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Bachelor Thesis (International Economics)

The impact of interest rates on Foreign Direct Investments: A panel data analysis on 36 OECD-countries

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Abstract

This study contributes to the knowledge about the determinants of FDI. It focuses on the effect of a change in the interest rates on FDI, using a panel dataset of 36 OECD countries and spanning over 24 years (1999-2022). The hypothesis that is tested is that a change in the domestic short term interest rates leads to a significant change in Foreign Direct Investment inflows. The main finding of this research is that there is evidence that a change in the interest rate has a significant impact on FDI on a 10% significance level. Therefore, the hypothesis is confirmed. However, good to mention is that the models in this study only predicts FDI on a low level. The only reliable finding is that there is a significant effect of the change in interest rates on FDI and further it is not possible to conclude more about the relation between interest rates and FDI.

Table of Contents

List of abbreviations

EXR	Exchange rates
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
IF	Inflation
IR	Interest rates
TOP	Trade openness

I Introduction

In an economic world where competition rises and enormous transitions are necessary, the investor climate for foreign investors becomes more and more important for home economies. This results in a policy race between countries, trying to make their economy as attractive as possible for (foreign) investors. One important way to achieve foreign capital is through Foreign Direct Investments (FDI). FDI refers to foreign direct investment equity flows in the reporting economy. Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Ownership of 10 percent or more of the ordinary shares of voting stock is the criterion for determining the existence of a direct investment relationship. Countries around the world are looking to attract FDI to their economy to reach a higher GDP growth.

FDI have many different determinants, as noted in chapter 2. However, it is necessary to perform more research in the determinants of FDI, because FDI are an important aspect of a globalized world economy. This research focuses primarily on the impact of interest rates on FDI. Interest rates are, in most of the countries, not adjustable by normal governmental policy makers. However, interest rates itself, especially the short term interest rates, are very easy to adjust by for example central banks. Therefore, research about the impact of interest rates on FDI could contribute to a better understanding what to do if a country wants to attract more (or less) FDI.

Like visible in chapter 2, the academic world is not unanimous about the impact of interest rates on FDI. Some researchers found a significant effect for one specific country, but others found contradictory evidence. This research takes a bigger sample size, focusing on almost all the OECD countries for a 24 year time-period. Therefore, this research contributes to the already performed empirical research.

Interest rates can be determinants for a lot of different economic indicators and mechanisms, such as GDP, inflation and the cost of debt, but the impact on FDI is unclear? Interest rates have a huge influence on the cost of borrowing. Higher interest rates increase the cost of borrowing because debt will become more expensive for borrowers when interest rates rise. Investors borrow money for their investments and

therefore investors, domestic and foreign, will be affected by interest rates. This can discourage investment in new projects or expansions, reducing FDI inflows, when interest rates are high because foreign companies find it more expensive to finance their investments in the host country. This shows a negative effect of interest rates on FDI. Another mechanism with a negative effect is the influence of interest rates on the currency valuation. When interest rates are high in a country, investors seek that currency resulting in an appreciation of the currency. The appreciation of the currency results in a decline of FDI, the foreign investments are less attractive because of the relative rise in currency costs. Interest rates also influence GDP in a negative way. Low interest rates influence overall economic growth. Lower rates stimulate economic activity by making borrowing cheaper, leading to higher GDP growth. If a country experiences high GDP growth, foreign investors will be more interested to invest in that country, resulting in a rise of FDI. Another very important mechanism for investors is stable and low inflation. To control inflation, central banks often need to raise their interest rates resulting in more attractive investment climate for foreign investors, resulting in more inflowing FDI.

There are not just negative effects of interest rates on FDI. A mechanism that is positively influenced by the interest rates, is the return on investment. High interest in a foreign country can be interesting for domestic investors, therefore resulting in a rise of FDI. There is also some empirical evidence that high interest rates attracted more FDI inflows for specific economies (Nguyen, 2023 & Jadvah, 2012).

This thesis focuses on the short-term interest rates. The short-term interest rate of course influences mechanisms on a different way as the mid-term and the long-term interest rates. With the focus on the short-term interest, you can research the effect of monetary policy on FDI. Also, the exchange rate volatility, like mentioned in this paragraph, gets really influenced by the short-term interest rate. The short-term interest rate also affects the sentiment and confidence of investors, who are looking for foreign businesses to invest in.

To conclude, there is not a clear outcome if you argue pure from economic theories. Therefore, it's necessary to discuss the existing literature in chapter 2. After that, an empirical research will be performed to find an answer on the question what the impact of interest rates is on FDI.

II Literature review

2.1 What are Foreign Direct Investments

To start with discussing the question what FDI are. FDI are capital flows from one country to another. With these capital flows investors, this can be individuals, firms or governments, seek long-term profits and influence over the enterprise's operations. Therefore, FDI are a major driver of international economic integration, serving for the transfer of capital, technology and management knowledge between countries around the world. The establishing of control over the decision-making of a foreign enterprise is a key feature of FDI.

There are two primary types of FDI, namely outflowing and inflowing investments. Outflowing FDI occur when local capital is invested in foreign resources. However, this thesis focuses on inflowing FDI. According to the Organization for Economic Co-operation and Development (from now on: OECD) inflowing FDI represents transactions that increase the investment that foreign investors have in enterprises resident in the reporting economy.

There is a great distinction between FDI and Foreign Portfolio Investments (from now on: FPI). In FPI an investor buys stocks of a company with his main goal to have a good return on investment on these stocks. The key feature of FDI, like mentioned before, is to establish effective control or at least influence over the decision-making of the operations of the foreign enterprise. This shows that FDI are more influential than FPI. Jeanne et al. (2012) stated that FPI are also more volatile than FDI, they illustrate this in their book with evidence from the Financial crisis of 2008. During this crises FDI remained at least positive, whereas FPI experienced a substantial decline, into negative values for almost a year.

Foreign enterprises seek FDI because these kinds of investments bring more resources than portfolio investments. According to Dunning (1980) FDI could be used for natural resource-, market-, efficiency- and strategic assets seeking. And according to Markusen (1995) multinational enterprises (from now on MNE) could benefit from FDI. FDI would increase returns to scale because this advantage is primarily based on knowledge capital such as patents, human capital, trademarks and brand name. Investors will bring this

knowledge capital to a foreign enterprise which promotes economic growth in the foreign country because of the spillover effect. Keller and Yeaple (2009) found for example that FDI resulted in the high productivity gain of between 8% and 19% for high-technology industries in the United States.

In some empirical studies the spillover effect of FDI is not warranted (Blalock and Gertler 2002). Rodrik (1999) says "today's policy literature is filled with extravagant claims about positive spillovers from FDI, the hard evidence is sobering.". According to Blalock and Gertler one of the reasons that the spillover effect is not granted is that MNE do not want their knowledge capital to leak in an economic sector in a foreign country. This would damage their competitiveness in a globalized world. For example, MNE with non-protectable technology will be less enthusiastic to invest their technologies in foreign countries which could copy their knowledge capital.

There are different forms of FDI, namely horizontal, vertical, conglomerate and platform FDI. All the four different forms will be discussed on after the other, to start with the horizontal FDI. Horizontal FDI involves a company investing in a foreign enterprise within the same industry, often through establishing a new branch or engaging in mergers and acquisitions. This type of FDI allows companies to expand their market share and increase revenue by replicating their business operations overseas.

Vertical FDI occurs when a business invests in different stages of supply chain in foreign countries. It can be either backward integration, where the investment is in early processes like extracting raw materials, or forward integration, where it targets later processes like marketing. While backward integration may involve different industries, forward integration typically occurs within the same or related industries.

When a domestic company invests in a foreign enterprise that is completely unrelated to its own sector, it is called conglomerate FDI. Conglomerate FDI is riskier than the vertical and horizontal FDI, because the domestic company does not have that much knowledge of the sector in which she invests, because it is totally different towards their own operations. The last type of FDI that will be discussed is platform FDI. When a company invests in a foreign country but the products that are manufactured are exported to a third country, then it concerns platform FDI. An example will explain this further. It concerns a

platform FDI, if a company in country A invests in an entity in country B, and the entity produces products but exports these products to country C. This type of FDI can be used for offshoring. For the bigger picture, there are more types of FDI, however these forms are not relevant enough for this thesis to be discussed.

There are also negative economic effects of FDI. FDI could give rise to the volatility of the balance of payments (Demekas et al., 2005). When the investments start to return capital to the investor, a capital flow is emerging from a foreign country to the domestic country. This results in a different balance of payment for both countries. This is not always a problem, however if these flows significantly influence the volatility of the balance of payments this could for example influence the exchange rates of a country and therefore the competitiveness of the economy.

According to Vukanović (2016), besides the volatility of the balance of payments there are other negative effects of FDI, especially for small economies with inflowing FDI. Big foreign companies could abuse their dominant market position in small economies. While abusing their market position they are attempting to monopolize and take over highly profitable sectors. The big foreign companies could also try to minimalize their global tax burden through transfer pricing. Finally, a large sum of FDI can demotivate domestic investments in the inflowing as the outflowing country.

2.2 Evolution of Foreign Direct Investment through the years

To get a better understanding of FDI, it is important to have a look at the development of FDI through the years. Te Velde (2006) published a paper regarding FDI in historical perspective, he wrote some interesting findings about the development of FDI since the early 20th century and the present. According to te Velde, FDI has evolved from early 20th century exploitation by colonial powers, focusing on resource extraction and infrastructure in developing countries, to a crucial element of global economic integration. In the beginning FDI served to expand the reach of developed countries into colonies, often at the expense of local economies.

After World War II, new nations emerged because of decolonization. This decolonization changed the use of FDI. Many countries viewed foreign investment with skepticism and

therefore implementing restrictive policies to protect their economic sovereignty. The post World War II period was therefore characterized by import substitution, where countries aimed to reduce dependency on foreign countries. In other words, this period experienced a decline in FDI according to te Velde.

However, he writes that by the late 20th century the global economy changes. This change was marked by trade liberalization, deregulation and advances in globalization. Those changes transform the FDI landscape. The shift towards more open policies resulted in an enormous rise of FDI around the globe, see Chart 1.

Today, FDI is integral to global economic strategies. It is strategically applied by multinational corporations to optimize global supply chains, access new markets and to use advanced technologies. Developing countries now see FDI as essential for enhancing their global market competitiveness. This is quite a big difference towards 80 years ago, when foreign investments were seen as a threat to domestic economies.

In standard (neoclassical) economic models, capital flows will go from developed economies to developing economies. Developed economies could invest their excess capital in developing countries and get better returns, because the marginal product of capital will be relatively low in developed economies and relatively high in developing economies. However, Lucas (1990) stated that this theory empirically does not hold, this finding got the name Lucas Paradox. Lucas argues that the reason behind this paradox is that factors like risk, uncertainty, weak institutional factors and differences in technology and human capital make developing economies decide to invest in developed economies. Although the empirical arguments from Lucas, there is new empirical evidence that this Lucas Paradox does not entirely hold for FDI. Lane and Milesi-Ferretti (2007) stated that developing economies are predominantly receiving inflowing FDI versus outflowing FDI. They also state that the amount of FDI flows is varies per region. These differences are bigger for FPI than for FDI.

Until now we spoke of developing economies benefiting from inflowing FDI flows and about developed economies also benefiting from inflowing FDI like the high-technology industries in the U.S.. Now the FDI flows of the world will be discussed. Like mentioned in this same paragraph, FDI flows have fluctuated considerably over the years. Also, the rise

of developing economies resulted in changes for FDI. This means that a lot of different regions profited from FDI in different periods. However, FDI is still linked with globalization waves (Pekarskiené, 2015), thus there is a main determinant in the total amount of FDI flows. This paper focuses on recent times, approximately the last 25 years. Graph 1 shows the fluctuations in FDI over the past 30 years. You can clearly see that there was an enormous rise between the early 1990s and just before the Financial crisis of 2008.

Chart 1: Global FDI flows over the last 30 years
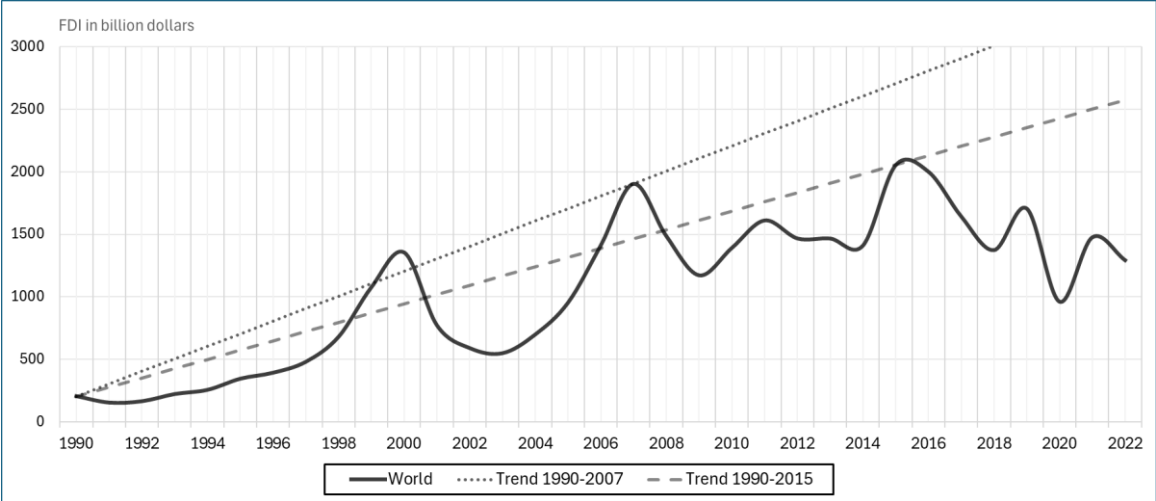
It is clearly visible that the total FDI flows never returned on the 1990-2007 trend after the crisis of 2008. The chart did recover from the financial crises crash however, after 2015 the decline started again and the Covid-19 crises has ensured that this decline could not be reversed.

2.3 Determinants of FDI, theory and evidence

In the neoclassical trade theory, the Heckscher-Ohlin model suggests that capital-abundant countries move their capital to foreign economies where returns on capital are higher. This process will continue until price equalization is achieved. Aliber (1970) expanded this view and claimed that the difference in capital returns was due to a difference in capital endowments and currency risks. The interest rates include a

premium according to the expected currency depreciation. Firms demand higher interest rates when currencies are not stable. Aliber thus claimed that interest rates and exchange rates are determinants of FDI.

Hymer (1976) and Kindleberger (1969) where the first to criticize the neoclassical model, because the model is limited to the perfect market, the model would not be a realistic prediction. They argued that investors needed ownership advantages like, product differentiation and new technologies or patents.

According to Vernon's product life cycle hypothesis (1966) companies first start exporting their innovations but later begin to move their production to lower cost countries to optimize profitability. This choice is often influenced by financing costs in foreign countries. The Investment Development Path (IDP) Model by Dunning and Narula (1995) links the country's economic development level to its FDI flows. They suggest that as countries develop, their FDI patterns evolve from being net receivers to net contributors.

Jadvah (2012) stated the following "According to the capital-market approach, the important reason for FDI inflows is motivated by interest rate differentials and MNCs' capital tendency to flow the region where capital gets highest return.". The interesting part of interest rates as a determinant of FDI is that interest rates are a policy instruments of governments and/ or central banks. This will be further discussed in chapter 2.4.

In conclusion, according to Faeth (2009), FDI should not be explained by just one theory. It is better to look at a combination of factors, such as a combination of ownership advantages, market size, cost factors, transport costs and protection and risk factors and policy variables (see chapter 2.4). Many empirical studies have already taken that approach.

In the recent decades there has been empirical research regarding the economic determinants of FDI. Buch (2005) found that FDI did give positive domestic agglomeration effect for German companies. So, if a domestic market is connected with foreign markets through FDI, the domestic market benefits from this connection. Kalyonchu et al. (2015) found that in Turkey GDP, openness of the economy, export + import and labor productivity have a positive effect on FDI. However, the inflation rate has a negative effect on FDI according to the same paper. The exchange rate is not discussed in this research,

Kaur and Sharma (2013) did look at the exchange rate as a determinant of FDI in the developing country India. They stated that exchange rates have a negative impact on FDI.

Besides the economic determinants, institutional determinants are also an important influence for FDI. Infrastructure quality, trade cost, institutional quality, political stability, regulatory quality and control on corruption are significant determinants of FDI in emerging markets (Paul and Jadhav, 2020). The fact that stable and effective institutions are important for FDI will be further discussed in chapter 2.4.

2.4 The impact of policy on FDI

Previously, the determinants of FDI are discussed. Some of these determinants can be influenced by policy from governmental policymakers. In this paragraph, the influence of policy on FDI will be discussed. Previously we stated that there are economical determinants and institutional determinants. For the institutional determinants this can be influenced by policies by the government. For example, an investment in a countries' infrastructure or working on strong institutions. These institutional determinants are a really interesting subject; however, this study focuses more on the economic determinants.

First, we will look at the influence of economic policy uncertainty (from now on: EPU). This occurs, for example, when economic policy is not stable. This can be the case for fiscal policy, monetary policy (this will be discussed in chapter 3) and trade policy. The growth rate of domestic EPU adversely affects FDI inflows (Canh et al., 2020). Countries who are looking for FDI inflows should therefore have their economic policy as stable as possible.

For trade policy, Musabeh and Zouaoui (2020) found that trade liberalization policies and integration into global business have a positive and significant correlation with FDI inflows growth for countries in North Africa. The same research found that increasing domestic investment in host countries attracts more FDI. Golub et al. (2003) had the same findings in their research regarding trade liberalization policies and FDI. They stated that "the removal of such trade barriers suggests that the quantitative effects of FDI could be substantial…". This shows that trade openness is a key feature of attracting FDI flows.

Until now the fiscal policy instruments of the government have not been discussed. Fiscal policy means the ability of the government to make changes through taxes and government expenditure patterns. With these changes the government could stimulate desired changes, for example in GDP or the business environment of the economy. Bhasin (2014) found that fiscal policy, precisely the number of tax treaties and the share of developmental expenditure in government did not significantly impact FDI inflows in India and some other central Asia countries. However, Göndor and Nistor (2012) did find a relationship between fiscal policies and FDI in emerging EU markets. They stated that that their results suggested that fiscal competition between governments for FDI is especially business environment competition, which is primarily influenced by fiscal policy.

Ogege and Boloupremo (2020) found that in Nigeria government expenditure is positively and significantly associated with FDI and that government tax revenue is positive and insignificant associated with FDI. This gives the impression that government spending is more important for FDI than the tax revenue of the government. To add, Fahmi and Septiani (2023) found that GDP had a significant and positive effect on FDI in Indonesia.

To conclude, a government is able to stimulate FDI inflows through various policy areas. The main areas are trade policy, economic policy stability and fiscal policy. For fiscal policy the expenditure side of the government is more important to stimulate FDI than the tax revenue side. One major area that can stimulate FDI through policy is the monetary sector. The influence of monetary policy will be discussed in the next chapter.

2.5 The impact of monetary policy on FDI

In the previous chapter we looked at the influence of policy on FDI, especially trade policy, fiscal policy and economic stability. One policy field was not discussed, namely monetary policy. This chapter will focus on the influence of monetary policy on FDI.

Like the previous chapter, first the influence of uncertainty of monetary policy will be discussed. Albulescu and Ionescu (2018) found that monetary uncertainty negatively affects the inflowing FDI in EU countries. This "monetary uncertainty" was calculated as the difference between the recorded and the forecasted interest rate values. They also found that banking stability has a positive effect on FDI. So, monetary policy is like the

other economic and institutional determinants from chapter 2.4, it should be as stable and as reliable as possible to attract FDI flows.

Exchange rates are of course an important aspect of FDI. When capital flows from one country to another country, usually there are exchange rates involved. Alba et al. (2010) found that under a favorable FDI environment, the exchange rate has a positive and significant effect on FDI inflows. This was a study on the inflowing FDI into the United States. Khandare (2016) found that in India exchange rates had a positive correlation on FDI inflows also. However, in the same paper there was a negative correlation between exchange rates and FDI in China. A positive relationship between exchange rates and FDI has also been found in Nigeria (Emmanuel et al., 2019). In this research there was a statistically significant positive relationship. This research also concluded that there is a not significant negative relationship between interest rates and FDI.

The relationship between exchange rates and FDI implies that governments can utilize exchange rates as a strategic tool in their policy-making arsenal. Central banks have the capability to influence exchange rates, thereby indirectly managing inflowing FDI. Policymakers in central banks can directly affect the volume of incoming FDI by adjusting their exchange rate policies. Another critical policy tool at the disposal of central banks is the interest rate. The dynamics of how interest rates affect FDI will be explored in the next section.

Inflation rates are also an economic phenomenon that could influence FDI inflows. FoEh et al. (2020) found that inflation rates have a very significant negative effect on FDI in the ASEAN countries. Valli and Masih (2014) also found a significant negative effect between interest rates and FDI in South Africa. This suggests that countries who experience high inflation will have relatively little FDI inflows.

Also, for inflation rates it is important that the policy is stable, because predictable inflation rates reduce uncertainty in business planning. Mason and Vracheva (2017) found that inflation targeting policy has a positive impact on attracting FDI. This effect is stronger for developed nations than for developing nations.

This thesis focusses on the influence of interest rates on FDI. There has been some empirical research on this question. However, there are some conflicting findings.

Expansionary monetary policy (increasing money supply to stimulate the economy) has a negative influence on attracting foreign direct investment in South East Asian countries according to empirical evidence (Nguyen, 2023). While the contractionary monetary policy has the effect of promoting FDI inflows. This contractionary response will happen because the central bank will increase the domestic interest rate when it implements a restrictive monetary policy. This increases the difference between domestic and foreign interest rates and thus attracts FDI according to Nguyen. However, Kumar et al. (2024) stated that interest rates differential is not a significant determinant of FDI flows to India. They did find a significant impact of domestic money supply growth on FDI flows. These results are contra on the results of Nguyen (2023), because growing the total money supply of a country is an expansionary monetary tool.

To conclude, it is not clear, based on the available literature, that interest rates significantly effect FDI. This means that it is less of a strategic tool in the policy-making arsenal of central banks. However, there are theoretical signs that interest rates influence FDI and some light empirical evidence. This thesis will research this question further.

III Methodology and Data

3.1 Hypothesis

In the introduction and in the literature, the economic theory and the empirical evidence have been discussed related to the impact of interest rates on FDI. There are arguments that interest rates have a negative effect on FDI, and there are some arguments that interest rates have a positive effect on FDI. However, it is still possible that there will not be a significant effect.

If you weigh all the mechanisms against each other, the economic story seems to tend to move that interest rates have a negative impact on FDI. In the empirical literature there is evidence that for some countries there is a positive effect. However, because of the lack of sufficient empirical evidence, you cannot predict the positive or negative effect. This implies that the hypothesis will only predict a significant effect. Therefore, the following hypothesis will be tested:

"A change in the domestic short term interest rates leads to a significant change in Foreign Direct Investment inflows."

3.2 Data

This study focusses on the test whether interest rates have a direct effect on FDI inflows of a country. To find this answer, data from all the OECD countries will be used, with exceptions from Costa Rica and Türkiye because of the lack of sufficient data. Therefore, the amount of countries that are relevant is 36. The data for the variables comes from the OECD and the World Bank Data Bank and are visible in Appendix 1. The time series of the data is twenty-four years, from 1999 until 2022.

The dataset consists of annual observations for the six variables that have been selected to test the effect. The dependent variable is FDI, and the independent variable is the interest rate (IR). Like discussed in chapter 1 & 2, FDI can be influenced by different determinants. Therefore, it is necessary to add control variables. The control variables that will be added are: Inflation (IF), Output (GPD), Exchange Rates (EXR) and Trade Openness (TOP). These control variables have been selected based on the already shown empirical evidence and economic theories. The data will be structured in a panel format

where each year represents a separate time period and for every year there are annual observations for all the 6 variables.

For the interest rate the short-term interest rate from the OECD will be used. The short-term interest rate are the rates at which short-term borrowings are effected between financial institutions or the rate at which short-term government paper is issued or traded in the market. This rate is useful to test the effect of the policy rate on FDI.

The data of the FDI inflows comes from the Databank of the World Bank Group. FDI refers to foreign direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital. Direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of an enterprise that is resident in another economy. Ownership of 10 percent or more of the ordinary shares of voting stock is the criterion for determining the existence of a direct investment relationship. The FDI inflows are measured as a percentage of GDP of the home country. GDP is the standard measure of the value added created through the production of goods and services.

For the control variables, the OECD database is also used for the data. The inflation rate is measured by the consumer price index (CPI) and is defined as the change in the prices of a basket of goods and services that are typically purchased by specific groups of households.

The last two control variable are the exchange rate and trade openness. The home currency of all the relevant OECD countries will be compared to the US dollar. For trade openness, the data comes from the Databank of the World Bank and counts trade as a percentage of GDP.

In this dataset a 5% threshold is used to delete outliers. This approach eliminates the most extreme 2.5% of data on either end of the distribution, reducing the influence of anomalies while preserving the overall integrity of the data. The outliers will be deleted for the dependent and the independent variable.

3.3 Methodology

This section focuses on the methodology used to research the effect of interest rates on FDI. The thesis focuses on the impact of a change in interest rates while controlling for inflation, GDP, exchange rates and trade openness. This empirical analysis is based on the 24-year time series dataset, mentioned in 3.2. Additionally, country fixed effects and time fixed effects are incorporated to control for time-invariant characteristics and unobserved heterogeneity across countries.

3.3.1 Baseline

To start, a simple fixed effect model will be performed to test the influence of interest rates on FDI. The model looks as follows:

$$FDI_{i,t} = \alpha + \beta_1 IR_{i,t} + y_i + \delta_t + \epsilon_{i,t}$$

A multiple linear regression model with fixed effects issued to test the impact of interest rates on FDI. The estimation is controlled by inflation, GDP, exchange rates and trade openness. The model looks as follows:

$$FDI_{i,t} = \alpha + \beta_1 IR_{i,t} + \beta_2 IF_{i,t} + \beta_3 GDP_{i,t} + \beta_4 EXR_{i,t} + \beta_5 TOP_{i,t} + y_i + \delta_t + \epsilon_{i,t}$$

Where FDI_{it} represents the FDI as a ratio of GDP I in year t for country i. IR_{it} is the short-term interest rate in year t for country i. ΔIF_{it} is the percentage of the Consumer Price Index (CPI) in year t for country i. GDP_{it} represents the growth rate of GDP in year t for country i. EXR_{it} is the growth rate of the exchange rate of the domestic currency relative to the US dollar in country i and year t. $TOP_{i,t}$ represents the ratio of the Trade Openness of an economy, this is measured as trade as a ratio of GDP. β_1 is the coefficient of the effect of interest rates on FDI. The control variables all have their own coefficient β_x. y_i represents the country fixed effects, which control for time-invariant characteristics of each country. δ_t represents time fixed effects, which control for common shocks or trends that affect all countries in a given year.

The Ordinary Least Squares (OLS) regression with fixed effects will be used to estimate the coefficients. Where the fixed effects model accounts for unobserved heterogeneity, ensuring more accurate and unbiased estimates. This model is useful because, like we have seen earlier, FDI can be influenced by a lot of factors (Faeth, 2009). It is not possible to fit all those variables in as control variables such as global economic trends or financial

crises, therefore the time fixed effects model is useful. The time fixed effects model gives the opportunity to control time-specific influences that affect the observational units in the same way. This could for example be the uncertainty of policy (chapter 2.4).

3.3.2 Robustness

To promote the endogeneity and robustness to the estimates, lagged versions of explanatory variables will be incorporated in the model. The independent variable, as the control variables, could have an effect on FDI that evolves in the next year. These results give an incomplete view if you only look at the change of FDI in the same year. Therefore, as the first robustness check the first difference of the variables will be taken into account. This gives the following model:

$$\Delta FDI_{i,t} = \alpha + \beta_1 \Delta IR_{i,t} + \beta_2 \Delta IF_{i,t} + \beta_3 \Delta GDP_{i,t} + \beta_4 \Delta EXR_{i,} + \beta_5 \Delta TOP_{i,} + y_i + \delta_t + \epsilon_{i,t}$$

Also, autocorrelation occurs when residuals in a regression model are correlated across time periods. Economic relationships often evolve over time, implementing lagged versions helps capturing these effects, just like the fixed- and country fixed effects. For this multiple linear regression model, the first lag will be used, therefore the model looks as follows:

$$FDI_{i,t} = \alpha + \beta_1 IR_{i,t-1} + \beta_2 IF_{i,t-1} + \beta_3 GDP_{i,t-1} + \beta_4 EXR_{i,t-1} + \beta_5 TOP_{i,t-1} + y_i + \delta_t + \epsilon_{i,t}$$

Like mentioned before, the control variables have been selected based on the economic theories and the empirical evidence. The four control variables IF, GDP, EXR and TOP all have a significant influence on FDI in the empirical literature and have clear annual values in international recognized datasets. This selection promotes the endogeneity of the model.

Besides the lagged version check-up test, a dynamic model, the Autoregressive Distributed Lag (ADL), will be used to check the robustness. In this the dynamic model the variables will be used in the current and the lagged versions, so (t) and $(t-1)$. Therefore you get the following formula, where the current variable as the lagged version have their own coefficient:

$$FDI_{i,t} = \alpha + \beta_1 IR_{i,t} + \beta_{1.1} IR_{i,t-1} + \beta_2 IF_{i,t} + \beta_{2.1} IF_{i,t-1} + \beta_3 GDP_{i,t} + \beta_{3.1} GDP_{i,t-1}$$
$$+ \beta_4 EXR_{i,t} + \beta_{4.1} EXR_{i,t-1} + \beta_5 TOP_{i,t} + \beta_{5.1} TOP_{i,t-1} + y_i + \delta_t + \epsilon_{i,t}$$

The Local Projection Method (LPM) directly estimates the impulse response on the change of the interest rate. The advantage of LPM is that the approach directly estimates the coefficients that describe the response of the dependent variable to the shock at each future point. In other words, LPM could help us to test the impact of interest rates on FDI on different time horizons. This provides insights into the economic adjustment process and the time it takes for policy changes to affect te economy.

Each horizon (h) where h can be 1 year, 2 years, etc., can be estimated with the following regression:

$$FDI_{i,t+h} = \alpha + \beta_{1,h} IR_{i,t} + \beta_{2,h} IF_{i,t} + \beta_{3,h} GDP_{i,t} + \beta_{4,h} EXR_{i,t} + \beta_{5,h} TOP_{i,t} + \gamma_{i+h} + \delta_{t+h}$$
$$+ \epsilon_{i,t+h}$$

Where all the variables are the same as the main equation, however h representing horizon has been added. By interpreting the coefficients $\beta_{1,h}$ for different horizons, we can discuss how the effect of interest rates on FDI evolves.

Good to mention, is that FDI alone is not a big determinant of the short-term interest rates and therefore there is not a big risk for reverse causality (Berument & Malatyali, 2001, Assamoah & Adu, 2016). The short-term interest rates is influenced by a lot of other factors, so FDI will not affect it significant. However, it is good to still pay attention to the risk of reverse causality.

IV Results

4.1 Baseline results

For the baseline a simple fixed effect model and a multiple linear regression model will be performed. The results in Table 1 show the coefficient of the interest rate on FDI in the simple fixed effect model. It is clearly visible that controlling for different variables is necessary, because the interest rate is not significant and the confidence interval is both negative and positive.

Table 1: Simple linear regression model (FE)

	Fixed effects level
FDI	
Coefficient interest rate	0.14
	(0.11)
Confidence interval	-0.1, 0.37
Observations (N)	773
R-squared within	0.10
R-squared between	0.01
Number of countries	36

Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the independent variable is the short-term interest rate. The p-value of the coefficient is > 0.1. The model has both time and country fixed effects. Time period of the data is 1999-2022 (OECD data). Confidence interval is 95%. Figures are rounded to two decimal places.

The results of the multiple linear regression model with fixed effects are visible in Table 2. Adding the control variables did change the results. The p-value of the coefficient of the interest rate is < 0.1, and thus significant based on a 10% significance level. The confidence interval of the interest rate is also almost totally positive, suggesting that interest rates probably have a positive effect based on a 10% significance level. The coefficient tells us that when interest rates rise with 1, FDI rises with 0.25.

The R-squared between shows a value of 0.6. This means that more than 60% of the variance between countries is explained by this model. The control variables have a non-significant p-value (viewable in Appendix A) and the coefficient of the interest rates

is not significant on a 5%-level, suggesting that it is good to perform the robustness checks that are mentioned in 3.3.2.

Table 2: Multiple linear regression model (FE)

	Fixed effects level
FDI	
Coefficient IR	0.25*
	(0.15)
Confidence interval	-0,05, 0.50
Observations (N)	743
R-squared within	0.11
R-squared between	0.62
Number of countries	35

Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the dependent variable is the short-term interest rate. * = p-value < 0.1 and ** = p-value < 0.05. The model has both time and country fixed effects. The model is controlled by four different control variables, namely inflation, GDP, exchange rate and trade openness (see chapter 3.2). Time period of the data is 1999-2022. Confidence interval is 95%. Figures are rounded to two decimal places.

4.2 Results robustness checks

Like discussed in the methodology (3.2), various robustness checks will be performed to ensure the findings from the fixed effects regression model discussed in 4.1. The first robustness check is the first difference test. In Table 3 are the results visible of this test.

The biggest differences towards the multiple linear regression model are the findings that the coefficient of the interest rate is positive and significant on a 1%-level. It is a very interesting finding that the coefficient turns to be significant on a 1%-level instead of the 10%-level when the first difference are taken into account. Also, two of the control variables are now significant instead of in the multiple linear regression model (viewable in Appendix B). This could have various reasons, such as that the First Differences method removes any time-invariant unobserved heterogeneity by focusing on changes over time within the same country. This could be the reason why there is a low within R-squared, and a high between, in the model. The coefficient is positive, suggesting that a rise of interest rates will result in more FDI inflows.

Table 3: First Differences model (FE)

	Fixed effects level
FDI	
Coefficient IR	0.58***
	(0.13)
Confidence interval	0.30, 0.85
Observations (N)	680
R-squared within	0.12
R-squared between	0.63
Number of countries	35

*Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the dependent variable is the short-term interest rate. * = p-value < 0.1, ** = p-value < 0.05 and *** = p-value < 0.01. The model has both time and country fixed effects. The model is controlled by four different control variables, namely inflation, GDP, exchange rate and trade openness (see chapter 3.2). Time period of the data is 1999-2022. Confidence interval is 95%. Figures are rounded to two decimal places.*

The First Differences test was the first robustness check. To check for more temporal dynamics of the relationship between the interest rate and FDI, the lagged versions of the variables except for FDI, will be used to test the effect. In Table 4 the results of the lagged version of the baseline regression are visible.

These results suggest that the impact of interest rates on FDI is at least not hugely influenced by the lagged version, because of the lack of significance. This suggests that, looking only at the lagged version, is not a good way to test the determinants of FDI. However, in the next robustness check the lagged version and the current version will be taken into account. Additionally, the low R-squared values suggest that looking at the lagged variables does not contribute much to the explanatory power of the model.

<div align="center">**Table 4:** Lagged versions model (FE)</div>

FDI	Fixed effects level
Coefficient IR $(t-1)$	-0.04
	(0.13)
Confidence interval	-0.31, 0.22
Observations (N)	681
R-squared within	0.11
R-squared between	0.17
Number of countries	35

Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the dependent variable is the short-term interest rate. The p-value is > 0.1. The model has both time and country fixed effects. The model is controlled by four different control variables, namely inflation, GDP, exchange rate and trade openness (see chapter 3.2). Time period of the data is 1999-2022. $(t-1)$ stands for the value of the variable one year ago. Confidence interval is 95%. Figures are rounded to two decimal places.

In Table 5 the results of the dynamic robustness test, the Autoregressive Distributed Lag (ADL) are visible. This model captures dynamic relationships by including lagged values, besides from the current time (t), for both the dependent and independent variables, including control variables.

The results show that the lagged version of FDI and interest have a significant effect (1%-level) in the ADL model. For interest, the effect is negative in $(t-1)$. From this it can be concluded that the increase of interest rates, like discussed in the Introduction (chapter 1), do have a negative effect on FDI, however it takes time before the rise in the interest rate actually has a negative effect on FDI.

In Table 5 it is also visible that the interest rates in (t) has a positive significant effect on FDI. The coefficient is similar to the coefficient of the interest rate in Table 3. This suggests that adding the lag of the interest rate does not affect the coefficient of the interest rate in t. Therefore, the evidence of the positive coefficient of the interest rates is strengthened.

<div align="center">**Table 5:** Autoregressive Distributed Lag model (FE)</div>

	Fixed effects level
FDI	
Coefficient IR (t)	0.74***
	(0.17)
Confidence interval	0.41, 1.07
Coefficient IR ($t-1$)	-0.57***
	(0.13)
Confidence interval	-0.83, -0.31
Observations (N)	680
R-squared within	0.14
R-squared between	0.63
Number of countries	35

Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the dependent variable is the short-term interest rate. * = p-value < 0.1, ** = p-value < 0.05 and *** = p-value < 0.01. The model has both time and country fixed effects. The model is controlled by four different control variables, namely inflation, GDP, exchange rate and trade openness (see chapter 3.2). Time period of the data is 1999-2022. $t-1$) stands for the value of the variable one year ago, and (t) stands for the value of the current year. Confidence interval is 95%. Figures are rounded to two decimal places.

The last robustness check is the Local Projection Method (LPM). This method involves estimating a series of regressions for each forecast horizon, providing a flexible approach to modeling dynamics without depending on the potentially restrictive assumptions of vector autoregressions (VARs). The findings of the LPM are visible in Table 6.

The results show that the coefficient of the interest rate is non-significant in all the three horizons. This suggests that changes in the interest rate do not have a strong or consistent impact on FDI in the short to medium term. What is striking is that the p-value decreases a lot in the second horizon. However, this decrease does not lead to anywhere close to a significant value.

Table 6: Local Projection Method (FE)

	Fixed effects level
FDI	
Horizon 1	
Coefficient IR	-0.04
	(0.13)
Confidence interval	-0.31, 0.22
Horizon 2	
Coefficient IR	-0.12
	(0.13)
Confidence interval	-0.38, 0.13
Horizon 3	
Coefficient IR	-0.11
	(0.134393)
Confidence interval	-0.38, 0.16
Observations (N)	608
R-squared within	0.11
R-squared between	0.57
Number of countries	35

Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the dependent variable is the short-term interest rate. The p-value are > 0.1. The model has both time and country fixed effects. The model is controlled by four different control variables, namely inflation, GDP, exchange rate and trade openness (see chapter 3.2). Time period of the data is 1999-2022. Confidence interval is 95%. Figures are rounded to two decimal places.

Across almost all the test, it is clear that the R-squared between countries is much higher than the R-squared within countries. This suggests that country-specific factors, besides the control variables, have a significant role in determining FDI. These factors could be for example economic stability, the level of trustable institutions and the education of the working population. The influence of such factors means that the influence of interest rates is difficult to measure.

4.3 Discussion

Like mentioned in the paragraph 4.1, the coefficient of the interest rate was significant on a 10%-level in the baseline regression. However, the R-squared within of the model is low. This suggests that there are other factors that influence FDI, which are not included in the model. These could be many different factors such as economic stability, good institutions and a well-educated working population. Further research could try to include these factors as control variables and so test the determinants of FDI better.

For further research it is also good to perform a more extensive literature review about all the different determinants of FDI. In this study the literature review about the determinants was mainly focused on the biggest determinants according to the existing evidence. However, this empirical research show that the biggest determinants do explain FDI on a low level.

There were interesting findings in the robustness checks. Two of the robustness checks gave a positive significant coefficient for the interest rate on a more significant level, namely 1%. Both gave approximately the same value of the coefficient for the current time (t). These robustness tests were the First Differences test and the Autoregressive Distributed Lag (ADL). Further research could focus on these two test and use these tests as a starting point to test the effect of interest rates on FDI.

V Conclusion

This study contributes to the knowledge about the determinants of FDI. It focuses on the effect of a change interest rates on FDI, using a panel dataset of 36 OECD countries and spanning over 24 years (1999-2022). The hypothesis that is tested is that a change in the domestic short term interest rates leads to a significant change in Foreign Direct Investment inflows. The main finding of this research is that there is evidence that a change in the interest rate has a significant impact on FDI on a 10% significance level. Therefore, the hypothesis is confirmed. However, good to mention is that the models in this study only predict FDI on a low level. The only reliable finding is that there is a significant effect of the change in interest rates on FDI.

In the literature discussed in chapter 2, there was no clear answer on the question what the effect of interest rate is on FDI. However, some empirical evidence suggested that there was a significant effect. This research was mostly performed for one single country and not with a dataset as big as this research. In the literature there was also plenty of evidence of different determinants of FDI, but not for the interest rate. Therefore, this research contributes to the empirical research about FDI.

To test the effect empirically a dataset was used of 36 OECD countries, all the OECD-countries except for Costa Rica and Türkiye because of insufficient data. The time series was 24 years (1999-2022). The control variables that were added are inflation, exchange rate, GDP growth and trade openness. The baseline regression is a multiple linear regression model and various robustness checks have been performed.

The findings of this study indicate that the hypothesis can be confirmed. The coefficient of the interest rate is significant in the baseline regression. However, the model has a low R-squared within value (0.1) and a high R-squared between value (0.6). This suggests that country-specific factors, besides the control variables, have a significant role in determining FDI. These factors could be for example economic stability, the level of trustable institutions and the education of the working population. These are factors that are not included in this research. Therefore, this research cannot be used to give a good overview of the determinants of FDI. However, the finding that a change in interest rate result in a significant change in FDI, does contribute to the knowledge about FDI.

Overall, the robustness checks support the conclusion that FDI is more responsive to contemporaneous economic conditions rather than the values of the variables included in the models. However, to make an important note, two of the robustness checks resulted in a positive significant coefficient for the interest rate, on a 1% significance level. Like mentioned in the discussion (4.3), further research is possible on the basis of these results.

To come to an end, this study does provide sufficient evidence to support the hypothesis that a change in the interest rate results in a significant change in FDI. However, the control variables that were added in this study do not reach far enough to include all influences on FDI in the model. Factors that were not included in the model and which have a certain impact on FDI, as mentioned in the literature review, are political stability, reliable institutions and a well-educated working population. These are all factors that could be included in further research into the effect of interest rates on FDI, because these effects are not measured in this model.

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Appendix A

Table 7: Multiple linear regression with control variables (FE)

	Fixed effects level
FDI	
Coefficient IR	0.25*
	(0.15)
Confidence interval IR	-0,05, 0.50
Coefficient IF	-0.09
	(0.09)
Coefficient EXR	0.03
	(0.03)
Coefficient GDP	0.05
	(0.06)
Coefficient TOP	0.02
	(0.02)
Observations (N)	743
R-squared within	0.11
R-squared between	0.62
Number of countries	35

Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the dependent variable is the short-term interest rate. * = p-value < 0.1 and ** = p-value < 0.05. The model has both time and country fixed effects. The model is controlled by four different control variables, namely inflation, GDP, exchange rate and trade openness (see chapter 3.2). Time period of the data is 1999-2022. Confidence interval is 95%. Figures are rounded to two decimal places.

Appendix B

Table 8: First Differences model with control variables (FE)

	Fixed effects level
FDI	
Coefficient IR	0.58***
	(0.13)
Confidence interval IR	0.30, 0.85
Coefficient IF	-0.31***
	(0.11)
Coefficient EXR	0.05*
	(0.03)
Coefficient GDP	-0.05
	(0.10)
Coefficient TOP	0.14***
	(0.04)
Observations (N)	680
R-squared within	0.11
R-squared between	0.62
Number of countries	35

Notes: Standard error is in parentheses and is robust. The dependent variable is FDI, and the dependent variable is the short-term interest rate. * = p-value < 0.1, ** = p-value < 0.05 and *** = p-value < 0.01. The model has both time and country fixed effects. The model is controlled by four different control variables, namely inflation, GDP, exchange rate and trade openness (see chapter 3.2). Time period of the data is 1999-2022. Confidence interval is 95%. Figures are rounded to two decimal.