

# Does FDI benefit the poor? An analysis of the relationship between foreign investment and poverty in Brazil<sup>1</sup>

Raphael Gomes da Silva<sup>2</sup>  
Caroline de Deus<sup>3</sup>  
Fernanda Aparecida Silva<sup>4</sup>  
Thaysa Lieberenz<sup>5</sup>

## Área 7: Economia Internacional

### Abstract

Foreign Direct Investment (FDI) is considered an important determinant of a country's economic growth and can influence poverty by creating new jobs, increasing the income of individuals, and reducing poverty in the region. Thus, this article aims to investigate the relationship between FDI and poverty in Brazil, through the labor market. The methodology used was the Instrumental Variable approach and the period chosen was the years from 1992 to 2019. The results found show that in the first stage, there was a negative impact of FDI on the unemployment rate, in both measured forms of investment. In the second stage, it was realized that FDI had a negative impact on poverty in the country. When analyzed by poverty lines, the impact is decreasing the closer to extreme poverty, indicating that the lack of education, skills, and technical knowledge may be necessary to hire for new jobs, which the poorest population may not have. This indicates that public policies to attract foreign capital to Brazil can be used as an instrument to alleviate poverty in certain regions of the country. Incentives for the inflow of capital aimed at the growth of the poorest population can facilitate economic development and increase the country's income.

### Keywords

Foreign Direct Investment; Poverty; Instrumental Variable; Unemployment.

### Resumo

O investimento direto estrangeiro (IDE) é considerado um importante determinante do crescimento econômico de um país e pode influenciar a pobreza a partir da criação de novos empregos e provocando um aumento da renda dos indivíduos e reduzindo a pobreza da região. Assim, esse artigo tem como objetivo investigar a relação entre o IDE e a pobreza no Brasil, através do mercado de trabalho. A metodologia utilizada foi a abordagem de Variáveis Instrumentais e o universo temporal foram os anos de 1992 a 2019. Os resultados encontrados mostram que no primeiro estágio, houve um impacto negativo do IDE sobre a taxa de desemprego, em ambas as formas medidas de investimento. No segundo estágio, percebeu-se que o IDE teve um impacto negativo sobre a pobreza no país. Quando analisado por linhas de pobreza, o impacto é decrescente quanto mais próximo da extrema pobreza, indicando que a falta de educação, habilidades e conhecimentos técnicos podem ser necessários para contratar para novos empregos, cuja população mais pobre pode não ter. Isso indica que as políticas públicas de atração de capital estrangeiro para o Brasil podem ser utilizadas como instrumento para aliviar a pobreza em determinadas regiões do país. Os incentivos à entrada de capital voltados ao crescimento da população mais pobre podem ser facilitadores do desenvolvimento econômico e do aumento da renda do país.

### Palavras-chave:

Investimento Direto Estrangeiro; Pobreza; Variáveis Instrumentais; Desemprego.

### JEL Classification:

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<sup>1</sup> The authors are thankful to CAPES and FAPEMIG for their financial support.

<sup>2</sup> PhD student in Applied Economics at the Federal University of Viçosa (UFV) - raphaelgsilva@ufv.br

<sup>3</sup> PhD student in Applied Economics at the Federal University of Viçosa (UFV) - caroline.deus@ufv.br

<sup>4</sup> Professor at the Rural Economics Department, Federal University of Viçosa (UFV) - fernanda.aparecida@ufv.br

<sup>5</sup> PhD student in Applied Economics at the Federal University of Viçosa (UFV) - thaysa.lieberenz@ufv.br

## 1 – Introduction

Developing countries have become destinations for flows of Foreign Direct Investment (FDI) due to the great returns and opportunities to explore these potential markets. The advantages indicated by the theory on the inflow of FDI into developing countries, such as economic growth, increased tax revenues, and job creation, among others, helped these countries unfold these investments with policies aimed at the capital attraction. FDI can influence poverty through the creation of new jobs, even if they are low-paid and unskilled, and help the knowledge and technology transfer, thus increasing the income of these individuals and reducing poverty in the region (CALVO; HERNANDEZ, 2006; JAVORCIK, 2015; ANETOR et al., 2020). Therefore, it is important to understand the dynamics between FDI and poverty reduction, as a step toward its eradication and the country's sustainable development.

The flow of FDI to developing countries intensified after the end of the Second World War and until the mid-1990s, these flows were driven by political motives, influenced by the Cold War. In the 1990s, developing countries showed themselves to be potential consumer markets, began or intensified their commercial opening process, and offered incentives for the inflow of FDI. These modifications changed the perception of developed nations, which started to invest in these countries for economic reasons (GOHOU; SOUMARÉ, 2012).

Two major destinations for these investments were Latin America and East Asia, although the experience lived by the regions was quite heterogeneous. East Asian countries took advantage of FDI to boost themselves economically, gained industrial competitiveness, became exporting potencies, and increased income. On the other hand, Latin American countries seem to be held back in commodity exports, have low industrial competitiveness and the impact of FDI on the region's income was very low (QUÍÑONEZ; SÁENZ; SOLÓRZANO, 2018).

This big difference in the success of the experiences with FDI opens discussions about the necessary conditions for a country to achieve the benefits indicated by the theory. Some studies have shown that the ability to absorb new technologies, the level of human capital, and the development of the financial market are determining factors for FDI to generate benefits in host countries (RIBEIRO; CARDOSO, 2019).

Several policy initiatives were created to promote FDI, starting in the 1990s in Latin American countries, stimulated by the idea that poverty reduction could be achieved by compensating the capital deficit and contributing to economic growth. These investments were expected to foster capital accumulation, improve productivity and accelerate technological changes in developing countries (CALVO; HERNANDEZ, 2006).

The flow of FDI to Latin American countries was high during the 1990s. About 41% of FDI inflows to developing countries went to Latin America between 1990 and 2001. The type of investment, as the amount, was heterogeneous among the countries in the region. While in Mexico this investment focused on the creation of productive capacity, oriented towards the manufacturing export sectors, in Argentina and Brazil the concentration occurred in the purchase of existing assets, privatizations, and mergers (CALVO; HERNANDEZ, 2006).

In the case of Brazil, the flow of FDI intensified from 1994 onwards, driven by trade liberalization and economic stabilization. The commercial opening encouraged the entry of foreign companies, gave incentives to installation, mergers, and acquisitions of national companies, and the expansion of multinationals already settled. The process was also stimulated by privatizations that gave place for investment by foreign companies (LAPLANE; SARTI, 1999).

In 2021, about 53% of total FDI went to developing countries, worth US\$836 billion. Latin America was the second region that received the most FDI this year, with around 16% of investments direct to developing countries, totaling US\$134 billion, second only to Asia, which attracted 74% of this investment. About 11% of the amount allocated to developing countries went to South America (US\$88 billion). The country that most attracts investment in the continent is Brazil, which received around US\$50 billion, 6% of the total destined for developing countries and 57% of the continent (UNCTAD, 2022).

Several studies have investigated the relationship between FDI and economic growth (ALFARO et al., 2003; HANSEN; RAND, 2006; JOO, AHMAD; SHAWL, 2021), but they were limited by the assumption that there is a perfect positive correlation between economic growth and well-being. Although

economic growth is necessary to increase the well-being of individuals, if not directed towards the poorest, can generate even more inequality (GOHOU; SOUMARÉ, 2012).

As for poverty, it is known that Brazil has continental proportions, and a large portion of the population can be considered poor. In this work, poverty will be considered as a measure of human subsistence, based on the World Bank (WB) poverty lines to make it possible to compare levels of poverty (SEN, 1976).

In this context, the question that arises is: how is this investment affecting the poorest in Brazil, and whether this is helping to reduce poverty or exacerbate inequality? There is no consensus in the literature on the relationship between FDI and poverty reduction. Although there is an agreement between studies on this relationship for African countries (NICITA et al. 2014; MAGOMBEYI; ODHIAMBO, 2018; AWUNYO-VITOR; SACEY, 2018; AYOMITUNDE et al., 2020) and some Asian countries (TSAI, HUANG; 2007; UTTAMA, 2015; AHMAD et al., 2019; MARISSA; ANDAIYANI; APRIANI; WIDYANATA, 2021; HANIM, 2021), those carried out for other developing countries showed a divergence of results, especially those directed to Latin America.

The priority of governments in developing countries, from a social point of view, is generally to increase the country's well-being and reduce poverty. The inflow of FDI, by reducing unemployment and stimulating technological progress and productivity, can facilitate the achievement of these goals. The type of FDI inflow can also influence well-being, those who only purchase primary materials do not generate the same benefits as those exploiting the local consumer market (GOHOU; SOUMARÉ, 2012).

Previous studies on the subject considered that FDI directly impacts poverty, regardless of the way it is measured, however, the relationship between these variables is not direct. FDI has an impact on some macroeconomic variables, such as unemployment, schooling, income, and tax revenues, and it is these variables that will influence the level of poverty. Therefore, the impact on poverty should not be measured directly as it was considered in previous studies but measured to capture the spillover effect that will impact the well-being of the country.

Since Brazil is one of the countries that received the most FDI in Latin America since the 1990s (CALVO; HERNANDEZ, 2006), the objective of this article is to investigate the relationship between FDI and poverty in the country, between the years 1992 to 2019. Considering that this impact is not direct, we will adopt a two-stage methodology to study this relationship. In the first stage, we will verify the influence of FDI on unemployment and other economic variables. In the second stage, we will analyze the relationship between unemployment and poverty, as well as income inequality.

As a result, we expect to find a negative relationship between FDI and poverty/inequality, which would identify that the possible benefits generated are being distributed across the economy. We will test the hypothesis that the FDI inflows reduce the unemployment rate, from this reduction, there is an increase in income and improvement in poverty rates and/or inequality reduction.

This study contributes to the literature by proposing a new empirical strategy to the problem, considering that the effect of FDI on poverty is indirect and not as estimated in previous studies. In this way, we will explore the Instrumental Variable approach, which better fits the structure of the analyzed influences. The results found can help to explain the impacts of the FDI inflows, verify the distribution of benefits created, and evaluate the government's role in producing policies capable of attracting this capital and/or the need for programs that help in the distribution of income.

The article is structured as follows, section 2 will make a review of the literature, and section 3 will show the methodology and data used. Section 4 will present the results and discussions, and section 5 will conclude.

## **2 – Literature Review**

### **2.1 – FDI and Economic Growth**

Foreign Direct Investment (FDI) refers to the ownership of productive assets of a subsidiary by a holding or parent company in a foreign country. There is a difference between owning productive assets and purchasing foreign shares or lending funds to companies and governments, the latter two types of investment are known as portfolio investments. The productive capital can enter a country in two ways: the

brownfield process, through the acquisition of national companies, or the greenfield process, through the creation of a new subsidiary in the country (CYPHER; DIETZ, 2014).

Mello (1997) defines FDI as international cooperation between companies that involve significant equity participation or administrative control by the foreign company. The author also considers other types of investments as FDI, like licensing, franchise, and joint ventures. Recently, the increase of FDI in the service sector has requested a broader definition of this type of investment.

There are many potential benefits of FDI in the host country, like economic growth, increase in tax revenues and the country's capital stock, job creation, improvement of local workers' skills and productivity, and dissemination of technological and management knowledge (FOWOWE; SHUAIBU, 2014).

The impact of FDI on the host's economic growth can occur through three channels: direct, multiplier, and spillover effects. The direct effect is related to the arrival of multinationals in the local economy, with new and cheaper products, the creation of job posts, the expansion of capital goods, and an increase in tax revenues. This is the first impact of the FDI on the host's economy, affecting mainly the job market, through the increase in productivity and the number of jobs (CALVO; HERNANDEZ, 2006; FOWOWE; SHUAIBU, 2014).

The multiplier effect is caused by the relationship between the subsidiary and the local economic agents, throughout the value chain. The subsidiary demands input supplies from the local companies (backward linkage), increasing their production. The local distribution companies are also benefited from the increase in production, as the subsidiary needs them to distribute the final product in the local market (forward linkage). These production increases enhance the creation and expansion of jobs (CALVO; HERNANDEZ, 2006; FOWOWE; SHUAIBU, 2014).

The spillover effect refers to the transfer of knowledge, skills, and technological innovations from subsidiaries to local companies, which occur after the relationship between the subsidiary company and the local market. The extra competitiveness that local companies face with the arrival of a foreign company can act as an incentive for innovations (CALVO; HERNANDEZ, 2006; FOWOWE; SHUAIBU, 2014).

Many studies carried out on the relationship between FDI and economic growth (ALFARO et al., 2004; CHOWSHURY; MAVROTAS, 2006; HANSEN; RAND, 2006; RIBEIRO; CARDOSO, 2019), most of which point to a positive impact of FDI on the economic growth of host countries. But this impact is related to the conditions that already exist in those countries that receive the investment. It is necessary to analyze the macroeconomic and institutional conditions of these countries to verify the capacity to absorb these transfers of knowledge and technology and transform them into economic growth. The level of human capital, the size, and development of the financial market, the degree of commercial openness, and the quality of institutions are relevant conditions for absorbing FDI and converting it into growth, especially in lower-middle-income countries (RIBEIRO; CARDOSO, 2019).

Some concern was put on the fact that the inflow of foreign capital may not always be beneficial to the host country. Depending on the country's industrialization level, domestic companies will not be able to compete with newly established foreign companies. This difficulty to compete with foreign companies may lead to the closure of several national companies and, with that, an increase in unemployment in the region, hindering economic growth. (CALVO; HERNANDEZ, 2006).

## **2.2 – FDI and Poverty**

The relationship between FDI and poverty is complex and often does not occur directly. FDI can directly impact poverty, through job creation, training provision, and contributions to general education, which improve human capital in host countries (TSAI; HUANG, 2007; MAGOMBEYI; ODHIAMBO, 2017; TEIXEIRA; LOUREIRO, 2019).

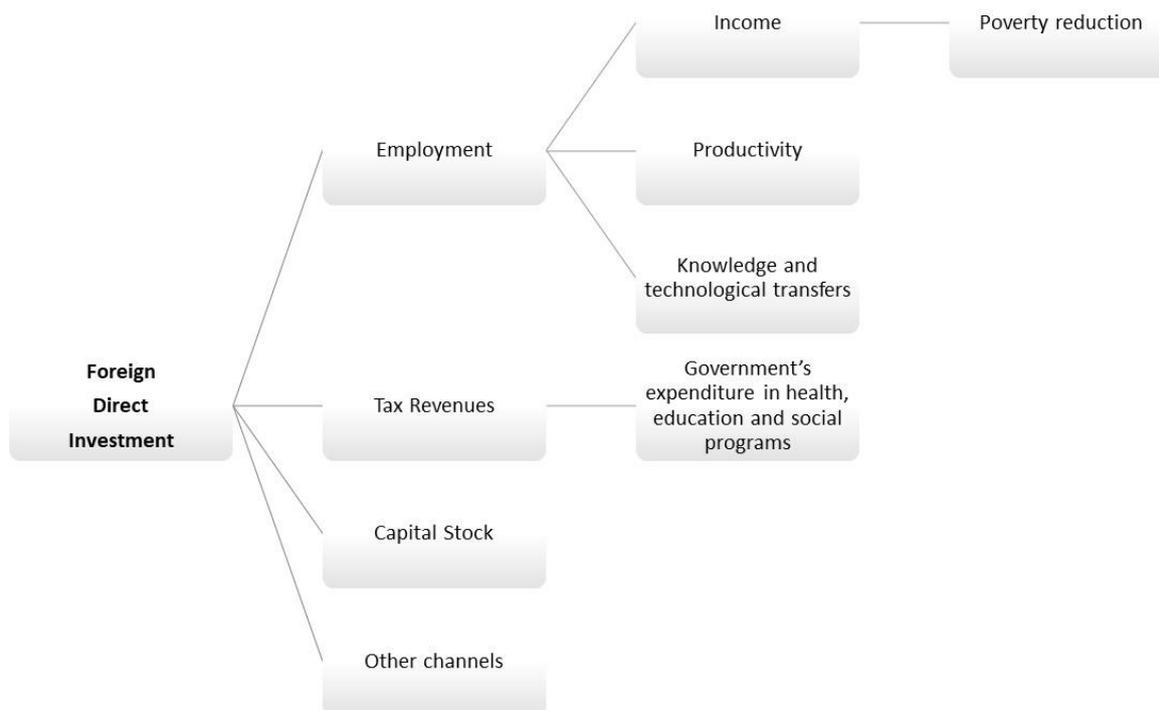
Assuming that people are poor because they do not have access to employment (involuntary unemployment) or can only find low-wage jobs, the inflow of FDI can reduce local poverty by expanding job opportunities and wages. Through wages, FDI can directly reduce local poverty, increasing the workers' revenue. For this channel to be viable, the number of jobs created in the host country must be greater than the number of lost jobs, and the economy must be labor-intensive (CALVO; HERNANDEZ, 2006, ANETOR et al., 2020).

The jobs created by FDI in the private sector can also help with knowledge and technology transfer. This way, local firms can follow and adopt new production or organizational ways, increasing their productivity and competitiveness, thus, consequently, creating new jobs. Through these transfers, FDI can also indirectly affect local poverty (CALVO; HERNANDEZ, 2006, ANETOR et al., 2020).

Indirectly, FDI promotes economic growth in host countries by increasing domestic capital accumulation and promoting exports. This leads to more tax revenue to finance public investment projects such as educational infrastructure, health and social redistribution policies, which are of critical importance for poverty reduction. Finally, growth can be promoted through FDI, generating technological and knowledge spillovers through horizontal and vertical links with local organizations, which can lead to new products and processes, as well as improvements in management techniques (CALVO; HERNANDEZ, 2006; SHAHBAZ et al., 2011; GOHOU; SOUMARÉ, 2012; TEIXEIRA AND LOUREIRO, 2019).

The impact of FDI on poverty will depend on other factors, such as the quality of institutions, technological gap, incentive policies for FDI, social capabilities, and income. Countries with developed institutions, like the financial market, will feel greater effects than those with weak institutions. The country's income is important as well since the impact in the poorest countries was found bigger than in wealthier countries. Some firms' characteristics are also important, like size, location, absorptive capacity, and business strategy (GOHOU; SOUMARÉ, 2012; MAGOMBEYI; ODHIAMBO, 2017; ANETOR et al., 2020). Figure 1 resumes all the discussed channels that FDI can impact on the host economy.

**Figure 1 - The impact of FDI on the host economy**



Source: Created by the authors based on literature review.

### 2.3 – Empirical Literature

Studies that have attempted to verify the impact of FDI on well-being or poverty reduction are scarce and the results ambiguous. The low interest in this area comes from the belief that there is no direct relationship between FDI and poverty or that FDI generates economic growth, so it causes improvement in well-being and reduction in poverty (FOWOWE; SHUAIBU, 2014).

Calvo and Hernandez (2006) investigated the impact of FDI on poverty in 20 Latin American countries through the 90s. Poverty was considered related to unemployment, thus FDI affects poverty

through the labor market. A simplistic model was created, which indicates that individuals are poor because they cannot keep a job. The poverty rate was then determined by the unemployment rate.

The results show that both FDI and domestic investment are important for reducing poverty in these countries. Although FDI impacted poverty in the region, the results were divergent between countries, with significant coefficients only for the Andean countries (Bolivia, Colombia, Ecuador, and Peru). It was identified that FDI only impacts poverty reduction when the country has certain preconditions, such as capital market development and the level of human capital to absorb technological changes (CALVO; HERNANDEZ, 2006).

Gohou and Soumaré (2012) examined the impact of FDI on poverty reduction in 52 African countries, between 1990 and 2007. It was considered that FDI impacts the society's well-being directly through the creation of jobs and increase in salary; and indirectly by increasing society's level of investment and inducing growth. As an indicator of well-being, it was used the Human Development Index (HDI) as it is a multivariate index and contains the dimensions of income, health, and education.

It was shown that FDI negatively impacted poverty in African countries. When divided into regions, the results show that the impact of FDI was positive in central and eastern regions, not significant in northern and southern, and ambiguous in western. It was also found that the impact on the poorest regions of the continent was greater compared to more developed regions (GOHOU; SOUMARÉ, 2012).

Fowowe and Shuaibu (2014) achieved similar results for the African region, analyzing a longer period, from 1981 to 2011, and a sample of 30 countries. As a variable for poverty was chosen the World Bank's Poverty Index, which shows the proportion of people living with up to \$1.25 a day. Some criticisms were made about the use of the HDI, the methodology of the index can hide the real impact generated on poverty.

The results showed that FDI contributed to the reduction of poverty in African countries for the analyzed period. Similar to Gohou and Soumaré (2012), the results indicated that the effect was stronger in the poorest and least developed African countries (FOWOWE; SHUAIBU, 2014).

Quiñonez, Sáenz, and Solórzano (2018) analyze the impact of FDI in 13 Latin American countries, between 2000 and 2014. Using a model similar to Fowowe and Shuaibu (2014) was used as a poverty variable the World Bank Poverty Index, the proportion of people living on less than \$3.20 a day.

The results did not show a significant relationship between FDI and poverty, even when using other alternative measurement variables for poverty. It was concluded that macroeconomic stability, infrastructure, human capital, and financial market development are the variables associated with poverty reduction in Latin American countries (QUIÑONEZ; SÁENZ; SOLÓRZANO, 2018).

Anetor et al. (2020) analyzed the impact of FDI, international aid, and international trade on poverty in the 29 countries of Sub-Saharan Africa between 1990-2017, using HDI as proxy for poverty. The results found indicate that both FDI and international aid contributed to the aggravation of poverty in the analyzed countries, contrary to what was expected. Only international trade has proven effective in reducing poverty in the region.

Do et al. (2021) used fixed effects regression and a spatial econometric model to empirically investigate the impact of FDI on poverty reduction in Vietnam, using panel data at the provincial level. The study concludes that FDI has contributed to poverty reduction not only directly, but also indirectly through human capital. However, FDI has indirectly exacerbated poverty through international trade. Furthermore, the empirical results of the spatial econometric model show that FDI tends to reduce poverty in the provinces.

Saleem et al. (2021) examined the direct and causal association between FDI and poverty reduction in Pakistan, with annual data from 1987 to 2018, and used the ARDL (Autoregressive-Distributed Lag) method for data analysis. They find a bidirectional causality between poverty and FDI, moreover, the causal effects of FDI on poverty reduction are stronger than the effects of poverty reduction on FDI.

As can be seen, there is no consensus on the impact of FDI on poverty. This difference in results may be a consequence of the use of different variables to measure poverty, the different models used, the temporal cuts made, or even the regions analyzed.

### **3 – Methodology**

### 3.1 – Empirical Strategy

For the present study, we used an approach similar to that of Fowowe and Shuaibu (2014), using the World Bank's Poverty Rate and the Gini index as a proxy for the poverty variable. We seek to verify the relationship between FDI and poverty in Brazil, between 1992 and 2019. However, unlike previous studies mentioned in section 2.3, we consider that the relationship between the two variables is indirect. When FDI enters the country, it affects some variables, such as unemployment, which in turn affects poverty, helping to reduce it. Therefore, FDI should not appear as an explanatory variable of the poverty function.

Similar to Calvo and Hernandez (2006), we assume that FDI directly impacts the job market through the creation of new jobs. Using this assumption, we restrict our FDI variable to only consider the inflow and stock of foreign investments.

In this way, FDI impacts the labor market, which we measure through the unemployment rate. The unemployment rate is the path that will then impact poverty. Thus, we follow a two-stage model. In the first stage, we investigated the impact of FDI on Brazil's unemployment rate. In the second stage, we verified the influence of unemployment on the Poverty Rate and the Gini Index.

Therefore, the relationship is a system of two equations that fits into the Instrumental Variables (IV) approach. In this case, the FDI is the instrument that will verify the impact of the inflow of foreign capital on the creation of jobs. For the estimation to be consistent, the instrument must satisfy two conditions: i) relevance and ii) exclusion restriction (ANGRIST; PISCHKE, 2009).

FDI is a relevant instrument, since, keeping the macroeconomic, infrastructure, and human capital effects fixed, it is strongly correlated with the unemployment rate. This means that variations in FDI explain part of the variations in the unemployment rate.

From the second condition, exclusion constraint, the instrument needs to be redundant and (almost) random (ANGRIST; PISCHKE, 2009). FDI meets the redundancy condition, as it does not directly affect poverty, that is, it is not correlated with the error term of the structural equation of the poverty variable. The way FDI influences poverty is through the unemployment rate. When controlling for observable characteristics that impact poverty, the instrument is also (almost) random, as FDI does not depend on the potential poverty outcome. In other words, it is known that FDI is not the result of a choice that influences poverty but is exogenous to it. Therefore, the FDI meets the exclusion constraint.

Of these three, the relevance condition is the only testable one. The sub-identification test was carried out to verify the validity of the instrument, and the weak instrument test was carried out to check the explanatory power of the FDI on poverty. The weak instrument test was also performed in the context of robust inference.

To avoid inefficiency problems, since we are working with aggregated data and few observations for Brazil, we use the 2SLS estimator in the IV approach. In the first stage, we assume that the unemployment rate is a function of a set of macroeconomic variables in the country, which will measure the stability of the local economy, infrastructure, and human capital, as shown in equation (1) below:

$$Unemploy_t = \beta_0 + \beta_1 FDI_t + \beta_2 IR_t + \beta_3 CPI_t + \beta_4 School_t + \beta_5 Elect_t + u_t \quad (1)$$

where  $Unemploy_t$  represents the unemployment rate in the year, from 1992 to 2019;  $FDI_t$  is the Foreign Direct Investment;  $IR_t$  is the interest rate;  $CPI_t$  is the Consumer Price Index;  $School_t$  is the population's average years of schooling;  $Elect_t$  is the percentage of the Brazilian population with access to electricity;  $\beta_s$  are the coefficients;  $u_t$  is the error term.

In the second stage, poverty is a function of the same set of variables as in the first stage. Equation (2) represents this function:

$$Pov_t = \alpha_0 + \alpha_1 Unemploy_t + \alpha_2 IR_t + \alpha_3 CPI_t + \alpha_4 School_t + \alpha_5 Elect_t + \varepsilon_t \quad (2)$$

where  $Pov_t$  is measured by the Gini index and the World Bank's Poverty Rate for Brazil, which are explained in the following data section. The other variables and their coefficients are defined as in equation (1).

### 3.2 – Data

For the unemployment variable, we used the annual unemployment rate in Brazil from 1992 to 2019, measured by the Brazilian Institute of Geography and Statistics (IBGE) through the National Household Sample Survey (PNAD). The data are available on the website of the Institute for Applied Economic Research (IPEA), which contains the annual unemployment series between 1992 and 2014, after this period unemployment data began to be released on a monthly or quarterly basis. We obtained the annual rate for the remaining years, 2015 to 2019, through the geometric mean of the monthly rates.

Traditionally, the World Bank uses three poverty lines, US\$1.90 per person per day, dollars in 2011 purchasing power parity (PPP), for low-income countries and/or countries with recent conflicts, US\$3.20 for lower-middle-income countries, and US\$5.50 for upper-middle-income countries. These different cuts were used so that the poverty line would be equivalent in well-being regardless of the individual's country.

Thus, to represent the poverty variable, we adopted these lines, which measure the percentage of people in extreme poverty. This distinction can show whether the impact of FDI varies with income levels. Differentiation by income levels is necessary to compare the impact caused. Initially, new jobs created through FDI may be restricted to skilled workers, only affecting other workers afterward. The poorer the person, the less likely he is to be qualified for the jobs created. If this is the case, the impact on the poor population may decrease with lower income levels. Therefore, we will use the three income variations to compare the impact of FDI on them.

We will also use the Number of People in a Situation of Poverty, which is the multiplication of the poverty line by the country's population, also provided by the World Bank. The Gini Index, which measures the degree of income concentration in the country, was also used. In this way, we verify the impact of investment on income inequality.

As for FDI, we used the level of Foreign Direct Investment in dollar units, measured in stock and inflow, whose data are disclosed in the World Investment Report of the United Nations Conference on Trade and Development (UNCTAD). Stock FDI measures the annual stock of foreign capital in the country, while inflow FDI measures the annual inflow of foreign capital. Inward FDI can be more volatile compared to stock FDI, as it depends not only on the economic conditions of the host country but also on those of the originating country and the world, thus being more prone to variations. To test the robustness of the results, we prefer to use both measurement methods.

For the control variables, we bring measures of human capital, infrastructure, and macroeconomic level. As a proxy for human capital, we insert the average years of schooling of the population aged 25 or over. This data is measured by the IBGE, through the PNAD. We used the series available between 1992 and 2014 on the IPEA site, and the remaining years were taken from the IBGE.

To capture the country's infrastructure, the standard from national and international literature was used and, for this, we chose the percentage of the Brazilian population with access to electricity, data made available by the World Bank.

Finally, the annual interest rate and the Consumer Price Index (CPI) were incorporated to represent the country's macroeconomic level. The annual interest rate used is a geometric average of the monthly accumulated Over/Selic interest rate. The CPI used is that measured by Getúlio Vargas Foundation (CPI – FGV). Both variables are available on the IPEA site. Table 1 summarizes the information on the variables.

Due to the temporal restriction that the FDI and some control variables have, available only after the 1990s, our analysis covered the period between 1992 and 2019. Some of our variables are measured using PNAD, this survey does not occur in census years, therefore, there is no data for the years 1994, 2000, and 2010, which were excluded from our analysis.

**Table 1 – Variables: description and source**

<i>Variable</i>	<i>Description</i>	<i>Source</i>
<b>POVERTY</b>		
Pov	Proportion of individuals living with income below the poverty line (measured in three dimensions, U\$1.90, U\$3.20 and U\$ 5.50 per day)	World Bank
PovN	Number (in million) of individuals living with income below the poverty line (measured in three dimensions, U\$1.90, U\$3.20 and U\$ 5.50 per day)	World Bank
GINI	Income Concentration Index	World Bank
<b>UNEMPLOYMENT</b>		
Unemploy	Annual Unemployment Rate	IBGE
<b>FOREIGN DIRECT INVESTMENT</b>		
FDISTOCK	Foreign Direct Investment Stock	UNCTAD
FDIFLOW	Foreign Direct Investment Inflow	UNCTAD
<b>MACROECONOMICS</b>		
CPI - FGV	Consumer Price Index	IPEADATA
IR	Annual Interest Rate	IPEADATA
<b>INFRASTRUCTURE</b>		
Elect	Proportion of domicile that has access to electricity	World Bank
<b>HUMAN CAPITAL</b>		
Schooling	Average years of schooling of the population age 25 or over	IPEADATA

Source: Created by the authors.

## **4 - Results and discussions**

### **4.1 – Descriptive analysis**

Table 2 presents descriptive statistics for the used variables of interest and control. The poverty variables indicated that in the analyzed period, on average 15 million people lived in Brazil with less than U\$1.90 per day, representing 8.72% of the population. The variable of US\$3.20 per day represented an average of 18% of the population, about 32 million people. The last poverty variable analyzed is that of people living with up to US\$5.50, which represented, on average 33% of the population, around 60 million Brazilians. It is important to note that in some periods more than half of the population fell into the last group analyzed.

**Table 2 – Descriptive Statistics**

Variable	Obs	Mean	Std.Dev.	Min	Max
Poverty U\$1.90	24	15.44	7.68	5.50	32
Poverty U\$3.20	24	32.31	13.53	14.20	57.20
Poverty U\$5.50	24	60.87	17.38	35.70	89.50
Poverty U\$1.90 (% pop.)	24	8.72	5.16	2.70	20.70
Poverty U\$3.20 (% pop.)	24	18.14	9.19	7	37.10
Poverty U\$5.50 (% pop.)	24	33.75	12.56	17.60	58
Gini	24	55.74	2.85	51.90	60.10
Unemployment	24	9.12	1.84	6.67	12.88
FDISTOCK	24	308.804	242.467	47.262	705.031
FDIFLOW	24	35.986	26.558	1.291	97.422
CPI	24	166	600.40	1.66	2.829
Electricity	24	96.76	3.27	88.80	99.80
Schooling	24	6.82	1.36	4.95	9.40
Interest Rate	24	3.57	8.01	0.48	33.43

Source: Results of the study.

The Gini Index measures the degree of income concentration in a country, ranging from 0 to 100. The higher the index, the greater the income concentration. For the analyzed period, the average Gini Index for Brazil was 55.74, and the minimum and maximum values recorded were 51.90 and 60.10 respectively. This indicates that during the analyzed period, there was significant variability in the concentration of income in the country.

The annual unemployment rate was on average 9.12% during the analyzed period, showing the highest value of 12.88% and the lowest value of 6.67%. It is worth mentioning that the chosen period covers significant economic events, such as the adoption of the real plan in 1994, the world economic crisis of 2008, and the Brazilian economic crisis of 2015, which helps to explain the great variability of this rate.

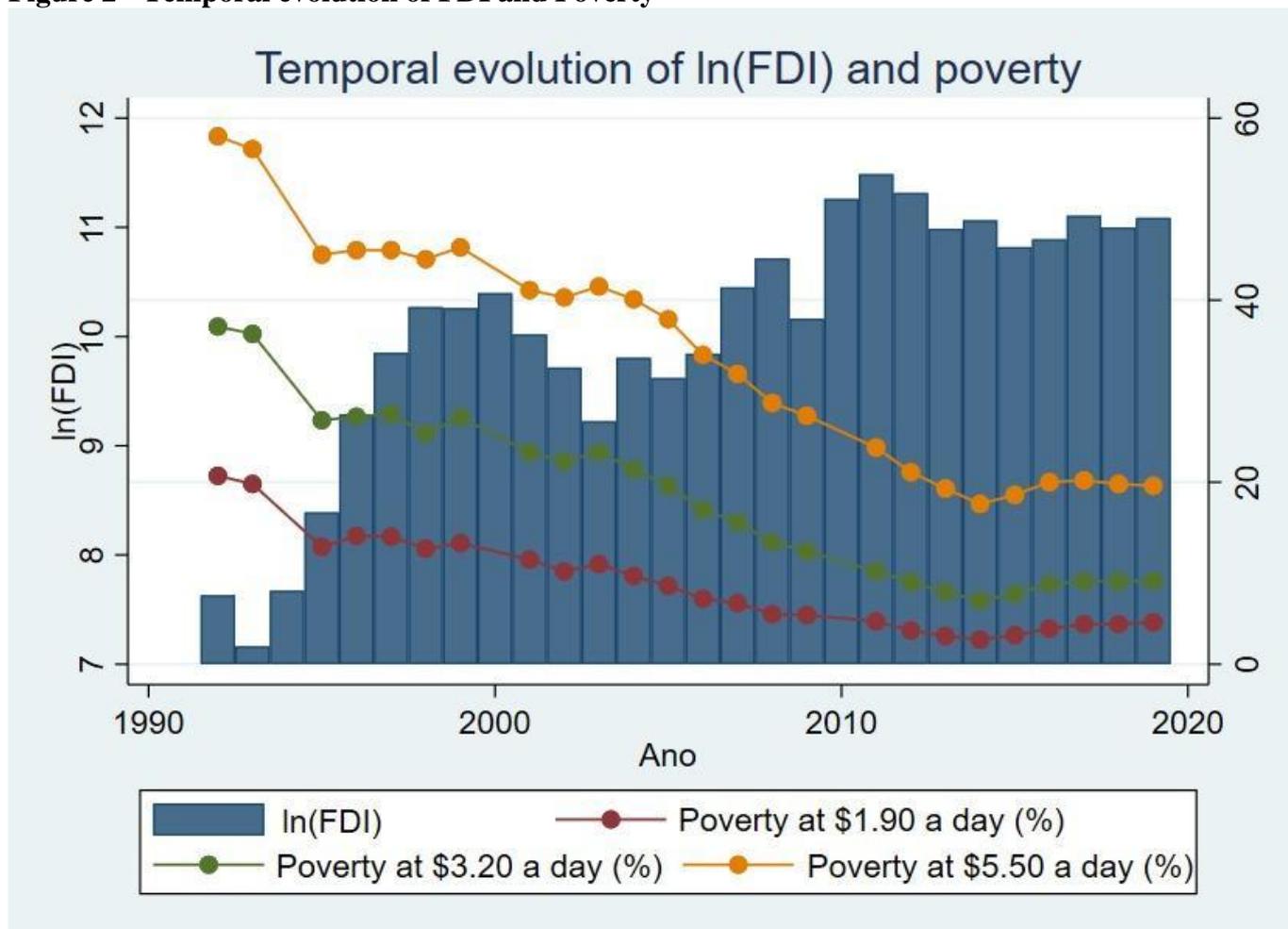
For FDI we chose to use two ways of measurement (stock and inflow) trying to verify if there were any significant differences between them since the FDI inflow is a variable more susceptible to variations due to the response to economic crises. The average stock of FDI in the country, during the analyzed period, was US\$308 million, with a maximum of US\$705 million and a minimum of US\$47 million. The annual inflow of FDI, on average, was US\$35 million. There is also a great variability verified in the FDI entering the country, a reflection of the incentive policies and the economic situation, which attract or repel this capital.

The control variables show great variability in the period. Highlights for the average years of studies, with an ascendant trend and an average of 6.8 years for the analyzed period, and the interest rate, with an average of 3.57% per year. The greatest variability was presented in the CPI, which still captures part of the economic stabilization that occurred in the early 1990s.

Figure 2 shows the temporal evolution of the FDI inflow, in logarithm, and of the three poverty variables used. Regarding investment, it is possible to notice a growth trend, more accentuated between the late 1990s and early 2000s, but that continued growing until recent years.

All three poverty variables show similar behavior, decreasing over time. Between 2000 and 2010 the fall appears to be more pronounced than in other periods. It is worth noting that all three variables were above 20% in the early 1990s, with the variable representing the population living on US\$5.50 a day representing more than half of the population. Recently, only the highest poverty line accounts for more than 20%, and the two lowest are at a level lower than 10% of the population.

**Figure 2 - Temporal evolution of FDI and Poverty**



Source: Adapted from UNCTAD and World Bank's data.

#### 4.2 - Results for the relationship between FDI and Poverty

In that subsection, we analyze the main results of the relationship between FDI and poverty. The first step is to attest to the FDI's validation as an instrumental variable. Table 3 shows the coefficients of the first stage, the sub-identification tests for instrument validity, and the instrument strength tests. We see that both FDI in Stock and Flow are statistically significant at the 1% level and reduce the unemployment rate. The FDI inflow had a lower coefficient than the stock FDI. Despite the low coefficient of both, the two instruments presented a high explanatory power for the unemployment rate. We saw, through the partial  $R^2$ , that the stock has explanatory power of 60% and the FDI inflow of 30%.

We reject the hypothesis of sub-identification of the matrix, which demonstrates that the instruments are relevant. Furthermore, instrument strength tests show that both are strong, including for robust inference. Cragg Donald and Kleibergen-Paap's F-Statistics for stock FDI exceeds the critical value for 10% bias, while for FDI inflow the value of Kleibergen-Paap's F-Statistic exceeds the critical value for 15% bias. Estimating the first stage with the two instruments separately was important to strengthen the relationship between Foreign Investment and unemployment. The Stock-Wright LM test and the Anderson-Rubin test show that both instruments are significantly strong with robust inference. The result found is within the expected, which was a negative relationship between FDI and unemployment.

This shows that the investment arriving in the country has created employment in greater quantity than those that are lost due to its arrival. Although the coefficient found is an indicator of the low impact

on unemployment, this may occur because a large part of the FDI is related to acquisitions or mergers of national companies, which limits the impact on job creation.

**Table 3** – First-Stage Regression.

Variable	(1)	(2)
FDISTOCK	-0,00001*** (2,13e-06)	
FDIFLOW		-0,00005*** (0,00001)
Constant	4,194 (25,56)	25,79 (29,53)
Observations	24	24
R <sup>2</sup>	0,751	0,593
Partial R <sup>2</sup>	0,6	0,3
F Statistic	37,67	32,97
<b>Controls</b>		
CPI	Yes	Yes
Interest Rate	Yes	Yes
Schooling	Yes	Yes
Electricity	Yes	Yes
<b>Underidentification Test</b>		
LM Statistic	8,3***	5,3**
P-value	0,003	0,02
<b>Weak Identification Test</b>		
Maximal IV size 10% - 16,38		
Maximal IV size 15% - 8,96		
Maximal IV size 20% - 6,66		
Cragg-Donald F statistics	24,7	8,2
Kleibergen-Paap F statistics	28,8	13,5
<b>Weak Identification Test – Robust Inference</b>		
LM S statistic (Stock-Wright)	7,7***	5,6**
Wald Test (Anderson-Rubin)	8,6***	3,6*

**Source:** Results of the study.

**Note:** Robust standard errors in parenthesis. \*\*\* p<0,01, \*\* p<0,05, \* p<0,1.

After proving the validity of the FDI as an instrument, we proceed to analyze the results of the structure equation, which presents the relationship between the unemployment rate and poverty. Table 4 presents the estimations for both types of FDI in the three poverty variables considered.

The results found are consistent with what was expected, a positive relationship between unemployment and poverty, considering both types of FDI. This indicates that reductions of 1 percentage point (pp) in the unemployment rate generated, on average, a reduction of 1.2 million in the number of people living on less than US\$1.90 a day, of 2.8 million of those living by US\$3, 20 per day and of 4.5 million in those of US\$5.50 per day, considering the stock FDI. The results for the FDI inflow showed similar results, all significant at the 1% level.

It is worth mentioning that the group that lives on less than US\$5.50 a day includes a much larger number of people in a situation of vulnerability, so a higher result was expected for this level of income. In addition, the demand for work derived from FDI, which may require skilled labor or more productive workers, could not contemplate the poorest, who could not have the necessary knowledge or skill required. People with a vulnerability level as low as that seen in the first two groups may not benefit as much from variations in the unemployment rate, as they do not have the skills demanded by the contractors.

**Table 4** – Coefficients estimated by IV for the number (in millions) of people in Brazil living with less than US\$1.90, US\$3.20 and US\$5.50 per day.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	US\$1,90	US\$3,20	US\$5,50	US\$1,90	US\$3,20	US\$5,50
	FDISTOCK			FDIFLOW		
Unemployment	1,227*** (0,194)	2,869*** (0,269)	4,511*** (0,446)	1,012*** (0,257)	2,793*** (0,394)	4,499*** (0,588)
Observations	24	24	24	24	24	24
R <sup>2</sup>	0,982	0,986	0,977	0,978	0,986	0,977
χ <sup>2</sup> Statistic	5.877	5.902	3.128	5.616	6.108	3.141
<b>Controls</b>						
CPI	Yes	Yes	Yes	Yes	Yes	Yes
Interest Rate	Yes	Yes	Yes	Yes	Yes	Yes
Schooling	Yes	Yes	Yes	Yes	Yes	Yes
Electricity	Yes	Yes	Yes	Yes	Yes	Yes

**Source:** Results of the study.

**Note:** Robust standard errors in parenthesis. \*\*\* p<0,01, \*\* p<0,05, \* p<0,1.

Table 5 presents the coefficients for estimating the same model, this time using the percentage of people living in poverty as the variable of interest. Again, the results are similar to the previous one, a positive relationship between unemployment and poverty. One percentage point reduction in the unemployment rate leads, on average, to a reduction of 0.58 pp in people living on less than \$1.90 a day, 1.40 pp in those living on \$3.20 a day, and 2.28 pp in those living with up to US\$5.50 per day, considering the stock FDI. Again, the results for the FDI inflow showed very similar coefficients.

**Table 5** - Coefficients estimated by IV for the percentage of people in Brazil living with less than US\$1.90, US\$3.20 and US\$5.50 per day.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	US\$1,90	US\$3,20	US\$5,50	US\$1,90	US\$3,20	US\$5,50
	FDISTOCK			FDIFLOW		
Unemployment	0,582*** (0,111)	1,405*** (0,143)	2,278*** (0,217)	0,452*** (0,142)	1,331*** (0,210)	2,218*** (0,273)
Observations	24	24	24	24	24	24
R <sup>2</sup>	0,986	0,992	0,991	0,982	0,992	0,991
χ <sup>2</sup> Statistic	10.072	12.365	9.049	9.655	13.207	9.243
<b>Controls</b>						
CPI	Yes	Yes	Yes	Yes	Yes	Yes
Interest Rate	Yes	Yes	Yes	Yes	Yes	Yes
Schooling	Yes	Yes	Yes	Yes	Yes	Yes
Electricity	Yes	Yes	Yes	Yes	Yes	Yes

**Source:** Results of the study.

**Note:** Robust standard errors in parenthesis. \*\*\* p<0,01, \*\* p<0,05, \* p<0,1.

To also test the effect of FDI on the country's income inequality, we used the Gini Index as a proxy for the poverty variable. Using the same modeling, table 6 presents the coefficients found. As expected, the relationship between the unemployment rate and the Gini Index was positive. Reductions of one percentage point in the unemployment rate lead, on average, to a reduction in the index by about 0.41 points for stock FDI and about 0.37 points to inflow FDI. It is worth remembering that the higher the Gini Index, the more unequal the distribution of wealth in the country analyzed. Again, the differentiation of the two types of FDI showed similar results.

**Table 6** – Coefficients estimated by IV for Gini Index.

Variable	(1)	(2)
	FDISTOCK	FDIFLOW
Unemployment	0,412*** (0,0962)	0,370*** (0,131)
Observations	24	24
R <sup>2</sup>	0,978	0,977
χ <sup>2</sup> Statistic	16.260	14.672
<b>Controls</b>		
CPI	Yes	Yes
Interest Rate	Yes	Yes
Schooling	Yes	Yes
Electricity	Yes	Yes

**Source:** Results of the study.

**Note:** Robust standard errors in parenthesis. \*\*\* p<0,01, \*\* p<0,05, \* p<0,1.

Our results are similar to those made for other regions, such as Asia (TSAI, HUANG; 2007; UTTAMA, 2015; AHMAD et al., 2019; MARISSA; ANDAIYANI; APRIANI; WIDYANATA, 2021; HANIM, 2021), which is the region with developing countries that receive the most FDI inflows and, second is Latin America, where evidence was found that this inflow reduced local poverty. They are also similar to some studies carried out for Africa (NICITA et al. 2014; MAGOMBAYI; ODHIAMBO, 2018; AWUNYO-VITOR; SACEY, 2018; AYOMITUNDE et al., 2020), which is the third largest receiver of FDI inflow, whose results also showed a strong impact of FDI on poverty reduction.

The results found here differ from those found previously for the region, both Gohou and Soumaré (2012) and Quiñonez, Sáenz, and Solórzano (2018) analyzed the impact of FDI on poverty and failed to find significant results for the region. In the aggregation of countries, perhaps the effect of FDI dissipates, as may not be very effective in other countries in the region that may have received low flows of foreign capital. The difference also could occur because of the methodology, since both used FDI as an explanatory variable for poverty as if the effect were direct.

## 5 - Conclusion

The objective of this article was to investigate the relationship between FDI and poverty in Brazil, between the years 1992 and 2019. Previous studies had already analyzed this relationship, but the methodologies used considered a direct effect of FDI on poverty, which is estimated in the same equation. In this study, we apply the 2SLS estimator in two stages, assuming that FDI affects employment, which in turn affects population poverty.

The results found, in line with expectations, indicated that in the analyzed period, FDI had a negative impact on poverty in the region, helping to alleviate it. The first stage indicated that there was a negative impact, albeit low, of FDI on the unemployment rate, in both measured ways of investment. This result indicates that the potential job creation of FDI was greater than the jobs lost because of it.

The second stage evaluated the impact of the unemployment rate on poverty, in which a positive relationship between the variables was found. When analyzed by poverty lines, the impact is decreasing the closer to extreme poverty, which can be explained by the lack of education, skills and technical knowledge that may be required to hire for new jobs, whose poorest population may not have.

This indicates that public policies to attract foreign capital to Brazil can be used as an instrument to alleviate poverty in certain regions of the country. Incentives for the entry of capital, as long as they are aimed at growth focused on the poorest population, as indicated by recent studies, can be facilitators of economic development and an increase in the country's income.

This work suffered from limitations of the data used. The lack of investment data and other control variables by region of the country made it impossible to carry out a more in-depth study on the regional effects of capital inflows since states can produce public policies to attract this capital.

A disaggregated analysis of Latin American countries can help to understand why previous results for the region were not significant, helping to understand the reason for the Brazilian success concerning the use of FDI. Just as an analysis by sector can shed light on the types of jobs that were created with the arrival of FDI, exploring deeper into the channel between FDI and employment. But these topics remain as a suggestion for future studies.

## 6 – References

AHMAD, F. et al. Impacto dos fluxos de IDE na redução da pobreza nas economias da ASEAN e SAARC. **Sustentabilidade**, v. 11, n. 9, p. 2565, 2019.

ALFARO, L.; CHANDA, A.; KALEMLI-OZCAN, S.; SAYEK, S. FDI and economic growth: The role of financial markets. **Journal of International Economics**, v. 64, n. 1, p. 89-112, 2004.

ANETOR, F. O.; ESHO, E.; VERHOEF, G. The impact of foreign direct investment, foreign aid and trade on poverty reduction: Evidence from Sub-Saharan African countries. **Cogent Economics & Finance**, v. 8, n. 1, 2020.

ANGRIST, J. D.; PISCHKE, J. **Mostly harmless econometrics: An empiricist's companion**. Princeton University Press, 2009.

AWUNYO-VITOR, D.; SACKKEY, R. A. Agricultural sector foreign direct investment and economic growth in Ghana. **Journal of Innovation and Entrepreneurship**, v. 7, n. 1, p. 1-15, 2018.

AYOMITUNDE, A. T.; IFEANYI, O. J.; OLUSEGUN, F. L.; FLORENCE, I. A. Re-investigating foreign direct investment and poverty alleviation: Does status quo still hold within ECOWAS sub-region?. **EuroEconomica**, v. 39, n. 3, p. 29-37, 2020.

CALVO, C. C.; HERNANDEZ, M. A. Foreign direct investment and poverty in Latin America. *In: Globalization and Economic Policy*, 5., Nottingham. **Anais [...]**, Nottingham: University of Nottingham, 2006.

CHOWDHURY, A.; MAVROTAS, G. FDI and growth: What causes what?. **World Development**, v. 29, n. 1, p. 9-19, 2006.

CYPHER, J. M.; DIETZ, J. L. **The process of economic development**. Routledge, ed. 3, 2009.

DO, Quynh Anh et al. Spatial impact of foreign direct investment on poverty reduction in Vietnam. **Journal of Risk and Financial Management**, v. 14, n. 7, p. 292, 2021.

FOWOWE, B.; SHUAIBU, M. L. Is foreign direct investment good for the poor? New evidence from African countries. **Economic Change and Restructuring**, v. 47, n. 4, p. 321-339, 2014.

GOHOU, G.; SOUMARÉ, I. Does foreign direct investment reduce poverty in Africa and are there regional differences?. **World Development**, v. 40, n. 1, p. 75-95, 2012.

HANIM, W. How does foreign direct investment (FDI) reduce poverty? Application of the triangular hypothesis for the Indonesian case. **Review of Integrative Business and Economics Research**, v. 10, n. 1, p. 400-411, 2021.

HANSEN, H.; RAND, J. On the causal links between FDI and growth in developing countries. **The World Economy**, v. 29, n. 1, p. 9-19, 2006.

JAVORCIK, B. S. Does FDI bring good jobs to host countries?. **The World Bank Research Observer**, v. 30, n. 1, p. 74-94, 2015.

- JOO, B.; SHAWL, S. Examining the FDI–growth nexus in BRICS: Panel data evidence. **The Indian Economic Journal**, v. 69, n. 4, p. 673-687, 2021.
- LAPLANE, M.; SARTI, F. Investimento direto estrangeiro e o impacto na balança comercial nos anos 90: Determinantes e estratégias. **Revista do Instituto de Economia da Unicamp**, n. 8, 1997.
- MAGOMBEYI, M. T.; ODHIAMBO, N. M. Dynamic impact of FDI inflows on poverty reduction: Empirical evidence from South Africa. **Sustainable Cities and Society**, v. 39, p. 519-526, 2018.
- MARISSA, F.; ANDAIYANI, S.; APRIANI, D.; WIDYANATA, F. Indonesia’s poverty reduction: Driving economic growth through foreign direct investment. **Management and Economics Review**, v. 6, n. 2, p. 277-290, 2021.
- MELLO JR., L. R. Foreign direct investment in developing countries and growth: a selective survey. **Journal of Development Studies**, v. 34, n. 1, p. 1-34, 1997.
- NICITA, A.; OLARREAGA, M. E.; PORTO, G. Pro-poor trade policy in Sub-Saharan Africa. **Journal of International Economics**, v. 92, p. 252-265, 2014.
- QUIÑONEZ, P.; SÁENZ, J.; SOLÓRZANO, J. Does foreign direct investment reduce poverty? The case of Latin America in the twenty-first century. **Business and Economic Horizon**, v. 14, n. 3, p. 488-500, 2018.
- RIBEIRO, M. J.; CARDOSO, L. C. B. Efeitos do investimento estrangeiro direto e das características dos países hospedeiros no crescimento econômico. *In: ENCONTRO NACIONAL DE ECONOMIA*, 47., 2019. São Paulo, **Anais [...]**. São Paulo: Fundação Getúlio Vargas, 2019.
- SALEEM, Hummera et al. Nexus between Foreign Direct Investment and Poverty Reduction: A case of Pakistan. **iRASD Journal of Economics**, v. 3, n. 3, p. 272–280-272–280, 2021.
- SEN, A. Poverty: An ordinal approach to measurement econometrics. **The Econometric Society**, v. 44, p. 437-46, 1976.
- SHAHBAZ, M.; LEITÃO, N. C.; MALIK S. Foreign direct investment-economic growth nexus: the role of domestic financial development in Portugal. **Economics Bulletin**, v. 31, n. 4, p. 2824–2838, 2011.
- TEIXEIRA, A.A.C., LOUREIRO, A.S. FDI, income inequality and poverty: a time series analysis of Portugal, 1973–2016. **Port Econ J** 18, 203–249, 2019.
- TSAI, P. Foreign direct investment and income inequality: further evidencel, **World Development**, 23 (3): 469-483, 1995.
- UNCTAD, United Nations Conference on Trade and Development. **World Investment Report 2022**. New York: United Nations, 2022.
- UTTAMA, N. P. et al. Foreign direct investment and the poverty reduction nexus in Southeast Asia. **Poverty Reduction Policies and Practices in Developing Asia**, v. 281, 2015.