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TALENT VS. HARD WORK: ON THE HETEROGENEOUS ROLE OF HUMAN CAPITAL IN FDI ACROSS EU MEMBER STATES

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Talent vs. Hard Work: On the Heterogeneous Role of Human Capital in FDI Across EU Member States

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Abstract: This paper explores the intricate relationship between human capital and foreign direct investment (FDI) across 28 European countries from 2003 to 2022. To address this relationship's complex and often ambiguous nature, a Bayesian shrinkage estimator is utilized to capture significant heterogeneity across different regions. The results indicate that the discouraging role of human capital in FDI is most pronounced in the "Eastern bloc," where cost-effectiveness serves as the primary driver of investment. In contrast, efficiency-seeking motives prevail in Western Europe, where higher levels of human capital contribute to increased FDI. Sectoral analysis further reveals that the critical transition for attracting FDI occurs not between the secondary and tertiary sectors, as traditionally believed, but between the tertiary and quaternary sectors. In these advanced sectors, quaternary FDI leverages innovation potential through high-skilled labor, underscoring the critical importance of human capital. These findings highlight the nuanced and region-specific dynamics of FDI, emphasizing the need for tailored policies to maximize the benefits of human capital in attracting foreign investment.

Keywords: human capital; foreign direct investment; regional heterogeneity; multi-speed Europe; Bayesian shrinkage estimator

JEL classification: C11; F21; I25; O14

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This paper explores the intricate relationship between human capital and foreign direct investment (FDI) across 28 European countries from 2003 to 2022. To address this relationship's complex and often ambiguous nature, a Bayesian shrinkage estimator is utilized to capture significant heterogeneity across different regions. The results indicate that the discouraging role of human capital in FDI is most pronounced in the "Eastern bloc," where cost-effectiveness serves as the primary driver of investment. In contrast, efficiency-seeking motives prevail in Western Europe, where higher levels of human capital contribute to increased FDI. Sectoral analysis further reveals that the critical transition for attracting FDI occurs not between the secondary and tertiary sectors, as traditionally believed, but between the tertiary and quaternary sectors. In these advanced sectors, quaternary FDI leverages innovation potential through high-skilled labor, underscoring the critical importance of human capital. These findings highlight the nuanced and region-specific dynamics of FDI, emphasizing the need for tailored policies to maximize the benefits of human capital in attracting foreign investment.

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1. Introduction

The critical importance of human capital in fostering development has been widely acknowledged in both academic and policy-oriented literature (Abbas et al., 2022; Mankiw et al., 1992; Pantelopoulos, 2023; Rossi, 2020; Zhang and Markusen, 1999). As a result, both industrialized and emerging countries prioritize cultivating human capital, recognizing it as a key driver of economic growth (Arokiasamy et al., 2023).

Investing in human capital not only enhances business efficiency but also significantly shapes nations' and governments' innovation capacity (Diebolt and Hippe, 2019; Ederer, 2006). Foreign Direct Investment (FDI), when harnessed effectively, can

amplify these dynamics; FDI that leverages human capital has the potential to improve productivity and facilitate technology transfer within host countries (Dhrifi, 2015; Saha, 2023).

Nevertheless, the interplay between human capital and FDI remains a contentious topic in the development literature. While there is widespread theoretical agreement that human capital significantly contributes to FDI attraction (Barro, 1991; Becker, 1964, 1994; Mankiw et al., 1992), empirical studies fail to consistently provide conclusive findings (Abbas et al., 2022; Borensztein et al., 1998; Kheng et al., 2017; Pantelopoulos, 2023). One plausible explanation for these divergent findings lies in the heterogeneous nature of the link between human capital and FDI, which has yet to become the focal point of empirical research.

In this context, previous studies have attempted to address the uncertainty regarding human capital's connection to FDI by proposing the concept of an inverted U-shaped relationship (see, e.g., Osuna, 2016; Rahman et al., 2023; Sethi et al., 2022). However, this approach may not fully capture the variations in the effect of human capital, which can be attributed to divergent investor motives across markets. Efficiency-seeking investors are naturally drawn to countries with a skilled labor force, recognizing the value of human capital (Edziah et al., 2021). Conversely, where FDI is driven primarily by market-seeking or resource-seeking motives, cost-effective labor may serve as the primary attractor instead of human capital (see, e.g., Ly-My and Lee 2019).

Moreover, the sectoral classification of FDI may shed light on the ambiguous role of human capital in attracting FDI. Studies that did not find strong evidence for the importance of human capital often focused on earlier periods when FDI mainly targeted the primary and manufacturing sectors (Schneider and Frey, 1985; Wilhelms and Witter, 1998). In contrast, human capital plays a more prominent role in the present era, possibly

due to the evolving structure of FDI. Nowadays, knowledge-intensive sectors (such as technology and research) acknowledge that a highly skilled workforce is crucial (Castro-Silva and Lima, 2023). Conversely, labor-intensive industries often prioritize low labor costs over human capital (Hou et al., 2021).

Considering that FDI's sectoral composition and investors' predominant motives vary across countries, failing to account for these specific differences—while relying on an aggregate view—may lead to distorted results. For these reasons, this paper seeks to unravel the country- and sector-specific effects of human capital on FDI across the European Union (EU). The EU member countries were selected because, amid the surge of globalization and the ongoing digital transformation, the EU is proactively engaged in enhancing human capital through strategic investments (European Commission, 2024).[1] However, despite this effort, significant disparities in human capital have emerged thus far (Hippe, 2020), while a similar pattern is observed in the variation in attracting FDI (Jirasavetakul and Rahman, 2018).

By applying an iterative Bayesian approach, this study accounts for such heterogeneity in EU host economies, enabling the identification of predominant FDI motives in these countries. The results indicate that the relationship between human capital and FDI significantly varies across EU countries, with higher levels of human capital in the "Eastern bloc" hindering FDI due to the region's focus on labor cost advantages. In contrast, Western European countries exhibit either an insignificant or positive association, highlighting the importance of other determinants, such as market growth and efficiency-seeking motives. Additionally, a detailed view of specific sectoral FDI is provided, showing that quaternary FDI consistently benefits from high-skilled

[1] The investment is primarily channeled via the European Social Fund under the Cohesion Policy.

labor, thereby confirming the original theoretical assumptions. In contrast, other FDI categories do not exhibit the same pattern; while human capital supports tertiary and secondary FDI in only a few countries, this effect is not confirmed for primary FDI.

These findings emphasize the importance of tailored policy approaches to maximize the benefits of human capital in attracting foreign investment. By highlighting the nuanced and region-specific dynamics of FDI, this approach contributes to a more comprehensive understanding of the nexus between human capital and FDI in Europe.

The remainder of this paper is organized as follows. The next section reviews empirical studies on human capital and its role in determining FDI. The third section explains the methodology, including the iterative Bayesian approach and a description of the data used. The fourth section presents the empirical findings and discussion. Finally, the last section summarizes the key findings and offers relevant policy recommendations.

2. Related Literature

The theoretical foundation supporting the significance of human capital, traditionally associated with education (Sweetland, 1996), extends beyond formal learning. It encompasses an individual's knowledge, competencies, skills, ambitions, and other attributes (Arokiasamy et al., 2023; Jagodka and Snarska, 2023). This concept originates from neoclassical growth theory (Lucas, 1990), human capital theory (Becker, 1964, 1994; Schultz, 1961), and endogenous growth theory (Romer, 1989; Mankiw et al., 1992), which posit that human capital acts as a driver of economic growth and investment.

For instance, Lucas (1990), drawing from neoclassical growth models, demonstrates that a limited level of human capital acts as the key factor hindering capital flow from rich to less-developed countries. Similarly, Zhang and Markusen's (1999) model obtains similar conclusions, namely multinational corporations (MNCs) have a

direct need for skilled labor but also rely indirectly on essential social infrastructure, such as transportation networks and legal institutions. The authors argue that even if poor countries offer inexpensive, unskilled labor, a scarcity in these critical areas may deter substantial investment by MNCs. Thus, enhancing the availability and educational quality of educated labor can enhance a country's location advantage (Mina, 2007; Noorbakhsh et al., 2001), potentially attracting increased foreign investment.

While there is consensus on this theoretical hypothesis, empirical studies do not always yield unambiguous conclusions. Nonetheless, these studies offer intuitive reasoning that supports various potential effects of human capital on FDI—whether negative, insignificant, or positive.

For instance, Urata and Kawai (2000) investigate the factors driving FDI by Japanese small and medium enterprises (SMEs). While the authors confirm the importance of both supply-side and demand-side determinants within recipient countries, they also uncover a negative role of skilled labor in Japanese FDI in developing countries. This evidence suggests that Japanese SMEs are interested in employing low-skilled and low-wage labor in these countries.

Similarly, Mina (2007) finds that highly skilled labor discourages FDI inflows to Gulf Cooperation Council (GCC) countries. The author provides two potential explanations: either an increase in human capital may promote domestic investment, or the result reflects the insufficient quality of human capital, which discourages FDI.

Schneider and Frey (1985) focus on the contribution of political and economic determinants of FDI in 80 less-developed countries. While considering both political and economic drivers, a skilled workforce is not found to be a significant determinant of FDI. Instead, the authors emphasize the role of economic development and the balance of payments in the host economies. Likewise, Root and Ahmed (1979) find no association

between various proxies of human capital and increased FDI inflows in the manufacturing sectors of developing countries.

In contrast, several studies confirm the theoretical hypothesis that human capital is pivotal in attracting FDI (see, e.g., Abbas et al., 2022; Kheng et al., 2017; Noorbakhsh et al., 2001; Pantelopoulos, 2023).

In this regard, Noorbakhsh et al. (2001), based on a large sample of developing countries, underscore the significance of human capital, measured by secondary and tertiary enrollment, in attracting investments. The authors highlight this significance alongside other factors such as domestic market growth, macroeconomic stability, and liberalized policies. Abbas et al. (2022) employ extreme bound analysis to examine over 30 potential determinants of FDI inflows to developing countries. The authors use tertiary enrollment as a proxy for human capital and confirm its inevitable role in attracting FDI. They also note that foreign investors seek both cost-effective and skilled labor in host economies. Additionally, Kheng et al. (2017) provide evidence that human capital promotes FDI. In their study of developing countries, they observe that higher levels of education are associated with increased investment.

Considering this diverse range of findings, it is evident that empirical research does not provide conclusive results regarding human capital's contribution to FDI. Several factors may explain this ambiguity. To some extent, the evidence may be sensitive to the choice of explanatory variables (Abbas et al., 2022), which can be subject to the Leamer (1983) critique. It is also important to recognize that investment decision-making involves various determinants that may overshadow the presence of low human capital in certain locations. Among these influential factors, empirical studies highlight market size, trade openness, and infrastructure (see, e.g., Abbas, 2023; Brahim and Dupuch, 2016; Moosa and Cardak, 2006; Pham and Wongsurawat, 2021).

However, some research suggests that this ambiguity may stem from the heterogeneous nature of the relationship between human capital and FDI, which remains underexplored. These studies often follow the Zhang–Markusen (Z-M) inverse U-shape theory (Zhang and Markusen, 1999), which posits that FDI initially increases with rising human capital levels. Beyond a certain threshold, further increases in human capital may not proportionally boost FDI growth due to diminishing returns in attracting FDI.

In this context, empirical research targeting specific regions provides limited evidence. For example, Osuna (2016) investigates the link between human capital and inward FDI within the Mexican federal states between 2007 and 2012. The author identifies a quadratic relationship between FDI and both tertiary and postgraduate enrollment. Interestingly, postgraduate enrollment appears to play a more critical role in attracting FDI.

Similarly, Rahman et al. (2023) present compelling evidence of an inverted U-shaped relationship between human capital and FDI across 20 APEC countries. The authors confirm the importance of human capital in attracting FDI, but only up to a certain threshold. Beyond this point, an excess of human capital could discourage foreign investors, attributed to the increased costs associated with advanced human capital. Additionally, Rahman et al. (2023) note that positive shocks in human capital seem to exert a more substantial effect on FDI inflows than negative shocks.

As far as our knowledge extends, no published research exists on the heterogeneous effect of human capital on FDI for EU countries, despite its relevance for at least two compelling reasons. First, the empirical literature somewhat consistently supports the hypothesis that human capital enhances FDI in developed countries. However, when examining evidence specifically from EU countries, the strength of this relationship is less pronounced (Abbas et al., 2022). This may be attributed to spatial

clusters pointing to EU heterogeneity and the poor process of overall income convergence (see, e.g., Canova, 2004; Le Gallo and Ertur, 2003; Vollmecke et al., 2016). Not only are countries from the Central and Eastern European (CEE) region—part of the EU but with low incomes—often identified as being in a poverty trap or a middle-income convergence trap (Begovic, 2018; Vollmecke et al., 2016), but there is also a current systemic presence of areas with low growth in Western Europe, suggesting the formation of economic clubs (Diemer et al., 2022).

A similar trend applies to inward FDI. It is a well-known trend that, compared to Western EU member states, the CEE countries—as late EU member states—have benefited from FDI by advanced economies mainly due to market-seeking and cost-saving motives (Jirasavetakul and Rahman, 2018), which might contradict the hypothesis regarding the positive role of human capital.

Accordingly, several earlier studies exclusively focus on CEE countries. For instance, Gorg and Greenaway (2002) examine bilateral FDI between the United Kingdom and six CEE countries between 1996 and 2000, finding that higher tertiary enrollment ratios, used as a proxy for human capital, are associated with lower inward FDI stocks. This evidence, therefore, suggests that vertical FDI is predominant in this region, namely that investment decisions are driven by cost considerations. These results align with Masca (2005), who similarly found that higher human capital levels corresponded with reduced FDI between 1997 and 2000 in select CEE countries, including Hungary, Romania, and Slovenia. The East–West differences observed even later (see, e.g., Brahim and Dupuch, 2016) thus support the need for country-specific evidence, given investors' varying motives in these host economies.

The second rationale for conducting this analysis stems from differences related to sectoral FDI classification. In this regard, technology-intensive FDI or FDI in services

may be attracted by an educated labor force, while other labor-intensive sectors may seek inexpensive, uneducated workers (Doytch and Eren, 2012). Marca (2005) further examines select CEE countries individually, finding that this negative relationship holds for Romania and Slovenia, where inward FDI is mainly directed toward sectors with low qualification requirements, such as manufacturing. Conversely, Hungary exhibits a positive connection between human capital and FDI, which could be explained by the fact that FDI in Hungary is more oriented toward higher-value-added sectors, which also require a qualified workforce. This suggests that a basic geographical division between Eastern and Western EU countries may not solely capture the diverse effects of human capital on FDI. A more comprehensive understanding requires considering both geographical and sector-specific breakdowns of FDI.

The contribution of this study is multifaceted. Since previous research has provided limited evidence on the curvilinear relationship between human capital and FDI in specific regions, this study offers new evidence for EU member countries, which may differ not only in FDI motives but also in sectoral structures. Furthermore, to the best of our knowledge, this study is the first to apply the iterative Bayesian approach to examine the heterogeneous role of human capital in FDI. By utilizing the Bayesian shrinkage estimator, the estimates become more stable and less dispersed (Maddala and Hu, 1994; Sevestre, 2002), enabling an individual assessment of human capital's contribution in each country, both for total FDI and specific sectors. In the next section, we elaborate on our estimation strategy.

3. Data and Methods

3.1. Data and descriptive statistics

Given that this study aims to examine the role of human capital in FDI, a key consideration in selecting variables for the analysis is the identification of suitable proxies

for human capital. Since human capital is a multifaceted concept—encompassing knowledge, skills, and competencies—educational attainment is often used as a proxy. This measure reflects the successful acquisition of these attributes through educational certificates and qualifications, which serve as effective substitutes for complex achievement tests (see, e.g., Schneider, 2020).

In line with this approach, the primary proxy variable selected is the share of the population that has successfully completed tertiary education, which includes universities, higher technical institutions, and other forms of advanced education. For data from 2014 onwards, sourced from Eurostat, this corresponds to ISCED (International Classification of Education) 2011 levels 5–8, while for data prior to 2013, it corresponds to ISCED 1997 levels 5–6.

Following previous studies, such as Abbas et al. (2022), Gorg and Greenaway (2002), and Osuna (2016), we opt for tertiary education over secondary or primary education. While primary and secondary education are indirectly linked to human capital, serving as essential prerequisites for tertiary education (Abbas et al., 2022), tertiary education is crucial for attracting foreign investment. It provides a skilled labor force with the capability to support and sustain technological advancements, particularly through the integration and use of information and communication technology (ICT).

For FDI, the data are obtained from the fDi Markets database, a comprehensive repository of greenfield FDI projects maintained by the Financial Times. This database offers detailed information on individual FDI projects, categorized by both source and destination countries, as well as by industry sector. This granularity allows for a thorough examination at a disaggregated level, considering both total FDI capital expenditure and

its sectoral distribution across primary, secondary, tertiary, and quaternary sectors.[2] To ensure comparability, the data are expressed as a percentage of GDP, sourced from the ARDECO database.

In addition to human capital as the primary independent variable of interest, it is also crucial to acknowledge other determinants of FDI. While numerous variables have been examined in empirical studies, not all have consistently proven to be robust determinants. Therefore, we select control variables based on the results of previous studies with systematic literature reviews or employing extreme bounds analysis (EBA) (e.g., Abbas et al., 2022; Chanegriha et al., 2017; Islam and Beloucif, 2024; Pham and Wongsurawat, 2021), thereby ensuring the inclusion of robust FDI determinants in the analysis.

In the baseline model, we incorporate economic growth (*Growth*) and institutional quality (*Quality*), represented by the regulatory quality indicator. Economic growth, calculated using GDP data from the ARDECO database, is considered as one of the robust determinants of FDI (see, e.g., Chanegriha et al., 2017; Eicher et al., 2012). Numerous studies demonstrate a positive relationship between economic growth and FDI, indicating that investors are more inclined to invest in regions with strong economic performance. This positive link can be attributed to factors such as economic stability, prosperity,

[2] It is important to note that the fDi Markets' classification by industry sectors does not follow ISIC aggregation. Nevertheless, we aim to approximate a reasonable classification as closely as possible. In the primary sector, natural resources and mining are included; and in the secondary sector, manufacturing, electricity, water, and construction are included. The tertiary sector includes various services reported in FDI, and the quaternary sector includes information and communication technologies, scientific activities, and education.

increased purchasing power, and improvements in infrastructure and the overall business environment.

Institutional quality is also recognized as a key driver of FDI (see, e.g., Abbas, 2023; Doytch and Eren, 2012). In this study, we employ the regulatory quality indicator from the World Governance Indicators database, published by the World Bank. This indicator reflects the government's perceived ability to implement policies and regulations that foster private sector development. Such measures can attract investors by enhancing the business climate.

Regarding the choice of control variables, it is important to note that we use the iterative Bayesian shrinkage estimator, which estimates a larger number of parameters. This method allows each coefficient to vary across countries, reflecting the diversity of explanatory variables. Given the large number of countries in the study, we adopt a more parsimonious model specification with fewer regressors to avoid overfitting and enhance the interpretability of the results. However, we vary the control variables across different model specifications to perform robustness checks, ensuring that our findings are not sensitive to the specific set of controls used, thus reinforcing the reliability of the results. Accordingly, we also consider real GDP per capita (*GDPpc*), political stability (*Stability*), trade openness (*Trade*), and labor costs (*LabCost*), with data sourced from the ARDECO database and the World Bank.

The inclusion of real GDP per capita ensures that we account for market potential, or consumer purchasing power (Ly-My and Lee, 2019). If higher FDI is observed alongside higher GDP per capita, this indicates that investors are attracted by the local market. Conversely, if FDI is higher in countries with lower GDP per capita, investors are likely motivated by advantage of cheap labor, suggesting a preference for vertical FDI.

Political stability is another indicator within the institutional quality group. It can assume that investors seek locations with higher political stability (see, e.g., Brada et al., 2006; Islam and Beloucif, 2024), as it simplifies long-term investment, reduces capital costs, and subsequently results in higher FDI capital expenditure.

Regarding trade openness, previous studies demonstrate a positive relationship with FDI, suggesting that free trade also promotes FDI expansion (Chanegriha et al., 2017). This positive effect can be attributed to improved market access and reduced barriers, which lower the input costs of FDI.

Finally, we expect a negative relationship between labor costs and FDI, as investors are generally attracted to lower costs, which reduce overall expenses, indicating a cost-seeking behavior. However, this relationship may not be straightforward if investors prioritize workforce quality and productivity (see, e.g., Hou et al., 2021).

Table 1. Descriptive statistics

	N	**Min**	**StDev**	**Mean**	**Max**
HC	560	10.700	10.918	36.290	62.600
FDI_total	560	0.088	4.151	2.680	56.178
FDI_prim	560	0.000	1.125	0.256	14.448
FDI_sec	560	0.000	1.710	1.101	15.876
FDI_ter	560	0.000	1.925	0.972	25.198
FDI_quat	560	0.000	0.445	0.349	3.059
Growth	560	-14.475	4.071	2.026	14.496
Quality	560	4.896	0.892	7.356	9.080
GDPpc	560	4074.000	18971.510	27700.000	101293.000
Stability	560	4.051	0.758	6.465	8.374
Trade	560	45.420	65.806	122.280	393.140
LabCost	560	51.300	18.161	102.260	213.500

Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

The analysis spans the longest possible period, from 2003 to 2022.[3] This period covers 28 European countries, including the 27 EU member states and the United Kingdom.[4] Descriptive statistics for all considered variables are presented in Table 1 above.

3.2 The Empirical Iterative Bayes Estimator

To capture the heterogeneous nature of human capital on FDI—whether overall or by sector—traditional panel data estimators are inadequate, as fixed and random panel data models assume coefficient homogeneity.[5] When the heterogeneity of the true model's coefficients is omitted and such models are employed, they may incorrectly confirm a curvilinear relationship (see, e.g., Hsiao, 2003). This implies that the Z-M inverse U-shape theory could be incorrectly validated, even though the actual relationship may differ.

To address this limitation, we adopt the iterative Bayesian approach proposed by Maddala et al. (1997), which effectively accounts for heterogeneity in slopes while maintaining some expected similarity among them, as all parameters are assumed to be drawn from a joint distribution with a common mean and a non-zero covariance matrix. This estimator not only enables us to capture the heterogeneous nature of human capital on FDI across the observed European countries, but it is also preferred for its robustness

[3] FDI data in this disaggregated structure have been available from the fDi Markets database only since 2003.

[4] The United Kingdom is included in the analysis due to its membership in the European Union for the majority of the observed period.

[5] Fixed models account for heterogeneity only in the intercept, while random effects models incorporate it in the random component. Therefore, the estimated coefficients for individual regressors in these models remain constant across both individual and time dimensions.

against non-stationarity bias (see, e.g., Baltagi et al., 2008). Hsiao et al. (1999) demonstrate that, in panel data models with coefficient heterogeneity, this approach yields more stable estimates and more accurate predictions. This is because the two alternative methods—pooling the data or estimating separate coefficients for each cross-section—rely on extreme assumptions, namely cross-sectional homogeneity or complete heterogeneity of slope coefficients.

In the random-coefficients model framework, the Bayesian approach for the FDI – human capital model can be rewritten with the following specification:

$$y_i = X_i \gamma_i + u_i \tag{1}$$

where y_i contains the FDI time series, X_i is the matrix with explanatory variables, and γ_i denote the slope coefficients. In the Bayesian framework, the prior distribution of γ_i is given by $\gamma_i \sim N(\mu, \Sigma)$, where the parameters μ (mean of γ_i), Σ (variance of γ_i), and σ_i^2 (residual variance) are unknown. Therefore, some assumptions must be made regarding the prior specification of these parameters. We can then derive the posterior distribution for the parameters γ_i. On the other hand, if μ, Σ, and σ_i^2 are all known, the posterior distribution of γ_i is normal and calculated by:

$$\gamma_i^* = \left[\frac{1}{\sigma_i^{*2}} X_i' X_i + \Sigma^{*-1} \right]^{-1} \left[\frac{1}{\sigma_i^{*2}} X_i' X_i \hat{\gamma}_i + \Sigma^{*-1} \mu^* \right] \tag{2}$$

where $\hat{\gamma}_i$ is the ordinary least squares (OLS) estimator of γ_i. The posterior distribution mean of γ_i and its variance are shown in Eqs. (3) and (4), respectively:

$$\mu^* = \frac{1}{N} \sum_{i=1}^{N} \gamma_i^* \tag{3}$$

$$V[\gamma_i^*] = \left[\frac{1}{\sigma_i^{*2}} X_i' X_i + \Sigma^{*-1} \right]^{-1} \tag{4}$$

Since Σ and σ_i^2 are generally unknown parameters, it is necessary to specify priors for them. Accordingly, Smith (1973) suggested using the mode of the joint posterior distribution, given by the following equations:

$$\sigma^{*2}_i = \frac{1}{T+\varsigma_i+2}\left[\varsigma_i \lambda_i + (y_i - X_i\gamma_i^*)'(y_i - X_i\gamma_i^*)\right] \tag{5}$$

and

$$\Sigma^* = \frac{1}{T-k-2+\delta}\left[R + \sum_{i=1}^{N}(\gamma_i^* - \mu^*)(\gamma_i^* - \mu^*)'\right] \tag{6}$$

where the parameters ς_i, λ_i, δ, and R arise from the specification of the prior distributions. Moreover, Smith (1973) proposed approximating these parameters by setting $\varsigma_i = 0$, $\delta = 1$, and R as a diagonal matrix with small positive entries (e.g., 0.001). By doing so, the estimators take the following forms:

$$\sigma^{*2}_i = \frac{1}{T+2}\left[(y_i - X_i\gamma_i^*)'(y_i - X_i\gamma_i^*)\right] \tag{7}$$

$$\Sigma^* = \frac{1}{T-k-1}\left[R + \sum_{i=1}^{N}(\gamma_i^* - \mu^*)(\gamma_i^* - \mu^*)'\right] \tag{8}$$

$$\gamma_i^* = \left[\frac{1}{\sigma^{*2}_i}X_i'X_i + \Sigma^{*-1}\right]^{-1}\left[\frac{1}{\sigma^{*2}_i}X_i'X_i\hat{\gamma}_i + \Sigma^{*-1}\mu^*\right] \tag{9}$$

and

$$\mu^* = \frac{1}{N}\sum_{i=1}^{N}\gamma_i^* \tag{10}$$

$$V[\gamma_i^*] = \left[\frac{1}{\sigma^{*2}_i}X_i'X_i + \Sigma^{*-1}\right]^{-1} \tag{11}$$

Eqs. (7–11) should then be solved iteratively, with the initial iteration using the OLS estimator $\hat{\gamma}_i$ to compute μ^*, Σ^*, and σ^{*2}_i. The second iteration is based on the

empirical iterative Bayes estimator γ_i*. The third and subsequent iterations are identical to the second. The empirical Bayes estimator proposed by Maddala et al. (1997) differs from the Smith estimator only in the computation of the parameters $\sigma *_i^2$ and $\Sigma*$, as shown in the following equations:

$$\sigma *_i^2 = \frac{1}{T-k}(y_i - X_i\gamma_i*)' (y_i - X_i\gamma_i*) \tag{12}$$

$$\Sigma* = \frac{1}{N-1}\left[R + \sum_{i=1}^{N}(\gamma_i* - \mu*)(\gamma_i* - \mu*)'\right] \tag{13}$$

We now present the results from applying this procedure to the FDI – human capital model, formulated as follows:

$$FDI_{it} = \alpha_i + \beta_i HC_{it} + \sum_{j=1}^{K}\gamma_{ji} CV_{jit} + \varepsilon_{it} \tag{14}$$

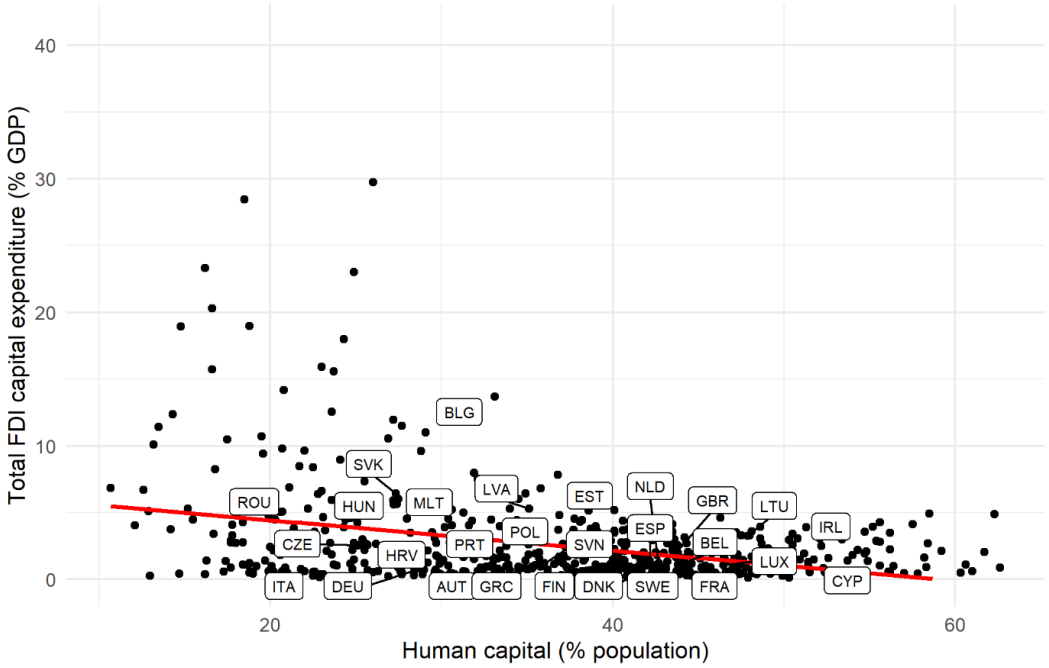
where FDI in the baseline model represents total FDI capital expenditure as a share of GDP (FDI_total_{it}) in the observed European country i in year t (with 2003–2020 as the total study period). The unknown parameters α_i, β_i, and $\sum_{j=1}^{K}\gamma_{ji}$ are specific to each European country, in line with the Bayesian shrinkage estimator. The main explanatory variable of interest, HC_{it}, denotes the share of the population with tertiary education. CV_{jit} represents the control variables: economic growth ($Growth_{it}$) and regulatory quality ($Quality_{it}$) from the baseline model, and subsequently real GDP per capita ($GDPpc_{it}$), political stability ($Stability_{it}$), trade openness ($Trade_{it}$), and labor costs ($LabCost_{it}$). The final term, ε_{it}, represents the error term.

In the sectoral analysis, we estimate additional models, alternating the dependent variable. Specifically, we sequentially introduce FDI from the primary sector (FDI_prim_{it}), followed by the secondary sector (FDI_sec_{it}), tertiary sector (FDI_ter_{it}), and finally the quaternary sector (FDI_quat_{it}). The remaining structure of the model (Eq. (14)) remains unchanged.

4. Empirical Results and Discussion

To explore the nuanced relationship between human capital and FDI in European countries, we first present a scatter plot of these variables, as shown in Figure 1.

Figure 1. The relationship between human capital and total FDI capital expenditure



Note: We depict the pooled observation of our sample (the EU-27 countries and the United Kingdom) in the examined period 2003-2022. The red line presents the corresponding linear regression line. The labels denote mean observations for the countries in the period 2003-2022.
Source: Own elaboration based on data from Eurostat and fDi markets.

While previous studies have identified an inverted U-shaped relationship (Osuna, 2016; Rahman et al., 2023), this pattern does not appear to hold for European countries. The analysis instead reveals that total FDI expenditure is generally higher in countries with lower levels of human capital, as illustrated by the red regression line in Figure 1. This phenomenon may be attributed to the significant role of host economies in Central and Eastern Europe, which lead in total FDI as a percentage of their GDP, despite their

relatively lower levels of human capital. Lithuania is an exception to this trend, aligning with other Western countries on the right side of Figure 1.[6]

Similar conclusions can be derived from the pooled regression, which shows that countries with higher levels of human capital tend to attract less total FDI (see Table A2 in the Online Appendix). This may be because foreign investors perceive these economies as more expensive, leading them to prefer more cost-effective opportunities, which can explain these findings.

This evidence is further supported by Abbas et al. (2022), who argue that MNCs may still depend on skilled domestic labor while seeking more affordable workforces in host countries. These findings are also applicable to the European sample, given the relative geographical proximity between European countries and the ongoing recovery of free intra-EU labor mobility to pre-pandemic levels (see, e.g., European Commission, 2023).

However, it is important to highlight country-level disparities in labor mobility and human capital. By employing a Bayesian shrinkage estimator, the varying effects of human capital on total FDI can be identified. The complete estimation results are presented in Table A2 in the Online Appendix. For clarity and ease of interpretation, country-specific evidence regarding the explanatory variables is illustrated in Figure 2.[7]

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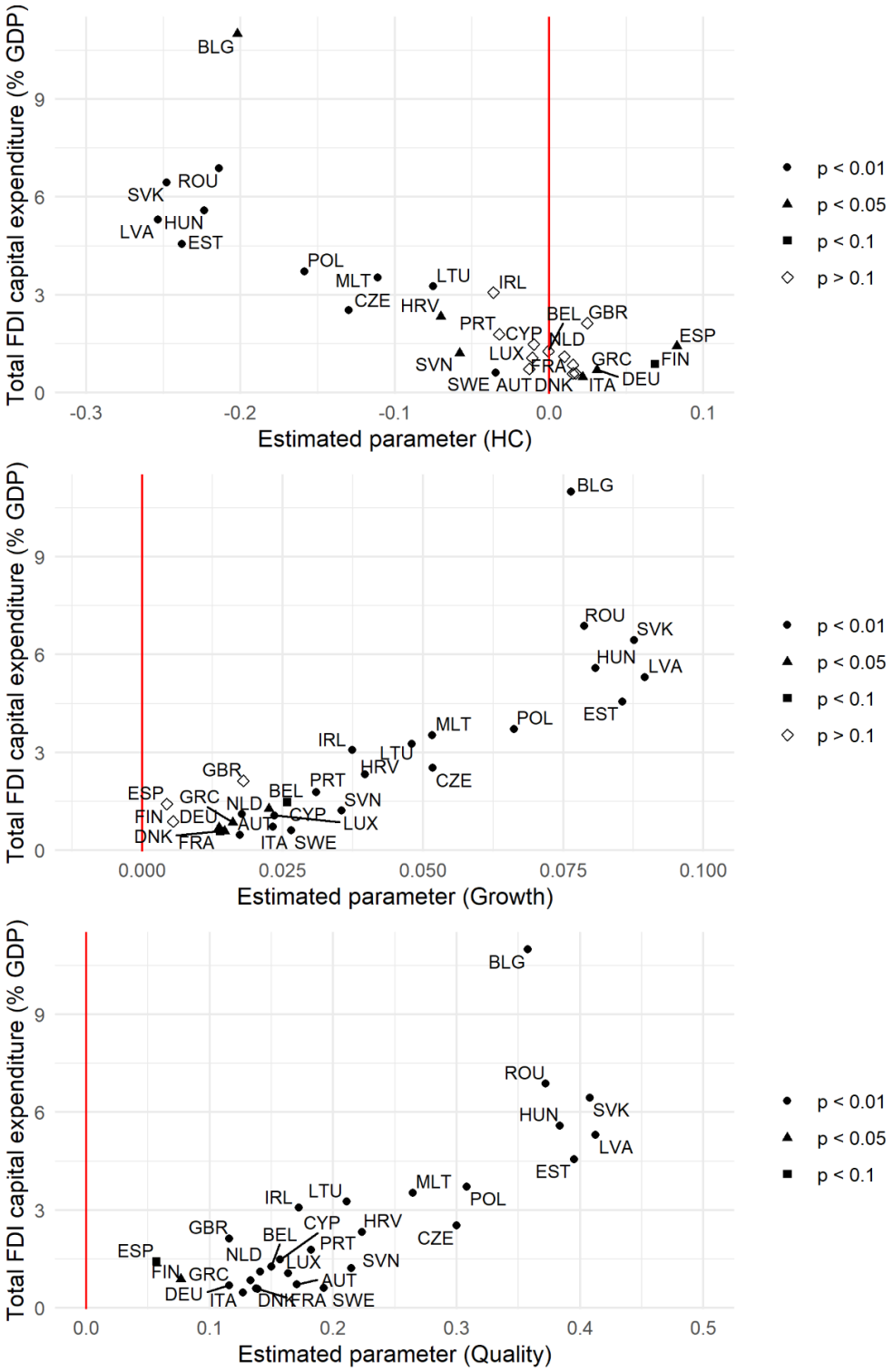
[6] However, it is worth noting that despite Lithuania's high level of tertiary education, the quality of its performance has been subject to scrutiny (see, e.g., Central Bank of Lithuania, 2019).

[7] The robustness of the results is further verified by altering the control variables in the baseline model specification. The results, presented in Table A3 in the Online Appendix, remain qualitatively similar, thereby confirming their robustness.

Figure 2. Estimated coefficients using Bayesian shrinkage estimator: Total FDI model



Note: We depict the estimated regression coefficients related to the human capital variable (HC), economic growth (growth), and institutional quality (quality) in relation to the dependent variable of the model, total FDI capital expenditure (% GDP).
Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

First, economic growth and institutional quality exhibit no significant variation. Both control variables appear to contribute to total FDI in host economies, aligning with previous empirical evidence (see, e.g., Doytch and Eren, 2012; Ly-My and Lee, 2019; Pham and Wongsurawat, 2021). This indicates that investors are inclined to enter European markets with greater growth potential, which can lead to higher returns on investment, and sound institutional quality, which provides stability and a favorable business environment.

On the other hand, the results concerning human capital do not uniformly indicate that higher levels of human capital reduce FDI in the respective countries. This contrasts to the pooled regression, underscoring the rationale for this analysis. The previously observed trend of lower FDI in countries with higher human capital is now primarily evident in "the Eastern bloc" (i.e., in the CEE countries). This outcome may be attributed to the fact that these countries have historically attracted substantial FDI due to competitive labor costs, largely concentrated in the motor vehicles sector. Thus, investors' market-seeking and cost-saving motives appear to remain prominent, as suggested by previous studies (see, e.g., Gorg and Greenaway, 2002; Masca, 2005). Based on these findings, the limited human capital level or low quality of education in these countries can also potentially serve as an opportunity for enhancement through investor-initiated training programs (for more, see, e.g., Kheng et al., 2017).

Conversely, in Western European countries, the effect of human capital on total FDI is either negligible (e.g., in Austria, Belgium, France, and the Netherlands) or explicitly positive. The negligible relationship can be attributed to investors prioritizing other factors, such as domestic market growth. On the other hand, the positive relationship suggests that the efficiency-seeking motive is predominant in the second group of Western European countries.

The role of human capital in promoting FDI has been confirmed in four Western European countries: Finland, Germany, Italy, and Spain. These countries exhibit favorable conditions for attracting FDI due to their skilled labor force and competitive compensation. The importance of human capital from foreign investors' perspective is further supported by examining location determinants cited by companies when announcing specific greenfield FDI projects from 2003 to 2022. According to the fDi Markets database (2024), 16% of investing companies emphasized the availability of a skilled workforce in Finland, Germany, Italy, and Spain, while only 2.5% indicated that lower costs were important.[8]

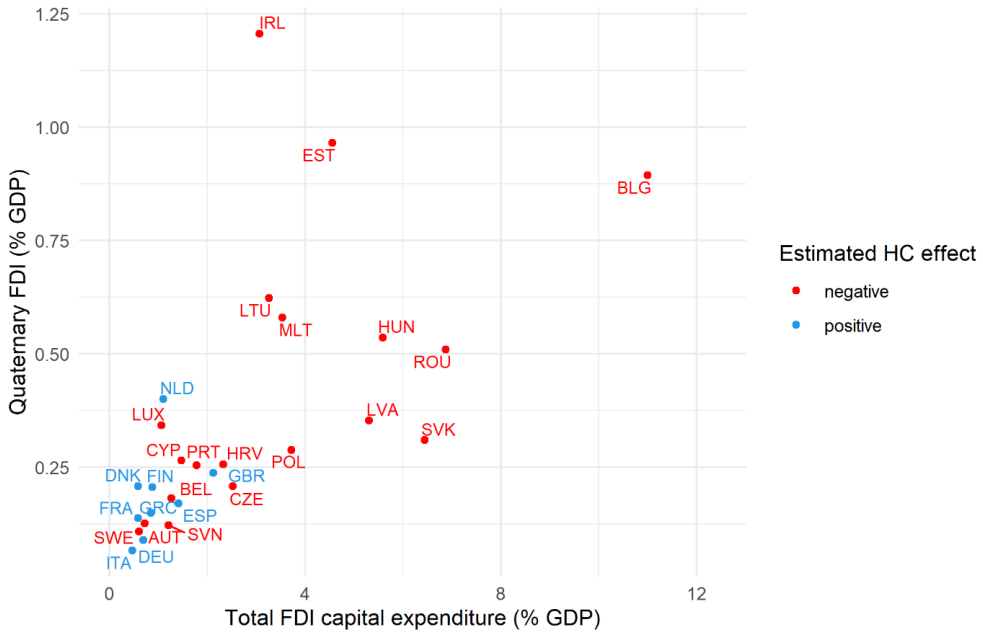
These countries' labor forces comprise not only the domestic population but also migrants from other European countries. According to the European Commission (2023), Germany, Spain, and Italy are the primary destination countries for over half of intra-EU migrants (57%), highlighting their attractiveness from a labor market perspective. Moreover, migrants exhibit a trend of increasing educational levels, which can help address the shortage of engineers and IT professionals, particularly in Germany and Spain.

In this context, it is worth noting that both Germany and Finland—countries where human capital plays a role in promoting FDI—are at the forefront of technological and innovation advancements. This could suggest that the orientation toward high-value-added sectors might partly explain why human capital is advantageous in these countries. This is even though they have a lower share of quaternary FDI in GDP compared to the

[8] It should be noted that FDI motives and determinants were not reported for all considered projects, though it is possible that more motives and determinants were reported for some.

CEE countries, where a deteriorating effect of human capital on total FDI is observed (see Figure 3).[9]

Figure 3. The knowledge-intensive FDI and the effect of human capital

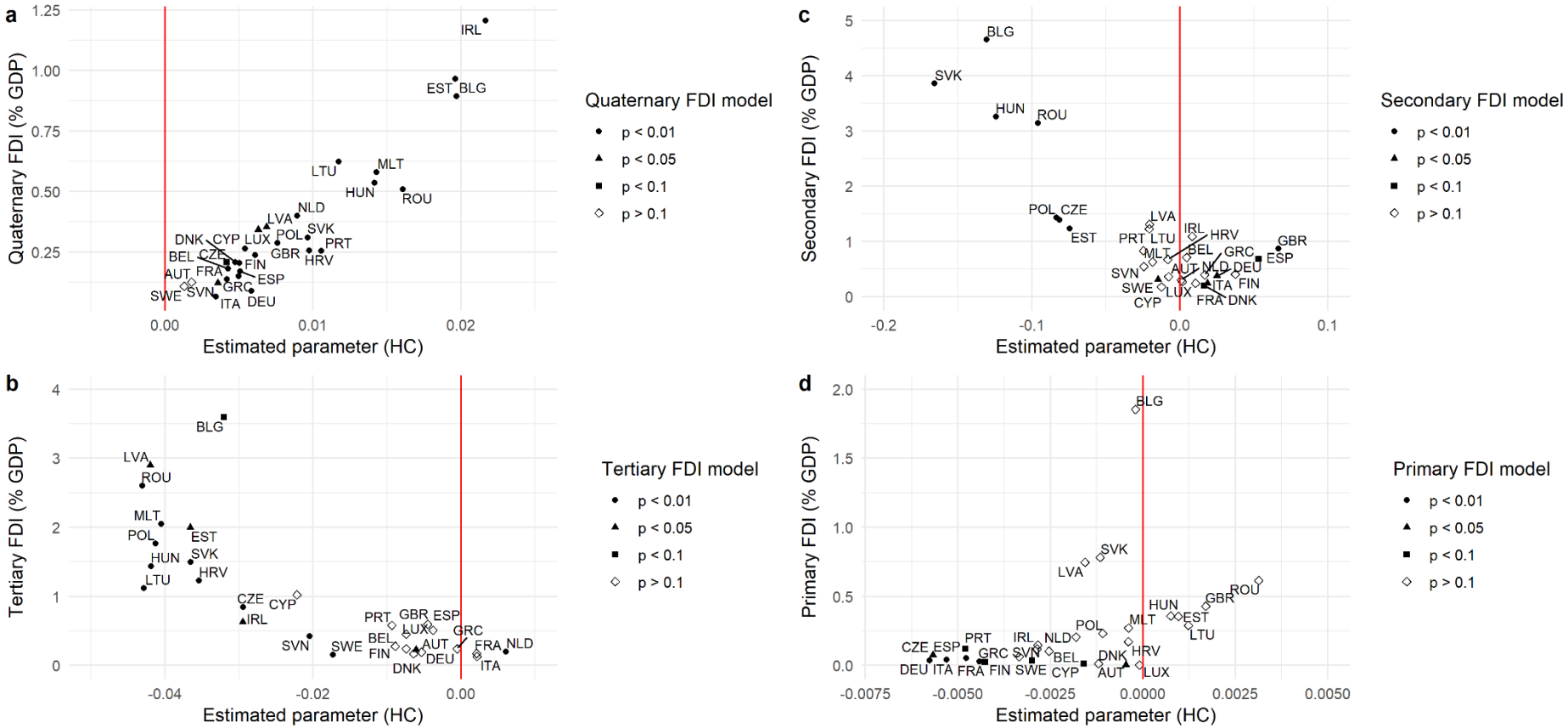


Note: We depict the annual average FDI capital expenditure to the quaternary sector (% GDP) relative to the annual average total FDI capital expenditure (% GDP) during 2003-2022. We color country labels based on the observed human capital effect: positive labels are represented in blue, while negative labels are depicted in red.
Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank

Given that European countries differ in their FDI sectoral structure, reflecting varying investors' motives, it is plausible that heterogeneity arises not only at the national level but also within the context of sectoral classifications. Therefore, the baseline model is re-estimated by replacing total FDI with sectoral sub-indicators—primary, secondary, tertiary, and quaternary FDI. The complete results are available in Tables A4–A5 in the Online Appendix. For clarity, a comparison of estimated coefficients related to human capital across sectors is illustrated in Figure 4.

[9] In absolute terms (million EUR), most countries where a positive human capital effect is observed dominate in the amount of quaternary FDI.

Figure 4. Estimated coefficients related to human capital using shrinkage estimator: Sectoral disaggregation



Note: We depict the estimated regression coefficients related to the human capital variable (HC) in relation to the dependent variable of the model: a. quaternary FDI capital expenditure (% GDP), b. tertiary FDI capital expenditure (% GDP), c. secondary FDI capital expenditure (% GDP), and d. primary FDI capital expenditure (% GDP).
Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

Overall, the estimated effects of human capital on sectoral FDI vary significantly. The most notable results pertain to quaternary FDI (Figure 4a), which includes investments in sectors with the highest value-added, such as high technology, research, and education.

In contrast to total FDI, human capital positively contributes to investments in the quaternary sector across all studied European countries. This suggests that quaternary FDI in host countries benefits from high-skilled labor, confirming the original theoretical assumptions. This finding is logical, as skilled employees can engage in research, foster innovation, and generate intellectual property. By investing in areas with high human capital, investors can leverage this innovation potential.

Among the countries analyzed, Ireland stands out with the highest positive estimated coefficient value for human capital. Ireland notably ranks third among the 27 EU countries in the Digital Economy and Society Index for human capital (European Commission, 2022). This underscores the significance of highly skilled labor, particularly in the Irish ICT sector and the presence of major tech firms in Dublin, which supports these findings.

Regarding tertiary and secondary FDI, a few countries, such as Germany, Italy, and the Netherlands, show substantial benefits from human capital. However, in most instances, the relationship is either negligible or adverse. These findings might initially appear surprising, as Doytch and Eren (2012) found that FDI in services, which fall under tertiary FDI, tends to be attracted by an educated labor force.

On the other hand, human capital is represented by tertiary school enrollment, and the demand for tertiary education (such as college or university degrees) can fluctuate depending on the specific services sub-sector. Highly skilled employees are often required in services such as education or information technology, which fall under quaternary FDI sector. This provides rationale for the findings and demonstrates that the true transition for human capital's role in

attracting FDI lies not between the secondary and tertiary sectors, as traditionally believed, but rather between the tertiary and quaternary FDI sectors.

Finally, for primary FDI, a few European countries, both Western and Eastern, such as the Czech Republic, Germany, and Sweden, show a decrease in investments associated with human capital. The remaining estimated coefficients are negligible. Since the primary sector involves activities such as agriculture, fishing, or mining—typically not requiring tertiary education—it is plausible that MNCs do not seek highly skilled labor when deciding to invest in the host country. In certain situations, a large concentration of highly skilled human capital may even discourage investment. Conversely, this scenario could necessitate the hiring of low-skilled workers at lower wages. However, it is important to conclude that primary FDI has represented the smallest share of FDI in European countries during the period under examination compared to other higher-value-added sectors.

Conclusions

Despite decades of efforts to promote convergence within EU member states, heterogeneity persists across different economies. This paper confirms this phenomenon by examining the role of human capital in attracting FDI in 28 European countries from 2003 to 2022.

While the pooled regression indicates that total FDI appears to be attracted by host economies with lower levels of human capital, these findings obscure differences across countries and the specific sectors into which FDI flows. The primary analysis, based on the Bayesian shrinkage estimator, reveals the heterogeneity in the role of human capital. It suggests that foreign investors seek both cost-effective and skilled labor across various European nations.

The persistent East–West differences notably remain evident. In the CEE countries, human capital is often associated with investors' focus on cost efficiency, while in Western Europe, this relationship is either negligible or beneficial. This can be explained by the fact that

investors in Western European countries are also motivated by additional factors, such as domestic growth potential or the availability of a skilled workforce. The sectoral analysis confirms that the role of human capital is most supportive in quaternary FDI, which requires qualified labor to provide the highest value-added.

Therefore, enhancing human capital across all examined European countries is crucial, particularly to attract quaternary FDI, such as in the research or IT sectors. In this context, CEE countries face several challenges; numerous struggling with insufficient funding for both research and education. Additionally, the challenge lies not only in quantitatively increasing human capital but also in improving its quality. Strengthening this area could not only attract more technologically demanding FDI but also facilitate the catch-up process, which other studies (see, e.g., Vollmecke et al., 2016) suggest is also determined by human-capital-related technological endowment.

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Table A1. Estimation results: Total FDI model (pooled regression)

	Dependent variable: Total FDI		
	(I)	**(II)**	**(III)**
HC	-0.098*** (0.016)	-0.115*** (0.015)	-0.101*** (0.016)
Growth	0.265*** (0.041)	0.279*** (0.040)	
Quality	-0.522*** (0.195)		-0.686*** (0.201)
Constant	9.556*** (1.350)	6.279*** (0.568)	11.385*** (1.369)
AIC	5.492	5.501	5.562
LogLik	-1533.737	-1537.313	-1554.495
R^2	0.185	0.175	0.123
N	560	560	560

Note: Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.
Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

Table A2. Estimation results: Total FDI (Bayesian shrinkage estimator)

	Dependent variable: Total FDI									
	(I)				**(II)**			**(III)**		
	Constant	*HC*	*Growth*	*Quality*	*Constant*	*HC*	*Growth*	*Constant*	*HC*	*Quality*
	-0.265	-0.013	0.023***	0.171***	1.171***	-0.015*	0.021***	-0.415	-0.013	0.192***
AUT	(0.216)	(0.008)	(0.006)	(0.016)	(0.263)	(0.008)	(0.006)	(0.264)	(0.009)	(0.014)
	0.137	-0.001	0.023**	0.150***	1.176	0.002	0.018	-0.310	0.008	0.164***
BEL	(1.262)	(0.035)	(0.011)	(0.04)	(1.553)	(0.035)	(0.011)	(1.522)	(0.035)	(0.014)
	8.438**	-0.202**	0.076***	0.358***	11.564***	-0.216**	0.078***	11.709**	-0.243**	0.168***
BLG	(3.63)	(0.092)	(0.025)	(0.098)	(4.241)	(0.092)	(0.026)	(4.661)	(0.101)	(0.029)
	0.781	-0.01	0.026*	0.157***	2.144	-0.014	0.023	0.430	-0.002	0.157***
CYP	(1.948)	(0.044)	(0.014)	(0.046)	(2.284)	(0.045)	(0.014)	(2.371)	(0.045)	(0.016)
	3.560***	-0.13***	0.052***	0.300***	5.812***	-0.132***	0.051***	4.352***	-0.133***	0.220***
CZE	(0.297)	(0.015)	(0.007)	(0.022)	(0.373)	(0.014)	(0.007)	(0.398)	(0.016)	(0.018)
	-1.159***	0.031**	0.014**	0.116***	-0.206	0.031***	0.01	-1.508***	0.030**	0.166***
DEU	(0.28)	(0.014)	(0.006)	(0.021)	(0.37)	(0.013)	(0.007)	(0.35)	(0.014)	(0.016)
	-1.313***	0.017	0.014*	0.138***	-0.029	0.015	0.011	-1.831***	0.020	0.187***
DNK	(0.486)	(0.015)	(0.007)	(0.02)	(0.625)	(0.015)	(0.007)	(0.560)	(0.014)	(0.014)
	9.866***	-0.238***	0.086***	0.395***	13.874***	-0.263***	0.091***	14.582***	-0.306***	0.174***
EST	(2.195)	(0.064)	(0.017)	(0.071)	(2.727)	(0.065)	(0.018)	(2.872)	(0.071)	(0.026)
	-0.518	0.015	0.016**	0.133***	0.501	0.01	0.013*	-0.694	0.015	0.164***
GRC	(0.445)	(0.015)	(0.007)	(0.02)	(0.559)	(0.016)	(0.007)	(0.505)	(0.015)	(0.014)
	-2.493**	0.083**	0.004	0.057	-2.100	0.083**	-0.001	-4.539***	0.118***	0.133***
ESP	(1.281)	(0.037)	(0.011)	(0.042)	(1.66)	(0.039)	(0.012)	(1.539)	(0.037)	(0.015)
	-2.514**	0.069*	0.005	0.077*	-1.939	0.071*	0.001	-4.035**	0.090**	0.156***
FIN	(1.149)	(0.038)	(0.01)	(0.045)	(1.475)	(0.037)	(0.011)	(1.634)	(0.044)	(0.019)
	-1.131**	0.015	0.015**	0.139***	-0.101	0.015	0.011	-1.403**	0.014	0.184***
FRA	(0.573)	(0.016)	(0.007)	(0.021)	(0.691)	(0.016)	(0.007)	(0.66)	(0.015)	(0.013)
	2.82***	-0.07**	0.04***	0.223***	3.942***	-0.062**	0.034***	3.294***	-0.072***	0.171***
HRV	(0.721)	(0.029)	(0.009)	(0.037)	(0.88)	(0.028)	(0.009)	(0.826)	(0.029)	(0.023)
	8.912***	-0.223***	0.081***	0.384***	11.620***	-0.227***	0.080***	10.825***	-0.236***	0.182***
HUN	(0.984)	(0.037)	(0.01)	(0.045)	(1.257)	(0.037)	(0.011)	(1.231)	(0.039)	(0.027)
	3.21**	-0.036	0.037***	0.172***	4.394***	-0.031	0.032***	2.987*	-0.019	0.112***
IRL	(1.465)	(0.035)	(0.011)	(0.038)	(1.685)	(0.034)	(0.012)	(1.654)	(0.032)	(0.015)

	-0.859***	0.022**	0.017***	0.127***	0.129	0.015	0.015***	-1.190***	0.026**	0.162***
ITA	(0.192)	(0.011)	(0.006)	(0.018)	(0.268)	(0.012)	(0.006)	(0.236)	(0.012)	(0.015)
	4.932***	-0.075***	0.048***	0.211***	6.342***	-0.072***	0.043***	6.282***	-0.083***	0.107***
LTU	(1.072)	(0.027)	(0.009)	(0.031)	(1.194)	(0.025)	(0.009)	(1.319)	(0.027)	(0.015)
	0.204	-0.011	0.024***	0.163***	1.574*	-0.011	0.021***	0.215	-0.013	0.176***
LUX	(0.767)	(0.019)	(0.008)	(0.024)	(0.891)	(0.019)	(0.008)	(0.916)	(0.019)	(0.015)
	10.371***	-0.254***	0.090***	0.413***	13.686***	-0.264***	0.091***	13.940***	-0.294***	0.175***
LVA	(2.478)	(0.066)	(0.018)	(0.073)	(2.907)	(0.066)	(0.019)	(3.151)	(0.073)	(0.027)
	4.628***	-0.111***	0.052***	0.264***	6.669***	-0.115***	0.050***	5.659***	-0.117***	0.166***
MLT	(1.337)	(0.042)	(0.011)	(0.05)	(1.65)	(0.043)	(0.012)	(1.651)	(0.044)	(0.027)
	-0.542	0.01	0.018***	0.141***	0.616	0.011	0.014**	-0.791	0.001	0.173***
NDL	(0.447)	(0.013)	(0.007)	(0.019)	(0.538)	(0.012)	(0.007)	(0.519)	(0.012)	(0.014)
	7.102***	-0.158***	0.066***	0.308***	9.034***	-0.154***	0.062***	8.601***	-0.162***	0.147***
POL	(0.989)	(0.032)	(0.009)	(0.039)	(1.165)	(0.031)	(0.01)	(1.197)	(0.032)	(0.019)
	1.465**	-0.032	0.031***	0.182***	2.750***	-0.033	0.027***	1.519*	-0.029	0.162***
PRT	(0.654)	(0.025)	(0.008)	(0.032)	(0.843)	(0.026)	(0.009)	(0.775)	(0.025)	(0.02)
	8.682***	-0.214***	0.079***	0.372***	10.795***	-0.205***	0.075***	10.473***	-0.223***	0.176***
ROM	(1.643)	(0.047)	(0.013)	(0.055)	(1.882)	(0.046)	(0.013)	(1.953)	(0.049)	(0.029)
	0.466	-0.035***	0.026***	0.193***	1.976***	-0.032***	0.023***	0.683	-0.039***	0.195***
SWE	(0.391)	(0.011)	(0.006)	(0.017)	(0.396)	(0.009)	(0.006)	(0.461)	(0.011)	(0.014)
	1.884**	-0.058**	0.036***	0.215***	3.308***	-0.058**	0.032***	2.208**	-0.060**	0.183***
SVN	(0.828)	(0.027)	(0.009)	(0.033)	(1.001)	(0.027)	(0.009)	(0.983)	(0.027)	(0.017)
	9.997***	-0.248***	0.088***	0.408***	13.022***	-0.253***	0.088***	12.504***	-0.268***	0.180***
SVK	(1.779)	(0.05)	(0.014)	(0.057)	(2.106)	(0.051)	(0.014)	(2.219)	(0.054)	(0.028)
	-0.034	0.025	0.018	0.116***	0.789	0.028	0.013	-0.35	0.028	0.138***
GBR	(1.399)	(0.039)	(0.011)	(0.044)	(1.74)	(0.039)	(0.012)	(1.745)	(0.04)	(0.016)

Note: Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

Table A3. Robustness check: Effect of human capital on total FDI (Bayesian shrinkage estimator)

	Dependent variable: Total FDI				
	Baseline model	*Incl. Stability*	*Incl. GDPpc*	*Incl. Trade*	*Incl. LabCost*
	(I)	**(II)**	**(III)**	**(IV)**	**(V)**
	-0.013	-0.017**	-0.017*	-0.015*	-0.015*
AUT	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)
	-0.001	-0.001	-0.011	-0.011	-0.003
BEL	(0.035)	(0.035)	(0.034)	(0.043)	(0.036)
	-0.202**	-0.196**	-0.236***	-0.200**	-0.199**
BLG	(0.092)	(0.089)	(0.089)	(0.092)	(0.092)
	-0.010	-0.016	-0.024	-0.022	-0.020
CYP	(0.044)	(0.046)	(0.044)	(0.062)	(0.047)
	-0.130***	-0.131***	-0.140***	-0.143***	-0.134***
CZE	(0.015)	(0.014)	(0.017)	(0.014)	(0.013)
	0.031**	0.029**	0.021	0.033**	0.028**
DEU	(0.014)	(0.013)	(0.014)	(0.013)	(0.012)
	0.017	0.013	0.006	0.020	0.012
DNK	(0.015)	(0.015)	(0.013)	(0.018)	(0.017)
	-0.238***	-0.250***	-0.245***	-0.220***	-0.259***
EST	(0.064)	(0.064)	(0.056)	(0.071)	(0.067)
	0.015	0.008	0.012	0.011	0.010
GRC	(0.015)	(0.016)	(0.014)	(0.018)	(0.015)
	0.083**	0.083**	0.064*	0.078*	0.071*
ESP	(0.037)	(0.040)	(0.034)	(0.047)	(0.040)
	0.069*	0.060*	0.054	0.070*	0.061*
FIN	(0.038)	(0.036)	(0.039)	(0.038)	(0.034)
	0.015	0.013	0.005	0.017	0.016
FRA	(0.016)	(0.016)	(0.015)	(0.019)	(0.016)
	-0.070**	-0.061**	-0.093***	-0.079**	-0.060**
HRV	(0.029)	(0.028)	(0.028)	(0.032)	(0.029)
	-0.223***	-0.220***	-0.230***	-0.223***	-0.232***
HUN	(0.037)	(0.037)	(0.035)	(0.045)	(0.041)
	-0.036	-0.032	-0.066**	-0.115**	0.024
IRL	(0.035)	(0.034)	(0.031)	(0.054)	(0.035)
	0.022**	0.015	0.019*	0.019*	0.014
ITA	(0.011)	(0.012)	(0.01)	(0.011)	(0.010)
	-0.075***	-0.074***	-0.125***	-0.107***	-0.094***
LTU	(0.027)	(0.026)	(0.027)	(0.033)	(0.025)
	-0.011	-0.012	-0.010	-0.013	-0.013
LUX	(0.019)	(0.019)	(0.019)	(0.022)	(0.020)
	-0.254***	-0.250***	-0.266***	-0.254***	-0.260***
LVA	(0.066)	(0.066)	(0.062)	(0.073)	(0.067)
	-0.111***	-0.113***	-0.118***	-0.091*	-0.113**
MLT	(0.042)	(0.042)	(0.039)	(0.048)	(0.045)
	0.010	0.010	0.004	0.009	0.010
NDL	(0.013)	(0.013)	(0.012)	(0.015)	(0.013)
	-0.158***	-0.153***	-0.190***	-0.190***	-0.139***
POL	(0.032)	(0.031)	(0.031)	(0.035)	(0.031)

	-0.032	-0.033	-0.042*	-0.045	-0.032
PRT	(0.025)	(0.026)	(0.024)	(0.028)	(0.026)
	-0.214***	-0.199***	-0.230***	-0.235***	-0.198***
ROM	(0.047)	(0.046)	(0.046)	(0.054)	(0.05)
	-0.035***	-0.035***	-0.046***	-0.034***	-0.030***
SWE	(0.011)	(0.009)	(0.01)	(0.01)	(0.009)
	-0.058**	-0.058**	-0.070***	-0.068**	-0.060**
SVN	(0.027)	(0.027)	(0.026)	(0.03)	(0.027)
	-0.248***	-0.243***	-0.245***	-0.222***	-0.250***
SVK	(0.05)	(0.05)	(0.048)	(0.055)	(0.054)
	0.025	0.024	0.006	0.040	0.032
GBR	(0.039)	(0.040)	(0.036)	(0.043)	(0.042)

Note: The following model specifications are presented in the table. Baseline model in column (I): total FDI is explained by human capital, economic growth, and institutional quality (WB indicator "regulatory quality"). Column (II): baseline model where WB indicator "regulatory quality" is replaced by "political stability". Column (III): baseline model where economic growth is replaced by real GDP per capita. Column (IV): baseline model where institutional quality is replaced by trade openness. Column (V): baseline model where institutional quality is replaced by labor costs. Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.
Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

Table A4. Estimation results: Sectoral disaggregation (Bayesian shrinkage estimator)

	Dependent variable:							
	Quaternary FDI				**Tertiary FDI**			
	Constant	*HC*	*Growth*	*Quality*	*Constant*	*HC*	*Growth*	*Quality*
AUT	-0.115***	0.002	0.008	0.022***	0.080	-0.006**	0.004	0.041***
	(0.008)	(0.001)	(0.005)	(0.005)	(0.073)	(0.003)	(0.006)	(0.005)
BEL	-0.119***	0.004***	0.010*	0.014**	0.284	-0.009	0.005	0.050***
	(0.009)	(0.001)	(0.006)	(0.007)	(0.295)	(0.009)	(0.006)	(0.014)
BLG	-0.111***	0.020***	0.010	0.020***	1.497*	-0.032*	0.014	0.104***
	(0.009)	(0.005)	(0.007)	(0.007)	(0.798)	(0.018)	(0.009)	(0.036)
CYP	-0.119***	0.005***	0.005	0.015**	1.265*	-0.022	0.012	0.095***
	(0.009)	(0.002)	(0.007)	(0.007)	(0.719)	(0.017)	(0.009)	(0.032)
CZE	-0.113***	0.004*	0.007	0.024***	0.993***	-0.029***	0.009	0.081***
	(0.009)	(0.002)	(0.006)	(0.006)	(0.165)	(0.007)	(0.006)	(0.008)
DEU	-0.127***	0.006***	-0.005	0.007	0.030	-0.005	-0.004	0.038***
	(0.009)	(0.002)	(0.004)	(0.006)	(0.092)	(0.004)	(0.005)	(0.006)
DNK	-0.120***	0.005***	0.004	0.015**	0.086	-0.006	-0.001	0.041***
	(0.009)	(0.002)	(0.007)	(0.007)	(0.180)	(0.006)	(0.006)	(0.009)
EST	-0.112***	0.020***	0.009	0.020***	1.751**	-0.037**	0.016*	0.116***
	(0.009)	(0.004)	(0.007)	(0.007)	(0.697)	(0.017)	(0.008)	(0.031)
GRC	-0.120***	0.005***	0.001	0.016**	0.021	-0.001	0.003	0.038***
	(0.009)	(0.002)	(0.006)	(0.007)	(0.133)	(0.005)	(0.005)	(0.007)
ESP	-0.121***	0.005***	0.007	0.011*	0.295	-0.004	0.004	0.051**
	(0.009)	(0.001)	(0.005)	(0.007)	(0.456)	(0.014)	(0.007)	(0.020)
FIN	-0.121***	0.005***	-0.001	0.015**	0.155	-0.007	0.005	0.044***
	(0.009)	(0.002)	(0.006)	(0.007)	(0.361)	(0.012)	(0.006)	(0.016)
FRA	-0.123***	0.004***	0.002	0.010*	-0.151	0.002	0.002	0.031***
	(0.009)	(0.001)	(0.003)	(0.006)	(0.188)	(0.006)	(0.005)	(0.009)
HRV	-0.117***	0.010***	0.007	0.017**	1.524***	-0.035***	0.013*	0.105***
	(0.009)	(0.003)	(0.006)	(0.007)	(0.374)	(0.012)	(0.007)	(0.017)
HUN	-0.113***	0.014***	0.007	0.020***	1.771***	-0.042***	0.015**	0.116***
	(0.009)	(0.004)	(0.007)	(0.007)	(0.371)	(0.012)	(0.007)	(0.017)
IRL	-0.111***	0.022***	0.010	0.019***	1.293**	-0.030**	0.012*	0.095***
	(0.009)	(0.002)	(0.007)	(0.007)	(0.502)	(0.013)	(0.007)	(0.022)

	-0.120***	0.003***	-0.001	0.016***	-0.134***	0.002	0.002	0.032***
ITA	(0.008)	(0.001)	(0.002)	(0.004)	(0.051)	(0.002)	(0.003)	(0.005)
	-0.115***	0.012***	0.007	0.018**	2.082***	-0.043***	0.017**	0.130***
LTU	(0.009)	(0.003)	(0.007)	(0.007)	(0.493)	(0.013)	(0.007)	(0.022)
	-0.118***	0.006**	0.005	0.017**	0.343	-0.007	0.003	0.053***
LUX	(0.009)	(0.003)	(0.007)	(0.007)	(0.223)	(0.006)	(0.006)	(0.011)
	-0.115***	0.007**	0.009	0.018***	1.997***	-0.042**	0.018**	0.127***
LVA	(0.009)	(0.003)	(0.007)	(0.007)	(0.741)	(0.017)	(0.009)	(0.033)
	-0.114***	0.014***	0.007	0.019***	1.903***	-0.041***	0.017**	0.122***
MLT	(0.009)	(0.005)	(0.007)	(0.007)	(0.562)	(0.015)	(0.008)	(0.025)
	-0.118***	0.009***	0.005	0.016**	-0.284***	0.006***	0.003	0.026***
NDL	(0.009)	(0.002)	(0.007)	(0.007)	(0.072)	(0.002)	(0.004)	(0.005)
	-0.118***	0.008***	0.003	0.016**	2.180***	-0.041***	0.02***	0.135***
POL	(0.009)	(0.002)	(0.006)	(0.007)	(0.406)	(0.013)	(0.007)	(0.018)
	-0.119***	0.011***	0.013**	0.010	0.455**	-0.009	0.006	0.058***
PRT	(0.009)	(0.002)	(0.006)	(0.006)	(0.206)	(0.008)	(0.006)	(0.010)
	-0.112***	0.016***	0.010	0.020***	2.008***	-0.043***	0.018**	0.127***
ROM	(0.009)	(0.005)	(0.007)	(0.007)	(0.601)	(0.015)	(0.008)	(0.027)
	-0.118***	0.001	0.003	0.019***	0.443***	-0.017***	-0.002	0.056***
SWE	(0.009)	(0.001)	(0.004)	(0.006)	(0.127)	(0.004)	(0.005)	(0.007)
	-0.120***	0.004**	0.001	0.016**	0.707***	-0.020***	0.004	0.069***
SVN	(0.009)	(0.002)	(0.006)	(0.007)	(0.218)	(0.007)	(0.006)	(0.010)
	-0.116***	0.010***	0.008	0.018***	1.620***	-0.037***	0.015**	0.110***
SVK	(0.009)	(0.003)	(0.006)	(0.007)	(0.483)	(0.013)	(0.007)	(0.022)
	-0.123***	0.006***	0.001	0.011*	0.336	-0.004	0.003	0.053***
GBR	(0.009)	(0.001)	(0.004)	(0.006)	(0.313)	(0.010)	(0.006)	(0.014)

Note: Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

Table A5. Estimation results: Sectoral disaggregation (Bayesian shrinkage estimator) (cont'd)

	Dependent variable:							
	Secondary FDI				**Primary FDI**			
	Constant	*HC*	*Growth*	*Quality*	*Constant*	*HC*	*Growth*	*Quality*
AUT	0.174	-0.008	0.018***	0.051***	0.007	0.001**	0.001	0.001
	(0.260)	(0.006)	(0.006)	(0.012)	(0.008)	(0.001)	(0.001)	(0.001)
BEL	0.057	0.005	0.018**	0.057	-0.010	-0.003	-0.001	0.030**
	(1.115)	(0.019)	(0.008)	(0.040)	(0.011)	(0.002)	(0.006)	(0.012)
BLG	7.995***	-0.131***	0.060***	-0.224***	-0.011	0.001	0.001	0.031**
	(2.418)	(0.043)	(0.014)	(0.086)	(0.011)	(0.006)	(0.006)	(0.013)
CYP	0.523	-0.012	0.019**	0.039	0.001	-0.002*	0.001	0.013*
	(0.983)	(0.014)	(0.008)	(0.035)	(0.009)	(0.001)	(0.002)	(0.007)
CZE	4.064***	-0.081***	0.039***	-0.088***	-0.011	-0.006**	0.002	0.030***
	(0.404)	(0.011)	(0.006)	(0.017)	(0.010)	(0.003)	(0.005)	(0.01)
DEU	-1.163***	0.025**	0.012*	0.099***	-0.008	-0.006***	-0.002	0.026***
	(0.438)	(0.010)	(0.006)	(0.018)	(0.009)	(0.002)	(0.004)	(0.007)
DNK	-1.397***	0.016*	0.007	0.107***	0.004	-0.001	0.001	0.007
	(0.537)	(0.009)	(0.007)	(0.021)	(0.009)	(0.001)	(0.003)	(0.007)
EST	4.703***	-0.074***	0.041***	-0.107**	-0.011	0.001	0.001	0.031**
	(1.478)	(0.028)	(0.009)	(0.053)	(0.011)	(0.005)	(0.006)	(0.013)
GRC	-0.725	0.017	0.010	0.084***	-0.011	-0.003	-0.001	0.030***
	(0.577)	(0.012)	(0.007)	(0.022)	(0.011)	(0.002)	(0.005)	(0.011)
ESP	-2.650	0.053*	0.006	0.152**	-0.016	-0.005***	0.002	0.038***
	(1.664)	(0.03)	(0.011)	(0.059)	(0.010)	(0.001)	(0.002)	(0.009)
FIN	-2.263	0.038	0.006	0.137***	-0.006	-0.004*	0.004	0.023*
	(1.385)	(0.024)	(0.009)	(0.050)	(0.011)	(0.002)	(0.004)	(0.012)
FRA	-0.887*	0.011	0.006	0.089***	-0.011	-0.004***	0.002	0.031***
	(0.454)	(0.008)	(0.006)	(0.018)	(0.011)	(0.002)	(0.004)	(0.011)
HRV	0.624	-0.008	0.019***	0.036*	-0.011	0.001	-0.003	0.030**
	(0.572)	(0.015)	(0.007)	(0.022)	(0.011)	(0.004)	(0.006)	(0.012)
HUN	7.742***	-0.124***	0.059***	-0.215***	-0.014	0.001	0.001	0.036***
	(1.135)	(0.024)	(0.008)	(0.041)	(0.011)	(0.004)	(0.006)	(0.012)
IRL	0.047	0.008	0.017	0.058	-0.013	-0.003	-0.001	0.035***
	(1.689)	(0.025)	(0.011)	(0.060)	(0.011)	(0.002)	(0.006)	(0.012)

	-0.737**	0.019**	0.016***	0.084***	-0.008	-0.005***	-0.001	0.026***
ITA	(0.293)	(0.009)	(0.006)	(0.013)	(0.009)	(0.002)	(0.003)	(0.006)
	2.038*	-0.021	0.029***	-0.012	-0.010	0.001	0.003	0.030**
LTU	(1.159)	(0.019)	(0.008)	(0.041)	(0.011)	(0.003)	(0.006)	(0.013)
	-0.416	0.002	0.014**	0.072***	0.009	0.001	0.001	0.001
LUX	(0.400)	(0.006)	(0.006)	(0.016)	(0.008)	(0.001)	(0.001)	(0.002)
	1.829*	-0.021	0.027***	-0.005	-0.010	-0.002	0.001	0.030**
LVA	(0.945)	(0.019)	(0.007)	(0.034)	(0.011)	(0.006)	(0.006)	(0.013)
	0.998	-0.019	0.022***	0.022	-0.010	0.001	0.001	0.030**
MLT	(0.911)	(0.02)	(0.008)	(0.034)	(0.011)	(0.005)	(0.006)	(0.013)
	-0.340	0.001	0.012**	0.069***	-0.012	-0.002	0.001	0.033***
NDL	(0.283)	(0.004)	(0.006)	(0.013)	(0.011)	(0.003)	(0.006)	(0.012)
	5.145***	-0.083***	0.044***	-0.123***	-0.013	-0.001	0.002	0.034***
POL	(0.703)	(0.014)	(0.007)	(0.026)	(0.011)	(0.003)	(0.006)	(0.012)
	1.514**	-0.025	0.024***	0.005	-0.015	-0.005*	0.001	0.038***
PRT	(0.741)	(0.017)	(0.007)	(0.028)	(0.011)	(0.003)	(0.006)	(0.011)
	5.751***	-0.096***	0.047***	-0.145***	-0.014	0.003	0.002	0.036***
ROM	(1.029)	(0.022)	(0.008)	(0.037)	(0.011)	(0.006)	(0.006)	(0.013)
	0.643	-0.015**	0.020***	0.034**	-0.004	-0.003*	-0.002	0.020**
SWE	(0.411)	(0.007)	(0.006)	(0.016)	(0.01)	(0.002)	(0.004)	(0.010)
	1.331*	-0.024	0.024***	0.011	-0.011	-0.003	0.002	0.032**
SVN	(0.741)	(0.015)	(0.007)	(0.028)	(0.011)	(0.003)	(0.006)	(0.012)
	9.943***	-0.166***	0.071***	-0.293***	-0.011	-0.001	0.001	0.031**
SVK	(1.476)	(0.028)	(0.010)	(0.053)	(0.011)	(0.006)	(0.006)	(0.013)
	-3.615***	0.067***	-0.003	0.186***	-0.012	0.002	0.001	0.033***
GBR	(1.078)	(0.017)	(0.008)	(0.039)	(0.011)	(0.004)	(0.006)	(0.012)

Note: Standard errors in parentheses. *p < 0.1, **p < 0.05, ***p < 0.01.

Source: Own calculations using data from the ARDECO database of the European Commission's Directorate General for Regional and Urban Policy, Eurostat, fDi markets, and the World Bank.

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