



Original Article

FDI and economic vulnerability: The role of local human capital

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Abstract: This study explores how the impact of Foreign Direct Investment (FDI) on economic vulnerability is influenced by the level of local human capital. Using global data from 2000 to 2018, our analysis finds that higher levels of local human capital are associated with lower economic vulnerability when FDI inflows increase. This indicates that a more educated and skilled workforce enhances a country's ability to effectively utilize FDI, thereby reducing susceptibility to external economic shocks. However, the impact of human capital varies over time. The effect is not significant from 2000 to 2009, but becomes pronounced from 2010 to 2018. This suggests that the role of human capital in reducing economic vulnerability in the context of FDI has become more important in recent years.

Keywords: FDI, economic vulnerability, local human capital.

1. Introduction

Foreign Direct Investment (FDI) has played a crucial role in global economic dynamics, with many countries and territories actively implementing policies to attract more FDI. Governments often view FDI as a pathway to spur economic development, increase employment opportunities, and integrate into the

global market. However, the impact of FDI on the economy remains a contentious issue. While many studies suggest that FDI can stimulate economic growth by introducing new technologies, management practices, and capital (De Mello, 1997), there is substantial evidence to the contrary. Some research indicates that FDI may have no significant impact or even a

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negative effect on the economy (Aitken & Harrison, 1999; Brouthers et al., 2008; Nunnenkamp & Spatz, 2004). Findings from this line of research illustrate that FDI inflows can lead to adverse outcomes, such as crowding out domestic investment, increasing income inequality, or creating dependencies on foreign entities, potentially hampering economic stability. Consequently, this raises an important question: does FDI actually contribute to economic vulnerability?

Economic vulnerability refers to the susceptibility of an economy to external shocks and disturbances, which can lead to significant instability and adverse effects (Cordina, 2004; Guillaumont, 2010). This concept is distinct from economic growth, which measures the increase in the value of goods and services produced by an economy. Interestingly, higher economic growth can sometimes be associated with greater economic vulnerability. If this is the case, the net impact of growth may be negative, as the benefits of increased production and income are overshadowed by the heightened risk of economic instability.

When examining the economic impact of FDI inflow, a substantial body of literature highlights the crucial role of human capital in the host country in harnessing the benefits of FDI. Human capital, which encompasses the education, skills, and abilities of the workforce, is essential for effectively utilizing the technologies, practices, and investments that FDI brings. If the level of human capital is low, the workforce may lack the necessary skills and knowledge to fully absorb and implement the advancements introduced by FDI, resulting in minimal or even negative economic impacts. Conversely, if human capital is high, the country is better positioned to leverage FDI for positive economic outcomes, such as increased productivity, innovation, and growth. Therefore, it is plausible to suspect that the impact of FDI on economic vulnerability is conditioned upon the level of human capital development in the country. High levels of human capital can mitigate the potential vulnerabilities associated with FDI, while low levels may exacerbate them.

We test our prediction using a sample of 121 countries in the world over the period from 2000 to 2018. We find that higher levels of local human capital enhance a country's ability to

utilize FDI effectively, leading to lower economic vulnerability. A more educated and skilled workforce improves the absorption and implementation of foreign investments, reducing susceptibility to external shocks. However, the influence of human capital varies over time; it was not significant during 2000-2009 but became pronounced from 2010-2018. This indicates that the role of human capital in mitigating economic vulnerability has gained importance in recent years.

2. Model specification and data

2.1. Model specification

To examine the impact of FDI and human capital on economic vulnerability, we use the following standard model:

$$\text{Economic Vulnerability}_{it} = \beta_0 + \beta_1 \text{FDI}_{it} + \beta_2 \text{Human Capital}_{it} + \beta_3 \text{FDI} * \text{Human Capital}_{it} + \text{Control}_{it} + \varepsilon_{it}$$

Where $\text{Economic Vulnerability}_{it}$ measures the level of economic vulnerability in country i at time t . In this paper, we follow Nguyen and Su (2021) and measure economic vulnerability using the Economic Vulnerability index (EVI), provided by the "Fondation pour les Etudes et Recherches sur le Développement International" (FERDI). The EVI is a specialized measure designed to assess the economic vulnerability of countries, particularly those in developing regions. This index focuses on identifying structural weaknesses and external risks that can impact a country's economic stability and growth. Unlike broader indices, FERDI's EVI emphasizes factors such as exposure to global economic fluctuations, dependence on volatile sectors, and internal structural weaknesses. It integrates data on factors like trade imbalances, economic diversification, and environmental risks to provide a comprehensive assessment of a country's economic resilience. By highlighting areas of vulnerability, FERDI's EVI assists policymakers in pinpointing critical areas for intervention and developing targeted strategies to mitigate risks and enhance economic stability. This approach helps guide international development efforts and supports countries in building more resilient and sustainable economies.

FDI is the level of FDI inflow into country. It is measured as the ratio of FDI inflow to a host country's GDP.

Human Capital indicates the level of human capital development in the country. Due to data on human capital being really limited, we use the ratio of government expenditure on education to GDP as a proxy for local human capital level in a host country.

The interaction term $FDI * Human\ Capital$ is the main variable of interest. It allows us to assess whether and to what extent the impact of FDI on economic vulnerability is conditioned upon the human capital level in the host country.

Meanwhile, $Control_{it}$ is a set of country-specific factors that could affect the level of economic vulnerability (Barrot et al., 2016; Cordina, 2004; Guillaumont, 2010; Wu et al., 2010; Nguyen & Su, 2021). Specifically, we add trade openness, measured as the ratio of exports plus imports to GDP (*Openness*). Arguably, trade openness can both benefit and expose economies to vulnerability. While it can spur growth by accessing larger markets and encouraging specialization, it also increases susceptibility to global economic fluctuations and external shocks. Countries heavily reliant on a few exports or lacking diversification may face greater instability due to trade disruptions and market volatility.

We also consider population size, measured as the natural logarithm of total population per sq. km of land area (*Population Size*). While a larger population can drive economic growth through increased labor supply, consumer demand, and potential for market expansion, it can also amplify economic risks if the growth outpaces infrastructure and resource development. A high population may strain public services and lead to higher unemployment rates, contributing to economic instability. Conversely, a smaller or aging population can result in a shrinking workforce, reduced economic dynamism, and higher dependency ratios, where fewer workers support a growing number of retirees. Therefore, while population size can offer economic opportunities, it also presents challenges that can affect a country's economic resilience and stability.

We further control for the level of domestic investment, measured as the ratio of total domestic investment to GDP (*Domestic Investment*). High levels of domestic investment can bolster economic stability by enhancing infrastructure, boosting productivity, and

fostering long-term growth. Investments in sectors such as technology, education, and health can build a more resilient economy capable of withstanding external shocks. However, if domestic investment is poorly directed or heavily concentrated in volatile sectors, it can increase vulnerability.

Finally, we also consider the level of infrastructure development in the host country, measured using the share of the total population that has access to electricity (*Electricity*). In fact, inadequate or poorly managed infrastructure can exacerbate economic vulnerability. Infrastructure deficits can lead to bottlenecks, increased costs, and hinder business operations, making economies more susceptible to disruptions. Thus, well-developed infrastructure can make economies more resilient to external shocks by improving efficiency and supporting economic diversification.

One common issue in estimating the impact of FDI is endogeneity. Arguably, the level of FDI inflow into a country may not be random and is, in fact, affected by a number of factors. As a result, ignoring the potential endogeneity issue may lead to estimation bias. To address this issue, we follow the common practice in the previous literature (i.e., Ullah et al., 2018) and estimate model (1) using the two-step system GMM estimator. GMM is a powerful method for addressing endogeneity. Theoretically, endogeneity arises when the explanatory variable (in our case, *FDI*) is correlated with the error term, leading to biased and inconsistent estimates using traditional OLS methods. GMM addresses this issue by allowing us to use instrumental variables that are correlated with the endogenous regressors but uncorrelated with the error term. These instruments help isolate the exogenous variation in the endogenous variables, thereby providing consistent and unbiased parameter estimates.

2.2. Data and sample overview

Data for our empirical analysis was retrieved from several sources. First, we collected data on the Economic Vulnerability Index (EVI) from the Foundation for Studies and Research on International Development (FERDI) (<https://ferdi.fr/en>). The index ranges in value from 1 to 100, with 100 indicating the highest

level of vulnerability. Second, we collected data for all other macroeconomic variables from the World Development Indicators platform provided by the World Bank.

Our empirical analysis spans the period from 2000 to 2018. We began our analysis in 2000 because the EVI data was significantly revised that year, allowing us to obtain more comparable and consistent estimates. We ended our analysis in 2018 to mitigate concerns that the onset of the COVID-19 pandemic in 2019 might introduce noise and affect our findings. After merging the data, we obtained a final sample consisting of 121 countries over the period from 2000 to 2018.

3. Empirical results

3.1. Descriptive statistics

Table 1 provides the descriptive statistics for all variables used in our empirical analysis. As shown in the table, the mean value of *EVI* is

0.331, with the maximum value reaching 0.827, indicating considerable variation in economic vulnerability across the countries in our sample. On average, FDI inflows account for 4.7% of GDP, suggesting a moderate level of foreign investment relative to the size of these economies. The mean value of *Human Capital*, measured as the ratio of government expenditure on education to GDP, is 0.041, reflecting the investment in education by these countries.

Regarding other control variables, the average trade openness (*Openness*), measured as the ratio of total imports and exports to GDP, is 0.806, indicating a high level of integration into the global economy. The mean value of population size (*Population Density*), measured as the natural logarithm of people per square kilometer of land area, is 4.093. On average, around 70% of the population has access to electricity (*Electricity*), illustrating the general level of infrastructure development. Finally, domestic investment (*Domestic Investment*) constitutes 13% of GDP on average.

Table 1: Descriptive statistic

Variable	N	Mean	Sd.	Min	p25	p50	p75	Max
EVI	1,108	0.331	0.119	0.083	0.242	0.315	0.401	0.827
FDI	1,108	0.047	0.136	-0.372	0.012	0.026	0.050	2.794
Human Capital	1,108	0.041	0.018	0.001	0.028	0.038	0.051	0.154
Openness	1,108	0.806	0.453	0.002	0.503	0.718	1.007	4.373
Population Density	1,108	4.093	1.430	0.434	3.080	4.166	4.950	8.981
Electricity	1,108	0.701	0.322	0.024	0.408	0.852	0.992	1.000
Domestic Investment	1,108	0.130	2.073	0.000	0.000	0.001	0.013	80.757

Source: Authors' calculation.

3.2. Correlation matrix

Table 2 presents the correlation matrix of all the variables used in our analyses. As can be seen from the table, the *EVI* appears to be negatively associated with *FDI*, suggesting that higher FDI inflows are correlated with lower economic vulnerability. Likewise, *Human Capital*, *Population Density*, and *Electricity* infrastructure all show a negative correlation with *EVI*, indicating that well-developed human resources, denser populations, and reliable infrastructure contribute to economic resilience. By contrast, the level of trade openness and domestic investment are positively associated with *EVI*, implying that greater integration into

global trade and higher levels of domestic investment may correspond with higher economic vulnerability. This could be due to the increased exposure to global market fluctuations and the potential risks associated with domestic financial cycles.

Regarding the correlation between control variables, the correlation coefficients between these variables are relatively low. This illustrates that multicollinearity is not a serious issue that could affect our empirical results. To further validate this assessment, we conducted a Variance Inflation Factor (VIF) test. The test results are presented in the last column of Table 2. All the VIF values are less than 2, which is well below the commonly accepted threshold of

10 that indicates problematic multicollinearity. These low VIF values further support the

view that multicollinearity is not a concern in our analysis.

Table 2: Correlation matrix

No.	Variables	1	2	3	4	5	6	7	VIF
1	EVI	1.000							
2	FDI	-0.077	1.000						1.05
3	Human Capital	-0.032	0.096	1.000					1.14
4	Openness	0.128	0.212	0.142	1.000				1.17
5	Population Density	-0.130	0.053	-0.137	0.257	1.000			1.17
6	Electricity	-0.459	0.078	0.233	0.228	0.232	1.000		1.17
7	Domestic Investment	0.167	-0.008	0.100	0.052	0.006	-0.032	1.000	1.02

Source: Authors' calculation.

3.3. Baseline result

The result of the model that investigates the impact of FDI and local human capital level on economic vulnerability is reported in Table 3. Column 1 provides the result, covering the period from 2000 to 2018. Column 2 presents the result for the subperiod from 2000 to 2009. Column 3 shows the result for the period from 2010 to 2018. We divide our sample into two sub-periods to investigate whether the effects of foreign direct investment (FDI) and local human capital levels on economic vulnerability remain consistent over time. We selected 2009/2010 as the structural break due to the global financial crisis in 2009, anticipating significant differences in economic characteristics and dynamics before and after the crisis. The pre-crisis period, marked by an economic boom leading up to the crisis, contrasts sharply with the post-crisis period, which involves recovery and necessitates caution. By analyzing these periods separately, we aim to evaluate how FDI and local human capital affect economic vulnerability under different economic conditions and determine if their impacts have shifted in response to the crisis.

As can be seen from Column 1 of Table 3, the estimated coefficient on the interaction term *FDI*Human Capital* is negative and statistically significant. This result indicates that as the level of local human capital increases, higher levels of FDI inflows lead to lower levels of economic vulnerability. In other words, the presence of a more educated and skilled workforce enhances the ability of the host country to effectively utilize the investments and innovations brought

in by FDI, thereby reducing its economic susceptibility to external shocks. This finding provides robust support to the view that local human capital is a crucial component for fully realizing the benefits of FDI. It underscores the importance of investing in education and skill development to maximize the positive impacts of foreign investments and bolster economic resilience. By ensuring a high level of human capital, countries can better harness FDI to foster sustainable economic growth and stability.

When breaking down the full sample into subsamples, we find compelling evidence that the impact of local human capital on economic vulnerability has evolved over time. During the period from 2000 to 2009, local human capital does not appear to mitigate the impact of economic vulnerability significantly. The estimated coefficient on the interaction term *FDI*Human Capital* is not statistically significant in this subsample, indicating that the level of local human capital during this period did not substantially influence the relationship between FDI inflows and economic vulnerability. This is surprising but perhaps feasible to expect due to several reasons. First, economic instability, such as the Dotcom crisis of the early 2000s and the 2008 global financial crisis, may have overshadowed any benefits of human capital. Second, the quality of local human capital may not have aligned with the needs of FDI-receiving sectors, and FDI inflows might have been concentrated in industries with limited local skill requirements. Furthermore, the benefits of human capital often have a lagged effect, meaning that the positive impacts of

investments in education and skills may not have fully materialized within this specific timeframe. In this regard, advancements in technology, particularly with Industry 4.0, are expected to enhance the effectiveness of human capital, allowing its impact to become more significant in subsequent periods.

However, a notable shift occurs when examining the period from 2010 to 2018. In this latter period, the estimated coefficient on *FDI*Human Capital* is strongly negative and significant, suggesting that higher levels of local human capital significantly reduce economic vulnerability in the context of increased FDI inflows. This indicates that the beneficial impact of human capital in leveraging FDI to reduce economic vulnerability is a more recent phenomenon, possibly due to improvements in education systems, policy changes, or other socio-economic developments that have enhanced the effectiveness of human capital in the host countries. Thus, the overall result is primarily driven by the more recent subsample, underscoring the increasing importance of

human capital in moderating the effects of FDI on economic vulnerability in the contemporary global economy.

The results of the other control variables also provide some important insights. As seen in Column 1, the level of trade openness appears to be positively associated with economic vulnerability, suggesting that economies more integrated into global trade may be more susceptible to external shocks and disturbances. Similarly, a greater level of domestic investment is also associated with higher economic vulnerability, indicating that while investment is generally considered beneficial for growth, it may also expose the economy to greater risks and uncertainties. On the other hand, the estimated coefficient on *Electricity* is negative and significant. This illustrates that adequate infrastructure supports stable and efficient production processes, reduces operational costs, and enhances the resilience of the economy against external shocks. Therefore, investing in infrastructure development, can significantly reduce economic vulnerability and promote sustainable economic stability.

Table 3: Baseline result

	Full sample (1)	2000-2009 (2)	2010-2018 (3)
FDI	0.016 (0.015)	-0.004 (0.008)	-0.044*** (0.005)
Human Capital	-0.459*** (0.160)	-0.919*** (0.047)	-1.613*** (0.149)
FDI*Human Capital	-1.298*** (0.262)	0.048 (0.139)	-0.516*** (0.105)
Openness	0.072*** (0.007)	0.060*** (0.003)	0.058*** (0.005)
Population density	-0.002 (0.003)	-0.011*** (0.001)	-0.004 (0.003)
Electricity	-0.173*** (0.014)	-0.162*** (0.005)	-0.182*** (0.012)
Domestic INVESTMENT	0.017*** (0.004)	0.020*** (0.002)	0.018*** (0.003)
Constant	0.388*** (0.014)	0.471*** (0.006)	0.358*** (0.014)
Year Dummies	YES	YES	YES
Sargan Test (p-value)	0.000	0.004	0.000
Hansen Test (p-value)	0.382	0.228	0.276
Observations	1,108	444	664
Number of countries	121	92	116

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

Source: Authors' calculation.

3.4. Robustness tests

This section provides several additional analyses to ensure the robustness of our empirical result.

First, in the baseline model, we measure FDI inflows as the ratio of total FDI inflow to GDP. To check whether our empirical results are affected by the measurement of the dependent variable, we use an alternative measure of FDI inflow into the country. Specifically, some previous studies also use the natural logarithm of FDI as a proxy for FDI inflow. We follow this approach and re-estimate the baseline model using the natural logarithm of FDI as the dependent variable. The results are provided in Column 1 of Table 4.

Second, there may be concerns that the ratio of government expenditure on education to GDP is not an ideal proxy for local human capital. However, data that accurately captures the level of local human capital is very scarce. As an alternative measure, we use the ratio of the

population that has attained or completed a Bachelor's degree or equivalent to the total population. Arguably, this measure is a more appropriate indicator of local human capital. However, it is worth noting that this selection of variable leads to a significant drop in the total number of observations. The results are provided in Column 2 of Table 4.

Third, there is a concern that the global financial crisis could have a substantial impact on the economy and potentially introduce noise into our results. To address this concern, we have excluded the period of the global financial crisis, from 2008 to 2009, from our analysis. By doing so, we aim to isolate the effects of the crisis from our findings and obtain a clearer picture of the economic dynamics under normal conditions. The extended results, which reflect this adjustment, are detailed in Column 3 of Table 4.

As can be seen from the Table, the estimated coefficient on *FDI*Human Capital* are consistently negative and significant. Thus, it ensures the robustness of our baseline result.

Table 4: Robustness tests

	Alternative measure of FDI inflow	Alternative measure of local human capital	Exclude global financial crisis period
	(1)	(2)	(3)
FDI	-0.020*** (0.007)	0.197*** (0.028)	0.183*** (0.018)
Human Capital	1.311 (2.564)	0.000 (0.000)	0.792*** (0.168)
FDI*Human Capital	-0.129*** (0.009)	-1.032*** (0.112)	-4.072*** (0.344)
Openness	-0.058*** (0.005)	-0.005** (0.003)	0.060*** (0.009)
Population density	-0.010*** (0.003)	-0.031*** (0.001)	-0.002 (0.003)
Electricity	-0.074*** (0.016)	0.000 (0.000)	-0.174*** (0.016)
Domestic investment	0.012*** (0.004)	0.545*** (0.043)	0.017*** (0.004)
Constant	0.791*** (0.135)	0.000 (0.000)	0.385*** (0.020)
Year dummies	YES	YES	YES
Sargan Test (p-value)	0.008	0.012	0.005
Hansen Test (p-value)	0.437	0.791	0.236
Observations	1,058	368	996
Number of countries	121	105	121

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

Source: Authors' calculation.

4. Conclusion

This study investigates the extent to which the impact of FDI on economic vulnerability is conditioned by the level of local human capital. By analyzing global data from 2000 to 2018, we aimed to understand how variations in local human capital influence the relationship between FDI inflows and economic vulnerability.

Our findings reveal that as the level of local human capital increases, higher levels of FDI inflows are associated with lower levels of economic vulnerability. This result provides support to the view that a more educated and skilled workforce enhances a country's ability to effectively utilize the investments and innovations brought by FDI, thus reducing its susceptibility to external economic shocks.

However, a more nuanced analysis of the data shows that the impact of local human capital varies over time. Specifically, when breaking down the sample into subsamples, we find that the impact of human capital on economic vulnerability is not prominent during the period from 2000 to 2009. It is only during the period from 2010 to 2018 that the effect becomes significant. This suggests that the role of human capital in mitigating economic vulnerability in the context of increased FDI inflows has become more pronounced in recent years.

Overall, these results underscore the evolving nature of the relationship between FDI, human capital, and economic vulnerability. They highlight the importance of investing in education and skill development to enhance a country's capacity to leverage FDI effectively and reduce economic susceptibility. The observed shift in significance over time indicates that the benefits of human capital in moderating the effects of FDI on economic vulnerability

have grown, reflecting broader changes in global economic dynamics and the increasing value of a skilled workforce in a rapidly changing economic environment.

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