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Foreign Direct Investment, Income Inequality and Poverty in Portugal, 1973-2014: What does cointegration analysis tell us?

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Foreign Direct Investment, Income Inequality and Poverty in Portugal, 1973-2014:

What does cointegration analysis tell us?

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Abstract

The empirical evidence on how inflows of foreign direct investment impact on income inequality and poverty of a country is scarce and produces divergent results. Moreover, most existing studies look into underdeveloped or developing countries. The aim of this study is to contribute to the empirical literature on the relationship between foreign direct investment (FDI), poverty and income inequality, focusing on a little explored context, a developed country, Portugal, characterized by having relatively high levels of inequality and poverty. Using time series estimates (cointegration), in particular, the Johansen test and Granger causality, for the period between 1973 and 2014, the results show that there is a longstanding relationship between inflows of foreign investment and the indicators of inequality and poverty. In particular, evidence points to the fact that FDI inflows are associated to lower levels of inequality and poverty. Nevertheless, Granger causality maintains that, in Portugal, between 1974 and 2014, it was this lower level of inequality and poverty that fostered greater inflows of FDI, and not the opposite. Thus, if the objective is to increase competitiveness by attracting FDI, it is crucial to promote integrated social and economic policies (education, labor market, taxation) that will help mitigate inequality levels and poverty rates.

Keywords: FDI, income inequality, poverty, time series, Portugal

Note: This article is sole responsibility of the authors and do not necessarily reflect the positions of GEE or the Portuguese Ministry of Economy.

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1. Introduction

In a context where economies and companies are increasingly more globalized, foreign direct investment (FDI) has grown in importance as the subject of scientific studies, in particular on their impact at various levels in the receiving countries (Tsai, 1995; Antonietti *et al.*, 2015). However, the results on the FDI impact on these countries, namely in terms of income distribution, are far from being perceptible (Franco and Gerussi, 2013; Herzer *et al.*, 2014) as they are wrapped up in ambiguity and dilemmas.

In a more accepted perspective, FDI is regarded as an important factor in a country's economic growth (Tsai, 1995; Seyoum *et al.*, 2015). Some authors maintain that FDI has a positive impact on economic growth as it enables the transfer of technology and accumulated knowledge in developed economies (Tsai, 1995; Anderson, 2005; Jensen and Rosas, 2007; Iwasaki and Tokunaga, 2014). The influence of foreign management, the presence of large multinational subsidiaries, and their outsourcing solutions in the FDI receiving countries improve not only technology systems, but also efficiency in the use of human capital (Iwasaki and Tokunaga, 2014). This flow of resources is regarded as being relatively stable, thus allowing for increased productive capacity, employment and trade (Iamsiraroj and Ulubaşoğlu, 2015). From this point of view, FDI generates positive externalities.

It has also been argued that FDI can have a potential negative impact in receiving countries due to the fact that tax incentives given to foreign companies investing in a specific country can impair and tweak investment incentives for domestic companies (Iwasaki and Tokunaga, 2014). Other factors such as the transfer of harmful technology (considering the proportions of the labor factor in the receiving country), the entry of a very strong competitor compared to local companies, and the country's lack of influence in trade (if, for e.g., the target of the arriving company is the domestic market, exports will not increase), support the idea that FDI may be detrimental to the receiving country (Ram and Zhang, 2002). Recent studies have associated the internationalization of a country, in general, and FDI, in particular, to the growth of poverty (Freeman, 2004; Rasiah, 2008; Fowowe and Shuaibu, 2014) and the unequal distribution of income (Jensen and Rosas, 2007; Basu and Guariglia, 2007).

From a political and economic viewpoint, studying the relation between FDI and inequality/poverty is essential, given the complementarity between social and economic measures for the long-term performance of a society (Çelik and Basdas, 2010).

Assessing the relationship between FDI, income inequality and poverty is no easy task (Jensen and Rosas, 2007), and there is a lack of empirical evidence (Iniguez-Montiel, 2014). In fact, some studies of different countries have produced conflicting results regarding this relationship (Jensen and Rosas, 2007; Çelik and Basdas, 2014). Studies in this field have dealt with Latin-American countries such as Mexico (Jensen and Rosas, 2007) and Peru (Ko, 2013), Asian countries, in particular India (Gosh, 2012), China (Chen *et al.*, 2011; Lessman, 2013), and economies in transition, such as Russia, Poland, Romania, Bulgaria and Ukraine (Franco and Gerussi, 2013). Some of these studies show that FDI aggravates income inequality (Tsai, 1995: Choi, 2006; Adams and Mengistu, 2008; Sakamoto and Fan, 2013), but nevertheless has a positive impact on poverty, mitigating or significantly reducing it (Freeman, 2004; Brooks *et. al.*, 2004; Rasiah, 2008; Sapkota, 2011; Gohou and Soumaré, 2012). Due to the ambiguous results from these studies, more empirical evidence is needed involving different types of countries, namely developed countries, in order to clarify the impact of FDI on income distribution and poverty.

Portugal is one of the most unequal and poorest countries in Europe, where there has been a considerable dynamism in terms of FDI over the last 30 years. According to PORDATA information, between 1994 and 2014, the FDI inflows (at current value) have grown each year, on average, 5.6 %. It is therefore scientifically relevant to examine if, and the extent to which, a greater inflow of FDI in the country has contributed to evolution of poverty and (income) inequality.

In order to detect the existence and direction of a long-term relationship between FDI flows and indicators of social inequality and poverty, we resort to cointegration techniques and Granger causality test.

This study is organized as follows: the following section deals with a detailed presentation of the state of the art on the impact of FDI on receiving economies, in particular in terms of income distribution and poverty. Section 3 presents the methodology; Section 4 shows the results, followed by Section 5 with the discussion of results and main conclusions.

2. Review of literature: inequality, poverty and FDI

2.1. FDI and income distribution

The Stolper-Samuelson theorem explains how the inflow of FDI in a given country leads to a drop in income inequality in that same country. The more developed countries tend to take advantage of the abundant skilled workforce in developing countries (Lee and Vivarelli, 2006). As such, and providing that there are constant returns to scale and perfect competition, FDI raises the demand for non-skilled workforce, which in turn (assuming that the demand for skilled labor remains constant) means the relative wages of non-skilled labor increase. As this will lead to the convergence of wages in the receiving country, FDI will help reduce income inequalities in the receiving economy.

Feenstra and Hanson (1996, 1997) criticized the implications of Stolper-Samuelson's model, presenting a general equilibrium model developed in 1996 that establishes the theoretical connection between FDI and wage inequality. In the model, the manufacturing sector is part of the final product from a continuum of intermediate goods, the production of which requires capital and skilled and non-skilled labor. By classifying the intermediate goods according to the degree of skill intensity, in the equilibrium between trade and prices of different factors among countries, the 'south' produces a number of non-skilled labor intensive intermediate goods and the 'north' skilled labor intensive intermediate goods. FDI shifts part of the production of intermediate goods from the north to the south. This portion is most skilled-intensive in the south, but least skilled in the north. Hence FDI leads to skill-biased demand shifts between countries. As stated by Feenstra (1998: 41), FDI "has a qualitatively similar effect on reducing the demand for unskilled relative to skilled labor within an industry as does skill-biased technological change". Feenstra-Hanson's model explains the positive relation seen between FDI and wage inequality in cases such as Mexico after 1985 (Lee and Vivarelli, 2006). Production shifts from a developed country to a developing country can lead to the increase in income inequality in both countries, as in the former the relative wage of non-skilled labor will reduce, and in the latter it will increase. In both cases, FDI will cause an increase in wage dispersion, which contributes to increasing wage inequality, thus there is a positive correlation between the two.

The negative impact of FDI on income distribution is also strengthened by the increasing demand for the use of skilled labor in new FDI-associated technologies (Lee and Vivarelli, 2006). Not only do the FDI companies use such technologies, but there are associated spillovers (effects of demonstration, imitation, technology upgrading between companies and industries upstream and downstream, transfer of knowledge through employees, pressure to improve competitiveness) that are reflected in the transfer of such technology to domestic companies. This leads to the increase in the use of skilled labor and aggravates income inequality.

2.2. FDI and poverty

The impact of FDI on human development and, therefore, on poverty levels, can be examined from at least two perspectives (Gohou and Soumaré, 2012): 1) social development: the priorities of the receiving countries' governments are to reduce poverty and improve well-being. FDI can help achieve those targets because such investment creates jobs, develop the skills/competences of local labor, and drive technological progress; and 2) economic development: recent literature on endogenous growth has it that human capital may be the key

contributor to self-sustained GDP growth *per capita*, and that one of the major contributors thereto is human development.

FDI can affect well-being/poverty whether directly or indirectly. A direct channel consists of spillovers to the private sector (backward and forward linkages). Spillovers can occur if FDI generates positive vertical repercussions with local suppliers (backward linkages) or through contracting with local companies (forward linkages). FDI can also create positive horizontal spillovers by promoting and strengthening competition and generating new technologies to be implemented. Besides these positive repercussions for local companies, FDI can directly influence well-being/poverty by creating new jobs. To be effective, the number of jobs created must be greater than those lost as a result of any FDI-related job losses, such as mergers and acquisitions, closure of local companies, etc.

The indirect impacts of FDI on well-being are mainly at macroeconomic level (Sumner, 2005). Where the net overall transfer of a country's income is positive, FDI is likely to increase the overall investments of a country, thus increasing economic growth. In this case, the well-being/poverty linkage is not direct.

Moreover, the effects of FDI on poverty can be positive or negative through other channels, in particular labor productivity (which can lead to wage increase, on the one hand, and jobs lost, on the other hand); demand for qualifications (and a fall in demand for unskilled labor, which is concentrated below the poverty line); the need for macroeconomic stability, which implies low inflation (the poorest population is the most affected by inflation, therefore this stability is beneficial); a fall in the relative price of goods and services, with the resulting positive effects on the purchasing power of the poorer population; or improvements in the local companies' competitiveness as a result of the entry of more efficient multinationals in the domestic market.

Thus, both the FDI policy and type are essential to improve the well-being of an economy, in other words, to reduce the levels of poverty. Should FDI be used only to purchase raw materials for a company outside the receiving country, the chances of creating jobs and spillovers will be limited. On the other hand, should the purpose of FDI be to access a specific national market, its impact on employment and its backward and forward linkages will then tend to be high. Therefore, the effective reduction in poverty will depend on various additional economic factors and policies which might contribute to increase or reduce the FDI effects on the poverty of the receiving economy (Sumner, 2005; Lee and Vivarelli, 2006).

2.3. Empirical evidence on the relationship between FDI and income distribution and poverty

The literature that relates FDI, income inequality and poverty may be divided into three different groups (Wu and Hsu, 2012): 1) those that find a negative correlation between FDI and income inequality/poverty, i.e., an increase in FDI is associated with the reduction of income inequality/poverty, therefore FDI is associated with an improvement in the receiving country; 2) those that find a positive correlation between FDI and income inequality/poverty, i.e., an increase in FDI is associated with the increase of income inequality, therefore it deteriorates the conditions of the receiving country; and 3) those who find no statistically significant relation between FDI and income inequality/poverty.

To summarize the existing empirical evidence in this area and assess the number of existing studies in the three groups mentioned above, we have searched the SciVerse Scopus bibliographical database using a combination of various keywords and restricting our search to the area of social sciences. We have, therefore, used the term "foreign direct investment" combined (AND) with the terms "poverty" OR "income distribution" OR "income inequality" OR "wage inequality".

The search carried out on 24 October 2015 produced 98 documents, of which only 55 dealt with topics associated with the theme under study, these being the documents taken into consideration. The remaining articles (43) were not considered as they did not relate the FDI inflows with inequality or poverty. More specifically, we removed the articles that addressed the relationship between FDI and labor market, FDI outflows

(irrelevant for this study as the aim is to study the effect of FDI inflows), the convergence/divergence of inter-country income, the influence of international aid in the fight against poverty, environmental issues, the FDI policies of the various countries, the FDI relationship with child labor, inter alia.

The majority of assessed documents (see Table 1) – 36 in all – show a positive relationship between income inequality, wage inequality and/or poverty and FDI. A negative relationship is found in fewer studies (11). Of the remaining studies (8), 4 have found mixed results, that is, evidence of negative and positive relationships between income/wage inequality and 4 show that FDI has no impact on income inequality, wage inequality and/or poverty.

Of the studies that show a negative relationship (12 articles), 8 (66.67 %) relate FDI with poverty. So the beneficial influence of FDI inflows occurs mostly at poverty reduction level in the receiving country. The positive relationship (which covers most of the analyzed articles, 64.9 %) between FDI and income inequality, wage inequality and/or poverty, which implies a harmful impact of FDI on the receiving country, is found mostly in studies that relate FDI with wage inequality (59.5 %) or income inequality (24.3 %). Studies showing mixed or null results are not so frequent, accounting for only 14 % of the total.

Table 1: Summary of the empirical studies on the relationships between FDI-income/wage inequality and FDI -poverty by type of variable

Relation	Variable	Nº articles	% total	Studies (examples)
Negative (12 articles; 21.1% total)	Income inequality	2	16.7%	Borraz and Lopez-Cordova (2007), Hussain et al. (2009)
	Wage inequality	2	16.7%	Davidson and Sahli (2015), Zhang (2013)
	Poverty	8	66.7%	Freeman (2004), Brooks et al. (2004), Rasiah (2008), Sapkota (2011), Gohou and Soumaré (2012)
	Sub-total	**12**	100.0%	-
Positive (37 articles; 64.9% total)	Income inequality	9	24.3%	Tsai (1995), Choi (2006), Adams and Mengistu (2008), Sakamoto and Fan (2013)
	Wage inequality	22	59.5%	Gupta (1994), Feenstra and Hanson (1997), Markusen and Venables (1997),Gopinath and Chen (2003), Driffield and Taylor (2000), Zhang (2001), Li and Coxhead (2011)
	Poverty	6	16.2%	Patnaik (1997), Mirza and Giroud, (2004), Thoburn (2004), Lee (2013)
	Sub-total	**37**	100.0%	-
Negative and Positive (4 articles; 7.0% total)	Income inequality	1	25.0%	Deng and Lin (2013)
	Wage inequality	3	75.0%	Wu (2001), Tomohara and Yokota (2011), Teekasap (2014)
	Poverty	0	0.0%	-
	Sub-total	**4**	100.0%	-
No relation (4 articles; 7.0% total)	Income inequality	3	75.0%	Sylwester (2005), Bussmann et al. (2005), Franco and Gerussi (2013)
	Wage inequality	0	0.0%	-
	Poverty	1	25.0%	Tsai and Huang (2007)
	Sub-total	**4**	100.0%	-
Total (57articles; 100.0%)	Income inequality	15	26.3%	-
	Wage inequality	27	47.4%	-
	Poverty	15	26.3%	-
	Sub-total	**57**	100.0%	-

Note: Two articles simultaneously addressed the relationship between FDI-poverty and FDI-income inequality, justifying a total of 57 articles instead of the 55 articles analyzed.

Source: Prepared by the authors, based on data retrieved from Scopus on 24 October 2015.

2.3.2. FDI and the fall in income inequality, wage inequality and/or poverty

Empirical studies in this group consist mostly of analyses of underdeveloped or developing countries, in particular African (Gohou and Soumaré, 2012; Fowowe and Shuaibu, 2014) and Asian countries (Brooks *et al.*, 2004; Rasiah, 2004; Freeman, 2004) – see Table 2.

Hussain *et al.* (2009), for e.g., studied the impact of globalization in Pakistan, a country that has in recent years been committed to the promotion of policies aimed at increasing trade and foreign direct investment, reducing barriers between both. The FDI process was gradual as, initially, FDI was only allowed in the industrial sector, with restrictions to investment in the agricultural sector only ending later. The time series used by the authors relates the FDI level (as a proportion of GDP) with the Gini coefficient in Pakistan, in that they intend to measure the impact of the FDI inflows on income inequality. The results show that FDI and Gini coefficient have a negative relationship, revealing that more FDI inflows have made income distribution more equal. The authors justify this trend with the fact that FDI directly and indirectly influences the poorest segments of society: it creates job opportunities, transfers technology that generates spillovers in the domestic economy, and generates revenue for the government that can be put to use in poverty reduction programmers. This clearly shows the need for local governments to create infrastructures to attract FDI with the aim of reducing poverty.

Moving on to a different context, Latin America, Borraz and Lopez-Cordova (2007) looked for ways to determine how globalization interferes in the well-being of the Mexican population, measuring the relationship between FDI and income inequality (again using the Gini coefficient) between 1992 and 2002, initially for the entire country and later for 9 different regions with different FDI levels into which the country was divided. The authors have come to the conclusion that globalization is negatively related to inequality, thus a more globalized society is also more egalitarian. The explanation for this stems from the fact that wage inequality has been mitigated, emphasizing female labor force. More specifically, globalization is seen as an enabler of job creation, especially for non-skilled women: the Mexican *maquiladoras* (foreign capital companies whose production is primarily intended for export) create jobs for which skilled labor is not required. In short, the study's results show that globalization/FDI reduce inequality as they offer better wages and opportunities for women to take part in the labor market. The study also found a small wage discrepancy among women in more globalized states/regions, that is, with greater FDI prevalence.

Davidson and Sahli (2015) focused on an African country, Gambia, to analyses the effect of FDI in the tourism sector and its influence on poverty reduction in this country. The authors chose the tourism sector as this is a booming business with high growth levels that has received much foreign investment, in a country where the economy is mostly based on the agricultural sector. The study consisted of questionnaires sent to all hotels. The results showed that FDI promotes qualifications and the transfer of knowledge to the local workforce. The authors also concluded that FDI in this sector is concentrated in high-end hotels, which tend to employ more people, pay higher wages and invest more in training. However, they also concluded that this is a seasonal job and employs fewer women. Overall, the results suggest that, although FDI does have some drawbacks, it is a rather useful instrument to reduce poverty.

Gohou and Soumaré (2012) also turned their attention to the African continent, this time focusing on a large group of countries to study the effects of FDI on well-being (measured through the Human Development Index (HDI) in 52 countries between 1990 and 2007. What they found was a positive relationship between the two variables, more specifically that the poorer and less developed the country, the greater the impact of FDI on poverty reduction, the reasons for this being job creation, skill development of local people, and the spur to technological progress. Their study also suggests that in order to reduce income inequalities within a country, conditions must be in place to attract foreign investments to labor-intensive sectors such as agriculture, education, health, and to infrastructure development.

Table 2: FDI (inflow) and the reduction of income/wage inequality and/or poverty

Studies	Country	Period	Inequality/ Poverty	Methodology	Mechanism
Hussain et al. (2009)	Pakistan	1972-2005	Income inequality (Gini coefficient)	Ordinary Least Squares (OLS)	Openness to international markets has a positive impact on income distribution as it favours lower income groups.
Borraz and Lopez-Cordova (2007)	Mexico (9 distinct regions and 32 states)	1992-2002		2SLS	Lower income inequality is detected in states characterized by greater links to the world economy.
Davidson and Sahli (2015)	Gambia	NA		Descriptive analysis	Foreign-owned hotels pay higher salaries, employ more people, and spend more on training.
Zhang (2012)	NA	NA	Wage inequality	Equilibrium models with 2 goods which are intensive in qualified and non-qualified labour	Long-term capital inflows will reduce wage inequality between skilled and unskilled labour.
Gohou and Soumaré (2012)	52 African countries	1990-2007	Poverty (HDI or real GDP *per capita*)	Panel data	The poorer and less developed a country, the greater the impact of FDI on reducing poverty. However, in absolute terms the richest countries benefit more than the poorest.
Fowowe and Shuaibu (2014)	30 African countries	1981-2011	Poverty	Panel data	FDI is considered an essential factor in the fight against poverty in the least developed countries of Africa in the years under analysis.

Source: Prepared by the authors

In the wake of Gohou and Soumaré's study (2012), Fowowe and Shuaibu (2014) studied the effect of FDI on poverty in 30 African countries, at 3-year intervals between 1981 and 2011. This is a relevant study in that Africa is actively determined to implement policies to attract FDI since the 1990s. These policies came about as an attempt to reverse the effects of sluggish growth and increase in poverty in the 1990s. It is, therefore, important to assess whether these measures for opening up to FDI provided for the conditions to reduce poverty, in addition to promoting economic growth. To this end, the authors use the poverty headcount index to measure the proportion of people living below the poverty line, that is, people living on less than 1.25 dollars a day.[4] A negative relation was found between FDI and poverty, proving that, for the sample in question, FDI contributed to reducing poverty.

All studies described above characterize FDI as a component of globalization that plays a rather significant role in the fight against income inequalities and in reducing poverty, thus arguing that the opening of these economies to the global markets and the consequent inflow of FDI favors the poorer sectors of society with lower incomes, leading to the convergence of income. FDI is, therefore, regarded by the authors as an important internationalization agent capable of alleviating poverty and uneven income distribution in a developing or underdeveloped country, thus contributing to the improvement of social well-being.

2.3.3. FDI and the increase in income inequality, wage inequality and/or poverty

The most representative group of empirical studies that relate FDI-income/wage inequality and FDI-poverty showed a positive relation between FDI and inequality/poverty, that is, FDI had a harmful effect on the receiving country, aggravating its inequalities and/or poverty levels.

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[4] This study also examines the reverse relation, that is, the effect of poverty on FDI: if poverty reduces, the domestic market will spend more on goods and services; this increase in internal demand will increase production and, therefore, will attract more internal and external investment.

Under the studies that deal with income inequality (see Table 3), Choi (2006) tested the effect of FDI stock (% of GDP) on income distribution (Gini coefficient) in 119 countries, concluding that FDI inflows aggravate income inequality. Richer countries and countries with a rapid growth tend to have greater income inequality, as, for example, in Latin America and Caribbean countries.

More recently, but also related with income inequality, Wu and Hsu (2012) analyzed 54 countries, 33 of which are developing countries and 21 are developed countries, and reached the conclusion that FDI makes income distribution more unequal in countries with lower level and quality infrastructures. Therefore, while FDI does not directly affect distribution and income, the impact occurs via the quality of infrastructures (e.g., transports, energy consumption, telephone lines).

Table 3: **FDI and the increase in income/wage inequality and poverty**

Studies	Country	Period	Inequality/ Poverty	Methodology	Mechanism
Choi (2006)	119 countries	1994-2002	Income inequality	Panel data	Entry of FDI leads to income inequality: rich countries and fast-growing countries tend to have a more unequal income distribution.
Wu and Hsu (2012)	54 countries	1980-2005		OLS	Absorption capacity will influence the efficiency of the FDI: countries with lower absorption capacity will be more unequal.
Adams and Mengistu, (2008)	82 developing countries	1991-2002		Panel data	FDI is positively correlated with income inequality.
Markusen and Venables (1997)	NA	NA	Wage inequality	Formal mathematical model	If countries are similar in size, the salary of the most qualified labor force and the skilled/non skilled wage ratio will increase the greater the use of skilled labor by multinational enterprises.
Lee and Wie (2013)	Indonesia	1990-2009		Time series/ Cointegration	FDI increases the demand for non-production workers and increases the use of technology that implies the employment of skilled labor, which is reflected in the increase in wages of the latter.
Velde and Morrissey (2004)	5 East Asian countries	1985-1998		Panel data	FDI increases wages for skilled and unskilled labor, but wage inequality increases.
Lee (2013)	Taiwan	1987-2010	Poverty	Time series/ Cointegration	In the short term, FDI contributes to the decrease in the average income of the poorest quintile of the population.
Ali and Nishat (2009)	Pakistan	1973-2008		ARDL model	Foreign inflows increase poverty in the short and long term, directly and indirectly.

Source: Prepared by the authors

Still on the topic of income inequality, this time in relation to 82 developing countries between 1991 and 2002, Adams and Mengistu (2008) showed that FDI was positively related with income inequality. The authors justified this with the relation between foreign investors of the receiving country and the interest in increasing the wealth of the richest classes of the country. Another reason given is that FDI generates monopolies, which in turn destroy the productive forces leading to unemployment and, consequently, the increase of inequality.

Using a formal model, and addressing the issue of wage inequality, Markusen and Venables (1997) considered two countries and two homogeneous goods, where the production factors are skilled labor and non-skilled labor, mobile between industries but not at international level. The model concludes that if the countries are similar in size and taking constant relative factor allocations into account, the wages of skilled labor will increase and, therefore, the ratio between skilled labor wages and non-skilled labor wages will increase. If the countries are similar in size, the wages of the more skilled labor and the ratio in question may increase the greater the use of skilled labor by multinationals. Hence, FDI is a critical factor for the increase of wage inequality.

Also on the topic of wage inequality, but using the actual study of an emerging or developing country, Indonesia, Lee and Wie (2013) studied the effects of knowledge transfer and education on the country's wage inequality between 1990 and 2009. According to the authors, because income inequality in Indonesia has increased in recent years, it is essential to examine whether this increase and the increase in demand for skilled labor are related, the latter resulting from the knowledge transfer through foreign investment and imported materials. The study concludes that if FDI inflows increase, the percentage of workers not related to production will increase, which will also increase the wage ratio. So, technological change leads to increased demand for skilled labor and, consequently, to the increase in wage inequality.

Velde and Morrissey (2004) studied another group of Asian countries, more specifically the 5 countries known as the Asian Tigers (South Korea, Singapore, Hong Kong, Philippines and Thailand). This study is not in line with other studies that advocate that the region achieved huge economic growth levels that enabled the reduction of poverty. According to the authors, opening up to the exterior and, in particular, the inflow of FDI lead to an increase in the demand of skilled labor. Moreover, the effect of FDI varies according to the receiving country, and no strong evidence that FDI influences wage inequality was found. In the case of Thailand, they found that FDI generated an increase in wage inequality. The authors link this result to the fact that the education system in this country does not prepare its workforce well enough so as to benefit from the FDI. They argue that the solution for this is to invest in the local human resources in order to avoid attracting FDI and, at the same time, to avoid increasing inequality.

As regards poverty, Lee (2013) investigated how liberalizing the economy influenced this variable in Taiwan, using several proxies as the liberalization indicator, in particular FDI inflows. The author concluded that the liberalization of capitals has a negative impact on the average income of poorer people, justifying the positive relation between the inflow of FDI and poverty with the demand for skilled labor by multinationals, which leads to the increase of poverty levels.

Ali and Nishat (2009) examined how the inflow of FDI and foreign aid and remittances influenced poverty in Pakistan. The results showed that these inflows (as a whole) increased poverty in the short and long run, although no statistical relevance was found in the FDI and remittance coefficients.

2.3.4. No relation between FDI and income inequality, wage inequality and/or poverty

Few studies (4.7 % of the sub-total, 3 on income inequality and 1 on poverty) show that FDI does not impact on income inequality and poverty (see Table 4).

Table 4: Absence of relationship between FDI and income inequality

Studies	Country	Period	Inequality/ Poverty	Methodology
Franco and Gerussi (2012)	Transition economies (17)	1990-2006	Income inequality	Panel data
Sylwester (2005)	Less developed countries (29)		Income inequality	Panel data
Bussmann et al. (2005)	72 developed and less developed countries	1970-1990	Income inequality	Panel data
Tsai and Huang (2007)	Taiwan	1964-2003	Poverty	Time series/ Cointegration

Source: Prepared by the authors

Sylwester (2005) looked into 29 underdeveloped economies and found that there is no significant relationship between net FDI inflows and income inequality, despite showing that FDI contributed to the economic growth of these economies. Franco and Gerussi (2012) reached an identical result for a sample of 17 transition economies between 1990 and 2006.

The analysis carried out by Bussmann *et al.* (2006) of 72 developed and developing countries focused on the impact that globalization had on income inequality in those countries between 1970 and 1990. The authors concluded that there was no evidence to justify the impact of strong FDI on income inequality, the latter measured using the Gini coefficient).

Tsai and Huang (2006) dealt with the issue of opening up to the exterior and the evolution of poverty in Taiwan between 1964 and 2003 and found no effect of and relationship between the inflow of FDI and poverty, although a significant one was found between outward FDI and income inequality.

3. Methodology

3.1. Data collection process

Having analyzed the variables used in studies similar to this one (one single country) and checked whether data were available, we defined the Gini coefficient as the indicator of income inequality, and the at-risk-of-poverty rate (corresponding to 60 % of the median) before any social transfer.

The time series were built based on PORDATA (in this case, the FDI inflow variables, gross domestic product, the economy's degree of openness, public expenditure and public social expenditure). However, regarding the dependent variables (Gini coefficient, at-risk-of-poverty rate), the database did not provide information for the first years, so we had to examine the relevant literature and use some works that gave us some of the missing data. Having done this, and through linear interpolation we were able to fill in the missing values.

3.2. Econometric specification

In the literature we have reviewed, the works on the study of a single country use mainly time series to calculate the desired results (see Table 5). The objective of our study is to examine the long-term relationship between poverty/income inequality indicators (dependent variables) and the FDI inflows (independent variable). This is why we also used the time series analysis, through cointegration. Other variables that may influence these indicators will be included in the model in order to make it a more solid model.

Table 5: Methods for analyzing data from empirical studies on single countries that deal with the relations between FDI-income inequality and FDI-poverty

Authors	Countries	Period	FDI indicator	Inequality variable/indicator	Method	Other variables included in the model
Nunnenkamp et al. (2007)	Bolivia	NA	FDI inflows	Poverty (Poverty headcount and poverty gap), Income inequality (Gini coefficient)	Adapted General Equilibrium Model	Sectors of production, factors of production, economic agents
Wu (2001)	China	NA	Inward FDI	Wage inequality - Relative factor price (skilled to unskilled labor)	Model of a small economy producing two goods, with two factors of production	Quality of goods, factors of production (skilled labor and unskilled labor), factor productivity, technological change
Mehmet and Tavakoli (2003)	China, Phililipines, Singapoure, Thailand	China: 1982-1998; Phillipines: 1980-1995; Singapore: 1983-1997; Thailand: 1980-1998	FDI inflows / Total FDI	Wage inequality	Time series - OLS	
Mah (2012)	South Korea	1982-2008	FDI inflows	Income inequality (Gini coefficient)	Error correction model	GDP per capita and labor unionization ratio
Lee and Wie (2015)	Indonesia	1990-2009	FDI inflows/Total investment	Wage inequality - skilled to unskilled labor wage ration	Time series	Education, experience, gender, technology
Kareem et al. (2014)	Nigeria	NA	Perception of people operating in oil companies in communities	Poverty	SEM	Impact on the environment, impact of oil exploration on people's well-being, dimension of concern about environmental problems, global awareness of environmental consequences
Hussain et al. (2009)	Pakistan	1972-2005	FDI as percentage of GDP	Income inequality (Gini coefficient)	Time series - OLS	Opening to trade, workers' remittances
Ali and Nishat (2009)	Pakistan	1973-2008	FDI in millions	Poverty- Poverty headcount ratio	ADRL model	GDP, foreign capital inflows, foreign aid, remittances, child mortality, education, spending on health and education, exchange rate
Tsai and Huang (2007)	Taiwan	1964-2003	FDI inflows as percentage of GDP	Poverty - Poor's average income	Time series/ Cointegration	GDP; Degree of openness to trade [(Imports + Imports) / GDP]; Public expenditure as a percentage of GDP; Proportion of public expenditure on social security
Lee (2013)	Taiwan	1987-2010	FDI inflows as percentage of GDP	Poverty - Poor's average income	Time series/ Cointegration	Imports / GDP, Exports / GDP, Expenditure FDI / GDP, Public Consumption / GDP, Social security expenditures/ GDP

Source: Prepared by the authors

As the model used by Tsai and Huang (2007) suits the needs of the chosen methodology, this will be the model we will use. The econometric specification of the model to be calculated, in line with Tsai and Huang (2007) is as follows:

$$\ln(y^r)_t - \ln(y^r)_{t-1} = \beta_1 + \beta_2(\ln(y)_t - \ln(y)_{t-1}) + \beta_3(\ln(x)_t - \ln(x)_{t-1}) + e_t$$

Where

y^r represents the income inequality or poverty indicator,

y represents the FDI inflows as a percentage of GDP, and

$ln(x)_t$ is a variable control vector in logarithm form in year t that includes:

- gross domestic product (GDP),
- the degree of openness to trade [(Exports + Imports)/GDP],
- public expenditure as a percentage of GDP, and
- the proportion of public expenditure allocated to social expenses.

e_t represents error, with its usual properties.

3.3. Choosing the cointegration techniques

The graphic analysis of the variables relevant for our analysis (see Figure 1) – inequality, poverty, inflows of foreign direct investment, *per capita* output, public expenditure (as a percentage of output) and the weight of social expenditure (in total public expenditure) – indicate strong tendencies, in other words, they are not stationary.

Figure 1: Evolution of the levels and first differences of the variables in study
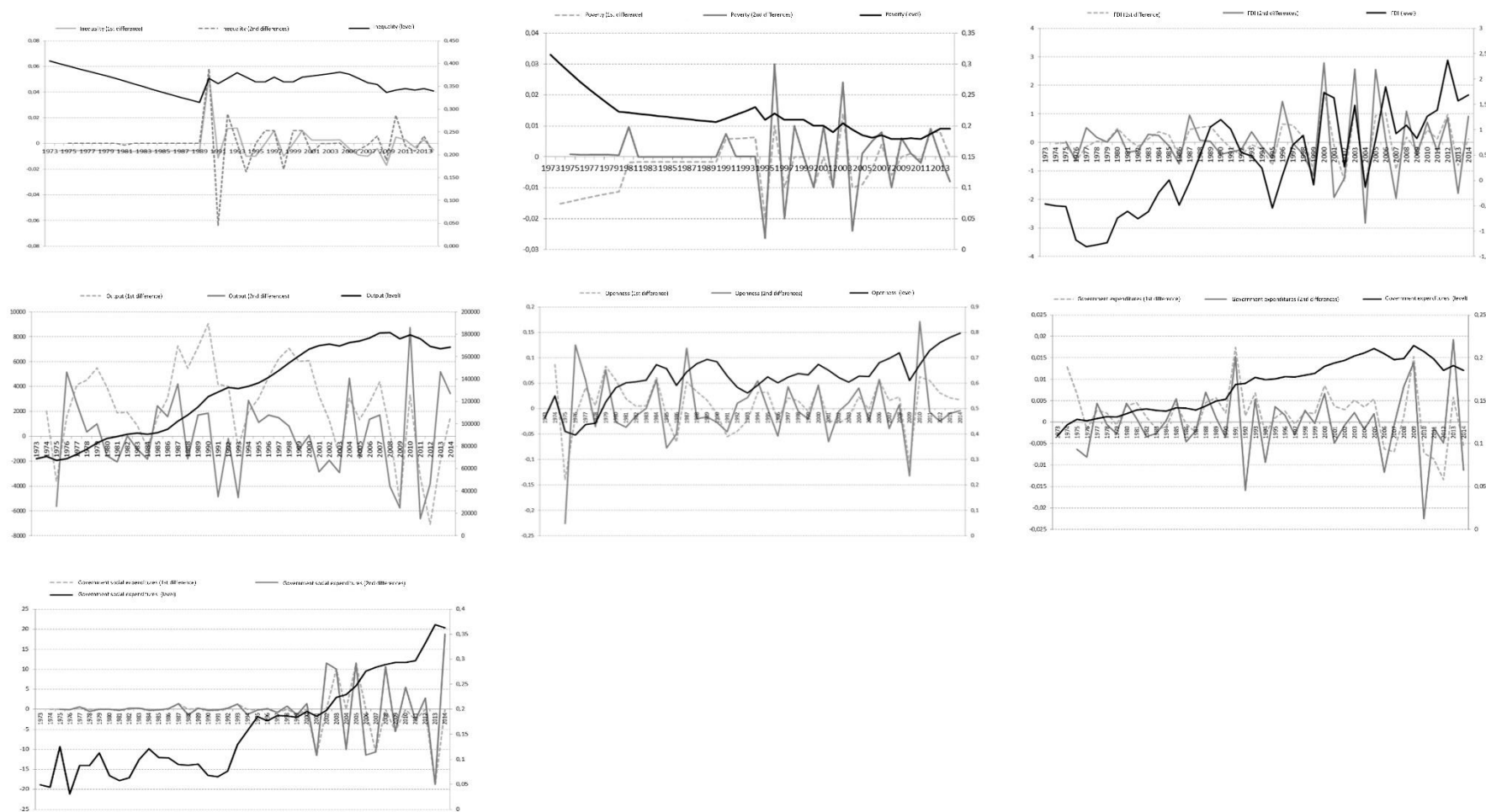
In this case, the use of traditional estimation methods (based on classical hypotheses of classical perturbation) in models that include such variables tend to lead to an erroneous statistical inference (Rao, 1994). The statistical inference of classical estimation methods is based on the hypothesis that the medians and variances of variables are well defined and invariable in time. However, when the medians and variances of variables vary over time (non-stationary variables), every statistic that use these medians and variances will also depend on time and, as such, will not converge to the real values (population) when the sample size tends towards infinity. Moreover, the hypotheses tests based on these statistics will be biased to rejecting the null hypothesis of absence of a relation between the dependent variable and the independent variables. So, where non-stationary variables exist, using the traditional estimation methods carries the risk of obtaining "spurious regressions" (Granger and Newbold, 1974), the estimations of which lack any economic significance. Studies based on time series analysis (Engle and Granger, 1987) show that cointegration techniques are the most appropriate estimation method when the variables of a model are non-stationary. In this context, given the nature of the variables in our study, we have concluded that the use of classical estimation methods would not be satisfactory. So, led by the most recent advances in time series analysis, we chose to use the cointegration techniques.

4. Results

4.1. Testing the integration of time series[5]

The time series under study show strong tendencies, visible in Figure 1 and confirmed by non-stationarity testing (Table 6).

The idea underlying cointegration is that, in the long run, if two or more series develop together, then a linear combination between them may become stable around a fixed median, despite their individual tendencies (that cause non-stationarity). Thus, where there is a long-term relationship between variables, the regression of all variables (cointegration regression) will have stationary perturbation, even though no single variable is considered stationary.

The results of the Augmented Dickey-Fuller tests (ADF) (Dickey and Fuller, 1981) and Phillips-Perron tests (PP) (Phillips and Perron, 1988) applied to the variables under study show that the series differentiated only once are stationary (Table 6), that is, the integration of variables is, at most, of order 1, that is, I (1). Additionally, based on Table 6 we can conclude that the variables (levels) of the model are non-stationary (statistical evidence does not reject the hypothesis of non-stationarity – the existence of a unit root).

Based on the results described above, we can conclude that the model series are I(1). As such, the series can be cointegrated (Dickey *et al.*, 1991), that is, there may be more than one linear combination of series, suggesting a long-term stable relationship between them.

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[5] The econometric software EViews 8.0 ® was used to analyse the integration order of series and cointegration.

14

Table 6: Non-stationarity tests of the series under study

	Augmented Dickey-Fuller test		Phillips-Perron test	
	Constant without trend	Constant and trend	Constant without trend	Constant and trend
Levels				
Inequality	-2.281722	-2.189711	-2.344085	-2.272851
Poverty	-3.772342***	-2.777341	-3.888010***	-2.784702
FDI	-0.818193	-4.833062***	-1.949695	-4.858281***
Output	-2.671098	-0.240020	-1.929884	0.927549
Openness	-1.783145	-2.643386	-1.682644	-2.709413
Government expenditures	-2.607210	-1.166355	-2.541203	-1.166355
Government social expenditures	0.310460	-2.333847	-1.638402	-5.365584***
First differences				
Inequality	-6.841365***	-6.791962***	-6.819223***	-6.774332***
Poverty	-6.228468***	-7.075271***	-6.271876***	-7.026744***
FDI	-6.832383***	-6.765890***	-10.35488***	-10.23771***
Output	0.942718	-0.991500	-3.365835**	-3.722092**
Openness	-7.066240***	-1.627758	-7.034898***	-6.951670***
Government expenditures	-5.997513***	-6.262526***	-6.020907***	-6.307495***
Government social expenditures	-11.39762***	-3.973120**	-27.27942***	-25.78341***

Notes: All variables are logarithmized. Null hypothesis: the variable has one unit root.

***(**)statistically significant at 1% (5%).

As the number of cointegration vectors is unknown, and because we need to ensure that all variables are potentially endogenous (as only then can we test for exogeneity), the recommended methodology is the one developed by Johansen (Johansen and Juselius, 1990).

4.2. Johansen test to the number of cointegration vectors

The structural regression to be estimated involves a relation between inequality and poverty and FDI, product, degree of openness, public expenditure and social public expenditure in the period 1973-2014 in Portugal. In cointegration notation, the vectors of potentially endogenous variables z_t and the normalized cointegration vectors can be represented as follows:

	Vectors of variables potentially endogenous	Normalized cointegration vectors
Inequality	$z_t = (ineq\ fdi\ y\ op\ g\ gsoc)$	$\beta_t = (1 - \beta_{1t} - \beta_{2t} - \beta_{3t} - \beta_{4t} - \beta_{5t} - \beta_{6t})$
Poverty	$z'_t = (pov\ fdi\ y\ op\ g\ gsoc)$	$\beta'_t = (1 - \beta'_{1t} - \beta'_{2t} - \beta'_{3t} - \beta'_{4t} - \beta'_{5t} - \beta'_{6t})$

In order to perform the cointegration test we need to assume that there is a certain tendency underlying the data. We have, therefore, included a deterministic linear tendency in the data, but the cointegration equations only have the constant, as we believe that the tendencies are stochastic.

For the inequality series, based on the Johansen cointegration tests (λ_{trace} and λ_{max}), and considering the standard significance levels, we can conclude (see Table 7) that there are 2 (λ_{max}) or 3 (λ_{trace}) cointegration vectors.

Table 7: Johansen cointegration test with the inequality variable

Hypothesis: Number of cointegration vectors	Eigenvalue	λ_{trace} (*Trace statistic*) [p-value]	λ_{max} (*Max-Eigen statistic*) [p-value]
None	0.639713	120.2926[***] (0.0004)	40.83413[*] (0.0410)
At least 1	0.569375	79.45851[***] (0.0070)	33.70075[*] (0.0525)
At least 2	0.424094	45.75775[*] (0.0777)	22.07241 (0.2167)
At least 3	0.271959	23.68534 (0.2141)	12.69590 (0.4806)

Notes: λ_{trace} and λ_{max} are Johansen cointegration tests for the null hypothesis that, among inequality/poverty (ln), FDI (ln), product (ln), degree of openness, public expenditure (ln) and weight of social expenditure in the overall amount of public expenditure, there are *r* linearly independent cointegration relations, that is, the 6 variables share 6-*r* stochastic tendencies;

***(**)[*] represents the rejection of the null hypothesis that among the 6 variables there are *r* linearly independent cointegration relations (compared to the alternative that there are *r*+1 linearly independent cointegration relations) with a 1% (5%)[10%] statistical significance.

In the case of poverty, the Johansen cointegration tests (λ_{trace} and λ_{max}) (see Table 8) show that there are 3 (λ_{max}) or 4 (λ_{trace}) cointegration vectors.

Table 8: Johansen cointegration test with the poverty variable

Hypothesis: Number of cointegration vectors	Eigenvalue	λ_{trace} (*Trace statistic*) [p-value]	λ_{max} (*Max-Eigen statistic*) [p-value]
None	0.744275	151.3627[***] (0.0000)	54.54610[***] (0.0006)
At least 1	0.611531	96.81656[***] (0.0001)	37.82169[**] (0.0160)
At least 2	0.513852	58.99487[***] (0.0032)	28.84970[**] (0.0343)
At least 3	0.371262	30.14517[**] (0.0456)	18.56163 (0.1102)
At least 4	0.221252	11.58354 (0.1780)	10.00273 (0.2117)

Notes: λ_{trace} and λ_{max} are Johansen cointegration tests for the null hypothesis that, among poverty (ln), FDI (ln), product (ln), degree of openness, public expenditure (ln) and weight of social expenditure in the overall amount of public expenditure, there are r linearly independent cointegration relations, that is, the 6 variables share 6-*r* stochastic tendencies.

***(**)[*] represents the rejection of the null hypothesis that among the 6 variables there are *r* linearly independent cointegration relations (compared to the alternative that there are *r*+1 linearly independent cointegration relations) with a 1% (5%)[10%] statistical significance.

4.3. Long-term relationship between inequality, poverty and foreign direct investment: estimating the cointegration vector and Granger causality

In the case of the inequality specification [Model 1], defining $r = 2$, we obtain the estimates for the cointegration vectors. If we standardize each of the two cointegration vectors in relation to inequality, we obtain two long-term balanced relationships. By choosing the 'most significant' cointegration vector (Dibooglu and Enders, 1995), we obtain the estimates for the cointegration vector (see Table 9).

The estimated results for the long-term elasticities between inequality and poverty and the remaining variables of the model (FDI, Product, Public Expenditure and Social Public Expenditure) are statistically very significant, showing that in the long run these variables are effectively (cor)related.

More specifically, the inflow of foreign direct investment (i.e., FDI) is significantly and negatively correlated with inequality and poverty. This shows that in Portugal, over the past 40 years (1973-2014), the levels of inequality and the poverty rate have been associated with greater FDI inflows.

As for the remaining variables, with the exception of product, the greater degree of openness to the exterior and the higher percentage of public expenditure (in product), as well as the greater weight of social spending under public expenditure have resulted in lower inequality and poverty rate.

Although the results leave no doubt as to the existence of statistically significant long-term relationships between the levels of inequality and poverty and the FDI inflows, the cointegration estimates alone are not sufficient to establish a causal link (Teixeira and Fortuna, 2010). So, to test causality, we have used Granger causality (see Table 9). According to results, both in the case of inequality and poverty we agree on the null hypothesis that FDI does not cause (as per Granger causality) inequality/poverty; however, these two variables do 'cause' (again as per Granger causality) FDI. In other words, the effect of the drop in the level of inequality and/or poverty rate, all other things being equal, is an increase in the inflows of foreign direct capital.

Table 9: Long-term estimates of inequality and poverty elasticities, Portugal, 1973-2014

Variables		Inequality – Model 1		Poverty – Model 2	
		$\hat{\beta}$	Standard errors	$\hat{\beta}$	Standard errors
FDI		-0.228***	(0.034)	-0.068***	(0.031)
Output		2.524***	(0.445)	2.973***	(0.404)
Openness		-0.800***	(0.193)	-0.835***	(0.177)
Government expenditures		-3.453***	(0.686)	-4.673***	(0.626)
Government social expenditures		-0.015***	(0.054)	-0.219***	(0.045)
		Log likelihood	326.8	Log likelihood	327.9
Nº observations		42		42	
Granger causality (*p-value*)	*H0*: FDI does not Granger cause inequality/poverty.	FDI →Inequality	0.524 (0.4735)	FDI →Poverty	0.292 (0.5922)
	H0: Inequality/ poverty does not Granger cause FDI.	Inequality→ FDI	4.201** (0.0474)	Poverty → FDI	14.120*** (0.0006)

Notes: The cointegration test was specified with 2 *lag* at series levels and a deterministic linear tendency. As regards inequality, we have 1 cointegration vector according to the maximum value test and 1 cointegration vector according to the trace test. As for poverty, the number of cointegration vectors are, respectively, 3 (λ_{max}) or 4 (λ_{trace}). Granger causality was specified with 1 lag at the levels.

***(**)[*] Statistically significant at 1% (5%) [10%].

5. Conclusion

The purpose of this work was to check whether there was any relationship between inflows of foreign direct investment (FDI), income inequality and poverty in Portugal over a period of about forty years (1973-2014). To that end, and given that we are dealing with long-term time series, we used the cointegration method.

Considering a range of other factors that potentially affect income inequality and poverty (gross domestic product, public expenditure and percentage of public expenditure relating to social spending), we analyzed the relationship between FDI, inequality and poverty. Once we confirmed that the series were stationary in the same order, the cointegration vectors estimated confirmed the presence of a statistically significant long-term relationship between the 3 variables. More precisely, the results point to a negative correlation between the FDI inflows, poverty and inequality in Portugal over the 42 years under analysis.

Regarding the relation between income inequality and FDI, our study differs from the tendency found in literature, in that we have concluded that FDI inflows were associated with lower levels of income inequality. As for poverty, the results confirm what most of the literature indicated – FDI inflows were associated with lower levels of poverty.

The results of the study can be explained by Stolper-Samuelson's theorem. Portugal once had a competitive advantage over the more developed economies, as the low wages (Barbosa *et al.*, 2004), and the period with the highest incidence of investment inflows in the country was precisely during that period, with low wages being a motivating factor for foreign investment. As demand increased, wages in Portugal may have converged, thus reducing income inequality and poverty. Moreover, the drop in the inequality and poverty indicators may well be underpinned by the reasons given in the studies by Hussain *et al.* (2009) and Freeman (2010). Portugal bears resemblance to Pakistan and Vietnam in that it has developed policies to attract foreign investment in the hope that they may bring direct and indirect benefits. Direct benefits include job creation, while indirect benefits include the production of spillovers into the domestic economy, for e.g., through the transfer of new skills, knowledge and know-how to local entities, and the generation of income for the State through the taxes that the foreign companies have to pay that may be used to reduce poverty and inequality. As seen in past years in Portugal, the country has increased its social spending.

While reviewing the bibliography we found a number of works that have detected similar results, those studies focus mostly on less developed economies, such as those of some African countries (Gohou and Soumaré, 2012; Fowowe and Shuaibu, 2014) and other developing countries (Hussain *et al.*, 2009; Morita and Sugawara, 2015; Freeman, 2010). This may be an indication of the frailness of the Portuguese economy and of the well-being of its population compared to other developed countries, showing that Portugal's economic and social growth depends on foreign capital.

Nonetheless, Ganger causality indicates that it was the lower inequality and poverty that 'caused' the inflow of FDI, and not the FDI that helped reduce inequality and poverty. In this sense, despite the fact that the country needs to ensure policies to attract FDI, as it is a driver of growth and development, there has to be a proper institutional framework for this 'driver', characterized by relatively low levels of inequality and poverty.

As Portugal is one of the OECD countries with the highest social inequality and poverty rates, we need to reach the level of social development of other developed countries. The policies to attract FDI may be useful, but our study proves that they cannot replace social measures that have as their core objective the reduction of inequalities and poverty.

Although this study contributes to the empirical literature in the area, it has some noteworthy limitations, derived mainly derived from the paucity of statistical information on inequality and poverty, which did not allow to build a longer and sturdier database.

It would be important if new studies were carried out on the same topic in order to confirm the results obtained. An analysis covering a longer period of time and focusing on more developed countries might help us assess the effect of FDI inflows on this type of countries. A further suggestion is the use of additional explanatory variables in the model, which may also affect how the social inequality and poverty indicators evolve, as in the case of human capital-related variables.

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26