt} .
- $MACRO STABILITY_{jt}$: including the exchange rate index, $EXCH_{jt}$, exchange rate volatility, $STDEXCH_{jt}$, inflation rate, INF_{jt} , volatility of inflation, $STDINF_{jt}$, and external debt rate, $DEBT_{jt}$.

Table 1. Classification of regions

Region name	Countries included	Number of countries
Europe and Central Asia (ECA)	Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia (FYR), Moldova, Poland, Romania, Russian Federation, Serbia, Slovak Republic, Slovenia, Tajikistan, Turkey, Turkmenistan, Ukraine and Uzbekistan	28
East and South Asia (ESA)	Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Hong Kong, India, Indonesia, Korea Rep., Lao PDR, Macao (China), Malaysia, Mongolia, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, Vietnam	22
Middle East and North Africa (MENA)	Algeria, Bahrain, Cyprus, Djibouti, Egypt (Arab Republic), Israel, Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen (Republic)	18
Sub-Saharan Africa (SSA)	Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo (Democratic Republic), Congo (Republic), Cote d'Ivoire, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe	41
Latin American countries (LAC)	Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, Venezuela (RB)	20

Note: Regional classification is based on the World Bank's classification.

- **INFRASTRUCTURE_{jt}**: including the number of fixed and mobile telephone lines per inhabitant, **MOBFIX_{jt}**, and internet access per inhabitant, **INTER_{jt}**.
- **INSTITUTIONS_{jt}**: including an index of political stability, **POL_{jt}**, democratic accountability, **ACC_{jt}**, government efficiency, **GOV_{jt}**, regulatory quality, **REG_{jt}**, law and order, **LAW_{jt}**, and corruption, **CORR_{jt}**.
- **CULTURAL TIES_{ijt}**: containing interaction terms of host's GDP and the presence of English/French language (**GDP_LANGUS_{jt}**, **GDP_LANGFRA_{jt}**) and colonial ties, **GDP_COLON_{ijt}**.
- **MARKET PROXIMITY_{ijt}**: including the interaction of GDP and distance between *i* and *j*, **GDP_DIST_{ijt}** α_{ij} denotes fixed effects, and ϵ_{ijt} is the error term. Equation (1) explains the FDI commitment of the investor in a region by host country characteristics containing more than 30 variables. A detailed definition and sources of the variables are given in Table 2.

Further, we include interaction terms for investors/regions like **GDP_BTRADE** for big economies with intensive trade relations, and market development, or infrastructure indicators interacted with institutional or macroeconomic factors. This permits us to capture multiple investment strategies in a given region. For example, we may find that an investor does not care for institutional quality, while it does so in locations with resources.

In any estimation of FDI determinants the issue of endogeneity of variables may arise. Note that our dependent variable is bilateral FDI stocks per head of the investor country while the explanatory variables, market size, market dynamics, and income level, are related to the host country. Since we take into account bilateral FDI stocks—not total inward stock into country *jt*—and not flows, we practically rule out reverse causality. In the case of bilateral trade relations where endogeneity with FDI may arise, we used past trade relations.

Table 2. Definition of variables

Variable	Definition	Source
FDI	Annual log of bilateral outward FDI stocks per capita at current US\$ (data scaled upwards by 171 to avoid logs of negative/zero values)	UNCTAD, OECD, and National Bank Statistics
GDP	Log of GDP at constant 2005 international billions US\$, PPP	WDI
GROWTH	5-year average of annual growth rate of GDP at constant 2005 US\$ relative to 5-year average regional mean	Authors' calculation based on WDI, WEO, and WIIW
GDPPC	Log of GDP per capita at constant 2005 international US\$, PPP	WDI
LPROD	Labor productivity defined as GDP per person employed at constant 2005 international US\$, PPP	Authors' calculation based on IMF-IFS, WEO, ILO, WDI, and United Nations Statistical Yearbook
WAGE	Monthly wages of host country (at constant 2005 US\$) as a share of home country's monthly wages	Author's calculations based on ILO, UNIDO, HDR and WDI
WAGE_LPROD	Interaction of WAGE and LPROD	
OIL	Log of Crude oil and NGL production (kt, kbbbl/day) per capita (data scaled upwards by 0.001 to avoid logs of zero values)	Authors' calculations based on World Oil Statistics IEA and Index Mundi
GAS	Log of Natural gas indigenous production (thousand cubic metres) per capita (data scaled upwards by 0.001 to avoid logs of zero values)	Authors' calculations based on World Natural Gas Statistics IEA and Index Mundi
OIL_GAS	Interaction of OIL and GAS	
MINORES	Minerals and ores exports (at current US\$, SITC Rev.3, codes 27 and 28) as a share of total exports	Authors' calculations based on COMTRADE, UNCTAD, and WDI
BTRADE	5-years lag of exports and imports (at current US\$) of home country to host country as a share of its total exports and imports of home country	Author's calculations based on IMF DOTS, COMTRADE, and WDI
OPEN	Exports and imports (at current US\$) divided by GDP at current 2005 international US\$, PPP	Author's calculations based on WDI
FTA	Dummy variable that equals 1 if there is Free Trade Agreement into force between home and host country, 0 otherwise	WTO
BIT	Dummy variable that equals 1 if there is Bilateral Investment Treaty into force between home and host country, 0 otherwise (date into force used)	ICSID and UNCTAD
DTT	Dummy variable that equals 1 if there is Double Taxation Treaty between home and host country, 0 otherwise	UNCTAD
EXCH	Log of nominal exchange rate index (2005=100) (national currency per currency of the sender country, period average)	WDI, OECD IDIS, and CIA World Factbook, various years
STDEXC	Standard deviation of past five years of nominal exchange rate index divided by mean of past five years of nominal exchange rate index	Author's calculations based on WDI, OECD IDIS, and CIA World Factbook, various years
INF	Log of annual growth OF CPI (2005=100) (data scaled upwards by 0.172 to avoid logs of negative/zero values)	Authors' calculation based on WDI, WEO, UN, and CIA
STDINF	Standard deviation of past five years of CPI (2005=100) divided by mean of past five years of CPI	Authors' calculation based on WDI, WEO, UN, and CIA data
DEBT	1-diff of external debt stocks (at current US\$) as a share of total exports (at current US\$)	Authors' calculations based on WDI, WRI, EIU, UNECE, UNECA, and CIA data
MOBFIX	Log of mobile and fixed-line telephone subscribers (per 1000 people) (data scaled upwards by 0.001 to avoid logs of zero values)	WDI
INT	Log of internet users (per 1000 people) (data scaled upwards by 0.001 to avoid logs of zero values)	WDI
ACC	Voice & Accountability	WGI
POL	Political Stability & Absence of Violence/Terrorism	WGI

(Continued)

Table 2. (Continued)

Variable	Definition	Source
GOV	Government Effectiveness	WGI
REG	Regulatory Quality	WGI
LAW	Rule of Law	WGI
CORR	Control of Corruption	WGI
LANG	Dummy variable that equals 1 if home and host country share a common language (that is spoken by at least 20% of the population), and 0 otherwise	CEPII
GDP_LANG	Interaction of GDP and LANG	
COLON	Dummy variable that equals 1 if home country was former colonizer in the host country	CEPII
GDP_COLON	Interaction of GDP and COLON	
DIST	Distance (in 1000 km) between sender country and destination country	Author's calculations based on CEPII
GDP_DIST	Interaction of GDP and DIST	
TAX	Log of highest marginal tax, corporate tax (%)	WDI, KPMG, Michigan University, OECD, Price Waterhouse, DoingBusiness, Eurostat, Tesche, WIIW, IBFD, Deloitte, Central & East European Tax Directory, Global Market Briefings, International Tax Review, Investment Guide for Southeast Europe, Ernst & Young

4. Empirical methodology—BMA

As discussed in Section 2, the literature on the determinants of FDI has identified a large number of variables that are being correlated with FDI. A recent survey on FDI determinants by Faeth (2009) presents nine theoretical models explaining FDI flows along with their empirical performance. In particular, the nine theoretical models are: (1) FDI based on the neoclassical trade theory (2), ownership advantages (3), aggregate variables (4), the ownership, location and internalization advantage framework (5), horizontal and vertical FDI models (6), the knowledge-capital model (7), diversified FDI and risk diversification models (8), and policy variables (9). The author shows that there is no single theory of FDI, but a variety of theoretical models attempts to explain FDI. In other words, not all determinants in each of the nine theoretical models are found significant. Thus, any analysis of FDI determinants should be explained more broadly by a combination of factors from a variety of theoretical models. Put differently, the various FDI theories are typically compatible with one another. For instance, a theoretical view holding that market size matters for FDI is not logically inconsistent with another view that emphasizes the role of openness on FDI.

Since theory does not provide sufficient guidance for selecting the proper empirical model, the issue of model uncertainty arises. So far the empirical literature on the robustness of FDI determinants is limited (two exceptions are Blonigen & Piger, 2014; Eicher et al., 2012). Model averaging techniques have been proposed to account for such model uncertainty. The basic idea behind model averaging is to estimate the distribution of unknown parameters of interest across different models. The fundamental principle of BMA is to treat models and related parameters as unobservable, and to estimate their distributions based on the observable data. Based on prior information on the parameters and considering all possible models, i.e. given by all possible combinations of regressors, the posterior probability of models and regressors are estimated.⁶

We have a data-set on FDI determinants stretching over 14 years and can thus, investigate how the effect of FDI determinants changes across countries and over time. Therefore, we will apply BMA in the panel data context based on LSDV estimation.

In the face of model uncertainty, a formal Bayesian approach can be used to treat the models as random variables, and conduct inference on them.

Let us assume that, in order to describe the data, y , we consider the following possible models M^j , with $j = 1, \dots, J$, grouped in the model space \mathcal{M} . Each model contains a different set k^j of explanatory variables, K , and includes individual effects, α_i . These models are normal linear regression models which differ in their regressors. The number of possible models is 2^K , where K is the number of explanatory variables.

Our data consist of N countries and T periods in each of the five regions. In vector y , which is of length NT , we group the dependent variables for all countries and all models. In matrix X , which is of dimension $NT \times (K + N)$, we stack the explanatory variables and the N dummy variables for each country. The regression coefficients and individual effects are given in the full $(K + N)$ -dimensional β vector. Then, any model M^j for country i with T observations is represented by:

$$y_i = \alpha_i t_T + X_i^j \beta^j + \varepsilon_i, \quad (2)$$

where X_i^j is the $T \times k^j$ submatrix of regressors of model M^j and β^j is the k vector of slope coefficients, $\beta^j \in \mathbb{R}^{k^j}$ ($0 \leq k^j \leq K$). t_T is a column vector of T ones, and ε_i is the $T \times 1$ error vector that is normal, with covariance matrix $\sigma^2 I_T$, not autocorrelated and independent of X_i^j , α_i , and β^j . The normality assumption guarantees good finite sample properties albeit not necessary for consistency (Fernandez, Ley, & Steel, 2001a).

According to the logic of Bayesian inference, the posterior distribution of any quantity of interest, in our case, $\theta^j (= \beta^j, \sigma, \alpha_i)$, is a weighted average of the posterior distributions of θ^j under each of the models, where the weights are given by the posterior model probabilities (PMPs) and is denoted by:

$$p(\theta^j | y_i) = \sum_{j=1}^{2^K} p(\theta^j | y_i, M^j) p(M^j | y_i). \quad (3)$$

This approach is typically known as BMA and it follows from direct application of Bayes' theorem Leamer (1978). $p(\theta^j | y_i, M^j)$, the posterior distribution of θ^j under model M^j , is typically of standard form. Nevertheless, due to model uncertainty we need to compute the PMPs. Therefore, we have to choose a prior distribution over the model space \mathcal{M} of all 2^K possible models. We follow standard procedures for BMA in linear regression models of the existing literature (see, for instance, Fernandez et al., 2001b; Hoeting, Madigan, Raftery, & Volinsky, 1999; Masanjala & Papageorgiou, 2008) by assuming a uniform distribution and that regressors are independent of each other, so that the prior probability of each model is

$$p(M^j) = \frac{1}{2^K} \quad (4)$$

implying that the prior probability of including any regressor equals $\frac{1}{2}$, and is independent of the combination of regressors included in the model.⁷ Given this prior the posterior model probability is given by

$$p(M^j | y_i) = \frac{p(y_i | M^j)}{\sum_{i=1}^{2^K} p(y_i | M^i)} \quad (5)$$

where $p(y_i | M^j)$ is the marginal likelihood of model M^j given by

$$p(y_i|M^j) = \int p(y_i|\alpha_i, \beta^j, \sigma, M^j) p(\alpha_i; \sigma) p(\beta^j|\alpha_i, \sigma, M^j) d\alpha_i d\beta^j d\sigma, \quad (6)$$

where $p(y_i|\alpha_i, \beta^j, \sigma, M^j)$ is the sampling model corresponding to Equation (2), and $p(\alpha_i, \sigma)$, and $p(\beta^j|\alpha_i, \sigma, M^j)$, are the relevant priors specified below in Equations (7) and (8), respectively.

Computational burden of BMA can be prohibitive as the number of models under consideration, 2^K , is huge since it increases exponentially with the number of regressors included. Moreover, because the integrals may not exist in closed form additional difficulties are raised in the derivation of the integrals in Equation (6). Having at least 30 regressors in our estimations, we approximate the posterior distribution on the model space \mathcal{M} by applying the Markov Chain Monte Carlo Model Composition (MC^3) methodology by Madigan and York (1995) to simulate a sample from \mathcal{M} . MC^3 is based on a Random Walk Chain Metropolis-Hastings algorithm which takes draws from the model space focusing on models with high posterior model probability. Posterior results based on the sequence of models generated from the MC^3 algorithm can be calculated by averaging over the draws.

Another important aspect under the Bayesian framework is the decision on the prior structure for the parameters in each model M^j : α_i , β^j , and σ . Since the choice of priors influences the results we therefore choose non-informative priors.⁸ Yet, improper non-informative priors for parameters that are not common to all models can lead to unmeaningful calculated PMPs. Therefore, we use the following benchmark priors developed by Fernandez et al. (2001a) that do not require subjective input or fine tuning for each individual model. We take the $\{\alpha_i\}$ to be independently uniformly distributed on the real line and also adopt a uniform prior for the scale parameter common to all models which gives us

$$p(\alpha_i, \sigma) \propto \frac{1}{\sigma}. \quad (7)$$

This prior implies that equal prior weight is given to all values of α and σ for $\ln(\sigma)$. Moreover, this distribution is invariant under scale transformations such as changes in the measurement units. For β^j , we adopt an informative g -prior structure

$$p(\beta^j|\alpha_i, \sigma, M^j) \sim N(0, \sigma^2 [g_j X^{ij} X^{ij}]^{-1}), \quad (8)$$

with the following choice of the scalar hyperparameter g_j

$$g_j = \min \left\{ \frac{1}{NT}, \frac{1}{(K+N)^2} \right\}. \quad (9)$$

This weighting factor, which is a decreasing function of the sample size, depends only on the number of regressors and the sample size. This prior resembles the one suggested by the risk inflation criterion (RIC) of Foster (1994) and has good small sample performance (Fernandez et al., 2001a).

5. Empirical results

We base our discussion below on the most important regressors having a posterior inclusion probability (PIP) above the recommended threshold of 0.50. According to Raftery (1995), evidence for a regressor with a posterior inclusion probability from 50 to 75 % is called weak, from 75 to 95 % positive, from 95 to 99 % strong, and >99 % very strong. Masanjala and Papageorgiou (2008) state that a PIP of 0.50 corresponds approximately to an absolute t -ratio of one. We also indicate the regressors that are included in at least one of the 10 best models, however, we do not discuss them in order to focus on the main results.

The results of the BMA approach are based on the MC^3 chain with four million draws for the pooled sample in Section 5.1.1 and two million for the regional samples in Section 5.1 (the initial half million draws are discarded). To verify convergence of the algorithm, and thus the accuracy of the posterior

moments, we regard the correlation between the analytical and MC^3 PMPs for a subset of models (for example, every model visited by the MC^3 algorithm) and take enough replications to ensure this correlation lies above 0.99 as suggested by Fernandez et al. (2001a). The correlation between visit frequencies and posterior probabilities for our BMAs lies above this recommended threshold.

5.1. FDI Determinants in different regions of developing countries

We begin our analysis of FDI determinants by performing the BMA analysis on the model specified in Equation (1) in each of the five developing regions for each single investor. Table 3 reports the posterior moments and mean coefficients of the BMAs regarding FDI in each developing region for each of our four OECD investor countries. Above the horizontal line, the regressors with a PIP of more than 0.5 are being presented, while below that line we report the regressors that are included in the 10 best models. Table 4 presents the frequencies of the robust determinants found in the BMAs for each region. The determinants are grouped under the areas: market size, market dynamics, market development, resources, openness and economic relations, macro stability, infrastructure, institutions, cultural ties, and market proximity.

5.1.1. FDI determinants for OECD investors in ECA

According to Tables 3 and 4 we find that established trade relations are the most robust FDI determinant for European investors in ECA. Furthermore, trade openness is also a robust factor for European investors in ECA. On the one hand, FDI in ECA is attracted by low wage countries.⁹ On the other hand, investors search for markets that are more advanced, with higher wages and higher productivity. Particularly, for France and the Netherlands, market development is an important factor of their FDI position in the region. Finally, for all our investors, except Germany, resource abundance has been an important factor of their FDI commitment in the region. Dutch FDI is much more correlated with resources than the other countries' FDI. In the case of the Netherlands, the coefficient of resources is the highest. Institutional factors are not important for European investors.¹⁰

Other factors that are above the 0.5 PIP threshold are, nevertheless, less robust and appear at lower frequency. For instance, macroeconomic stability is a robust factor only for two investors (i.e. lower exchange rate volatility in Germany and lower inflation in France), developed infrastructures are only important for two investors (the US and the Netherlands) and institutions appear also only for two investors both with negative and positive signs.

These robust determinants highlight the fact that not a single theory of FDI, as postulated by Faeth (2009), could be identified, but rather a combination of theories. The suggested determinants correspond to the following investment strategies in ECA: (1) all investor countries have been engaged in advanced transition countries in the CEEC. For European investors, trade relations and openness were important factors of investment in these countries. Investments are also promoted by relatively high productivity, better infrastructure, and economic stability. Germany has exclusively invested in countries of ECA with these features. Hence, it appears that Germany's investment in ECA—which accounts for a major share of its global FDI commitment in DC (see Figure 1)—is fairly conservative. (2) In contrast to Germany, the US, France, and the Netherlands have all had a second equally important investment strategy in that region: they invest in oil and gas producing countries, such as Russia, Azerbaijan, Kazakhstan, and in early transition countries with low wages and less developed institutions (the US tolerates low democracy in this region and has concluded DTT with these countries). (3) France and the Netherlands pursue the most differentiated investment strategies in ECA. In addition to the aforementioned strategies, investors are also in search for large, low wage countries in ECA, namely Russia and Turkey, and for small European transition countries like Serbia, Romania, and Bulgaria. France is willing to tolerate a less developed legal system, provided the size of the market is large and wages are low.

(Continued)

US				GER				FRA				NED			
PIP	Var	MEAN	SE	PIP	Var	MEAN	SE	PIP	Var	MEAN	SE	PIP	Var	MEAN	SE
ECA															
1.00	WAGE_LPROD	0.2083	0.0393	1.00	BTRADE	48.1944	2.7066	1.00	BTRADE	66.3911	5.1170	1.00	BTRADE	166.41	7.1054
1.00	WAGE	-2.1130	0.4084	0.99	OPEN	0.2036	0.0484	1.00	OIL	0.0671	0.0139	0.99	WAGE	-20.894	4.2063
1.00	DTT_ACC	-0.0169	0.0035	0.63	STDEXCH	-0.0305	0.0260	0.95	WAGE_LPROD	0.7087	0.3432	0.99	WAGE_LPROD	2.0911	0.4201
1.00	OIL_GAS	0.0060	0.0010	0.56	GDP_DIST	-0.0178	0.0196w	0.92	GDP_INF	-0.0049	0.0022	0.98	GDP_DIST	0.0875	0.0212
0.99	DTT	0.1028	0.0257	0.43	MOBFIX	0.0146	0.0198	0.89	WAGE	-6.1903	3.1539	0.98	GDP	-0.3824	0.0956
0.86	GDPPC_ACC	-0.0020	0.0017	0.25	STDINF	-0.0117	0.0230	0.73	GDP	-0.1190	0.0821	0.97	OIL	0.1007	0.0324
0.82	MOBFIX_ACC	0.0022	0.0012	0.23	GDP	0.0292	0.0615	0.71	OPEN	0.0630	0.0468	0.90	MOBFIX	0.0432	0.0194
0.20	MOBFIX	0.0026	0.0056	0.14	INT	-0.0018	0.0053	0.71	GDP_DIST	0.0237	0.0170	0.54	GAS	0.0218	0.0227
0.17	OIL	0.0028	0.0069	0.11	ACC	-0.0020	0.0066	0.52	WAGE_LAW	-0.0920	0.1002	0.45	OPEN	0.0647	0.0804
0.15	GDP	-0.0032	0.0087	0.06	WAGE	-0.2793	1.4013	0.27	POL	-0.0036	0.0066				
0.13	GDPPC	-0.0026	0.0081	0.06	WAGE_LPROD	0.0261	0.1335	0.20	LAW	-0.0040	0.0091				
0.06	GOV	-0.0003	0.0015					0.09	STDINF	-0.0019	0.0072				
ESA															
1.00	LPROD	0.2017	0.0287	1.00	BTRADE	31.5937	1.7460	1.00	LPROD	0.1887	0.0323	1.00	GDP_LANGUS	0.5839	0.0579
1.00	BTRADE	5.1777	0.8261	1.00	WAGE	6.8269	0.8647	1.00	BTRADE	18.253	3.6571	1.00	OPEN	0.2551	0.0412
1.00	OPEN	0.2477	0.0201	1.00	LPROD	0.2893	0.0239	1.00	GROWTH	-0.0338	0.0080	1.00	MOBFIX	-0.0636	0.0118
1.00	MOBFIX	-0.0314	0.0037	1.00	MOBFIX_WAGE	0.2870	0.0370	0.93	GDP_LANG	0.1042	0.0420	1.00	LPROD	0.4670	0.0627
1.00	GDP_LANG	0.2285	0.0292	1.00	GDP_LANG	0.2367	0.0238	0.91	GOV	0.0285	0.0122	1.00	GAS	-0.0513	0.0103
1.00	MOBFIX_WAGE	0.2498	0.0326	1.00	OPEN	0.1144	0.0175	0.91	GDP_COLON	-0.0858	0.0384	1.00	MOBFIX_WAGE	0.5646	0.1034
1.00	GROWTH	-0.0335	0.0073	1.00	GOV	0.0368	0.0069	0.71	EXCH	0.0267	0.0203	1.00	GROWTH	-0.0686	0.0150
0.72	WAGE_LPROD	-0.0470	0.0334	1.00	MOBFIX	-0.0362	0.0040	0.68	OPEN	0.0415	0.0330	1.00	WAGE_LPROD	-1.1142	0.3122
0.21	GAS	-0.0024	0.0052	1.00	GROWTH	-0.0509	0.0062	0.40	CORR	0.0080	0.0109	1.00	BTRADE	14.2103	3.5284
0.09	LAW	0.0008	0.0028	1.00	WAGE_LPROD	-0.7578	0.0865	0.32	STDEXCH	-0.0195	0.0330	0.98	GOV	0.0552	0.0164
0.07	CORR	0.0007	0.0032	1.00	EXCH	0.0455	0.0098	0.31	MOBFIX	-0.0038	0.0063	0.96	WAGE	9.2215	3.1704

Table 3. (Continued)

US		GER					FRA			NED			
PIP	Var	MEAN	SE	PIP	Var	MEAN	SE	PIP	Var	MEAN	SE	Var	MEAN
0.06	MINORES	0.0068	0.0314	1.00	GAS	-0.0198	0.0043						
0.06	GOV	0.0007	0.0032	0.75	LAW	-0.0096	0.0066						
				0.70	STDEXCH	-0.0712	0.0580						
				0.54	STDINF	0.0589	0.0608						
LAC													
1.00	GDP_BTRADE	1.8444	0.0953	1.00	BTRADE	-313.22	55.418	1.00	BTRADE	-237.47	44.027	1.00	BTRADE
0.99	OPEN	0.2039	0.0477	1.00	GDP_BTRADE	41.430	8.0350	1.00	GDP_BTRADE	44.019	6.1433	1.00	FTA
0.78	GDP	-0.0800	0.0562	0.77	FTA	0.0350	0.0226	0.98	DTT	-0.1002	0.0265	1.00	GDP_BTRADE
0.58	WAGE_LPROD	0.1546	0.1471	0.66	LPROD	0.0482	0.0366	0.98	FTA	0.0715	0.0192	0.86	GROWTH
0.57	WAGE	-1.5613	1.4916	0.57	INF	-0.0129	0.0126	0.98	INF	-0.0307	0.0088	0.81	GAS
0.52	GAS	0.0337	0.0363	0.51	WAGE	-1.8080	2.3735	0.94	WAGE	-4.0884	1.3328	0.26	GDP_COLON
0.49	DTT	0.0451	0.0498	0.49	WAGE_LPROD	0.1717	0.2305	0.94	WAGE_LPROD	0.3925	0.1295	0.17	BIT
0.49	OIL_GAS	-0.0104	0.0115					0.92	STDEXC	-0.0400	0.0154	0.11	MI_NORES
0.42	INF	-0.0124	0.0162					0.91	POL	-0.0175	0.0075	0.11	POL
0.27	INT	0.0018	0.0033					0.77	MI_NORES	0.0953	0.0700	0.10	OPEN
								0.76	MI_NORES	-0.5742	0.4039		
								0.13	GAS	-0.0027	0.0081		
MENA													
1.00	GAS	0.0119	0.0014	1.00	GOV	0.1483	0.0276	0.99	GDP_LANG	0.2436	0.0670	0.99	LPROD
0.99	GDP_LANG	0.0472	0.0112	1.00	GROWTH_GOV	-0.0692	0.0154	0.97	LPROD	-0.1685	0.0540	0.99	WA_GENED
0.82	FTA	-0.0136	0.0077	0.99	OPEN	0.2788	0.0608	0.88	INF_CORR	0.0170	0.0077	0.99	WAGE_LPROD
0.60	MOBFIX	0.0038	0.0035	0.99	GROWTH	0.2409	0.0726	0.76	GDP	0.1739	0.1077	0.81	POL
0.43	GDP	0.0135	0.0170	0.49	LAW	0.0349	0.0406	0.47	WAGE_LPROD	-0.0130	0.0177	0.72	MOBFIX

(Continued)

Table 3. (Continued)

US		GER				FRA			NED						
PIP	Var	MEAN	SE	PIP	Var	MEAN	SE	PIP	Var	MEAN	SE	PIP	Var	MEAN	SE
0.25	DEBT	0.0013	0.0026	0.44	GAS	-0.0134	0.0168					0.48	LAW	0.0225	0.0264
0.15	EXC	0.0016	0.0043	0.36	POL	-0.0159	0.0234					0.47	OIL GAS	0.0061	0.0073
0.15	INT	-0.0003	0.0007	0.16	MOBFIX	-0.0056	0.0160								
0.13	BIT	-0.0015	0.0046												
0.09	LPROD	-0.0013	0.0048												
SSA															
1.00	STDINF	0.0091	0.0017	1.00	BTRADE	29.762	4.8404	1.00	WAGE	2.8598	0.3888	1.00	GDP_LANG	0.1867	0.0284
1.00	STDEXC	-0.0094	0.0013	1.00	DTT	0.0941	0.0074	1.00	WAGE_LPROD	-0.2542	0.0347	1.00	GDP_ACC	0.0214	0.0026
0.86	GDP_LANG	0.0058	0.0029	1.00	LPROD	-0.0897	0.0087	0.99	EXCH_GDPPC	0.0060	0.0012	1.00	GDP_INT	0.0112	0.0012
0.73	WAGE_LPROD	0.0030	0.0019	0.99	INT	-0.0047	0.0013	0.99	EXCH	-0.0295	0.0069	1.00	INT	-0.0198	0.0043
0.63	OIL_GAS	0.0004	0.0003	0.97	GDP_INT	0.0013	0.0004	0.88	OIL	-0.0141	0.0069	0.99	ACC	-0.0319	0.0071
0.45	POL	0.0004	0.0005	0.86	GDP	0.0566	0.0301	0.86	BTRADE_OIL	8.1302	3.8323	0.93	GDP	-0.1553	0.0486
0.28	WAGE	0.0120	0.0212	0.75	MOBFIX	-0.0029	0.0020	0.67	MOBFIX	0.0057	0.0053	0.90	POL	-0.0126	0.0057
				0.53	EXCH_GDPPC	0.0001	0.0002	0.57	STDEXCH	-0.0119	0.0117	0.78	STDINF	0.0375	0.0236
				0.51	GDPPC	0.0288	0.0330	0.45	GDPPC	0.0706	0.0850	0.54	WAGE	0.1809	0.1914
				0.45	GDP_LANG-GUS	0.0069	0.0085	0.44	GDP	-0.0597	0.0732	0.49	OIL_GAS	0.0037	0.0042
								0.35	INT	0.0014	0.0022	0.46	WAGE_LPROD	0.0138	0.0172
								0.15	OPEN	0.0003	0.0009	0.13	LPROD	-0.0155	0.0455

Notes: Variables X Y (e.g. GDP INT) are interaction terms of X (GDP) and Y (INT) variables.

Table 4. Frequencies of robust FDI determinants by region of investment

AREA	Variable		ECA		ESA		LAC		MENA		SSA
Market size		Large	Small	Large	Small	Large	Small	Large	Small	Large	Small
	GDP	2	3	4	1	4	1	2		3	1
Market Dynamics		High	Low	High	Low	High	Low	High	Low	High	Low
	GROWTH				4	1		1	1		
Market Development		Devel- oped	Poor	Devel- oped	Poor	Devel- oped	Poor	Devel- oped	Poor	Devel- oped	Poor
	GDPPC		1							2	
	LPROD			4		1			2		1
	WAGE_ LPROD	3			3	3		1		1	1
	WAGE		3	3			3		1	2	
Resources		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	OIL GAS	3			2	2		1		3	1
	MINORES					1					
Open- ness, Economic Relations		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	BTRADE	3		4		4	3			2	
	OPEN	3		4				1			
	FTA					3			1		
	BIT										
	DTT	1				2				1	
Macro Stability		Stable	Unstable,	Stable	Unstable,	Stable	Unstable,	Stable	Unstable,	Stable	Unstable,
			Deprecia- tion		Deprecia- tion		Deprecia- tion		Deprecia- tion		Deprecia- tion
	EXCH				2						2
	STDEXCH	1		1		1				1	
	INF	1				2			1		
	STDINF				1						1
	DEBT										
Infra- structure		Devel- oped	Poor	Devel- oped	Poor	Devel- oped	Poor	Devel- oped	Poor	Devel- oped	Poor
	MOBFIX	2		3	3					1	1
	INT									2	2
Institu- tions		Strong	Poor	Strong	Poor	Strong	Poor	Strong	Poor	Strong	Poor
	POL					1	1		1	1	1
	ACC	1	1								
	GOV			3				1	1		
	REG										
	LAW		1		1						

(Continued)

Table 4. (Continued)

AREA	Variable		ECA		ESA		LAC		MENA		SSA
	CORR							1			
Cultural ties		Close	No ties	Close	No ties	Close	No ties	Close	No ties	Close	No ties
	LANGUS			4				1		2	
	LANGFRA							1			
	COLON			1							
Market proximity		Close	Far	Close	Far	Close	Far	Close	Far	Close	Far
	GDP_DIST	1	2								

5.1.2. FDI determinants for OECD investors in ESA

The developing region of East and South Asia has received a lot of interest from all our investor countries. There is a number of location factors which governs OECD FDI in ESA uniformly, and, in general, host countries in this region have to fulfill a number of criteria.

Our BMA analyses suggest that established trade relations, openness, high labor productivity, big markets size with English language, as well as low telecommunications infrastructure appear to be the most robust determinants of OECD FDI in ESA.

Thus, a dual investment strategy appears to be in place in ESA: (1) OECD investors reveal strong (and similar) preference—more than in other regions—in their highly focused investment strategy on big and developed markets characterized by openness, established trade linkages, and good management of English language. Dynamic markets is not in their preferences, however, high level of productivity is required—proxied by high education levels—and well-developed infrastructure. These factors are not only highly robust, but also have a high impact on the size of the FDI position. A 1% increase in the market size (GDP) is reflected in an increase in the bilateral investment position of 0.10% originating from France, 0.23% from the US and Germany, and 0.58% from the Netherlands. High labor productivity increases on average FDI positions in each country in ESA by 0.19% (from France), 0.20% (from the US), 0.29% (from Germany), and 0.47% (from the Netherlands). In high wage countries, an increase in telecommunication infrastructure leads to more FDI. The countries corresponding to this investment strategy include Hong Kong, Singapore, Malaysia, and South Korea. (2) The BMA estimations suggest a second FDI focus for all four OECD investors: countries with established trade links, low wages, low productivity, and poor infrastructure. Once again, these factors are highly robust.¹¹ However, we find lower elasticities for FDI associated with these factors. The elasticity of FDI with respect to lower telecommunication infrastructure lies between 0.04 and 0.06% (see Table 3).

Moreover, OECD FDI in ESA does not focus on resource abundant countries. In particular, Germany and the Netherlands are not interested in gas abundant countries. As in the case of FDI in ECA, we find that macroeconomic and institutional factors are no prominent determinants in ESA. We only observe that Germany and France accept exchange rate devaluations which might indicate that they are interested in investing in countries which keep their currencies competitive through devaluations.

5.1.3. FDI determinants for OECD investors in LAC

According to Tables 3 and 4 the most robust FDI determinants for OECD investors in LAC are large markets with established trade relations, minor trading partners, FTAs, high productivity countries with high wages, low inflation, and resource abundance.

Table 5. Determinants of FDI in developing countries in general by different investor

US	GER						FRA						NED					
	PIP	Mean	SE				PIP	Mean	SE				PIP	Mean	SE			
FTA	1.0000	0.0610	0.0086															
BTRADE	1.0000	10.520	0.4962			BTRADE						BTRADE				BTRADE		
WAGE	1.0000	-3.4656	0.3019			WAGE						TAX				WAGE		
WAGE_LPROD	1.0000	0.3406	0.0282			WAGE_LPROD						GDP_LANGFRA				WAGE_LPROD		
GDP_LANGUS	1.0000	0.1321	0.0214			GOV						GDP				TAX		
GDP_DIST	0.9931	0.0062	0.0019			GDP						WAGE_LPROD				MOBFIX		
MOBFIX	0.9799	-0.0123	0.0037			TAX						WAGE				INF		
TAX	0.9716	-0.1101	0.0335			INF						DTT				OIL		
OPEN	0.7927	0.0026	0.0016			GDP_COLON						STDEXC				ACC		
REG	0.4762	-0.0055	0.0063			GDP_DIST						INF				GDP_DIST		
STDEXC	0.4497	-0.0092	0.0111			STDEXC						STDINF				STDINF		
INF	0.3285	-0.0029	0.0046			OPEN						FTA				GOV		
GDP	0.2021	-0.0099	0.0216													INT		
ACC	0.145	-0.0010	0.0026															

This indicates that all investors invest in large markets with whom intensive trade relations have already been established. Given the negative coefficient of established bilateral trade relations, we can retrieve a threshold value of GDP beyond which this determinant gets positive, and find that this is the case for all big economies in LAC, i.e. Brazil, Mexico, and Venezuela. On the other hand, as the BMA indicates that established bilateral trade relations is also a negative robust factor for European investors, FDI is attracted by economies with whom investors maintain little trade relations. This suggests that European FDI is partly a substitute for trade. However, European investors also prefer destinations that are under the umbrella of a common FTA. The BMA results indicate that both highly productivity countries interacted with high wages, and low wages are robust determinants for three investors, but with a lower PIP. Resource abundance (gas and minerals) appears to be robust FDI determinant for three investors. Macroeconomic stability with a dislike for inflation appears as a robust determinant, however, is subordinate to the aforementioned ones. The same applies for institutional factors.

In addition, the variables which appear as robust FDI determinants correspond to conflicting investment strategies, which we can sort out by checking the coincidence of robust factors for specific cross-sections: (1) We find that investors primarily focus on large LAC markets with whom also intensive trade relations have been established (such as, Mexico, Brazil, Venezuela). The US and Germany prefer these destinations due to low wages. (2) We see that three countries (the US, Germany, France) have also a preference on advanced markets with relatively high wages and productivity, as well as better macroeconomic stability. OECD investors have established economic relations with these destinations, reflected in DTT (the US) or FTA (Germany, France). Examples are Argentina and Chile. (3) The US, Germany, and France show a third common investment criteria in the poorest economies with whom France and Germany maintain a few trade relations. An example is Peru. (4) The US, France, and the Netherlands pursue a resource-seeking investment strategy too. The US invests in Argentina, Bolivia, and Brazil for gas and France in Chile for minerals. The Netherlands prefers high growth destinations with abundant in minerals and gas, covered by FTA, or without trade links. A few examples are Chile, Argentina, and Bolivia.

5.1.4. FDI determinants for OECD investors in MENA

As we have seen in Figure 1, the region of MENA received increasing attention from European investors during the investigation period. For France, MENA has even become the most important FDI location, although immediately followed by ECA and ESA. In contrast, the US commitment in MENA has remained rather moderate.

According to the results of the BMA analyses (see Tables 3 and 4) our investors seem to pursue fairly individual investment strategies. Besides GDP, which appears—also in combination with cultural ties—for the US and France, no other determinants are consistently found to be robust. Three factors which belong to the “market development” area are reported with a negative sign. There are practically no robust factors in the areas of “economic relations”, “macroeconomic stability”, and “infrastructure”. We find, however, repeatedly that institutional factors are robust determinants. For two countries, “cultural proximity” is also a robust investment factor.

Although investors are attracted by fairly individual factors in MENA, we can derive some common investment strategies: (1) All four investors focus primarily on developed markets, and the US and France even on large developed markets. However, within this strategy, they have a different set of FDI determinants. This is also reflected in the FDI destinations that are related to this FDI strategy. For instance, the US and France prefer more culturally related destinations (such as, Israel and Egypt). Developed infrastructure is a condition for the US and the Netherlands. European investors also care for developed institutions, e.g. Germany for government efficiency, France for low corruption, and in the Netherlands law and order appears in the 10 best models. France and the Netherlands—the two countries with the strongest presence in MENA—have invested in a number of more developed countries in the Middle and Far East (such as, Kuwait, Emirates, Saudi Arabia, Israel, and Cyprus). Germany has invested in just a few places (e.g. Emirates, Malta, and Cyprus). (2)

France and the Netherlands have also a second in rank investment strategy in less developed markets with low wages and low productivity. Again, France shows a preference for culturally related countries in this group. The FDI destinations in North Africa and the Near East (such as, Algeria, Morocco, Tunisia, Lebanon, Libya) correspond to this investment strategy. (3) Finally, we see that the US, France, and the Netherlands pursue resource-oriented investment strategies in North Africa and the Gulf region.

In addition, the presence of French and Dutch FDI in MENA can be explained by the willingness of their investors to engage in very different areas which might also bear higher risks. Germany has increased its investment preference in all parts of MENA following, however, clearer and thus more restrictive investment criteria. For all European investors—with France to a lesser extent though—these destinations are new and challenging. Established trade relations do not show to be an important determinant. Consequently, a part of European FDI in MENA seems to be market-seeking.

5.1.5. FDI determinants for OECD investors in SSA

The results presented in Tables 3 and 4 indicate that among our OECD investors FDI determinants differ in SSA. However, as we discuss below, one can associate the same investment strategies among them with those factors.

Thus, the robust FDI determinants are manifold—much more than in the aforementioned regions. Nevertheless, market size appears to be a robust factor for three OECD investors. Oil and gas are also robust factors for three investors. Three variables that indicate “market development” are found as additional robust factors (i.e. *GDPPC*, *EXCH_GDPPC*, *WAGE_LPROD*, *WAGE*). In contrast to ECA, ESA, and LAC but as in MENA, variables in the area of “openness and economic relations” are marginally robust FDI determinants. As in the case of the other investment regions, macroeconomic and institutional factors are of minor importance.

Despite the diversity of robust FDI factors, we can extract three types of investment strategies pursued by OECD investors in SSA: (1) All four countries have an investment focus on large developed markets. Diverse robust FDI factors correspond to this strategy: large income per capita, high wages and labor productivity, and developed telecommunication infrastructure. Moreover, for the US and the Netherlands English language is important within this strategy, while for Germany and France established trade relations matter. The FDI destination that covers all of these criteria is South Africa. (2) The European investors also pursue a second investment strategy, by focusing on poor countries, with poor infrastructure, and weak institutions. (3) Finally the US, France, and the Netherlands invest in SSA for resource-seeking motives. An example is Nigeria. The Netherlands holds resource-seeking investment in several locations, such as, Nigeria, Angola, Cameroon, the Republic of Congo, and South Africa.

If we compare the FDI determinants found for OECD FDI in SSA with the motives revealed in the other regions, we see that SSA can be only of minor importance to our investors. It offers little potential for market-seeking FDI that our investors associate with labor productivity and infrastructure.¹² SSA is largely seen as an FDI location for resource-seeking FDI as shown in Asiedu (2006).

5.2. FDI determinants for OECD investors in developing countries in general—Similarities and differences

Having established robust FDI determinants in specific groups of developing countries, we would like to conclude our analysis with the factors our investors care in developing countries in general. To achieve that, we perform the BMA analysis by pooling all developing countries simultaneously.¹³

Table 5 reports the posterior inclusion probability (PIP), the posterior mean, and the posterior standard error of the BMA results for all developing countries for each of the four OECD investors during the period 1995–2008.

These estimations show that established trade relations, high wages together with high productivity, low taxes, and market size are the most robust determinants of OECD FDI in developing countries.

In particular, all investors prefer destinations with whom good trade relations are established. FDI follows trade. The US and France prefer culturally related destinations. Linguistic ties is an important condition for them. All investors search for the most advanced markets in the developing world with high wages and high labor productivity; and all, except the Netherlands, search large markets. This suggests that all investors pursue a market-seeking FDI strategy. Thus, we can confirm the result found in the empirical literature on the importance of the market size factor (see Section 2) but indicate, in addition, its specific nature. All investors reveal an efficiency-oriented investment strategy, looking for locations with low wages or low tax rates. This confirms the findings of Braconier et al. (2005), Bénassy-Quéré et al. (2007), and Bellak and Leibrecht (2009) but in a much larger country context than the existing literature. From this, we can also conjecture that investors wish to engage in vertical FDI where productions are dislocated to low wage destinations.

Comparing the scale of the FDI impact of variables across investor countries we see that established trade relations have a considerably higher impact for European investors than for the US. French FDI is less sensitive to the wage level than that of other investor countries. The US focuses more than the other countries on big markets. FDI of France and the Netherlands reacts stronger to taxation than German FDI. The superior size of the coefficients of all variables in the estimation for the Netherlands reflects its leading investment position.

In contrast to the picture drawn in the literature (see Section 2), we see that macroeconomic stability is in general no robust FDI factor and, if so, it appears with a lower PIP. The little robustness of institutional factors in our results is in contrast to the findings of Busse, and Hefeker (2007) and Wernick et al. (2009) who propose that institutions play a major role for FDI decisions. However, their studies include only a very limited number of other variables while we include some 30 additional explanatory variables in our BMA. Thus, we have to conclude that when a large number of potential determinants are included in the estimations, institutional factors are no longer important.

Besides the FDI determinants that were found in common among the four OECD investors, investors also reveal individual preferences in developing countries. For the US, the area of “openness and economic relations” is more important than that for other investors. The US prefers globalized destinations. Furthermore, it is explicitly searching for destinations covered by a free trade arrangement. Surprisingly, telecommunication infrastructure is a robust factor with negative sign for the US. This might indicate that a part of its investment focuses on the poorest developing countries, i.e. those with a poor infrastructure. Note, however, that the impact of these individual US determinants is far less than that of the aforementioned factors, as shown by the size of their coefficients. Germany is the only investor for whom institutional quality is a robust FDI determinant. It searches destinations with government efficiency. France and the Netherlands care for macroeconomic stability. Surprisingly, France has an investment focus on countries which are not covered by a DTT. This might reflect the fact that it thrives among others for destinations which are less familiar to her. In the case of the Netherlands, developed infrastructure, low inflation, and oil abundance are additional robust FDI determinants.

Overall, the determinants of OECD FDI found robust in developing countries do not fall under a single theory but a combination of theories posited in Faeth (2009). These results are in line with those in Eicher et al. (2012) and Blonigen and Piger (2014).

6. Conclusions

The purpose of this study is to shed light on the robustness of FDI determinants in developing countries. To achieve that, we examine outward FDI stocks from four major OECD investors, namely the US, Germany, France, and the Netherlands into 129 developing countries grouped into five world

regions over the period 1995–2008. In an attempt to find robust explanatory factors we employ a BMA approach. We utilize more than 30 different potential determinants which can be clustered into market size and market dynamics, market development (including labor costs and human capital), resources, openness and bilateral trade relations, geographical and cultural proximity, macroeconomic factors, institutional factors, and infrastructure. Finally, we allow for heterogeneity across investor countries in each developing region. The BMA analysis permits us to identify the dominant FDI determinants for individual OECD investors in DC, in general, and within the aforementioned regions. The results suggest that, under the BMA analysis for a large number of candidate FDI determinants, some factors proposed in the literature cannot be identified as robust. In other words, the identified determinants do not fall under a single theory, but a combination of theories presented in Faeth (2009).

When investigating the FDI determinants of individual investors in all DC simultaneously, we find that all investors prefer developing countries with established trade relations between them. All pursue two main strategies: (1) an efficiency-oriented FDI strategy opting for destinations with low wages and attractive tax rates and (2) a market-seeking FDI strategy searching advanced markets with high productivity and high wages; and with some preference for big economies. Concerning the size of the impact of these factors on FDI, the criteria “labor qualification” and “established trade relations” are by far the most robust ones. In contrast to the literature, we do not find that macroeconomic and institutional factors to be consistently robust FDI determinants when a large set of determinants is taken into account. Our investors show some individual requirements on FDI locations: For the US “openness and economic relations” are more important than that for others. The US and France prefer markets with linguistic ties. Institutional quality is a robust determinant only for Germany; and macroeconomic stability only for France and the Netherlands. The Netherlands is the only investor that prefers locations with oil abundance.

Developing countries that wish to attract FDI should invest in the qualification of their workforce and establish economic relations with potential investors. Low wages and taxes have a lower potential to attract FDI.

Within the regarded regions Eastern Europe and Central Asia, East and South Asia, Latin America and the Caribbean, Middle East and North Africa, and Sub-Saharan Africa, our OECD investors reveal to some extent similar, but also differentiating investment patterns.

The Eastern Europe and Central Asia (ECA) region has become the major FDI destination for our European investors, while US’s commitment in ECA has remained moderate. For Germany, ECA has become the most important FDI destination, and it ranks second, close to its Asia commitment, for the Netherlands. European investors reveal high importance to destinations in Eastern Europe that have become open economies and established trade partners. All investors search for advanced markets in Eastern Europe with high productivity and higher wages. For Germany, this is the only investment strategy in ECA, while the US, France, and the Netherlands have also been searching for oil and gas abundant locations in Central Asia. France and the Netherlands pursue the most diversified investment strategy in ECA, searching for low wage late transition countries and low wage big economies too (such as, Turkey and Russia). For European investors, Eastern Europe has gained an equal important role as has Latin America (LAC) for the US. Their FDI has been attracted by Eastern European countries due to a favorable productivity-wage level and trade integration. The US commitment in Eastern Europe is much smaller than the European one is in Latin America, which may be related to missing cultural and political ties that we found to be important for the US.

East and South Asia (ESA) has increased significantly FDI positions from all our OECD investors over the past decade. All our investors show—more than in other regions—the following highly focused and common investment strategies: (1) on advanced large markets with a high productivity level, a good management of English language, open economies and with established trade relations, and (2) low wage/low productivity destinations with poor infrastructure with whom they have established good trade relations.

Latin America and the Caribbean (LAC) has been traditionally the most important FDI destination for the US. It ranks in fourth place in importance for Germany and France and in third place for the Netherlands; the latter having the highest commitment of all investors in this region. All investors prefer big LAC markets with whom good trade relations have already been established. Besides that, investment strategies reveal to be heterogeneous among OECD investors. European investors have placed their FDI also in destinations that are minor trade partners, which would indicate that FDI is a substitute for trade in these distant destinations. In addition, investors look for destinations with low wages as well as advanced economies with high productivity in LAC. The US, France, and the Netherlands invest in the region for resource-seeking motives. Since Dutch FDI is to a considerable extent resource-seeking, it has become the most intensive in the region. Trade liberalization and FTA negotiations seem to have been important for LAC countries to attract FDI, developing productivity/education will be important for further FDI.

The Middle East and North Africa (MENA) has also grown significantly in importance for our European investors, but only modest for the US. Investment motives are very individual in this region, although, all four investors have a strong focus on developed markets in the region. The US and France prefer destinations with cultural proximity. A developed infrastructure is a strong criterion for the US and the Netherlands. In contrast to other regions, we find that investors in MENA namely European investors, care for institutional quality. Established trade relations are not an important determinant for OECD investors. For European investors, except for France, this region is rather new and challenging. The US, France, and the Netherlands, but not Germany, have placed resource-oriented investment in the region. MENA countries can become more attractive for OECD investors when trade openness and external and cultural relations improve. There is an additional potential for market-seeking as well as efficiency-seeking investment. To become more attractive, countries have to improve their level of productivity, i.e. education.

The FDI commitment of major OECD investors in Sub-Saharan Africa (SSA) has remained very modest. Despite the heterogeneity of FDI determinants in SSA, one can conjecture that all investors prefer South Africa, due to its market size, the English language, and the market development which is reflected in higher productivity and telecommunication infrastructure. European investors have also invested in poor countries in that region. All investors, except for Germany have placed FDI in SSA out of resource-seeking motives. The commitment of investors in SSA is not likely to attract FDI in a rapid fashion, as the region offers little potential for entry in advanced DC markets with an educated workforce, sufficient infrastructure, and effective administrations.

In summary, we can see from the analysis that major OECD investors show to a large extent common investment strategies in the regarded regions, although, the factors identified in our BMA analysis as robust determinants may be quite heterogeneous and do not fall under a single theory, but a combination of theories of FDI determinants. The Netherlands and France pursue the most diversified investment strategies while the US and Germany have a more restricted scope. In contrast to other investors, resources are not robust investment criteria for Germany. A common feature that appears is that investors reveal a strong preference for advanced markets with a qualified labor force, and prefer destinations with whom trade relations have been established. However, they also place FDI for reasons of cost-efficiency and thus search for locations with competitive wages and attractive tax rates. Investment is still resource-seeking to a considerable extent.

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Notes

1. The other main OECD investors into DC are the UK, Switzerland, and Japan; unfortunately their FDI statistics for our sample period are incomplete, as discussed below, and thus excluded from this study.
2. Market-seeking FDI typically goes hand in hand with horizontal FDI where the entire production takes place in the host country in order to serve the local market, but not the export market. This type of FDI usually permits firms to operate in markets which are protected by high tariff barriers.
3. However, in our examination below we cannot perform the FDI analysis broken down by industry due to data unavailability.
4. The intermediate or final product needs to be shipped back to the FDI home country, which requires sufficiently low tariffs or free trade arrangements.
5. Li and Resnick (2003) argue, however, that democratic countries limit multinational firms (MNF) in pursuing monopolistic behavior and local governments in offering generous incentives, which may as well result in reduced FDI.
6. BMA techniques have been applied in numerous empirical applications. In the growth context, Fernandez et al. (2001b) apply the BMA with different priors to determine the most robust growth regressors that should be included in linear cross-country growth regressions. León-González and Montolio (2004) extend the BMA to a panel data framework.
7. Since many researchers prefer more parsimonious models, there exists some discussion about the priors on the model space. Nevertheless, regular posterior odds ratios already include a reward for parsimony. Brock and Durlauf (2001), among others, are opposed to uniform model priors because of the implicit assumption that a regressor's probability is independent of the inclusion of others. They recommend a hierarchical structure for the model prior. However, this requires agreement on which regressors proxy the same theories. As stated in Eicher, Papageorgiou, and Raftery (2011), such a consensus is often not present and, therefore, independent model priors are preferable.
8. In a growth regression context, two recent studies of Ley and Steel (2009) and Eicher et al. (2011) have analyzed the effects of prior choices on the robustness of parameter choices and coefficient estimates.
9. The motivation of the US, France, and the Netherlands to invest in destinations in ECA with low wages which offer a reasonable productivity confirms previous findings by Lansbury et al. (1996) for FDI inflows in Eastern Europe in general.
10. Also, the study of Campos and Kinoshita (2010) could not verify that institutions matter for FDI flows into Eastern Europe.
11. Note that for France, the BMA does not indicate telecommunications and wage interacted with labor productivity as robust factors, but rather small coun-

tries that were former colonies.

12. The constraint of low productivity and missing education for FDI inflows into SSA is also found in Azémar and Desbordes (2010) and Suliman and Mollick (2009).
13. As we wish to include the taxation factor the pool excludes several countries in SSA and MENA for which taxation data are unavailable.

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