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Searching the US FDI determinants in the EU: is there a euro effect?

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Abstract

In this paper, we analyze the potential determinants of US outward FDI with a particular focus on the euro effect during the period 1985-2016. To this aim, we consider a large set of candidate variables based on the theory as well as on previous empirical analysis. We select the covariates using a data-driven methodology, the Bayesian Model Averaging (BMA) analysis. Our sample includes over 90% of its stock and analyze the effect of the euro not only on American FDI in Europe, but also on the rest of the world. Within Europe, we consider the Euro Area (EA) but also core and peripheral members as well as the EU countries. We conclude from the BMA analysis that US MNCs engage in complex integration strategies which involve both horizontal (HFDI) and vertical (VFDI) motives both at the world and European levels. However, HFDI strategies predominate in EA core countries, whereas VFDI prevails in the EA periph-ery. As for the *euro effect*, the adoption of the common currency seems to have played an important role in the overall US FDI strategy: the launching of the euro has mainly promoted US HFDI in EU and EA countries.

Keywords: FDI determinants; Foreign Direct Investment; US; European Union; Euro area; Bayesian Model Averaging; Variable selection
JEL classification: F21, F23, C11, C52

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1 Introduction and motivation

The economic impact of regional integration in Europe has been a topic widely addressed in the literature. The main focus has been on the effects on trade, but some studies have also given insights into how the European Union (EU), and in particular the Euro area (EA), have affected foreign direct investment (FDI). The adoption of the euro has affected both the size and the allocation patterns of capital within the Economic and Monetary Union (EMU). As the introduction of the euro was preceded by other stages of economic integration (Customs Union, European Monetary System and the Single Market), the EMU effect has to be analyzed as an on-going process with a time dimension. Regarding EU countries, FDI should be expected to be affected by major institutional changes, such as the creation of the EU itself in 1957, major enlargement rounds (e.g., United Kingdom (UK), Denmark, and Ireland joining the EU in 1973; and the EU's eastern enlargement in 2004), and the establishment of the EU single market since 1993. In addition, it might be interesting to investigate whether there is an extra benefit of a common currency over (relative) exchange rate stability. The increased intra-European capital mobility has been one of the expected benefits derived from the adoption of a single currency; this effect may be explained by the following reasons. First, the elimination of intra-area currency risks and the reduction of country-risk premia encouraged significant cross-border capital flows within the Euro area. Second, the first years of the single European currency coincided with an unprecedented growth of global capital flows. Rapid technological changes and the gradual opening and liberalization of markets have notably contributed to the increase in international direct investment. Third, the euro has also coincided with an important EU enlargement process to the East. Consequently, new investment relationships appeared between EU country pairs, mainly between the *old* and the *new* EU member states. Existing Member States gained access to new customers in countries which were geographically closer to the old industrial centre and where costs were considerably lower.

Most of the empirical literature so far has focused on the study of intra-European FDI and the measurement of a possible *EMU membership effect* at an aggregate level, that is, they mostly focused on the impact for the EA as a whole. The consensus emerging from this literature is that the euro has been pro-FDI, in particular as regards intra FDI[1]. Baldwin

[1]As reported in Carril-Caccia and Pavlova (2018) the estimated increase in FDI due to the EU membership ranges between 28 and 83 percentage points, while the incremental effect of euro area membership ranges between 21 and 44 percentage points. However, these studies consider different periods and different sets of

et al. (2008) and Neary (2009) suggest that the Single Market programme and the euro adoption should be positive for intra-euro area vertical FDI (VFDI) due to the pro trade effects of the Single Market integration and euro adoption but should discourage intra-euro area horizontal FDI (HFDI), as the single currency and Single Market integration reduce trade costs. Empirically, the positive effect appears to dominate as shown inter alia by Flam and Nordstrom (2008), Brouwer et al. (2008), or De Sousa and Lochard (2011). Baldwin et al. (2008) also conclude that the euro stimulates VFDI based on the observation that the euro's pro-FDI effect was much larger in manufacturing than it was in services[2].

In this paper, we differ from most of the previous literature in that we focus on the magnitude and the determinants of the FDI *euro effect* from a third-country perspective, namely, the FDI coming from the United States (US), the most prominent investor in the EU from a historical standpoint.

In the case of the EU, the analysis of the factors driving FDI from third countries, and especially from the US, although scarcely studied, is a major topical issue for several reasons. First, the EU is the main destination for FDI in the world: FDI stocks held by third country investors in the EU amounted to €6,295 billion at the end of 2017, providing Europeans with 16 million direct jobs (Commission (2019)). Second, from an economic policy viewpoint, apart from the well-established advantages brought by FDI in terms of convergence and technological diffusion promoting growth and employment, it also represents a key source of external financing with clear macroeconomic consequences. As countries in the euro-area periphery are seeking to redress imbalances and reduce their liabilities in a period of low growth prospects, FDI is becoming increasingly important as a potential driver of growth. This is because it is a non-debt-creating liability, but also because it is typically more productive than internal investments.[3] Third, as the largest share of FDI into EU Member States is from EU firms (intra-EU), and this is also the component that has seen the greatest decline since the end of 2007, the analysis of inward FDI into the EU from third countries is gaining momentum. Finally, with the entry into force of the Lisbon Treaty in December 2009, the EU's exclusive competence over the common commercial policy has been extended to cover FDI too now. The EU has one of the world's most open investment

countries, so they are not fully comparable. See, i.e. Baldwin et al. (2008), Neary (2009) and Stojkov and Warin (2018).

[2]See also Coeurdacier et al. (2018).

[3]See Helpman (2006).

regimes, as acknowledged by the OECD in its IP/19/2088 investment restrictiveness index. In terms of countries of origin, the "traditional" main investors in the EU are still the advanced economies such as the US, Switzerland, Norway, Canada, Australia and Japan. They remain well ahead and still control more than 80 percent of all foreign-owned assets. In 2016, US and Canadian investors accounted by far for the largest share of foreign investors in terms of assets controlled (61.8%). They started investing from the launching of the EU and have kept their acquisition rates constant over time.

Historically, the US and the EU (and its predecessors) have extensive trade and investment ties that have evolved since World War II as the EU's membership has grown in parallel with the upsurge of global supply chains and the increasing cross-border investment. According to Kim (2004) most of US FDI flows in Europe in the early 1960s were characterized as defensive import-substituting investments to supply local markets (HFDI). However, at the end of the 1980s, 85 percent of the market for US goods and services in the EU were supplied by the US affiliates, while exports from the US had just a residual role. As a result, the economic integration processes in Europe have turned the type of US FDI into "rationalizing" motive investments (VFDI) and offensive export substituting investments (HFDI). The former reduce the number of locations to supply all European markets and the latter are led by strategic asset seeking. In 2018, the largest destinations in the EU for U.S. investment were the Netherlands ($883 billion), the UK ($758 billion), Luxembourg ($714 billion), and Ireland ($442 billion).

As regards the empirical literature on FDI stemming from countries outside the monetary union, Baldwin et al. (2008), Neary (2009) and Sondermann and Vansteenkiste (2019) argue that the greater integration of the Eurozone market might make it more attractive to have a production platform inside the Eurozone. Empirically, this is confirmed by Petroulas (2007) who finds also a pro-FDI euro effect from investor countries outside the monetary union; however, this effect was found to be smaller than for intra-euro area FDI. Straathof et al. (2008), who analyze the internal market effect on trade and FDI using bilateral data of FDI stocks for 30 OECD countries from 1981 to 2005 in a gravity model find that EU countries attract 14% more FDI from EU-outsiders. More recently, two other additional factors may have interacted with the possible *euro effect* affecting inward FDI coming from third countries. First, the effects of the Great Recession. Indeed, the EU's weight in global inward FDI decreased after 2007, but has rebounded somewhat since 2015. On average,

between 2000 and 2007, EU countries attracted 43.1% of the world's FDI, while in the period 2008-16 the EU attracted, on average, only a 26.7%. However, this drop in inward FDI into the EU owing to the crisis has been more marked in non-euro area EU countries and from 2015 the EU has been witnessing a surge in new investors from emerging economies, mainly China, Singapore and Brazil. In detriment of more classic investing countries, as the US, a second factor that may affect inward FDI from the US is the Brexit issue; although the impact of Brexit is uncertain, most studies have estimated an aggregate reduction in FDI into the UK of between 12% and 28% (Campos (2019) and Campos et al. (2019))[4]. This FDI diversion from both, EU countries and the rest of the world, can be due to the future increasing cost of accessing the EU Single Market from the UK, making the country less attractive for foreign investors.

Nevertheless, in the case of the US, this FDI diversion is less clear. The UK has many inherent benefits that have enabled it to maintain its FDI share, such as macroeconomic stability, flexible labour markets, a light regulatory regime, and, importantly, its already strong integration into global FDI. According to Treasury (2016) despite a reduction in the UK's share of FDI since the launch of the euro, the UK remains a major beneficiary of global FDI flows, and is likely to remain so whether in or out of the Eurozone. Moreover, the possible effect of exchange-rate stability linked to the euro does not apply to the UK and the US and the UK share cultural, political and historical links generating some inertia that may offset the negative Brexit effects, at least in the short run. As recently Feng et al. (2019) have highlighted, bilateral FDI tends to be higher between countries that share a common official language and this association is especially high in countries sharing English as the native language, as is the case between the US and the UK. Finally, the diverting FDI effect can also be minimized through prospective bilateral agreements, which can be in line with the new *Trumpnomics* applied to international economic relations. Therefore, the analysis of US FDI drivers into the EU and the *euro effect* deserves further attention.

In our research, in addition to studying the determinants of US FDI in Europe and the role of the euro we also consider the rest of the countries that receive American FDI. In particular, our sample contains the stock of outward US FDI in 58 countries from 1985 to 2016, which represents the 92.7% of total US FDI stock in 2016[5]. We also consider EU and EA countries separately. To the best of our knowledge, few previous empirical studies

[4]See, also, Dhingra et al. (2016), Bruno et al. (2016) or Treasury (2016).
[5]See Bureau of Economic Activities (BEA) statistics.

have analyzed whether and how the launching of the euro has affected the US FDI patterns across different EA member groups, i.e. the locational choice between core and periphery of the EU. Some exceptions are Shatz and Venables (2000), and more recently, Camarero et al. (2018), Sondermann and Vansteenkiste (2019) and Camarero et al. (2019). In addition, our sample period covers several years before the inception of the euro.

Moreover, we divert from previous studies in the empirical approach. To assess the *euro membership effect*, instead of just using a dummy variable in an, otherwise, *ad hoc gravity setting*, we consider a wide set of 43 FDI potential determinants. For this purpose, we apply a Bayesian Model Averaging (BMA) analysis to select and assess the relative importance of the incumbent covariates overtime. Bayesian inference offers the tools to attach probabilities to the different possible models. Raftery (1995) showed that when there are many candidate independent variables, standard model selection criteria based on p-values can be misleading. He proposed the use of Bayesian inference to take into account model uncertainty explicitly. The uncertainty surrounding FDI modelling makes the BMA methodology especially suited to discriminate among the large set of candidate regressors that has been posited as possible FDI determinants by different theories. Chakrabarti (2001) was the first to put forward this uncertainty in FDI studies using Extreme Bound Analysis. More recently, Blonigen and Piger (2014) and Eicher et al. (2012) use a BMA approach to account for model uncertainty in FDI.

The key variables used to assess the *euro effect* on US outward FDI are a dummy variable euro and its interaction with other measures (see table 2). The main findings suggest that US FDI is explained by both horizontal and vertical motives both for the whole country group and for EU and EA samples. Moreover, HFDI strategies predominate in EA core countries, whereas VFDI prevails in the EA periphery. As for the *euro effect*, the adoption of the common currency seems to have played an important role in the overall US FDI strategy: our results imply that the launching of the euro has mainly promoted US HFDI in both EU and EA countries.

The reminder of the paper is organized as follows: in Section 2 we briefly review the main theoretical approaches to FDI determination, with an emphasis in the formulated hypotheses and their differences; Section 3 presents a summary of the BMA methodology, while Sections 4 and 5 describe the data together with the results; finally, Section 6 concludes.

2 The underlying literature

2.1 Types and decisions of foreign direct investment

The analysis of FDI determinants is complex because of the diversity of multinational companies (MNCs) and different reasons for investing abroad. However, the literature has traditionally focused on two forms of FDI , namely, HFDI, motivated by market access, and VFDI, encouraged by comparative advantage.

In the theory of HFDI, a firm invests abroad by replicating a part of its activities or production processes in another country so as to avoid transportation costs, tariffs and other types of trade costs. This strategy is referred to as "market access motive" and was introduced by Markusen (1984) and Markusen and Venables (1999, 2000). In HFDI models, exports and FDI are substitutes, and the decision to serve a market via exports or setting up an affiliate company abroad constitutes a proximity-concentration trade-off, that is, to concentrate the production in a local firm and serve the foreign market via exports, or becoming close to the foreign market through a subsidiary firm. The key hypothesis concerning transportation cost is that FDI increases when transportation and trade costs are substantially high.

On the other hand, firms engage in VFDI when they fragment their production process across countries. The main reason for such disaggregation is the cost considerations arising from countries' factor cost difference. Firms are encouraged to fragment production and locate a production stage in a country where the factor used intensively in that stage is abundant. This strategy is known to as the "comparative advantage motive" and was introduced by Helpman (1984) and Helpman and Krugman (1985). The effect of trade and transportation costs is negative in VFDI, in contrast to HFDI, where such effect is positive.

More recently, the literature has suggested the existence of other foreign investment strategies, alternatives to HFDI and VFDI, such as the knowledge-capital model, complex integration strategies and export platforms.

Markusen et al. (1996), Carr et al. (2001) and Markusen and Maskus (2002) developed the knowledge-capital model, where two countries engage in HFDI if they are similar in both size and labour endowments, and trade costs are moderate to high, or VFDI if the parent country is small and skilled relative to the host country.

Yeaple (2003a) presented a model focused on complex integration strategies, where MNCs

are both horizontally and vertically integrated. Firms from one developed country can invest in another northern developed country, with similar characteristics (HFDI), or in a southern developing country (VFDI) or in both simultaneously (complex integration).

Export-platform FDI occurs when a MNC engages in HFDI in a foreign country with the aim of serving a third country through exports. Ekholm et al. (2007) developed a model which shows that export-platform FDI arises endogenously in a three-country model with two large, high-cost countries (North) and a small, low-cost country (South), when one of the North countries forms a Free Trade Area with the South country, thereby reducing trade costs between them. Then, the North country which is in the Free Trade Area with the South country produces the good to be sold in the home market, whereas the final product sold in the other northern country is produced in the South and exported.

The eclectic OLI[6] paradigm has a crucial importance in the literature of FDI decisions. This theory was proposed by John H Dunning in 1980[7], and until nowadays has remained the dominant analytical framework for accommodating a variety of operationally testable economic theories of the determinants of FDI and the foreign activities of MNCs. It maintains that FDI decisions of MNCs are determined by the interaction of three sets of interdependent variables: Ownership, location and internalization advantages. However, the empirical literature has usually explored the role that each of them has in explaining the emergence of MNCs separately. In this paper, we focus on location determinants.

2.2 Choosing FDI determinants

There are many location determinants that influence FDI decisions. Many empirical studies have adopted a gravity equation approach from the international trade literature and examined the patterns of FDI as a function of country characteristics such as market size, distance, factor endowment, transportation cost, tariffs, corporate taxes, natural resources, institutional quality and exchange rate among others[8]. Consequently, a wide range of different variables has been employed in the previous literature.

However, there is little consensus on which ones are postulated to be potential FDI determinants. The main reason for this lack of consensus is that previous research has gener-

[6]Ownership, Location and Internalization.

[7]See Dunning (1980).

[8]See, for example, Anderson and van Wincoop (2003), Chaney (2008), Disdier and Head (2008), Head and Mayer (2014) for surveys of the trade gravity literature.

ally focused on regression models involving specific sets of variables determined by the researcher and the particular theoretical framework for FDI they chose to analyze. By conditioning on a particular regression model specification, this practice ignores uncertainty regarding the model specification itself, which might have dramatic consequences on inference. Particularly, inference regarding the effects of the covariates considered in a particular specification can depend critically on the rest of the included or even omitted variables. Next, we summarize the most recent evidence and techniques applied on variable selection in the case of FDI determination.

Following a frequentist approach, Chakrabarti (2001) used Extreme Bound Analysis (EBA) to determine which explanatory variables are “robust" and which are “fragile" FDI determinants to small changes in the conditioning information set. The dependent variable employed is per capita FDI inflows. In a cross-section sample of 135 countries for 1994 he finds that market size, measured as GDP per capita, has a strong explanatory power to explain FDI in the host country.

Later, BMA were found to be a better method to account for model uncertainty as part of the estimation procedure (Raftery (1995)). According to Berger and Sellke (1987), conventional sensitivity analyses overstate the significance and the width of confidence intervals when model uncertainty is not accounted for. If this is the case, whether a statistically significant FDI determinant is relevant when alternative specifications are considered remains ambiguous. The BMA methodology can be applied to examine the large set of variables that have been proposed as FDI determinants by alternative FDI theories. Another difficulty commonly found in this type of analysis is that even the most comprehensive FDI datasets contain large sections of missing data. Selection bias could produce incorrect coefficients estimates. To address both model uncertainty and selection bias, Eicher et al. (2012) introduce the Heckit BMA, which extends the statistical foundations of BMA to include Heckman (1979) selection bias procedure. They use a sample of 46 countries (25 OECD countries) from 1988 to 2000, and FDI flows as the dependent variable. The results show only mixed support for horizontal or export platform FDI theories, whereas the evidence of vertical FDI was quite weak. Later, Jordan and Lenkoski (2018) use a Tobit Bayesian Model Averaging (TBMA) technique to improve the estimation of the inclusion probabilities of Eicher et al. (2012) and develop a full Bayesian model. Such method gives support for roughly the same determinants as the Heckit BMA when modeling the magnitude of

FDI flows.

Blonigen and Piger (2014) apply Bayesian statistical techniques to obtain the most relevant FDI determinants for a group of OECD countries, as well as for the world economy in 2000. In contrast to Eicher et al. (2012), and Jordan and Lenkoski (2018), Blonigen and Piger (2014) use FDI stocks. They found that the variables with consistently high inclusion probabilities include traditional gravity variables such as cultural and distance factors, relative labour endowments and trade agreements.

Antonakakis and Tondl (2015) employ the same methodology to examine the determinants of the outward FDI stock from OECD investors to 129 developing countries over the period 1995-2008. Their results suggests that no single theory governs the decision of FDI from OECD regions to developing countries but a combination of theories. In particular, OECD investors tend to invest in countries with whom they have established intensive trade relations and offer qualified labour force. Other potential determinants are low wages, attractive tax rates and resource abundance.

Evidently, Bayesian statistical techniques have not only been applied to FDI, but also to other fields of economics. These are the cases of export market shares Benkovskis et al. (2019), current account balances (Desbordes et al. (2018)), and the relationship between energy consumption and economic growth (Camarero et al. (2015)). In the present research, we apply Bayesian statistical techniques to select from a large set of potential variables those that are potential US FDI determinants, with a particular focus on the euro effect, during the period 1985-2016. For that objective, we use the R-package BayesVarSel (García-Donato and Forte (2015)), and apply Bayesian Variable Selection techniques for linear regression models using Gibbs sampling.

3 Econometric methodology

In model selection, the true statistical model is unknown and this uncertainty is explicitly considered. The Bayesian approach to model selection has a number of appealing theoretical properties described in Berger and Pericchi (2001). The final product of such approach is the posterior distribution over the model space; a probability mass function that assigns to each model its probability conditional on the data observed.

3.1 The variable selection problem

Concerning variable selection, each entertained model corresponds to a specific subset of a group of (e.g., k) initially considered potential explanatory covariates. Therefore, the model space $\mathcal{M}$ has 2^k potential models and each competing model M_j for $j = 0, \ldots, 2^k$ relates the response variable to a subset of k_j covariates, such as:

$$y_{it} = \alpha_j + X_{j,it}\beta_j + \gamma_{j,i} + \epsilon_{j,it} \qquad \epsilon_{j,it} \sim \mathcal{N}_n(0, \sigma^2 I), \tag{1}$$

where $i = 1, ..., N$ is the number of countries; $t = 1, ...T$ is the number of periods of time; α_j is the constant term; y_{it} is the n dimensional vector of observations for the response variable, the US FDI stock in the host country; $X_{j,it}$ is the n x k_j design matrix of FDI determinants; $\epsilon_{j,it}$ a white noise error with zero mean and constant variance; and $\gamma_{j,i}$ is an unobservable time-invariant country heterogeneity component. Such component may introduce a bias in the results. In order to remove it, we are going to employ fixed effects. Within the BMA methodology, as proposed by Moral-Benito (2013), it consists on subtracting the country mean for every observation using the within transformation. Considering the model $M_j (j = 1, \ldots, 2^k)$:

$$(y_{it} - \bar{y}_i) = \alpha_j + (X_{j,it} - \bar{X}_{j,i})\beta_j + (\gamma_{j,i} - \bar{\gamma}_{j,i}) + (\epsilon_{j,it} - \bar{\epsilon}_{j,i}). \tag{2}$$

$$\ddot{y}_{it} = \alpha_j + \ddot{X}_{j,it}\beta_j + \ddot{\epsilon}_{j,it} \qquad \ddot{\epsilon}_{j,it} \sim \mathcal{N}_n(0, \sigma^2 I). \tag{3}$$

Where $\bar{X}_{j,i} = \frac{1}{T}\sum_{t=1}^{T} X_{j,it}$; $\bar{\epsilon}_{j,i} = \frac{1}{T}\sum_{t=1}^{T} \epsilon_{j,it}$; and α_j is the constant term. Moreover, $\ddot{y}_{it}$ is the n dimensional vector of observations for the response variable, the US FDI stock in the host country; $\ddot{X}_{j,it}$ is the n x k_j design matrix of host country FDI determinants; and $\ddot{\epsilon}_{j,it}$ a white noise error with zero mean and constant variance again, but this time in terms of mean deviations.

Assuming that one of the models in $\mathcal{M}$ is the true model, the posterior probability of any model is:

$$P(M_j * |y) = \frac{m_j * (y) P(M_j *)}{\sum_j m_j(y) P(M_j)}, \tag{4}$$

where $P(M_j)$ is the prior probability of M_j and m_j is the integrated likelihood with respect

to the prior distribution for the parameters π_j:

$$m_j(y) = \int f_j(y|\beta_j, \alpha_j, \sigma)\pi_j(\beta_j, \alpha_j, \sigma^2)d\beta_j d\alpha_j d\sigma^2, \tag{5}$$

also called the (prior) marginal likelihood.

3.2 Prior specification

The two inputs that are needed to obtain the posterior distributions are π_j and $P(M_j)$: the 2^k prior distributions for the parameters within each model and the prior distributions over the model space, respectively.

The prior distributions π_j can be expressed as:

$$\pi_j(\beta_j, \alpha_j, \sigma^2) = \pi_j(\beta_j|\alpha_j, \sigma^2)\pi_j(\alpha_j|\sigma^2). \tag{6}$$

In our work, we implement the prior distribution for the parameters proposed by Bayarri et al. (2012), which fulfil different criteria that should be taken into account to drive a variable selection problem and provide a reliable theoretical result at relatively small computational cost. This prior, known as the Robust prior, is:

$$\pi_j^R(\alpha_j, \beta_j, \sigma) = \pi(\alpha_j, \sigma)x\pi_j^R(\beta_j|\alpha_j, \sigma) = \sigma^{-1} \times \int_0^\infty {}_{k_i}(\beta_i \mid 0, g\,\Sigma_i)\, p_i^R(g)\, dg, \tag{7}$$

where $\Sigma_i = Cov(\hat{\beta}_i) = \sigma^2 (V_i^t V_i)^{-1}$ is the covariance of the maximum likelihood estimator of β_i with

$$V_i = (I_n - X_0(X_0^t X_0)^{-1} X_0^t)X_i, \quad X_0 = (1_n, y_{-1}), \tag{8}$$

In equation 7, the hyperparameter g determines the strength of the researcher's prior belief that the coefficients are zero. A small (large) value of g indicates that the researcher is very certain (uncertain) that the coefficients are zero. The choice of a fixed value of g could critically affect posterior inference and predictive accuracy. According to Liang et al. (2008) and Feldkircher and Zeugner (2009), posterior results depend substantially on the researcher's prior choice under a fixed g-prior, ignoring the true underlying data generating process. Both studies highlight that flexible g-priors, priors that are data-dependent, adapt better to information content in the data.

In our research, we employ the flexible-g prior proposed by Bayarri et al. (2012) within the Robust prior:

$$p_j^R(g) = \frac{1}{2}\sqrt{\frac{1+n}{k_j+k_0}}\,(g+1)^{-3/2}, \;\; g > \frac{1+n}{k_j+k_0} - 1, \tag{9}$$

Above, k_0 denotes the number of fixed covariates, which in our case is $k_0 = 1$, the constant term.

With respect the prior over the model space $\mathcal{M}$, it can be approximated as:

$$P(M_j|\theta) = \theta^{k_j}(1-\theta)^{k-k_j}, \tag{10}$$

where k_j is the number of covariates in M_j, and the hyperparameter $\theta \in (0,1)$ has the interpretation of the common probability that a given variable is independently included.

Most of the previous literature has chosen θ as fixed, $\theta = 1/2$, which assigns equal prior probability to each model ($P(M_j) = 1/2^k$); or random, $\theta \sim Unif(0,1)$, giving equal probability to each possible number of covariates or model size (Scott and Berger, 2010). According to Forte et al. (2018), using a fixed value of θ performs poorly in controlling for multiplicity (the occurrence of spurious explanatory variables as a consequence of performing a large number of tests). For these reasons, in our research we make use of random $\theta \sim Unif(0,1)$ for the prior distribution over the model space.

3.3 Summaries of the posterior distribution and model averaged inference

When k is moderate to large, posterior probabilities of individual models can be very small and the research could lose interest. A useful summary is the posterior inclusion probabilities (PIPs) of every covariate, defined as:

$$P(x_r|y) = \sum_{x_r \in M_j} P(M_j|y), i = 1, ..., k. \tag{11}$$

These should be interpreted as the importance of each variable for explaining the response variable. According to Raftery (1995), evidence for a regressor with a posterior inclusion probability from 0.50 to 0.75 is called weak, from 0.75 to 0.95 positive, from 0.95 to 0.99 strong, and >0.99 very strong.

The posterior distribution easily allows for obtaining model averaged estimates of any quantity of interest Δ (assuming it has the same meaning across all models). If Δ refers to the regression coefficients (β_r):

$$P(\beta_r|Y) = \sum_{M_j} P(\beta_r|M_j, y)P(M_j|y). \tag{12}$$

In this case, the model averaged estimates should be used and interpreted with caution because the "same" parameter may have a different meaning in different models Berger and Pericchi (2001).

3.4 Sampling method for posterior estimation

Another important point within the Bayesian techniques is the number of models in $\mathcal{M}$ (2^k). If k is small (say, k in the twenties at most), exhaustive enumeration is possible but if k is larger, heuristic methods need to be implemented. According to García-Donato and Martínez-Beneito (2013), sampling methods with frequency-based estimators outperform searching methods with renormalized estimators. The searching procedure of this last group could bias the estimation. Within the sampling methods with frequency-based estimators, highlights the Gibbs sampling of George and McCulloch (1997). This method is a Markov Chain Monte Carlo (MCMC) technique which generates posterior samples by sweeping through each variable to sample from its conditional distribution with the remaining variables fixed to their current values. In our work, we are going to apply this sampling method.

4 Data

In our analysis, we select from 43 different variables that were available for the 58 FDI destinations in our sample and that have been previously been considered in the theoretical and/or empirical literature on the determinants of FDI. We put a special emphasis in the *euro effect*, so that we also consider several interactions of this dummy with other relevant potential FDI covariates. We also analyse whether these determinants differ when we consider the overall group of countries and when we focus on EU, EA, and core and peripheral EMU countries. For this aim, we use the US outward FDI stock in 58 host countries over the period 1985-2016, that is, a total of 32 years. In Table 1 we enumerate the countries included

in the different groups considered in our analysis. Table 2 contains the candidate variables grouped by the different criteria (mostly countries' characteristics) commonly considered in the literature. We also describe how they have been defined, their source and report previous studies that have also used these countries' characteristics. To ease the discussion of the empirical results, we will follow the same ordering in the next section.

Table 1: Samples of countries

Sample of countries	**Countries included**	**Number of countries**
Whole sample	Algeria, Argentina, Australia, Austria, Barbados, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, Cyprus, Denmark, Dominican Republic, Egypt, El Salvador, Finland, France, Germany, Ghana, Greece, Guatemala, Honduras, Hong Kong, Hungary, India, Ireland, Israel, Italy, Japan, Luxembourg, Malaysia, Mauritius, Mexico, Netherlands, New Zealand, Norway, Panama, Peru, Philippines, Poland, Portugal, Republic of Korea, Romania, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Trinidad and Tobago, Turkey, United Kingdom, United Arab Emirates, Uruguay and Venezuela.	58
EU countries	Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Romania, Spain, Sweden and United Kingdom.	19
EA countries	Austria, Belgium, Cyprus, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain.	13
EA core countries	Austria, Belgium, France, Germany, Luxembourg and Netherlands.	6
EA peripheral countries	Cyprus, Finland, Greece, Ireland, Italy, Portugal and Spain.	7

Table 2: Variables

Variable	Definition	Source	Authors
Dependent variable			Blonigen and Piger (2014), Antonakakis and Tondl (2015).
FDI outward stock	FDI outward stock from the United States to the host country at current U.S. dollars.	BEA.	
Economic and monetary integration			
1. Euro	Dummy variable which takes value 1 if the host country has adopted the Euro at period t, 0 otherwise.	Own elaboration.	
2. EU	Dummy variable which takes value 1 if the host country is in the EU at period t, 0 otherwise.	Own elaboration.	
GDP measures			Brainard (1997), Carr et al. (2001), Bergstrand and Egger (2007), Head and Mayer (2004), Martí et al. (2017), Chiappini (2014), Markusen et al. (1996),Markusen and Venables (1999, 2000) Markusen and Maskus (2002), Blonigen et al. (2003), Disdier and Mayer (2004).
3. LogRealGDP	Logarithm of the host country's real GDP at constant 2010 US dollars.	WDI from World Bank and WEO from IMF.	
4. LogSumRealGDP	Logarithm of the host country's and US real GDP sum at constant 2010 US dollars.	WDI from World Bank and WEO from IMF.	
5. LogRealGDPdiff	Absolute difference between the host country's and US real GDP at constant 2010 US dollars.	WDI from World Bank and WEO from IMF.	
6. RealGDPgrowth	Average 5 years growth rate of the host country's real GDP.	WDI from World Bank and WEO from IMF.	
7. LogRealGDP*Euro	Interaction between the logarithm of the host country's real GDP and the dummy variable euro.	Own elaboration.	
Geography measures			
8. LogDistance	Logarithm of the bilateral distance in kilometres between host countries' capital cities and Washington D.C.	GeoDist from CEPII.	

Variable	Definition	Source	Authors
9. TZD	Time zone difference between host countries' capital cities and Washington D.C.	Own elaboration.	
10. Landlocked	Dummy variable which takes value 1 if the host country is landlocked, 0 otherwise.	GeoDist from CEPII.	
Labour endowment			Carr et al. (2001), Martí et al. (2017), Chiappini (2014), Markusen et al. (1996),Markusen and Venables (1999, 2000) Markusen and Maskus (2002), Alfaro and Charlton (2009), Yeaple (2003b), Blonigen et al. (2003).
11. EducLev	Education level of the host country measured as the average education years of population.	Education statistics from World Bank and UNDP.	
12. SkillLev	Skill level of the host country measured as the percentage of population age 25 + with completed and incompleted secondary schooling.	Education statistics from World Bank.	
13. HCI	Human capital index of the host country, based on years of schooling and returns to education.	PWT 9.1.	
14. EducLevDiff	Absolute difference between the host country's and US education level.	Education statistics from World Bank and UNDP.	
15. SkillLevDiff	Absolute difference between the host country's and US skill level.	Education statistics from World Bank.	
16. Log(USRelGDP*USRelEduc)	Logarithm of the interaction between US relative GDP and US relative education level to the host country.	Own elaboration.	
17. Log(USRelGDP*USRelSkill)	Logarithm of the interaction between US relative GDP and US relative skill level to the host country.	Own elaboration.	
18. EducLev*Euro	Interaction between the education level of the host country and the dummy variable euro.	Own elaboration.	
19. SkillLev*Euro	Interaction between the skill level of the host country and the dummy variable euro.	Own elaboration.	

Variable	Definition	Source	Authors
Trade and worldwide openness			Di Giovanni (2005), Bergstrand and Egger (2007), Brainard (1997), Camarero and Tamarit (2004), Camarero et al. (2018), Markusen and Venables (2000), Helpman and Krugman (1985).
20. TradeOpenness	Total imports and exports of the host country divided by the total GDP at current US dollars.	WDI from World Bank.	
21. LogUSExports	Logarithm of the US exports to the host country at current US dollars.	DOTS from IMF.	
22. LogUSImports	Logarithm of the US imports from the host country at current US dollars.	DOTS from IMF.	
23. RTA	Dummy variable which takes value 1 if the US and the host country are in a regional trade agreement, bilateral or multilateral, at period t, 0 otherwise.	WTO.	
24. KOFGI	KOF globalization Index of the host country.	Gygli et al. (2019)	
25. LogUSExports*Euro	Interaction between the logarithm of US exports to the host country and the dummy variable euro.	Own elaboration.	
26. LogUSImports*Euro	Interaction between the logarithm of US imports to the host country and the dummy variable euro.	Own elaboration.	
Agglomeration economies			Head and Mayer (2004), Bobonis and Shatz (2007), Crozet et al. (2004).
27. UrbanPopulation	Percentage of population of the host country living in urban areas according to national statistical offices.	WDI from World Bank.	
28. PopulationUrbanAggl	Percentage of population of the host country living in metropolitan areas	WDI from World Bank.	
29. LogPopulationDensity	Logarithm of the population density.	WDI from World Bank.	

Variable	Definition	Source	Authors
Cultural proximity			
30. ShareLanguage	Dummy variable which takes value 1 if the US and the host country share a language which at least 9% speak in each country, 0 otherwise.	GeoDist from CEPII.	Head and Ries (2008), Daude and Stein (2007).
31. Colony	Dummy variable which takes value 1 if the US and the host country have had (or do have) a colonial link, 0 otherwise.	GeoDist from CEPII.	
Natural resources			
32. OilRents	Oil rents of the host country as a percentage of the total GDP.	WDI from World Bank.	Dunning (1977, 1979),Chiappini (2014), Khayat (2017).
33. GasRents	Gas rents of the host country as a percentage of the total GDP.	WDI from World Bank.	
Infrastructure endowment			
34. Telephone	Fixed telephone subscriptions per 100 people in the host country.	WDI from World Bank.	Di Giovanni (2005), Alfaro and Chen (2015).
35. Cellular	Mobile cellular subscriptions per 100 people in the host country.	WDI from World Bank.	
Freedom measures			
36. Political rights	Indicator of host country's political rights that ranges between 1 (completely free) and 7 (not free).	Freedom house.	Wei (2000), Chiappini (2014), Kinoshita and Campos (2003), Hyun (2006), Lui (1985), Egger and Winner (2005).
37. Civil liberties	Indicator of host country's civil liberties that ranges between 1 (completely free) and 7 (not free).	Freedom house.	

Variable	Definition	Source	Authors
Population dependency measures			Narciso (2010).
38. OldDependencyRatio	Ratio of older dependents, people older than 64, to the working-age population, those ages 15-64.	WDI from World Bank.	
39. YoungDependencyRatio	Ratio of younger dependents, people younger than 15, to the working-age population, those ages 15-64.	WDI from World Bank.	
Bilateral investment treaties			Busse et al. (2010), Neumayer and Spess (2005).
40. BIT	Dummy variable which takes value 1 if the US and the host country are in a bilateral investment treaty at period t, 0 otherwise.	UNCTAD	
Macroeconomic and financial instability			Martí et al. (2017), Chiappini (2014).
41. InflationGDPdeflator	Inflation level of the host country measured by the annual growth rate of the GDP deflator.	WDI from World Bank.	
Taxes			Di Giovanni (2005), Chiappini (2014).
42. TaxHaven	Dummy variable which takes value 1 if the host country is a tax haven, 0 otherwise.	Oxfam.	
Exchange rate			Froot and Stein (1991), Blonigen (1997), Benassy-Quere et al. (1999).
43. NominalExchangeRate	Nominal exchange rate between the US and the host country, measured as the value of a US dollar in foreign currency. 2010=100.	WDI from World Bank.	

NOTES: BEA=Bureau of Economic Analysis, WDI=World Development Indicators, WEO=World Economic Outlook, IMF=International Monetary Fund, CEPII= Centre d'Etudes Prospectives et d'Informations Internationales, UNDP=United Nations Development Programme, PWT 9.1=Penn World Table 9.1, DOTS=Direction of Trade Statistics, WTO=World Trade Organization, UNCTAD=United Nations Conference on Trade and Development.

5 Empirical results

The results for the different country-groups analyzed are presented in table 4. The posterior inclusion probabilities and the posterior means of the different samples and estimations are obtained from the best 100000 models using the Gibbs sampling. This number of iterations guarantees PIPs convergence, as they stabilize long before, at 20000 iterations, which is the maximum that the R-function GibbsBvs allows to elaborate the plots (see Appendix A). Following the same order as in section 4, the variables are grouped according to country characteristics. We will consider that a covariate is potentially relevant when its PIP is higher than 0.5, as suggested by Raftery (1995). These cases are marked in bold in the empirical results Table 4. In addition to the table, we have also included descriptive graphs of the posterior inclusion probabilities in Appendix B.

The first two variables that we discuss are the dummies euro and EU membership. The euro is significant and has a positive posterior mean for the whole sample, as well as for the EU countries and the core EMU countries. The posterior inclusion probability is 1 for the whole sample, implying a distinctive role of the EMU countries in outward US FDI over the rest of the world. Also, among the EU countries, the relevance of (a positive) euro dummy implies that more FDI is concentrated in euro area members. Moreover, core countries hosts are preferred to peripheral ones. Thus, we have some evidence that the euro by itself has been a factor that attracts US FDI to EA countries. The EU dummy is only relevant (with a PIP of 0.74) for the whole sample. Later in this section we will discuss the interactions of the euro dummy with other covariates in order to gain a wider perspective on the channels through which a common currency may influence US FDI patterns.

The second group of covariates consists of different GDP measures. In this case, the real GDP of the host country, as well as the sum of parent and host real GDP, are found to be potential FDI determinants in the whole sample as well as in the EU countries, all of them with positive posterior mean. In the EA and core EA members, only real GDP would be a robust FDI determinant. This evidence would support HFDI. The same conclusion could be reached from the negative mean obtained for the absolute GDP difference between the US and the host country in the EA core countries (also Carr et al. (2001), Markusen et al. (1996) and Markusen and Maskus (2002) obtained this type of results). Real GDP growth displays a negative impact possibly because it is capturing the economic crisis effect. The interaction between the host country's real GDP and the euro show a negative impact for

Table 3: Empirical results

	Whole sample		EU countries		EA countries		EA core countries		EA peripheral countries	
Variables	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**
Economic and monetary integration										
Euro	**1**	**4.378 (0.951)**	**0.512**	**0.576 (0.637)**	0.291	0.355 (0.597)	**0.588**	**1.176 (1.052)**	0.254	0.431 (0.858)
EU	**0.740**	**0.030 (0.022)**	0.258	0.007 (0.014)	0.023	0.000 (0.002)	0.026	0.001 (0.010)	0.025	0.000 (0.003)
GDP measures										
LogRealGDP	**1**	**0.680 (0.132)**	**0.998**	**1.400 (0.309)**	**0.999**	**1.691 (0.322)**	**1**	**3.975 (0.612)**	0.298	0.323 (0.566)
LogSumRealGDP	**0.994**	**1.833 (0.381)**	**0.857**	**3.602 (1.595)**	0.048	0.003 (0.312)	0.181	-0.379 (1.014)	0.055	0.146 (1.127)
LogRealGDPdiff	0.237	0.103 (0.283)	0.192	0.615 (1.451)	0.081	0.077 (0.373)	**0.686**	**-1.567 (1.222)**	0.062	-0.163 (1.113)
RealGDPgrowth	0.234	0.000 (0.000)	**0.710**	**-0.002 (0.002)**	0.033	0.000 (0.000)	**0.971**	**-0.006 (0.002)**	0.125	0.000 (0.001)
LogRealGDP*Euro	**1**	**-0.605 (0.125)**	0.410	0.063 (0.088)	**0.749**	**0.160 (0.102)**	0.437	0.178 (0.214)	**0.729**	**0.190 (0.153)**
Geography measures										
LogDistance	0.151	0.001 (0.011)	0.084	-0.018 (0.094)	0.022	0.000 (0.018)	0.017	0.001 (0.045)	0.021	0.000 (0.018)
TZD	0.153	0.000 (0.001)	0.074	0.001 (0.008)	0.022	0.000 (0.001)			0.020	0.000 (0.002)
Landlocked	0.289	-0.010 (0.021)	0.048	0.000 (0.005)	0.024	0.000 (0.004)	0.019	0.000 (0.010)		
Labour endowment										
EducLev	0.308	0.020 (0.044)	0.074	0.001 (0.016)	0.026	0.000 (0.004)	0.041	-0.002 (0.022)	0.084	-0.012 (0.054)
SkillLev	**0.814**	**-0.004 (0.002)**	**0.999**	**-0.011 (0.005)**	**0.975**	**-0.011 (0.002)**	0.276	0.003 (0.006)	**0.967**	**-0.013 (0.004)**
HCI	0.262	0.030 (0.070)	**0.981**	**-0.845 (0.263)**	0.222	-0.089 (0.194)	0.331	0.247 (0.376)	0.101	0.019 (0.148)
EducLevdiff	0.381	0.029 (0.051)	0.069	0.000 (0.010)	0.025	0.000 (0.005)	0.033	0.000 (0.009)	0.060	0.008 (0.045)
SkillLevdiff	**1**	**0.011 (0.001)**	**1**	**0.007 (0.002)**	0.031	0.000 (0.000)	0.097	0.000 (0.001)	0.046	0.000 (0.001)
Log(USRelGDP*USRelEduc)	**1**	**-2.089 (0.332)**	0.092	0.072 (0.368)	0.026	-0.007 (0.103)	0.036	-0.033 (0.447)	0.146	-0.455 (1.374)
Log(USRelGDP*USRelSkill)	0.286	0.053 (0.135)	0.391	-0.288 (0.418)	0.051	0.022 (0.133)	**0.523**	**0.433 (0.494)**	0.053	-0.025 (0.208)
EducLev*Euro	**0.586**	**0.031 (0.033)**	**0.838**	**0.042 (0.024)**	0.040	0.001 (0.004)	0.049	0.002 (0.010)	0.089	0.003 (0.012)
SkillLev*Euro	**0.666**	**-0.005 (0.005)**	0.111	0.000 (0.001)	**1**	**0.011 (0.002)**	0.183	0.001 (0.003)	0.070	0.000 (0.002)
Trade and worlwide openness										
TradeOpenness	0.174	0.000 (0.000)	**1**	**0.004 (0.001)**	**1**	**0.003 (0.001)**	**0.605**	**0.001 (0.001)**	0.026	0.000 (0.000)
LogUSExports	0.298	-0.023 (0.046)	0.198	0.026 (0.064)	0.469	0.091 (0.109)	0.029	0.002 (0.025)	**0.953**	**0.433 (0.153)**
LogUSImports	0.164	-0.004 (0.020)	**0.953**	**-0.281 (0.104)**	0.259	0.053 (0.103)	**0.864**	**0.642 (0.322)**	0.033	0.000 (0.026)
RTA	**0.869**	**-0.065 (0.036)**								
KOFGI	**1**	**0.016 (0.002)**	**1**	**0.018 (0.004)**	**0.979**	**0.015 (0.004)**	0.297	0.004 (0.007)	0.101	0.001 (0.004)
LogUSExports*Euro	**1**	**0.669 (0.101)**	0.434	0.086 (0.113)	0.055	0.004 (0.026)	**0.500**	**-0.101 (0.108)**	**0.708**	**-0.231 (0.177)**
LogUSImports*Euro	**1**	**-0.392 (0.080)**	**1**	**-0.270 (0.084)**	**1**	**-0.273 (0.076)**	**0.525**	**-0.232 (0.245)**	0.249	-0.033 (0.066)

Table 4: Empirical results

	Whole sample		EU countries		EA countries		EA core countries		EA peripheral countries	
Variables	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**	**PIP**	**Posterior mean**
Agglomeration economies										
UrbanPopulation	0.309	0.000 (0.000)	0.422	0.004 (0.005)	**0.905**	**0.011 (0.005)**	**1**	**0.030 (0.005)**	0.258	-0.008 (0.015)
PopulationUrbanAggl	0.149	0.000 (0.000)	0.059	0.000 (0.000)	0.023	0.000 (0.000)	0.018	0.000 (0.000)	0.020	0.000 (0.000)
LogPopulationDensity	**1**	**-0.941 (0.188)**	0.118	0.116 (0.416)	**0.999**	**3.107 (0.711)**	0.043	-0.071 (0.518)	**0.998**	**5.911 (1.038)**
Cultural proximity										
ShareLanguage	0.283	0.005 (0.011)	0.061	0.001 (0.006)	0.022	0.000 (0.003)			0.020	0.000 (0.003)
Colony	0.165	0.002 (0.011)	0.061	0.001 (0.006)	0.022	0.000 (0.003)	0.016	0.000 (0.002)	0.021	0.000 (0.004)
Natural resources										
OilRents	0.336	0.002 (0.003)	**0.991**	**-0.191 (0.051)**	0.384	-0.408 (0.600)	0.035	-0.016 (0.120)	0.022	-0.003 (0.075)
GasRents	0.420	0.009 (0.014)	0.048	0.000 (0.016)	0.186	0.038 (0.088)	0.055	-0.005 (0.024)	0.043	0.029 (0.177)
Infrastructure endowment										
Telephone	**0.995**	**0.004 (0.001)**	0.075	0.000 (0.000)	0.049	0.000 (0.000)	0.053	0.000 (0.001)	**0.872**	**-0.007 (0.003)**
Cellular	0.219	0.000 (0.000)	0.053	0.000 (0.000)	0.033	-0.000 (0.000)	0.023	0.000 (0.000)	0.028	0.000 (0.000)
Freedom measures										
Political Rights	**0.904**	**-0.031 (0.014)**	0.049	0.000 (0.003)	0.031	0.000 (0.004)			0.022	0.000 (0.003)
Civil Liberties	**0.848**	**0.031 (0.017)**	0.049	0.000 (0.003)	0.070	0.002 (0.007)	0.018	0.000 (0.002)	0.032	-0.001 (0.007)
Population dependency measures										
OldDependencyRatio	0.286	-0.002 (0.004)	**0.983**	**-0.028 (0.009)**	0.033	0.000 (0.002)	0.040	0.000 (0.003)	0.229	0.006 (0.014)
YoungDependencyRatio	0.193	0.000 (0.001)	0.051	0.000 (0.001)	0.032	0.000 (0.000)	0.163	-0.004 (0.011)	**0.987**	**-0.041 (0.010)**
Bilateral investment treaties										
BIT	0.446	0.033 (0.045)	**1**	**0.795 (0.083)**						
Macroeconomic instability										
InflationGDPdeflator	0.168	0.000 (0.000)	**1**	**-0.002 (0.000)**	0.032	0.000 (0.001)	0.041	0.000 (0.002)	0.065	0.000 (0.002)
Taxes										
TaxHaven	0.160	0.001 (0.007)	0.059	0.001 (0.006)	0.023	0.000 (0.002)	0.016	0.000 (0.002)		
Exchange rate										
NominalExchangeRate	**0.827**	**-0.0002 (0.000)**	0.116	0.000 (0.000)	**0.995**	**-0.002 (0.000)**	**0.888**	**-0.002 (0.001)**	0.049	0.000 (0.000)
Number of observations		1840		595		416		192		224

NOTES: The standard deviation is in parenthesis in the *Posterior mean* column. Some dummy variables are not included in the different subsamples. It is because they are constant or causes perfect collinearity.

the whole sample. A possible reason for this negative sign is related to the fact that EA markets are small in comparison to China and Japan, for example, and thus, this interaction is indicating that, for euro area countries, size is not relevant individually but as a whole. This effect changes for EA countries, and additionally, for the peripheral ones. Then, the market size effect has been reinforced after the introduction of the euro, an effect also compatible with HFDI.

As regards some of the measures related with geography, none of them turns out to have an inclusion probability above 0.5. A potential explanation for this is that, with the exception of Canada and Mexico, the US is relatively far from its most important FDI destinations. As both are members of NAFTA, probably the effect is diluted in the corresponding dummy *RTA*, that we have included in the group of "Trade and worldwide openness" and has a PIP of 0.869.

Concerning the labour endowment measures, the results are consistent with both HFDI and VFDI strategies, and indirectly, with the knowledge capital model. In fact, the skill level is found to be relevant for all the samples with the exception of the core EA countries, whereas HCI is also a potential determinant for EU countries. In both cases, the effect is negative. A possible reason (as GDP per capita in Martí et al. (2017) and Chiappini (2014)) is that both variables could be measuring labour costs, showing evidence in favour of VFDI. The absolute skill level difference between the US and the host country has a positive posterior mean for the whole sample and the EU countries. We would have expected a negative sign instead as, according to Blonigen et al. (2003), absolute skill endowment difference must reduce FDI from the parent to host country, because it indicates labour endowment dissimilarity (HFDI). However, European countries may have, in some cases, a more skilled labour than the US. Thus, such dissimilarity effect might imply that US MNCs are looking for locations with skilled labour, that would be still consistent with HFDI. The interaction between the relative GDP and relative education level to the host country is found to be a robust determinant for the whole sample. The posterior mean is large and negative, as expected, in line with the knowledge-capital model of Markusen et al. (1996), Carr et al. (2001) and Markusen and Maskus (2002), that also consider this interaction in their empirical specifications[9]. In this framework, FDI from the parent to the host country

[9]In this article, instead of considering GDP differences and skill differences in the interaction variables, we employ the US relative GDP and US relative endowment levels to the host country, because the two variables have always positive values and an increase in both of them means that US is richer and more skilled than the

only rises if the headquarter country is small and more skilled than the affiliate country (VFDI). In our case, as in Blonigen et al. (2003) we find a positive impact of the US relative GDP and US relative skill level interaction in EA core countries. A possible explanation of such sign could be the negative effect of both variables. If this was the case, the motive for FDI would be horizontal. Finally, as for the *euro effect*, in the case of the whole sample, the interaction between the common currency dummy and labour endowments of the host country is positive with education and negative with skill. This contradictory result can be attributed to heterogeneity or to the role of skills as a proxy for wages in some cases. These interactions have high PIP also for education in the EU sample and skill in the EA sample. In both cases are positive, meaning that since the introduction of the euro, US MNCs have mainly looked for skilled investment destinations in Europe, effect compatible with HFDI.

Regarding trade and worldwide openness covariates, wherever these variables have been found to be potential US FDI determinants have a positive posterior mean in the EA, core, and peripheral countries, implying that FDI and trade have been complements. Such impact could imply VFDI, and/or the positive effect of investment liberalization in the volume of trade and viceversa (Brainard (1997), Camarero and Tamarit (2004) and Camarero et al. (2018)). The dummy representing regional trade agreements is highly relevant for the whole sample. However, its posterior mean is large and negative. Therefore, American FDI has been reduced with those countries that are engaged in a trade agreement with the US, leading to a substitutability pattern between trade and investment, consistent with HFDI. The KOF globalization index is found to be not only relevant in the whole sample as well as in the EU and EA groups, with a PIP of 1 or near to 1, but also to have a positive posterior mean in the three cases. Its interpretation would be that US FDI is attracted by the worldwide openness of the investment destinations. Finally, concerning the interaction of the *euro effect* on US exports, it is found to be a robust determinant in the whole sample as well as in the core and peripheral EA members. As for imports, the interaction is a potential determinant in all the groups, with the only exception of the periphery. The sign of these interactions, except for the jointly effect of euro and US exports in the whole sample, is always negative. Thus, investment and trade have been mainly substitutes for the countries that have adopted the euro, pattern consistent with HFDI.

Concerning agglomeration economies, population density has high PIP in the whole sam-

host country

ple, EA countries and periphery. Only in the first case the posterior mean would have a negative sign, probably due to the heterogeneity of the group or because agglomeration effects might be capturing competition across firms (Crozet et al. (2004)). Urban population is also relevant for EA and core EA countries and with a positive sign, consistent with the benefits of geographic proximity that can emerge from the concentration of firms, a result also found by Head and Mayer (2004) and Bobonis and Shatz (2007).

In the case of natural resources, only in the EU countries group we find oil rents in the host country as a potential relevant covariate with a negative posterior mean. In our case, this variable may capture cyclical differences between the host countries that have oil rents (i.e. the UK, Denmark, and Romania) and the rest.

As for the covariates included in “infrastructure endowment", only "Telephone" is found to be a potential FDI determinant, and only for the whole sample and EA peripheral countries. For the whole sample, its effect is positive, as an increase in the percentage of fixed telephone subscriptions means a higher infrastructure development. On the other hand, its posterior mean is negative for the EA peripheral countries. This impact is a priori unexpected, but it is also true that fixed telephone subscriptions have been notably reduced for the last fifteen years in Europe, giving way to cellular subscriptions. In contrast to the heterogeneous world sample, in Europe they could be representing an obsolete technology.

Regarding freedom measures, political rights and civil liberties indexes are relevant explaining US FDI for the whole sample. The political right index presents a negative posterior mean, as an increase in this index means a reduction in the freedom of the host country. However, the civil liberties index displays the opposite effect. This result is obviously puzzling, although given the irrelevance of these measures in the EU countries, does not seem to affect the overall result.

As for the population dependency measures, the old dependency ratio is a robust FDI determinant for EU countries. Its negative impact would reflect, according to Narciso (2010), that older industrialized countries tend to export capital to younger economies. For EA peripheral countries, young dependency is the relevant covariate within this group. Our negative effect might be because the most of these countries have suffered high young unemployment rates during the economic crisis (overall Spain and Greece).

Concerning bilateral investment treaties and macroeconomic instability, both are only rel-

evant for EU countries. The dummy variable BIT has a positive effect and captures the US BITs signed with Poland and Romania (the only EU countries that hold this condition within this sample) which entered into force in 1994, before they became EU members. The positive posterior mean implies that the treaty attracted US FDI to those countries. On the other hand, the inflation level of the host country measured by the annual growth rate of the GDP deflator shows a negative impact on US FDI, as large inflation levels imply macroeconomic instability.

In the case of nominal exchange rate of the host country, its effect is negative and significant for the whole sample, as well as for EA and core EA countries. Thus, an appreciation of the dollar against the foreign currency deters FDI to the host country. According to Benassy-Quere et al. (1999), if the investor aims to serve the local market, an appreciation of the local currency (depreciation of the investor currency), increases FDI inflows due to higher purchasing power of the local consumers. Thus, the negative effect of an appreciation of the dollar shows evidence in favour of HFDI.

6 Conclusions

The adoption of a single currency is supposed to have generated important effects on cross-border capital mobility within the EA, and notably, in FDI allocation patterns. The *euro effect* has to be analyzed as an on-going process with a time dimension. Most of the empirical literature so far has focused on the study of intra-European FDI. In contrast, in this paper we focus on the FDI drivers from a third-country perspective, namely, the FDI coming from the US, the most prominent investor in the EU from a historical standpoint. We also divert from previous studies in the empirical approach. To assess the *euro effect*, instead of using a dummy variable in an, otherwise, *ad hoc gravity setting*, we consider a wide set of FDI potential determinants and analyze their role in different country groups. To this aim we use a data-driven methodology, the BMA analysis, to assess the relative importance of over forty covariates for US FDI.

We analyse the outward US FDI stock in a sample of 58 countries, that represent over 90% of the total American FDI over the period 1985-2016. Moreover, we also analyze the sub-samples of EU and EA countries, and within last group, core and peripheral countries. Although this variable selection exercise is relevant by itself, we also provide the posterior

mean obtained for the variables selected in each sample. This, tentatively, allows us to discriminate among FDI locational theoretical approaches, and how the euro has affected the US FDI determinants, selecting the most significant for each group of countries considered.

Our research selects around 19 variables out of the 43 covariates considered for the whole sample. As expected, the results point to more parsimonious models when more homogeneous sub-samples are analyzed. For EU countries, 16 variables are robust US FDI determinants, in the EA sample 10, and for core and peripheral countries 10 and 7, respectively. The main findings suggest that, considering GDP, labour endowment, and trade measures, US FDI is explained by both horizontal and vertical FDI motives not only in the whole sample, but also for EU and EA countries. Moreover, HFDI strategies predominate in EA core countries, whereas VFDI prevails in the EA periphery. Additionally, agglomeration economies, natural resources, infrastructure endowment, freedom, population density, BIT, macroeconomic instability and exchange rate measures can also explain US FDI determinants.

As for the *euro effect*, the adoption of the common currency seems to have played an important role in US FDI when we analyse the whole, EU and EA core countries samples. We find that, not only the euro dummy, but also its interaction with other relevant variables (GDP, trade, skills) also play a relevant role in explaining the concentration of US FDI in Europe. Moreover, our results show that the launching of the euro has mainly promoted US HFDI in EU and EA countries.

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Appendix A Trace of posterior inclusion probabilities

The following trace plots are obtained from 20000 iterations, the maximum that the R-function GibbsBvs allows to elaborate such plots. The PIPs are very close to converge with such number of iterations.

Figure 1: Whole sample trace estimation

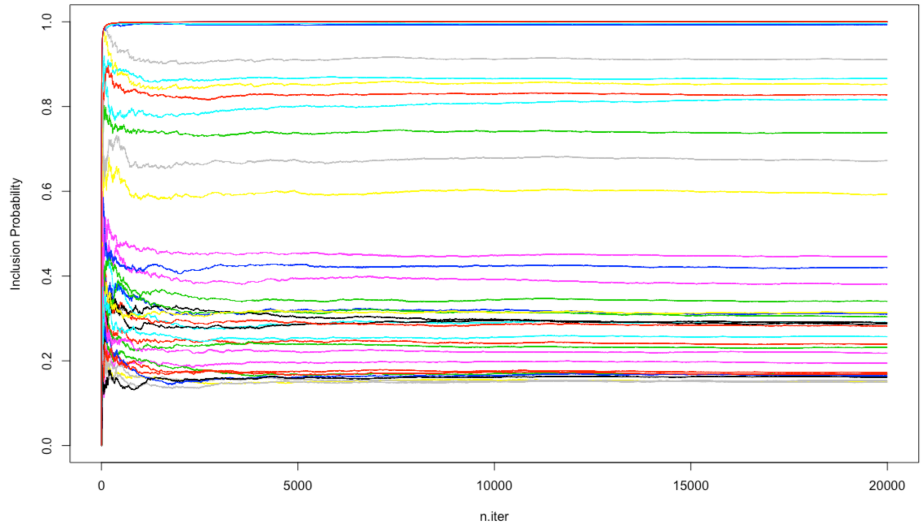


Figure 2: EU countries trace estimation

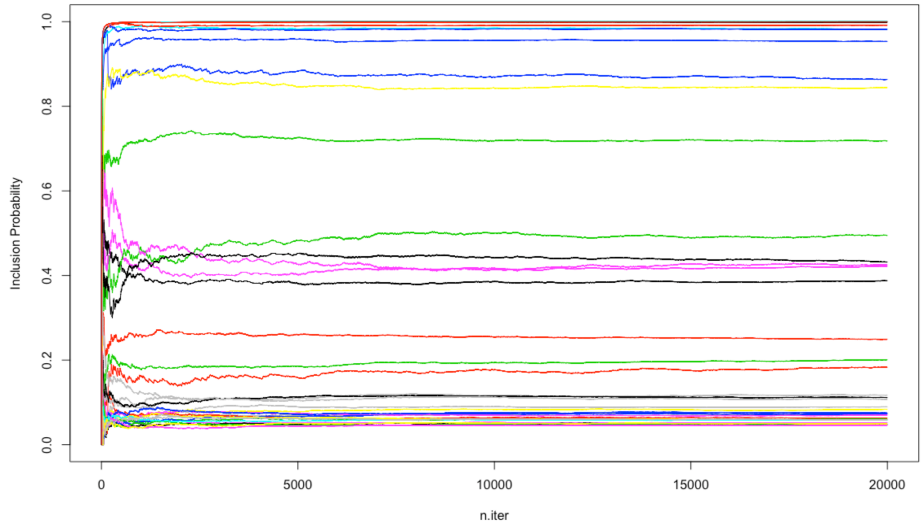


Figure 3: EA countries trace estimation

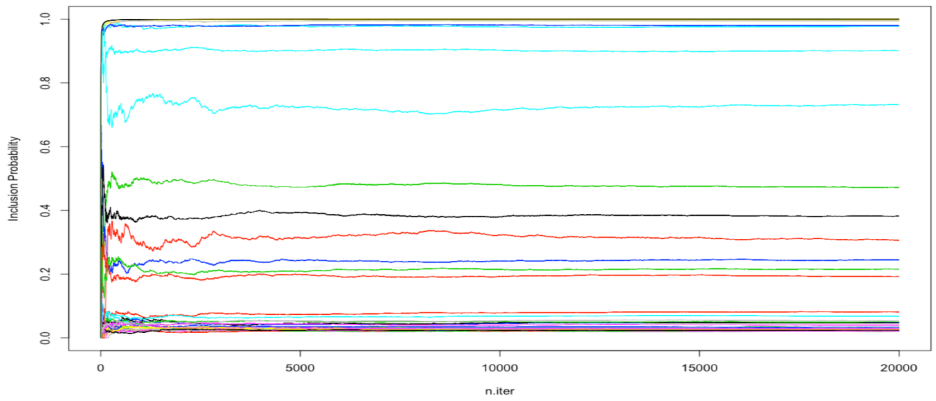


Figure 4: EA core countries trace estimation

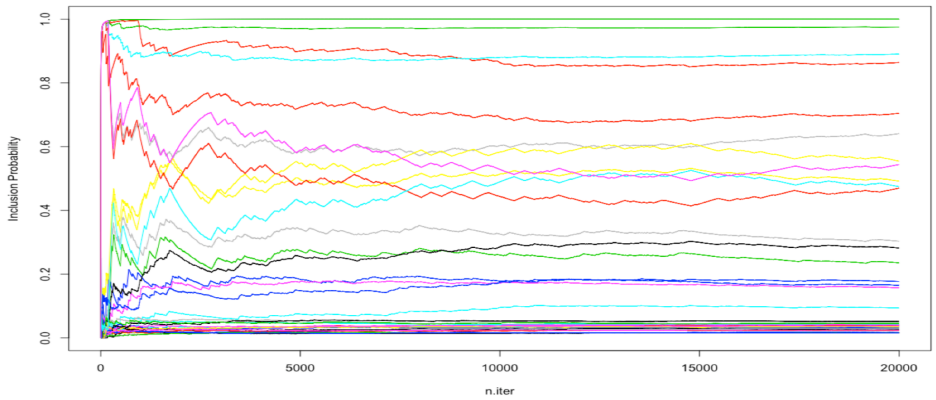
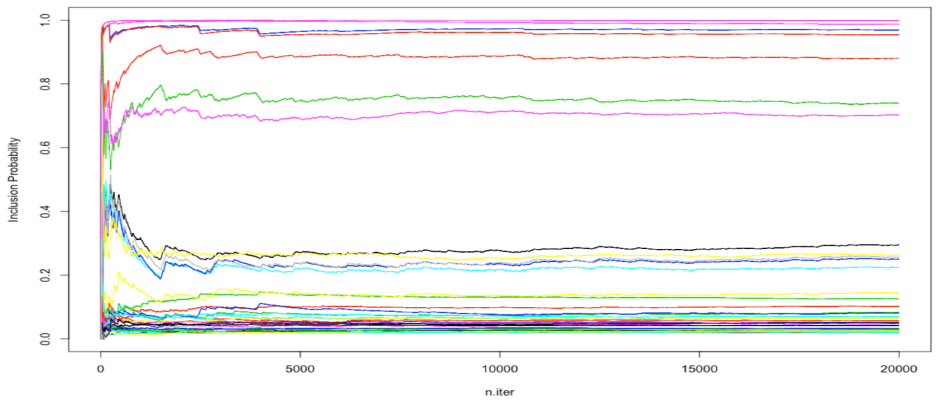


Figure 5: EA peripheral countries trace estimation



Appendix B Posterior inclusion probabilities

Figure 6: PIPs for whole sample

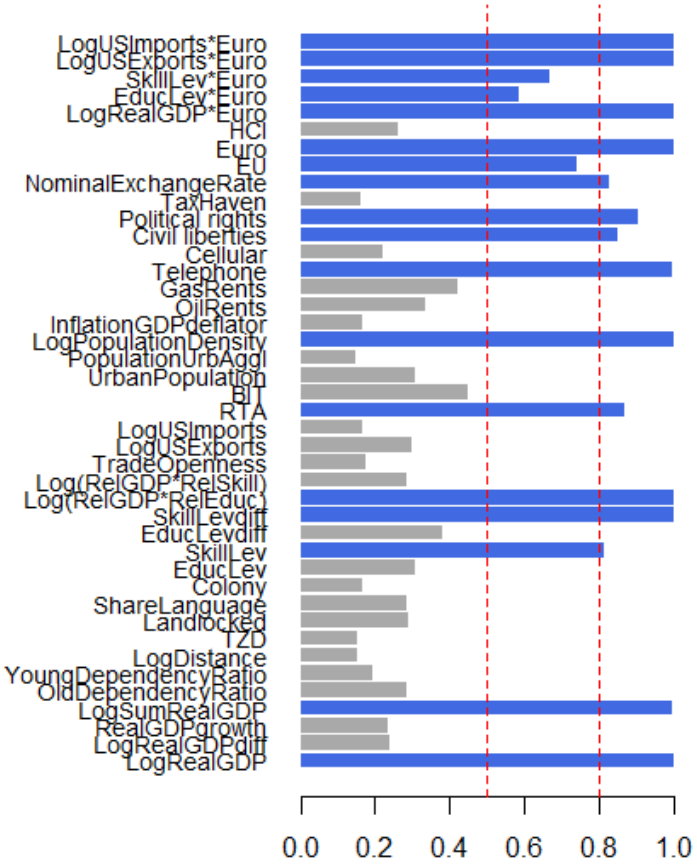


Figure 7: PIPs for EU countries

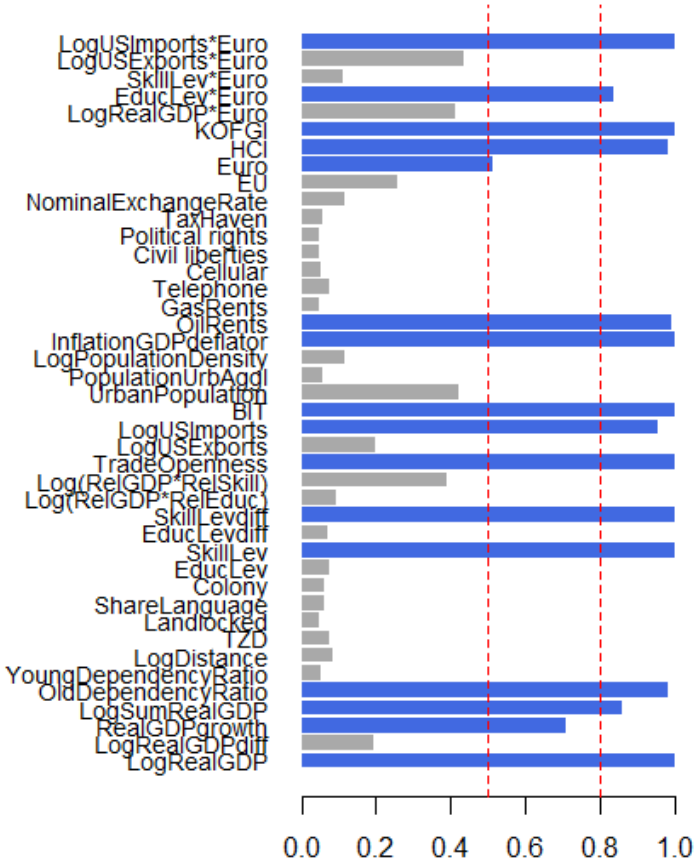


Figure 8: PIPs for EA countries

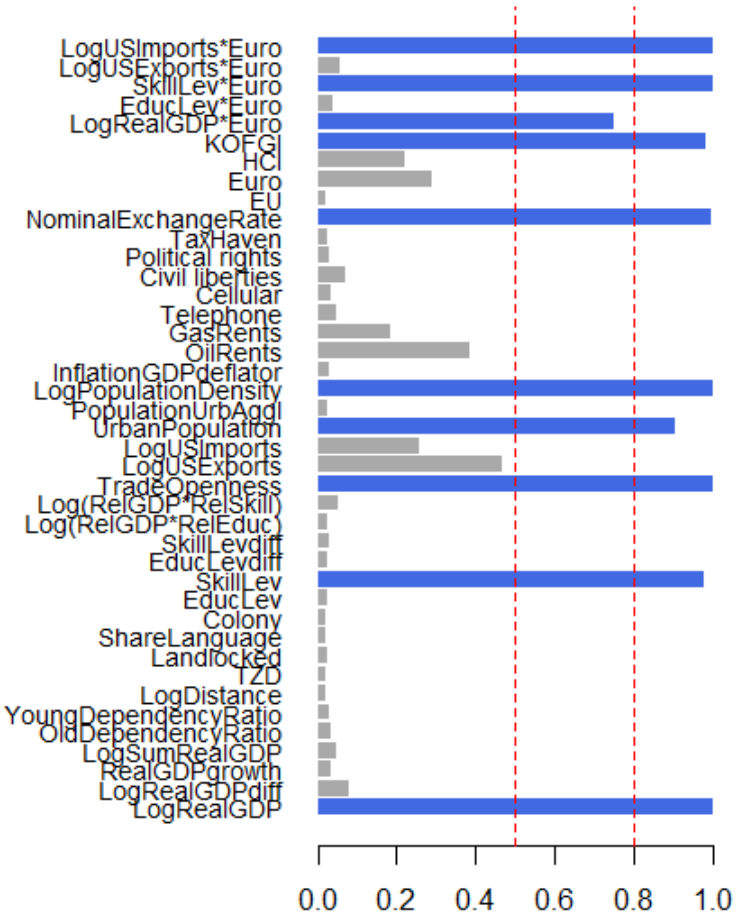


Figure 9: PIPs for EA core countries

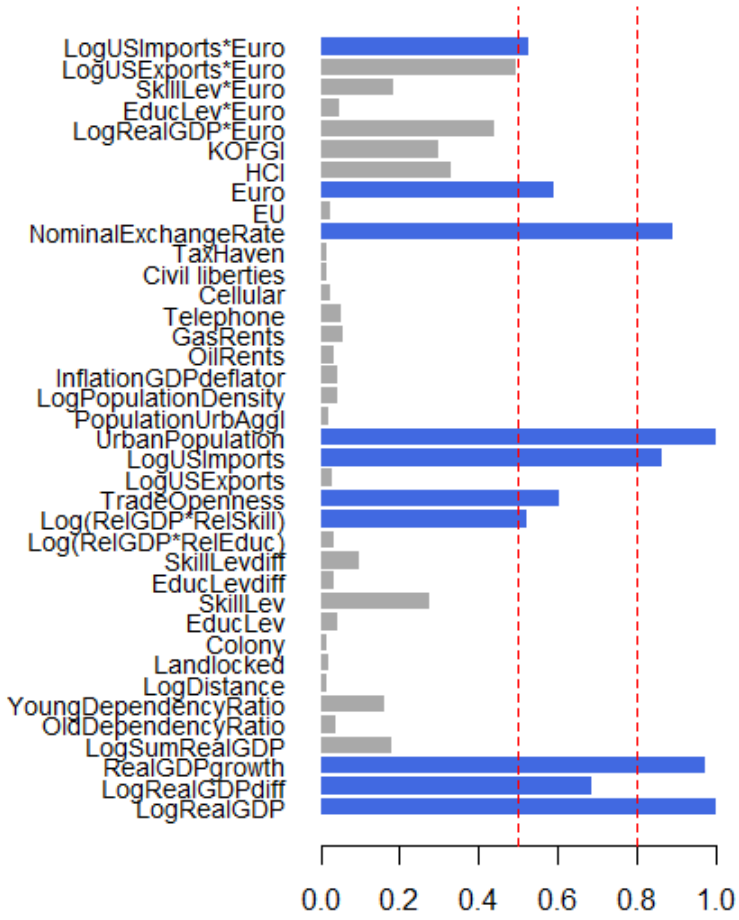


Figure 10: PIPs for EA peripheral countries