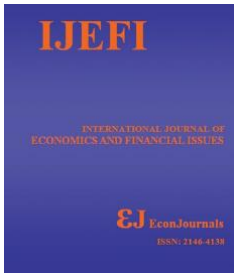

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2025, 15(3), 139-149.

Bayesian Model Averaging Approach of the Determinants of Foreign Direct Investment in Morocco

Anass Arbia[1]*, Khalid Sobhi[1], Mohamed Karim[1], Nor-Eddine Chtioui[2], Rachid Houmad[3]

[1]Macroeconomics and Public Policy Research Team, Faculty of Legal, Economic, and Social Sciences of Salé, Mohammed V University of Rabat, Outa Hssain Road, Sala Al Jadida, P.O. Box 5295, Salé, Morocco, [2]Research Laboratory in Management of Organizations, Business Law, and Sustainable Development, Faculty of Legal, Economic, and Social Sciences of Souissi, Mohammed V University of Rabat, Morocco, [3]Economic Analysis and Modeling Laboratory, Faculty of Legal, Economic, and Social Sciences of Souissi, Mohammed V University of Rabat, Morocco. *E-mail: anass.arbia@Um5r.ac.ma

Received: 21 November 2024 **Accepted:** 07 March 2025 **DOI:** https://doi.org/10.32479/ijefi.18612

ABSTRACT

Historically, research on foreign direct investment (FDI) was based mainly on Dunning's Ownership-Location-Internalisation (OLI) paradigm. However, the emergence of digitalisation has highlighted the key role of information and communication technologies (ICTs), while globalisation has underscored the importance of political and social institutions in promoting foreign investment. Beyond location advantages, traditionally focused on macroeconomic aspects, it has become essential to integrate the digital, institutional, and financial dimensions to better understand the determinants of FDI. This study therefore sets out to identify the main factors influencing FDI in Morocco, incorporating recent advances in digitalisation and globalisation. To address the diversity of potential factors influencing FDI, the Bayesian model averaging (BMA) approach was adopted to reduce the uncertainty associated with the choice of variables. A model integrating the technological, economic, institutional, and financial dimensions (ICT-E-I-F) was thus developed for the period 1995Q1–2023Q4.The empirical evidence reveals that trade openness (PIP = 1.00), human capital (PIP = 1.00), and macroeconomic stability (PIP = 1.00) have a highly significant influence on FDI. Conversely, factors such as taxation (PIP = 0.96) have a moderate impact. Additionally, other factors, such as fixed telephone subscriptions (PIP = 0.80), GDP growth (PIP = 0.63), GDP per capita (PIP = 0.52), and the financial market size (PIP = 0.52), exhibit a weakly significant impact on FDI.

Keywords: Foreign Direct Investment, Bayesian Model Averaging, Morocco
JEL Classifications: C11, F21, O55

1. INTRODUCTION

Despite its natural and human resources, Morocco remains a marginal destination for foreign direct investment (FDI), especially when compared with other regions. This situation persists despite the political and economic reforms undertaken to enhance its attractiveness. According to Economou et al. (2017), developing countries (DCs), such as Morocco, face major challenges related to financing and market liquidity, hindering the inflow of FDI. Yet, in times of global financial crisis, these investments play a crucial role in stimulating economic activity where local financial resources are insufficient.

FDI offers significant benefits to host economies, including job creation, skills transfer and the integration of modern technologies (Arbia et al., 2023a; Economou et al., 2017). For multinational enterprises (MNEs), they represent an opportunity to expand, acquire strategic resources and reduce risk, while governments see them as a key lever for boosting economic growth and employment. However, despite these advantages, Morocco is struggling to compete with other emerging economies in terms of attractiveness, due to persistent challenges related to governance, corruption and the perception of political and economic risks (Balasubramanyam and Forsans, 2010).

FDI flows depend on attraction (pull) factors linked to the characteristics of the host countries, and repulsion (push) factors associated with the countries of origin (Odedokun, 2004). Against this backdrop, Morocco has invested in improving its infrastructure, tax policies and economic governance to meet the expectations of foreign investors. However, these reforms need to be seen in the broader context of globalisation and digitalisation, which are gradually redefining the determinants of FDI.

Globalisation, as a multidimensional phenomenon, facilitates world economic integration through the flow of capital, goods and ideas (Clark, 2000). At the same time, digitalisation, the driving force behind the fourth industrial revolution, is playing an increasing role in attracting FDI, thanks in particular to technologies such as artificial intelligence (AI), big data and the internet of things (IoT), which reduce transaction costs and improve connectivity (Arbia and Sobhi, 2024). These developments make information and communication technologies (ICTs) essential for enhancing the attractiveness of DC economies, including Morocco (Arbia et al., 2023b; Arbia and Sobhi, 2024).

Despite these advances, FDI remains concentrated in developed economies, leaving developing and transition countries, including those in Africa, in a weak position (Ajide and Ibrahim, 2022). Although Morocco enjoys relative political stability and economic openness, it continues to face socio-economic, cultural, political and institutional obstacles that limit its attractiveness.

Faced with these challenges, this study proposes an innovative contribution through the use of the Bayesian model averaging (BMA) to explore the determinants of FDI in Morocco. This method overcomes the uncertainties inherent in traditional economic models by incorporating a wide range of variables and estimating their posterior inclusion probability (PIP). The research, covering the period 1995Q1-2023Q4, analyses thirteen variables specific to the Moroccan context, including numerical, economic, institutional and financial dimensions, which are often neglected in previous studies. The main objective is to gain a better understanding of the ICT, economic, institutional and financial factors influencing FDI in Morocco. This study also aims to fill the gaps in existing research by proposing a model integrating these dimensions and providing implications for improving the country's attractiveness. The central question is as follows: How do ICT, economic, institutional and financial factors influence FDI in Morocco?

The remainder of this article is structured as follows: Section 2 provides a review of the literature on FDI; section 3 describes the data and methodology; section 4 presents the empirical results; section 5 offers an in-depth discussion of the results obtained; and section 6 concludes by highlighting the policy implications.

2. LITERATURE REVIEW

2.1. Theoretical Lessons

Morocco, as a destination for FDI, motivates this study adopting the host country perspective. The OLI (Ownership, Location, Internalization) paradigm, widely used to analyse MNEs, focuses on investment attraction characteristics (Eden and Dai, 2010; Paul and Feliciano-Cestero, 2021). This framework, which is particularly relevant for developing countries, emphasises location-related advantages in order to examine the macroeconomic determinants of FDI.

However, with globalisation and digitalisation, the traditional determinants have changed. Dunning and Lundan (2008) have enriched the OLI paradigm by integrating the institutional dimension, including formal and informal institutions, to link macroeconomic and microeconomic analyses. Within this broader framework, this study proposes an approach that integrates ICT, economic, institutional and financial factors, in order to provide a more comprehensive analysis of FDI.

Over the decades, globalisation and the development of ICTs have encouraged the growth of international production activities, inspiring various theories on trade and FDI. Adam Smith, in The wealth of Nations (1776), introduced the first concepts of the gains from trade (Tiong, 2022). After 1945, MNEs increased the importance of FDI, initially dominated by the United States and the United Kingdom, before spreading to Europe and Japan (Dunning and Lundan, 2008). In the 1980s, two major trends emerged: the US as the main destination for FDI and Japan as a key investor in the US and European markets (Nayak and Choudhury, 2014). In parallel, the rise of MNEs in DCs began in the mid-1980s (Dunning and Lundan, 2008).

Many theories attempt to explain FDI, each providing distinct perspectives while discussing or criticising the others. These approaches, with their strengths and limitations, include imperfect market theories, the institutional approach, emerging economies, and regional integration agreements (Tiong, 2022). They also encompass vertical FDI, horizontal FDI, and international trade theory (Arbia et al., 2023a; Azeroual and Cherkaoui, 2015). Other theories enrich this framework, such as portfolio theory and risk diversification (Jean, 2022), the gravity model, Hymer's vertical integration, the theory of resources and capabilities, comparative advantage, and André Gunder Frank's theory of dependence (1966) (Arbia et al., 2023a; Tiong, 2022).

FDI theories have evolved from a vision of a perfectly competitive market to approaches based on market distortions, such as the OLI paradigm (Dunning, 1977) and the theory of transaction costs (Williamson, 1985). Kindleberger (1969) emphasised the importance of market imperfections in explaining FDI. Since the 1970s, the motivations of MNEs have diversified, moving from the search for resources to more complex objectives (Criscuolo et al., 2005). Globalisation and the industrial revolutions have accelerated these dynamics, while the ICT revolution has amplified FDI from emerging markets (Arbia and Sobhi, 2024).

Institutional factors play a central role in the choice of MNEs to invest abroad, particularly in the face of competition from local players with linguistic, cultural and legal advantages. This perspective has inspired institutionalist theories, such as the linkage, leverage and learning (LLL) theory (Mathews, 2002) and the disequilibrium and springboard approach (Luo and Tung,

2007). Hymer (1960) laid the foundations of FDI by highlighting the need for MNEs to control local activities in order to eliminate competition and maximize profits. Caves (1971) completed this analysis by distinguishing between horizontal FDI, based on the replication of production, and vertical FDI, based on the division of manufacturing stages. Helpman et al. (2004) have shown that only the most successful companies invest abroad, while the others focus on exports. Furthermore, risk diversification, as described by Markovitz (1959), allows MNEs to reduce their exposure through geographical diversity. Tinbergen's gravity model also highlights the influence of economic size and distance on FDI flows (Folfas, 2011). In parallel, theories of resources and capabilities (RBV) value the internal assets of companies, while comparative advantage explains the attraction of FDI by the specific resources of host countries. However, dependency theory criticizes these investments in developing countries, highlighting their dependence on multinationals and their difficulty in generating local added value (Arbia et al., 2023a). This theoretical framework, enriched by transaction costs (Williamson, 1985) and the three institutional pillars (Scott, 1995), offers a global analysis of FDI in a world marked by globalisation and digitalisation.

2.2. Empirical Lessons

This section draws on the locational advantages of the OLI paradigm to analyse the macroeconomic determinants of FDI, linked to the characteristics of the host country. It highlights the changing motivations of multinationals, where, since the 2000s, factors such as infrastructure, expanding markets, human capital and knowledge assets play a central role (Tiong, 2022). The characteristics studied are grouped into four dimensions: ICT, economic, institutional and financial factors (ICT-E-I-F).

2.2.1. Dimension of factors linked to information and communication technologies

Over the past two decades, the global economy has shifted from a resource-based model to a knowledge-based economy. The rapid development of ICTs has fostered the emergence of the digital economy, characterised by a growing flow of intangible data and information, in addition to tangible goods (Tiong, 2022). This economy relies on essential infrastructures, including the internet, mobile and fixed telephones, and broadband networks (Arbia and Sobhi, 2024; Asongu and Odhiambo, 2020), which form the indispensable foundations of the digital economy**.**

Many studies have focused on telecommunications, mainly by analysing fixed and mobile phone subscriptions (Anwar and Nguyen, 2013; Asiedu, 2002; Kok and Acikgoz Ersoy, 2009; Shah, 2014) and internet usage (Blonigen and Piger, 2011; Camarero et al., 2018). This study extends this perspective by incorporating mobile phones and internet use, beyond the traditional analysis of landline phones. Infrastructure is widely recognised as a key factor in attracting FDI, as it reduces operational costs and facilitates production and distribution for multinationals (Ajide and Ibrahim, 2022). However, their role varies from region to region. In sub-Saharan Africa (SSA), Asiedu (2002) observes that they do not significantly attract FDI, while Kariuki (2015) confirms a positive effect of improved infrastructure in Africa. For the Common Market for Eastern and Southern Africa (COMESA) countries, Meressa (2022) identifies telephone subscriptions as a key determinant. In the Middle East and North Africa (MENA) region, underdeveloped infrastructure limits its influence on FDI (Abdel-Gadir, 2010). However, Jiménez (2011) highlights their positive role in European FDI flows to North Africa, and Bouklia and Zatla (2001) confirm their importance in Mediterranean countries. In Nigeria, Yohanna (2013) shows that infrastructure has a significant impact on FDI. On the other hand, in Morocco, telecommunications promote the attractiveness of FDI, according to Azeroual and Cherkaoui (2015). However, Lam'hammdi and Makhtari (2018) found no significant influence. These discrepancies highlight the importance of the regional context and the level of infrastructure development.

2.2.2. Dimension of economic factors

Access to local and neighbouring markets, characterised as 'market research', is a major motive for FDI. This motive is based on market size (GDP, GDP per capita), growth potential and trade openness (Tiong, 2022). In Africa, these factors, combined with adequate infrastructure, high human capital and rapid growth, favour FDI (Ajide and Ibrahim, 2022; Asiedu, 2002). However, obstacles such as dependence on raw materials and macroeconomic instability remain (Brown and Ibekwe, 2018).

In the MENA region, similar determinants emerge: economic size, trade openness and quality infrastructure (Abdel-Gadir, 2010). Trade openness plays an ambiguous role here: while it stimulates export-oriented FDI, tariff barriers can also act as an incentive to circumvent these restrictions (Rogmans and Ebbers, 2013). In Tunisia, market size and infrastructure are key, while inflation acts as a brake (Thaalbi, 2013). In Morocco, FDI is attracted by skilled human capital, trade openness and political stability, although credit to the private sector remains a challenge (Arbia et al., 2023a; Moujahid & Khariss, 2021; Azeroual and Cherkaoui, 2015). Cross-cuttingly, key drivers include market size, economic openness and macroeconomic stability, amplified by human capital and strong institutions (Eicher et al., 2012).

2.2.3. Dimension of institutional factors

Institutional and political determinants play a central role in attracting FDI. Political stability, the quality of institutions and governance directly influence investment decisions. Studies such as those by Hakimi and Hamdi (2017) show that strong institutions, measured by indicators such as anti-corruption and regulatory quality, encourage FDI flows, while corruption and political instability discourage them (Asiedu, 2006).

Although democracy protects property rights and stabilises the business environment, it can sometimes reduce FDI by restricting monopolistic behaviour (Ajide and Ibrahim, 2022). Conversely, some autocratic regimes attract investors thanks to simplified regulations, despite the risk of expropriation. Indices such as the Worldwide Governance Indicators (WGI) and the Index of Economic Freedom (ILE) show that transparent and efficient institutions stimulate FDI (Daude and Stein, 2007). However, in regions such as East Asia, greater control over corruption can paradoxically act as a brake on FDI by increasing entry costs (Camarero et al., 2021). In the MENA region, governance and

political stability are determining factors for FDI (Abdel-Gadir, 2010). In Morocco, although institutional progress is attracting FDI, challenges such as corruption persist (Azeroual and Cherkaoui, 2015). Finally, global studies confirm that countries with solid and transparent institutions remain the most attractive to investors in the long term (Ali et al., 2010).

2.2.4. Dimension of financial factors

Access to finance is a key factor for FDI, as these investments involve high upfront costs, requiring a solid financial system in host countries (Buch et al., 2009). Internationally, research has shown that financial development plays a key role in attracting FDI, notably by improving the allocation of resources and diversifying risks, thereby creating a favourable environment for foreign investment (Alfaro et al., 2009). For example, in Malaysia, Tang et al. (2014) showed that financial development has a significant impact on inward FDI, while in Oman, Al Shubiri (2016) highlighted the positive influence of financial indicators such as currency velocity. These global results are complemented by regional studies that illustrate specific dynamics. In the MENA region, for example, financial development has been identified as a key factor in maximising the impact of FDI on economic growth, although the effects vary across contexts. In Tunisia and Turkey, reforms such as banking liberalisation and the strengthening of financial markets have reduced the cost of access to capital, thereby encouraging FDI (Kutan et al., 2017). In Morocco, on the other hand, despite financial progress, the impact on FDI remains limited due to poorly optimised credit for the private sector (Arbia et al., 2023a; Azeroual and Cherkaoui, 2015). In Africa, limited private credit is a major obstacle to attracting FDI (Ajide and Ibrahim, 2022). However, work such as that by Sghaier and Abida (2013) has shown that a robust financial sector amplifies the positive effects of FDI on economic growth in countries such as Tunisia, Algeria and Egypt. These studies highlight the critical role of financial reforms in maximising the impact of FDI on local economies. Empirical studies show that financial development is an essential condition for maximising the impact of FDI, but that its effects vary according to geographical and economic contexts, requiring reforms tailored to each country in order to guarantee a favourable environment for foreign direct investment.

3. DATA AND METHODOLOGY

3.1. Data

The data, taken from the World Development Indicators (WDI), the Heritage Foundation, Global Financial Development, the International Monetary Fund (IMF) and the International Telecommunication Union (ITU), are based on empirical studies and the country's specific characteristics, and are used to select thirteen explanatory variables divided into four dimensions (ICT, economy, institutions and finance), with the flow of FDI (% of GDP) as the main variable. First, the ICT analysis incorporates fixed telephone subscriptions (FTS), mobile telephone subscriptions (MTS) and internet use (IU), and to address multicollinearity, a principal component analysis (PCA) identifies principal component 1 (PC1), based on MTS and IU to construct a composite telecommunications index (ITI), while FTS is treated separately (Table 1), thus ensuring a robust and tailored interpretation of telecommunications in the context of FDI.

Secondly, the economic variables include GDP per capita (GDPpc), gross fixed capital formation in relation to GDP (GFCF), trade openness (trade), GDP growth rate (GDPg), inflation (INF), tax incentives (Tax) and human capital (HC). These data come mainly from the WDIs, with the exception of the Tax variable, which was collected from The Heritage Foundation.

Third, institutional variables include two main indicators: the index of economic freedom (IEF) and the governance of index (GI). For the IEF, based on the approach of Kang and Jiang (2012) and Tiong (2022), this study uses the IEF, calculated as the average of five sub-indices: business freedom, financial freedom, anti-corruption, monetary freedom and property rights. Scored from 0 to 100, the EFI reflects the level of economic liberalisation, using data from the Heritage Foundation.

For the GI, the method of Kaufmann et al. (2007) is adopted to measure institutional distance through a GI. Calculated as the average of six dimensions (control of corruption, government effectiveness, political stability, quality of regulation, rule of law and freedom of expression), the GI ranks countries on a scale of 0 to 100, with data taken from the World Bank's Worldwide Governance Indicators (WGI).

Fourth, the financial variables include the financial market size (FMS), a variable often neglected in the literature on the determinants of FDI (Islam and Beloucif, 2024), thus bringing an innovative aspect to this study. In addition, the financial sector development indicator (FSDI) is used, calculated as the weighted average of liquid liabilities, credit to the private sector and bank credit extended to the private sector. This study, covering the period 1995-2023, uses the quadratic match-sum method to convert annual data into quarterly data, following the approach of Sbia et al. (2014).

3.2. Methodology

3.2.1. Model specified

Research on FDI, based on the OLI paradigm, emphasises location advantage in analysing pull factors. With digitalisation and globalisation, ICTs and economic, political and social institutions

Table 1: Eigenvalues, difference, cumulative proportion of variation, factor loadings and correlation matrix

Principal component (PC)	Eigenvalue	Difference	Proportion
Variable			
1	2.561	2.142	0.853
2	0.419	0.400	0.993
3	0.018	-	1.000
Factor loadings	**PC 1**	**PC 2**	**PC 3**
Variable			
FTS	0.520	0.853	0.032
IU	0.601	-0.393	0.695
MTS	0.606	-0.342	-0.717
Correlation matrix	**FTS**	**IU**	**MTS**
FTS	1.00		
IU	0.66	1.00	
MTS	0.68	0.98	1.00

play a key role. This study, focusing on Morocco, uses the BMA method to analyse the impact of ICT, the economy, institutions and finance (ICT-E-I-F) on FDI. The ICT-E-I-F model is defined by Equation 1:

$$FDI = f(ICT, E, I, F) \quad (1)$$

ICT represents the telecommunications related elements of the ICT domain. The economic dimension (E) integrates various economic factors such as domestic investment, market size, market potential, macroeconomic stability, investment incentives and human capital. The institutional dimension (I) covers institutional aspects, in particular the governance indicator and the index of economic freedom. Finally, the financial dimension (F) includes the financial sector development indicator and the financial market size of the.

Different theories, such as the perfectly competitive market (Kemp, 1964; MacDougall, 1958) and market imperfections (Hymer, 1960), explain FDI flows. No single model covers all types of investment, hence the frequent adoption of an eclectic approach, described in equation 2 as follows:

$$Y_t = \psi_0 + \sum_{i=1} ICT_t + \sum_{i=1} Economic_t + \sum_{i=1} Institutional_t + \sum_{i=1} Financial_t + \varepsilon_t \quad (2)$$

Yt represents the FDI/GDP ratio, used to reflect the Moroccan economy's dependence on FDI. This measure, supported by studies such as Ajide and Ibrahim (2022); Arbia et al. (2023a); Asiedu (2002), justifies liberalisation and incentive policies aimed at attracting more foreign investment.

The factors in the ICT-E-I-F model include ICT (fixed telephone subscriptions and ITI index), economic factors (domestic investment, market size and potential, macroeconomic stability, investment incentives, human capital), institutional factors (IEF and IG) and financial factors (financial market size and financial sector development indicator). This model, used to analyse inward FDI flows to Morocco, is represented in equation (3) as follows:

$$FDI_t = \alpha_0 + \alpha_1 FTS_t + \alpha_2 ITI_t + \alpha_3 GFCF_t + \alpha_4 GDPpc_t + \alpha_5 Trade_t + \alpha_6 GDPg_t + \alpha_7 INF_t + \alpha_8 Tax_t + \alpha_9 HC_t + \alpha_{10} GI_t + \alpha_{11} IEF_t + \alpha_{12} FSDI_t + \alpha_{13} FMS_t + \varepsilon_t \quad (3)$$

Equation (3) models FDI inflows to Morocco over period t, with ε representing a stochastic error term. The dependent variable (FDI_t) measures net FDI flows as a percentage of GDP. The independent variables include: fixed telephone subscriptions (FTS_t), ICT infrastructure composite index (ITI_t), gross fixed capital formation ($GFCF_t$), GDP per capita ($GDPpc_t$), trade openness ($Trade_t$), GDP growth ($GDPg_t$), inflation rate (INF_t), tax burden (Tax_t), human capital (HC_t), governance indicator (GI_t), index of economic freedom (IEF_t), financial sector development indicator ($FSDI_t$), and financial market size (FMS_t). Each coefficient (αi) quantifies the marginal impact of these factors on FDI flows.

The logarithmic transformation, often used in the literature (Arbia and Sobhi, 2024; Asongu and Odhiambo, 2020), normalises the data, improves linearity and facilitates interpretation. For this study, the dependent variable remains untransformed, while most of the independent variables (except GDPg, INF, ITI, FSDI, and FMS) are transformed into natural logarithms to interpret temporal changes.

3.2.2. Econometric methodology: BMA for linear regression

This section presents the analytical approach used to study the effects of ICT, economic, institutional and financial factors on FDI flows to Morocco. Within the basic framework of a simple linear model represented in equation 4:

$$y_t = x_t \beta + z\alpha + \varepsilon_t \quad (4)$$

In this model, y_t represents FDI flows for period t. The explanatory variables x_t include global factors (ICT, economic, institutional and financial), while z groups together characteristics that are specific to and constant in Morocco. The coefficients β and α measure the impact of these variables, and ε_t is the stochastic error term reflecting unexplained variations. If z is restricted to Morocco specific characteristics and a constant, the equation simplifies to a linear regression, presented in equation 5.

$$y_t = x_t \beta + c + \varepsilon_t \quad (5)$$

In this study, the BMA method for linear regression is used to manage uncertainty in the selection of explanatory variables by averaging quantities of interest, such as model parameters, over the set of possible models. With 13 explanatory variables considered (K = 13), the total number of possible models is 213 = 8192. According to the Bayesian framework, the a posteriori distribution of any quantity of interest, θj (=βj, σ, α), is a weighted average of the a posteriori distributions computed for each model. The total probability of the a posteriori distribution, given data D, is expressed in Equation 6 as:

$$P(\theta^j \mid D) = \sum_{J=1}^{J} P(\theta^j \mid M^j, D)\, P(M^j \mid D) \quad (6)$$

Where P(θj|Mj,D) is the a posteriori distribution of θj, given the model Mj, and P(Mj|D) is the probability that Mj is the correct model. The a posteriori distribution of θj is thus an average of the a posteriori distributions of the different models studied, weighted by the models' a posteriori probabilities (PMPs). The a posteriori probability of a model, or PMP (P(Mj|D), is given by the following equation 7:

$$P(M^j / D) = \frac{P(D / M^j)P(M^j)}{\sum_{n=1}^{J} P(D / M_n)P(M_n)} \quad (7)$$

Where P(Mj) represents the a priori probability that Mj is the correct model, and P(D|Mj) corresponds to the marginal probability of the data under model Mj, and is written in the following equation 8:

$$(D/M^j) = \int P(D/\beta^j, M^j) P(\beta^j/M^j) d\beta^j \quad (8)$$

Where βj denotes the vector of parameters of model Mj, P(βj|Mj) corresponds to the a priori density associated with model Mj, and

P(D|βj,Mj) represents the probability of the data conditional on the model parameters. The a posteriori probability of inclusion (PIP) determines the weight assigned to each explanatory variable, as shown in equation (9):

$$(\beta^{j} / D) = \sum_{j=1}^{J} P(\beta^{j} / M^{j}) P(M^{j} / D) \quad (9)$$

Implementing the BMA requires an a priori probability to be assigned to each model. In case of uncertainty, a uniform distribution is often used, assuming that all models are equally likely. As recommended by Antonakakis and Tondl (2015) and Vakhitova and Alston-Knox (2018), a uniform a priori remains a simple and common choice and is shown in Equation 10 as follows:

$$P(M^{j}) = \frac{1}{2^{K}} \quad (10)$$

The unit information prior (UIP), estimated by the Bayesian information criterion (BIC) (Raftery, 1995), is sensitive to a priori influencing the integrated likelihood (Eicher et al., 2009). Despite criticism of uniform a priori (Antonakakis and Tondl, 2015), they remain preferred in more than 50% of BMA studies (Fragoso et al., 2018) and were retained for this analysis.

4. PRESENTATION OF RESULTS

4.1. Preliminary Analysis

Table 2 presents the descriptive statistics for the variables studied. The data show significant heterogeneity between variables. For example, FDI has a mean of 0.5394 with moderate variability (SD of 0.3051), while the ITI variable, representing terms of trade, has a mean close to zero (0.0006) with low dispersion (SD of 0.0004). Logarithmic variables such as GDPpc, Trade and FTS show relatively low standard deviations, indicating data stability. In contrast, GDPg shows a high amplitude between its minimum (-4.7523) and maximum (3.4010), indicating significant economic variability.

Table 3 also shows the correlation matrix for the explanatory variables. The maximum value observed is 0.68, which is still below the threshold of 0.7. The correlation coefficients therefore indicate that the variables are not highly correlated.

Table 2: Summary of descriptive statistics

Variable	Mean	Maximum	Minimum	SD
FDI	0.5394	1.6965	0.0408	0.3051
LFTS	13.1004	13.7551	12.5252	0.3963
ITI	0.0006	0.0040	−0.0001	0.0004
LGFCF	1.8776	2.0608	1.6882	0.0980
LGDPpc	6.4464	6.8773	5.8156	0.3434
LTrade	2.7902	3.2583	2.4259	0.2054
GDPg	0.8885	3.4010	−4.7523	1.0552
INF	0.5084	1.8899	0.0392	0.4327
LTax	2.8052	2.8964	2.6403	0.0628
LHC	3.6192	3.9376	3.1725	0.2177
LGI	2.3698	2.5126	2.2136	0.0856
LIEF	2.6815	2.8073	2.4842	0.0778
FDSI	0.3019	0.4413	0.1406	0.0826
FMS	0.0561	0.0693	0.0241	0.0115

SD stands for Standard Deviation. 'L' indicates that the variable is in the form of a natural logarithm

4.2. Analysis of Stationarity

Applied econometrics is essential for quantitative analysis, but the non-stationarity of time series is a major challenge, leading to biases in regressions (Jalil and Rao, 2019). This non-stationarity manifests itself in the absence of a long-term mean and an increasing variance over time, compromising the precision of the estimates. This study uses Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to analyse the stationarity of the variables (Table 4). The results show that some variables (Trade, GDPg, Inflation, ITI) are stationary at level I(0), while others become stationary only after differentiation I(1). As the majority of variables are non-stationary in level, a transformation is necessary to avoid bias in the econometric models. The significance levels (10%, 5%, 1%), the Schwarz criterion for the choice of lags and the methodology of Dolado et al. (1990) confirm the robustness of the results, underlining the importance of dealing with non-stationarity before any econometric estimation.

4.3. BMA Analysis in Linear Regression: Comparison with the Ordinary Least Squares (OLS) Method

The uncertainty associated with a single model can be reduced using the BMA, which averages the results over all possible models. Analyses including OLS were carried out. Table 5 compares the BMA and OLS regression results for models 1(a) and 1(b) respectively.

The results of the OLS regression, presented in model 1(b) (Table 5), were analysed by examining the coefficients and diagnostics of the residuals. Autocorrelation and heteroscedasticity tests were performed. Although autocorrelation does not affect the consistency of OLS estimates, it does reduce their effectiveness (Drukker, 2003). The Durbin-Watson (DW) statistic, used to detect autocorrelation, indicates a positive autocorrelation of the residuals with a value of 0.52 (Durbin and Watson, 1992). This situation can lead to an underestimation of the estimated standard deviations and compromise the effectiveness of the results. In addition, the Breusch-Pagan test revealed significant heteroscedasticity (p-value = 0.00 < 0.05), highlighting the need to correct these problems to ensure the validity of the conclusions.

The BMA in linear regression, unlike OLS regression, reduces uncertainty by averaging the parameters over several models. In the absence of prior knowledge, a uniform prior is commonly used (Raftery et al., 1997). Model 1(a) (Table 5) presents the results of the BMA with the PIP, means and standard deviations a posteriori. The PIP measures the robustness of the explanatory variables for the FDI (Arin and Braunfels, 2018), while the means and standard deviations assess the size, sign and precision of the coefficients (Feldkircher et al., 2014). A PIP ≥ 50% indicates a probable effect, according to Raftery (1995), with a threshold recommended by Antonakakis and Tondl (2015).

According to Table 5, Model 1(a) highlights PIP for each explanatory variable, with values above 50% in bold. The BMA results identify fixed telephone subscriptions (FTS), GDP per capita (GDPpc), trade openness (Trade), GDP growth (GDPg), human capital (HC), inflation (INF), taxation (Tax) and financial market size (FMS) as major FDI attractors. Table 6 confirms these

Table 3: Correlation matrix of explanatory variables

Variable	LFTS	ITI	LGFCF	LGDPpc	LTrade	GDPg	INF	LTax	LHC	LGI	LIEF	FSDI	FMS
LFTS	1.00												
ITI	0.26	1.00											
LGFCF	0.56	0.20	1.00										
LGDPpc	0.46	0.05	0.41	1.00									
LTrade	0.49	0.07	0.64	0.66	1.00								
GDPg	−0.09	0.12	−0.08	−0.04	−0.09	1.00							
INF	−0.09	−0.07	−0.01	−0.09	0.05	0.09	1.00						
LTax	0.41	0.00	0.40	0.60	0.44	−0.19	−0.22	1.00					
LHC	0.32	0.07	0.28	0.52	0.50	−0.02	−0.05	0.31	1.00				
LGI	−0.28	−0.11	−0.48	−0.49	−0.52	−0.09	0.06	−0.33	−0.40	1.00			
LIEF	0.00	−0.42	−0.19	0.16	0.05	−0.15	−0.10	0.19	0.12	0.18	1.00		
FSDI	0.58	0.11	0.49	0.67	0.68	−0.18	−0.12	0.58	0.53	−0.33	0.14	1.00	
FMS	0.41	0.09	0.40	0.37	0.38	−0.04	−0.15	0.35	0.36	−0.30	0.03	0.43	1.00

'L' indicates that the variable is in natural logarithm form

Table 4: Stationarity analysis of variables

Variable	ADF test		PP test		Decision
	I (0)	I (1)	I (0)	I (1)	
FDI	−2.360	−4.039***	−2.457	−8.173***	I (1)
LFTS	−1.671	−2.825***	−1.366	−4.900***	I (1)
ITI	−8.616***	–	−9.406***	–	I (0)
LGDPpc	−1.823	−1.985**	−1.405	−5.443***	I (1)
LTrade	−3.231*	–	−3.228*	–	I (0)
GDPg	−2.724*	–	−6.970***	–	I (0)
LHC	−1.169	−5.851***	−1.760	−5.257***	I (1)
INF	−3.290**	–	−3.560***	–	I (0)
LGFCF	−1.982	−3.177***	−1.496	−5.199***	I (1)
LTax	−1.719	−2.530**	−1.716	−5.746***	I (1)
LGI	−2.091	−2.615***	−1.742	−6.090***	I (1)
LIEF	−2.132	−2.459**	−1.639	−5.434***	I (1)
FDSI	−1.411	−6.098***	−2.023	−5.844***	I (1)
FMS	−1.631	−5.556***	−1.845	5.313***	I (1)

*, ** and *** represent significance at the 10%, 5% and 1% respectively. The choice of optimal exogenous variables is based on the methodology of Dolado et al (1990). The criterion used to determine the lags of each variable is the Schwarz criterion (SC)

Table 5: BMA and ordinary least squares results

Variable	Model 1(a): BMA in linear regression			Model 1(b): ordinary least squares		
	PIP	Post Mean	Post SD	Coefficient	Standard Error	Probability
ICT-dimension						
Fixed telephone subscriptions (FTS)	0.80	−0.27	0.17	−0.236	0.214	0.2731
ICT telecommunications infrastructure (ITI)	0.04	2.12	17.93	48.724	69.058	0.4821
E-dimension						
Gross fixed capital formation (GFCF)	0.09	−0.08	0.35	0.061	0.914	0.9473
GDP per capita (GDPpc)	0.52	−0.34	0.41	−0.820**	0.338	0.0170
Trade openness (Trade)	1.00	2.41	0.43	2.388***	0.637	0.0003
GDP growth (GDPg)	0.63	0.03	0.03	0.069**	0.029	0.0176
Inflation (INF)	1.00	−0.63	0.11	−0.580***	0.102	0.0000
Taxation (Tax)	0.96	−3.56	1.35	−3.481***	1.241	0.0060
Human capital (HC)	1.00	−0.7	0.16	−0.891***	0.184	0.0000
I-dimension						
Governance indicator (GI)	0.17	−0.15	0.52	−1.250	0.936	0.1848
Index of economic freedom (IEF)	0.06	0.02	0.15	0.730	0.528	0.1702
F-dimension						
Financial sector development indicator (FSDI)	0.09	−0.16	0.78	0.473	1.985	0.8121
Financial market size (FMS)	0.52	3.51	4.12	7.373**	3.603	0.0433
Constant	1.00	12,67	3	15.790***	5.091	0.0025
R-Squared	0.4746			0.48		
Bayesian info criterion (BIC)	−36.63276					
Posterior model probability (PMP)	0.111103					
Durbin-watson (DW) statistic				0.52		

*** and ** indicate significance levels of 1% and 5% respectively

Table 6: OLS regression applied to attractiveness factors from the BMA model

Variable	Coefficient	Standard Error	Probability
Fixed telephone subscriptions (FTS)	−0.281***	0.103	0.0073
GDP per capita (GDPpc)	−0.522**	0.216	0.0176
Trade Openness (Trade)	2.503***	0.353	0.0000
GDP growth (GDPg)	0.058***	0.022	0.0084
Inflation (INF)	−0.613***	0.085	0.0000
Taxation (Tax)	−3.320***	0.832	0.0001
Human capital (HC)	−0.726***	0.141	0.0000
Financial market size (FMS)	6.837**	2.973	0.0234
constant	12.417***	2.041	0.0000
R-squared	0.4746		
Durbin-watson stat	0.5206		

*** and ** indicate significance levels of 1% and 5% respectively

results by showing that the coefficients of the attractiveness factors are very close to the a posteriori average coefficients of model 1(a), which reflects a high degree of consistency in the estimates.

5. DISCUSSION OF THE RESULTS

This analysis, based on the BMA for linear regression, highlights the main factors determining the attractiveness of FDI in Morocco. These factors include fixed telephone subscriptions (FTS), GDP per capita (GDPpc), trade openness (Trade), GDP growth (GDPg), human capital (HC), inflation (INF), taxation (Tax) and the financial market size (FMS). Fixed telephone subscriptions (PIP = 0.80), have a moderate but negative effect on FDI, which can be attributed to several reasons. On the one hand, the lack of modern infrastructure adapted to new technologies discourages investors. Secondly, the positive effects of ICTs take time to fully materialise, although the Digital Plan 2030 adopted by Morocco aims to modernise these infrastructures to enhance its attractiveness. Lastly, rapid modernisation of ICTs may divert some investment towards electronic multinational enterprises (e-MNEs) or low-capital commitment models, thereby limiting traditional FDI flows.

In economic terms, GDP per capita (PIP = 0.52) appears to be a significant but negative factor, reflecting Morocco's small market size, a major obstacle to the attractiveness of FDI. This finding is in line with the conclusions of previous studies (Ajide and Ibrahim, 2022; Anyanwu, 2011) and highlights the need to increase purchasing power in order to strengthen competitiveness. In contrast, trade openness (1.00), is proving to be an essential lever for attracting foreign investors, as it reduces restrictions and promotes international trade. Theoretical and empirical literature, including studies by Asiedu (2002), Ajide and Raheem (2016) and Arbia et al. (2023a), confirms the positive relationship between trade openness and FDI. Investors generally favour high-growth countries, as these offer better prospects of profitability (Tiong, 2022).

The results also show that strong market potential, as measured by the GDP growth rate (PIP = 0.63), is a significant factor in attracting FDI. Indeed, the market growth rate, as a key indicator of economic potential, has a positive and determining effect in Morocco. This is due to several interdependent factors. On the one hand, sustained economic growth stimulates domestic demand and makes the country more attractive to foreign investors, attracted by expanding opportunities. Secondly, economic reforms and public policies focused on strategic sectors such as industry, agriculture and energy create a framework conducive to growth and market development. Finally, this dynamic generates multiplier effects across various sectors, consolidating overall economic potential and strengthening Morocco's attractiveness to FDI. These results are consistent with the work of Mottaleb (2007), who also emphasised the importance of economic growth as a lever for attracting FDI.

On the other hand, inflation (PIP = 1.00) acts as a significant brake on the attractiveness of FDI, by increasing operating costs and creating macroeconomic instability. Foreign investors, who are generally risk averse, avoid countries with high inflation rates, which worsen the business climate and have distorting effects on the tax system (Kodongo, 2011). Controlling inflation is therefore crucial to attracting foreign capital. In addition, taxation (PIP = 0.96) acts as a deterrent, due to the high charges it imposes on foreign companies and the uncertainty associated with the complexity of tax systems. This factor, combined with higher operating costs, reduces Morocco's competitiveness against destinations offering more favourable tax regimes (Sekkat and Veganzones-Varoudakis, 2007).

Human capital (PIP = 1.00) is a key factor, but paradoxically it is negatively correlated with FDI. Foreign investors are often looking for low-skilled, low-cost labour to meet their needs. This is particularly true when specialised technical skills or the transfer of know-how are not priorities for foreign companies operating in Morocco. This negative correlation can also be explained by the poor integration of the local population into the multinationals' labour market, a finding already established by studies such as those by Ajide and Ibrahim (2022).

Finally, the size of the financial market (PIP = 0.52) appears to be a moderate but important asset for the attractiveness of FDI in Morocco. A well-developed financial market facilitates links between FDI and the local economy, supports local suppliers and improves access to credit for foreign investors. These elements strengthen investor confidence and create an environment conducive to the efficient allocation of resources (Alfaro et al., 2004). However, this variable remains little explored in the literature, underlining the need for further studies to fully assess its impact.

6. CONCLUSION AND POLICY IMPLICATIONS

Mobilising FDI is a strategic priority for Morocco, which faces economic challenges such as weak domestic resources, a savings deficit, falling international aid and persistent trade deficits. The results of this study, based on the bayesian model averaging (BMA)

approach for the period 1995Q1-2023Q4, reveal that the main attractive factors include trade openness (PIP = 1.00), GDP growth (PIP = 0. 63) and the financial market size (PIP = 0.52), while disincentives such as GDP per capita (PIP = 0.52), human capital (PIP = 1.00), inflation (PIP = 1.00), taxation (PIP = 0.96) and fixed telephone subscriptions (PIP = 0.80) dampen attractiveness.

These results imply priority policy actions: (i) Increasing GDP per capita through policies that boost household incomes to stimulate domestic demand, (ii) controlling inflation through rigorous fiscal and monetary management to reinforce macroeconomic stability, (iii) reducing the tax burden on businesses through appropriate incentives and simplifying procedures, and (iv) modernising ICT infrastructure with a focus on digital technologies to overcome the limitations of fixed-line telephone subscriptions.

However, the study has limitations, particularly in the ICT indicators used, which focus on fixed-line and mobile subscriptions and internet use, and which risk becoming obsolete in the face of the emergence of new technologies. A future analysis incorporating more diversified ICT tools, such as smartphones and broadband networks, would provide a more in-depth understanding of their impact on FDI and help guide public policies towards more effective and competitive development strategies.

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