Every Flow Must Have Its Ebb

The Impact of the Financial Crisis on FDI Flows: A Comparison Between Euro and Non-Euro Countries

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Abstract

Previous research has found that the euro increases FDI flows, yet the evidence of to what extent the EMU membership enhances FDI flows differs between studies. This thesis aims to estimate the impact the financial crisis has had on FDI flows and to further compare the impact the crisis has had on the euro countries to non-euro countries. Bilateral FDI data for both inflows and outflows for the OECD countries between the years 2005 and 2018 were estimated through the gravity model, employing different estimation methods for robustness checks, each with country- and time- fixed effects. We noticed a tendency for a larger negative impact of the financial crisis for the eurozone compared to the OECD countries. Yet, we could not confirm these results with the most robust method. The conclusion entails that the positive effects of belonging to a currency union does not balance out the negative impacts of the financial crisis, instead the financial crisis together with the macroeconomic imbalances within the eurozone, became the origin for the European Sovereign Debt Crisis.

Keywords: Currency Union, Euro, Financial Crisis, FDI

Abbreviations

OCA: Optimum Currency Area

ECB: European Central Bank

EMU: European Monetary Union

ERM: European Exchange Rate Mechanism

EU: European Union

FDI: Foreign Direct Investment

GDP: Gross Domestic Product

HDFE: High-Dimensional Fixed Effects

MNC: Multinational Corporation

MNE: Multinational Enterprise

MRT: Multilateral Resistance Term

OCA: Optimum Currency Area

OECD: Organisation for Economic Co-operation and Development

OLS: Ordinary Least Squares

RTA: Regional Trade Agreement

PIIGS: Portugal, Ireland, Italy, Greece, Spain

PPML: Poisson Pseudo Maximum-Likelihood

Table of contents

1. Introduction

 In 2008, the world got hit by the most severe economic crisis since the Great Depression (Stiglitz, 2009). Even though the financial crisis had its start in the United States, it soon spread to the European continent and had an impact globally. The crisis brought on the surface discrepancies in the sizes of debt between the member states of the European Union (EU). Portugal, Ireland, Italy, Greece and Spain (PIIGS) faced extensive sovereign debts and became the targets of bailouts and austerity programs since 2009. These events led to tensions and discord in the region and has questioned the sustainability of the EU and the European Monetary Union (EMU) (Esposito, 2013).

The past decades have simultaneously been characterized by ever deepening economic and political integration within the EU. Parallel to the process of integration, globalization in the form of liberalization of trade and markets have been a contributing factor to the increasing number of Foreign Direct Investment (FDI) flows between countries (Camarero et al., 2018). The European countries receive a majority of the world's total inflows and are the senders of a majority of the outflows, which is a position they have kept during the financial crisis despite the lowered number of total FDI flows (Dinga & Dingová, 2011). In the light of these developments, this thesis will thus investigate what is the impact the financial crisis has had on FDI flows and to compare the impact the crisis has had on the euro member countries to non-euro member countries. Analyzing the impact of the financial crisis on FDI flows is important considering the urgency for economies to keep the capital flows - both national and forgeign - to quickly recover from a shock. By including the role of the euro we will also get insights to the benefits of being part of a currency union and to whether the EMU membership is helpful for sustaining foreign investments during a financial crisis. A common currency is expected to reduce uncertainty stemming from exchange rate volatility, and thus increase trade and FDI flows between the countries sharing a common currency (Camarero et al., 2018), yet at the cost of losing autonomy over national monetary policy (Micco et al., 2003). We will investigate this by estimating FDI inflows and outflows separately for member countries of the Organisation for Economic Co-operation and Development (OECD) covering the years 2005-2018, employing different estimation methods. We will begin with Ordinary Least Squares (OLS) fixed effects and Poisson Pseudo-Maximum Likelihood (PPML) fixed effects regressions followed by High-Dimensional Fixed Effects (HDFE) and PPML HDFE method

for robustness checks. The PPML regressions are used to include the effects of zero value FDI flows.

FDI increases development, growth and employment and is an important source for external financing for the euro area (Sondermann & Vansteenkiste, 2019). Moreover, FDI flows help to create stable and long-lasting economic ties between countries, promote local enterprise development and improve competitiveness for both host and partner economies through technological exchange and innovation (Camarero, et al., 2018). Hence, that is why many countries wish to attract FDI through the promotion of policies among other things (Dinga & Dingová, 2011). Previous research has concluded that there indeed is a positive relationship between a common currency and FDI flows, however, the size of the effect deviates between studies (Dinga & Dingová, 2011; Schiavo, 2007; Petroulas, 2006; Camarero et al., 2018). Estimating the impact of crises on FDI flows have thus been less studied. Poulsen & Hufbauer (2011) compared the effects of the global recessions since the 1970s to the financial crisis in 2008 and concluded that the crisis has led to a greater impact on FDI flows than the previous crises. Globally, FDI flows experienced a downward surge during the global financial crisis, decreasing by 16 percent in 2008 from the previous year, and by further 40 percent in 2009 (Poulsen & Hufbauer, 2011). We found no study focusing on estimating whether the financial crisis has had different effects on euro and non-euro members' FDI flows, and therefore our contribution to the literature will be to examine whether the effects of the financial crisis have differed between the euro and non-euro countries in the sample consisting of OECD countries.

1.1. Disposition

The disposition of the thesis is as follows; a background (Chapter 2) provides an introduction to currency unions, economic crises, and FDI. This will be followed by a theoretical framework (Chapter 3) that introduces Optimum Currency Areas (OCA) and asymmetric shocks - theories applicable for this topic. Their relevance for the topic will be discussed in terms of how OCAs are developed to reduce the costs stemming from trading in different countries in different currencies for instance through reduced exchange rate volatility and price stability. We will further assess how these theories expect OCA to be affected by economic crises. Thereafter, we will present a literature review (Chapter 4) of previous studies on currency unions and FDI. More specifically, we will provide insights to what researchers have gained on the euro's effect on FDI, and on how economic crises have affected FDI flows. The upcoming chapters begin with a presentation of our estimation strategy (Chapter 5) which presents the gravity model

together with our model estimation and the variables included for the purpose of this thesis. This will be followed by a data description (Chapter 6) with details on our data selection and a discussion of data limitations. The empirical results and analysis (Chapter 7) will present and analyse the key findings. We will add robustness to our results by estimating our model with different estimation methods to increase the credibility of our findings. The results (Chapter 8) will then be discussed and related to the theories presented in the theoretical framework. We will also position our study in relation to previous studies. Lastly, the thesis will end with a conclusion (Chapter 9) and suggestions for future research.

2. Background

The background will introduce this thesis' three key components - currency unions, economic crises and FDI. Related to currency unions we will also separately present exchange rates as one of the expected advantages of being part of a currency union is reduced exchange rate volatility, which is expected to positively affect FDI flows. Since our focus lies on the euro, the EMU has its own presentation. The economic crises section will specifically focus on the global financial crisis. The ambition of the background is to introduce the key components to motivate the purpose of this thesis.

2.1. Currency Unions

The principal motives for engaging in a currency union, are political and economic (Bordo & Jonung, 1999). Throughout history, forming a currency union has been part of a process of political unification. Second to that have been economic reasons; reducing transaction costs between countries by introducing a common currency, the gains from trade this gives rise to, access to wider markets, as well as harmonization of policies. Thirdly, other non-economic reasons for the formation of a currency union include common history, language, culture and religion, which have been especially important in the establishment of multinational monetary unions (Bordo & Jonung, 1999). In the case of the establishment of the EMU, it was considered as a necessary development towards a more political and economic integration in Europe. From a political perspective, a common currency was to be a unifying symbol for the European identity, and economically the common currency was expected to boost the movement of capital, one of the fundamental freedoms of the EU, as well as promote trade and FDI (Dinga & Dingová, 2011). According to Dinga & Dingová (2011), there are in total three ways how currency unions can affect FDI flows. A common currency is expected to reduce the uncertainty around exchange rates, which eliminates firms' need for hedging (Dinga & Dingová, 2011). This reduces costs for firms and is expected to positively affect the expected returns. The second mechanism, through which a common currency affects FDI flows, is reduced transaction costs. The use of the same currency decreases the cost of capital flows associated with the use of several currencies and therefore also reduces costs for firms. Lastly, a common currency increases price stability within the union, which will help firms to make better-informed localization decisions. Price transparency will ease the comparison of factor prices, as one of the motivators for firms to invest abroad is to optimise production through

decreased costs, and price transparency will help firms to make more efficient decisions in this regard (Dinga & Dingová, 2011). The immediate consequence of joining a currency union however is that an individual country within the currency union loses its monetary policy autonomy; instead a central bank determines the supply of money and interest rates, which will be the same for the whole union (Burda & Wyplotz, 2017).

2.1.1. Exchange Rates

The choice of exchange rate regime is crucial in our analysis to understand the different options of monetary policy for a country to react to an economic shock. Exchange rates are closely linked to foreign investment decisions and there are several ways exchange rates can affect FDI flows. Being a member of a currency union benefits foreign investments because a currency union reduces exchange rate uncertainty, which otherwise could cause a hold on foreign investments (Blonigen, 2005). FDI outflows are, for example, expected to increase when foreign firms can invest at lower costs than local firms caused by a devaluation of the local currency (Blonigen, 2005). Exchange rates might also impact FDI flows if firms are instead interested in acquisitions of technology or managerial skills, without any requirements of currency transactions. Then a depreciation of a currency may start a 'fire sale' of these assets among foreign global firms because the price of the asset is lower without lowering the nominal returns (Blonigen, 2005).

2.1.2. The European Monetary Union (EMU)

The EMU was developed for a better functioning European Single Market through closer political economic integration and increased free capital movement between the member states (Dinga & Dingová, 2011). The EMU also lowered concerns about exchange rates for its members since they no longer borrowed in their own currency (Lane, 2012). In 1999, the first twelve countries: Austria, Belgium, Netherlands, Finland, France, Germany, Ireland, Italy, Luxembourg, Portugal and Spain joined the union, followed by Greece in 2001, and Slovenia in 2007, Cyprus and Malta in 2008, Slovakia and Estonia in 2009 and 2011 respectively (Camarero et al., 2018). In addition to being part of the EMU, these countries are also part of the EU. The EU is a political and economic union between 27 member countries that deepens the economic integration through the Single Market which guarantees the free movement of goods, capital, services and labour. There should thus be free labour and capital movement and mobility of production factors within the whole area of the preferential trade agreement

(Persson, 2020). All the EMU countries are part of the EU, but the following EU countries; Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Sweden, Denmark and the former member of the EU, the United Kingdom, are not part of the EMU (European Union, 2021).

The differences among the EMU countries - between the original and the newer members - expose the eurozone for asymmetric shocks. Two risk factors are highlighted, the failure to synchronize the euro countries' business cycles to compensate for the loss of macroeconomic autonomy and the risk of over-borrowing caused by the lack of a banking or a fiscal union (Ferreiro et al., 2016; Lane, 2012). This is, among others, a threat to foreign investments. Therefore, the eurozone created both *the Stability and Growth Pact*, to eliminate the over-borrowing by constraining the annual budget deficits at three percent and the stock of public debt to 60 percent of the Gross Domestic Product (GDP), and the *no bailout clause*, implying that governments who failed to satisfy their debt obligations would face a sovereign default (Lane, 2012). Still, the eurozone did not manage to regulate their member countries' too large deficits and consequently international investors reduced their capital flows into the area (Burda & Wyplosz, 2017; Lane, 2012). Together, the decline of foreign investments and the effects of the global financial crisis shocked the eurozone asymmetrically and the sovereign debt crisis developed as a result of the macroeconomic imbalances among the EMU members (Lane, 2012). The EMU countries that more heavily depended on external funding - the PIIGS - suffered more and had to be bailed out by the other member countries. Until this day the eurozone lacks plans to handle a crisis and the debt ratios, despite being stabilized, are still at different levels and hard to reduce (Lane, 2012).

2.2. Economic Crisis

Historically viewed economic crises are not a new phenomenon in Europe. In the past decades, European countries have experienced several economic crises, such as for instance the oil crises in the 1970s, or the financial crisis in Finland and Sweden in the early 1990s (Fregert & Jonung, 2017). The path that generally tends to lead to an economic crisis is preceded by a boom-phase during which the economy expands, often as a result of low interest rates, which tend to encourage increased loan-taking and drive up the asset prices. Wealth effects play a crucial role, as asset owners often experience that their wealth has increased as a result of the higher asset prices. This phase is in general regarded as a period of increasing optimism, where new investment and business opportunities are seen as favourable and borrowing increases.

However this period of overheating of the economy is not permanent and at some point, boom turns into bust. In the bust-phase interest rates start rising again, asset prices fall and borrowing slows down, meaning that the economy undergoes a period of contraction (Fregert & Jonung, 2017). Although the European countries have experienced several crises, the financial crisis in 2008 has been the worst crisis the Eurozone as a whole has experienced during its existence.

2.2.1 The Global Financial Crisis

The global financial crisis, also called the Great Recession, began in the US during 2007 after an implosion of banks and a collapse of the US financial markets, and in 2008 this further developed into a global crisis after the crash of the investment bank Leman Brothers (Lane, 2012). The crisis struck against the whole European area, and as a consequence the European countries experienced a drop in exports by 20 percent and a decrease of GDP by four and a half percent (Burda & Wyplosz, 2017). According to Ferreiro et al. (2016) the EMU members suffered more than Sweden, Denmark and the United Kingdom, who performed relatively better in terms of GDP growth. Out of the euro countries, Greece, Italy, Ireland and Portugal, who joined the EMU after its introduction in 1999, together with Spain, who stands out among the original EMU members, experienced the most negative consequences (Ferreiro et al., 2016). The financial crisis' negative impacts on the eurozone were caused by both their lack of an independent monetary policy and their weak fiscal policies. This forced them to rely on the European Central Bank (ECB), who does not consider individual countries in their policy making (Burda & Wyplosz, 2017). Although, despite the crisis' tremendous economic consequences for Europe, Kahouli and Maktouf (2015) concluded that the global crisis had little effect on FDI stocks, which they argue is a result of a strong confidence in economic recovery among foreign investors and the long term commitment of trade agreements.

2.3. FDI

FDI is defined as an investment made by a company based in one country, acquiring a long-lasting interest in a company or entity based in another country (Camarero et al., 2018). The investor obtains control over the foreign affiliate, as long as it holds an ownership of at least ten percent of the foreign company (Van Marrewijk, 2012). Generally, we can distinguish between two types of FDI: vertical and horizontal FDI. The rationale behind vertical FDI is to obtain access to cheaper factors of production in another country. Horizontal FDI on the other

hand are driven by a company looking to expand to new markets by opening an affiliate in another country (Van Marrewijk, 2012). By and large, horizontal FDI are an alternative to exporting to another country, and are equivalent to producing in the country where products are eventually supplied (Petroulas, 2006). On a theoretical level, FDI can be considered to be interrelated with trade, as horizontal FDI can be considered as a substitute for trade, and vertical FDI as a complement for trade (Petroulas, 2006).

Apart from the above-mentioned impacts of exchange rates on FDI, there are several factors that may affect foreign firms decisions and localization (Bloningen, 2005). The main macroeconomic determinants are taxes, institutions, trade protection, trade effects, and exchange rate effects. All of these should be investigated further since researchers have found contradicting results (Bloningen, 2005). Due to the scope of this thesis, we will focus on the role of exchange rates considering our aim that is to estimate the impact a currency union - the EMU - has had on FDI flows during the financial crisis compared to non-euro countries. One of the major advantages of the EMU is its aim of creating an OCA with the benefit of increasing the exchange rate stability, which is important for attracting foreign investments, especially during a crisis. Consequently, OCA and exchange rates will be the prominent components of the theoretical framework and the literature review and we will also present how a crisis can affect these.

3. Theoretical Framework

This section will present the OCA theory that will be the theoretical framework for this thesis. This theory is useful for the analysis to understand why some of the EU countries joined the EMU. The theory further develops how an OCA is affected by asymmetric shocks, which is important for grasping how the financial crisis can have impacted the eurozone and their FDI flows. The chapter will begin with an overview of the OCA theory, and thereafter explain the linkages through which a currency union might be helpful for FDI flows in times of crisis.

3.2. Optimum Currency Areas and Asymmetric Shocks

A region constitutes an optimum currency union, if sharing a currency between the member states creates no loss of welfare (Burda & Wyplotz, 2017). The theory of OCA by Robert A. Mundell (1961) introduced the idea that certain regions, not necessarily limited by national borders and which already trade intensively with each other, would be better off by sharing a common currency. This would however require among other things the absence of frequent asymmetrical shocks as well as the mobility of factors of production between the regions sharing a common currency. Since, in the case of unemployment or inflation, the external price of the currency cannot be expected to stabilize either of these issues through adjustments in the exchange rate (Mundell, 1961). According to Mundell (1961), the stabilization would instead take place through capital and labour mobility from suffering industries to those sectors with surplus demand, and thus balance would be reinstalled in prices and employment internally. Where there is no factor mobility, regions should have their own currencies (Mundell, 1961).

The anticipated advantages of belonging to a currency union are various; reduced exchange rate volatility, reduced transaction costs, increased liquidity from using a common currency, greater transparency and supposedly higher competition between countries as a result of greater transparency in prices (Krugman, 2013). These factors, the reduced exchange rate volatility in particular, are thereafter expected to further positively affect trade and FDI flows. However, it also costs to be part of an OCA. A single currency implies that there can only be one central bank, and that the currency union as a whole has a common external flexible exchange rate. Hence, being part of a currency union means losing the say over a country's own monetary policy, as the union as a whole is only able to conduct one type of monetary policy. This means that a currency area can choose to tackle either unemployment or inflation among its member countries (Mundell, 1961).

Problems with the type of inflexibility in monetary policy arise if a currency union is hit by an asymmetric shock, for instance by an economic crisis, which affects only some of the member countries (Burda & Wyplosz, 2017). This is problematic as measures to tackle these kinds of shocks would also have an impact on those countries which were not affected by the shock, and would render them in imbalance while trying to stabilize the affected region. Therefore, without an external adjustment mechanism such as flexible exchange rates in each specific member state, the adjustment process in the affected countries must occur through prices and wages, which can be a very painful and difficult process (Burda & Wyplosz, 2017; Krugman, 2013).

This is exactly what happened in Europe after the financial crisis. The global financial shock of 2008 had asymmetric effects on the euro area; the countries which depended most on external funding, for example Ireland, suffered more than others (Lane, 2012). The macroeconomic imbalances between the EMU countries were caused by long periods of debt collection and by running budget deficits for a long time (Burda & Wyplosz, 2017). The institutional design of the euro together with the financial crisis thus initiated the debt crisis. To understand the link between the debt crisis and the euro, the relationship should be divided into three phases. The first phase increased the fiscal risks due to how the euro was institutionally designed; the second phase developed once the crisis broke out and the initial design flaws magnified the fiscal impact; the third phase is connected to the recovery period after the crisis that was slowed by the monetary union as well as by the chaotic political response to the crisis and the lack of plans to cope with a shock of a similar extent (Lane, 2012). Other contributors fueling the debt crisis were domestic recessions, banking-sector distress, and a decline of international investors (Lane, 2012). One of the consequences of the debt crisis was an increased divergence in the euro area (Ferreiro et al., 2016).

The focus of this paper is to estimate whether the financial crisis with its consequences had an impact on FDI flows, and to investigate how the EMU countries were affected by the crisis compared to non-euro countries. According to Poulsen & Hufbauer (2011), the global impact of the financial crisis in 2008 has led to a greater impact on FDI flows in magnitude compared to global recessions since the 1970s. Globally, FDI flows experienced a downward surge during the financial crisis, falling by 16 percent in 2008 from the previous year, and by further 40 percent in 2009 (Poulsen & Hufbauer, 2011). According to Poulsen and Hufbauer (2011), three main reasons can be distinguished to account for the global dive in FDI flows. Primarily,

the financial crisis led to liquidity constraints for firms and corporations globally, which negatively affected their capacity to invest. Secondly, the world economic slowdown generally decreased firms' investments abroad. That there was a cutback of foreign investments for the eurozone has been established by researchers, our aim is to compare the effect of the financial crisis the EMU experienced to the effect the other OECD countries experienced, to know if there are any advantages to being part of a currency union during a financial crisis. Thirdly, the crisis is likely to have led to a more cautious attitude among firms, which is likely to have influenced a move away from high-risk investments to safer ones (Poulsen & Hufbauer, 2011). Given that the euro countries created an OCA they should have had the tools to maintain FDI flows at a higher rate than non-euro countries. According to the OCA theory, the cautiousness would be reduced since the eurozone can decrease exchange rate volatility and increase price stability, making investments in the euro area more well-informed and safe. On the other hand, some question whether the eurozone is an OCA. An OCA requires the absences of asymmetrical shocks, and the euro countries were, in fact, asymmetrically shocked by the financial crisis and unable to quickly recover. Still, we know that economies that suffer noticeably from a crisis can potentially invite a ´fire sale´ among foreign investors. This would at least increase FDI inflows. Especially, considering the expectation that the stronger economies in the eurozone, such as Germany and France, would bail-out the more affected countries to save the euro. Consequently, the financial crisis impact on FDI flows can take two directions in theory, and we wish to estimate what happened in reality.

4. Literature Review

This section aims to give an overview of previous literature that is relevant for our thesis as well as strengthens the theoretical foundations of our analysis. The literature review is divided into two parts, the euro's effect on FDI flows and the impact of crises on FDI flows. These, the euro and the financial crisis, are the two factors whose effects on FDI inflows and outflows we aim to estimate.

4.1 The Euro's Effect on FDI Flows

The impact that currency unions have had on FDI has been less studied than the effect currency unions have had on trade, but it has been gaining more interest. Since the establishment of the EMU, more studies have been conducted on the expected effects of a common currency on FDI flows (Dinga & Dingová, 2011). In general, the studies have found that there is a positive relationship between a common currency and FDI flows, although there is no consensus regarding the size of the effect (Dinga & Dingová, 2011).

According to Schiavo (2007), the EMU has increased FDI flows for its members. In fact, by using the gravity model and sample data from OECD countries, he shows that reducing the exchange rate volatility with a single currency drives international FDI flows. Schiavo (2007) also found that a shared currency is not the only factor that increases FDI flows; participation in the Exchange Rate Mechanism (ERM) - a softer version of the EMU - also had a positive effect on FDI flows. After having controlled for the exchange rate volatility the effect of the common currency variable remained positive, suggesting that there are also other channels through which currency unions have an effect on FDI flows, than the exchange rate stability alone (Schiavo, 2007). Petroulas (2006) used a difference-in-differences approach to analyse the effect of the euro on inward FDI flows to the eurozone. The introduction of the euro was estimated to increase FDI inflows by approximately 16 percent within the EMU area, and by eight percent from non-member countries to the euro area. In addition, the flows increased by eleven percent from euro countries to non-member countries (Petroulas, 2006). He however studied the effects of the euro in the years 1992-2001, right at the beginning of the introduction of the common currency. Germany and the Benelux-area (Belgium-Luxemburg) were found to attract most of the FDI flows to the EMU and when these areas were excluded from the model, the euro-effect seemed to disappear (Petroulas, 2006). Camarero, Gómez-Herrera and Tamarit

(2018) studied the relationship between euro, trade and FDI flows. By using the gravity model with time-varying fixed effects, they found that EMU has a positive impact on trade and that inward and outward FDI positions have also had a positive effect on increasing trade in the EMU countries, showing a complementary relationship between FDI and trade (Camarero at al., 2018). By including a FDI variable to the analysis when estimating the effect of the euro, Camarero et al. (2018) showed that the omission of FDI from the gravity equation would incorrectly allocate a larger effect for the introduction of the common currency on trade, thus emphasizing the importance of including the FDI variable in the estimation.

Dinga & Dingová (2011) used a difference-in-differences approach together with propensity score matching on country-pair data for OECD countries to capture the effect of policy changes and to estimate the effect of the adoption of euro on FDI flows. Unlike the previous papers, their initial finding is that the euro does not have an impact on FDI flows. However, when they looked instead at a subset of EU countries, the effect of the euro is significant, although membership in the EU was found to have a larger effect on FDI flows with an increase of 55 to 166 percent, depending on their matching score specification, compared to the euro with an increase of 14.3 to 42.5 percent (Dinga & Dingová, 2011). Dinga & Dingová's (2011) findings thus suggest that the effect of the euro found in previous studies would be smaller than presented. They assume that the reasons for these results could be the more elaborated econometric techniques used, the longer time span included in their study, or the inclusion of the EU membership variable, as it turned out to be a more dominant factor in attracting FDIs than the euro over time. Nevertheless, when examining FDI flows within the EU, the euro had a larger impact on FDI flows than the EU membership, which they relate to the fact that EMU countries share more integrated markets and have more economic linkages in common (Dinga & Dingová, 2011).

4.2. The Impact of Crises on FDI Flows

As mentioned previously, the effect of economic crises on FDI flows has been less studied. Previous research has nonetheless found that while crises prior to the financial crisis in 2008 have reduced FDI flows, FDI are still less volatile than other foreign investments (Lipsey, 2001). According to Lipsey (2001), who studied FDI from US firms during three crises - the Latin America crisis, the Mexican crisis and the East Asian crisis - FDI require long term commitments and are not as easily reversed, hence, they are considered as relatively stable

funds. Independently of an economic or monetary crisis, foreign investment firms are more likely to keep producing and investing (Lipsey, 2001). Poulsen and Hufbauer (2011) examined how the financial crisis in 2008 affected FDI flows, compared to previous recessions' impact on them. The results indicated that developed countries' FDI outflows are recovering more slowly from the financial crisis than they have recovered from past crises, although the size of the impact on FDI flows was approximately the same. Poulsen and Hufbauer (2011) conclude that the worldwide extent of the financial crisis has led to a more substantial response in the FDI flows compared to the past crises affecting only certain countries.

According to Camarero et al. (2018), the crisis has had both positive and negative impacts on FDI. They concluded that there were overall discouraged investment flows globally. However, despite the financial crisis, it also reduced prices for some shares which in turn has resulted in new investments. For the EMU countries, both FDI inflows and outflows are estimated to be relatively stable until the introduction of the financial crisis in 2008. The effects of the crisis were estimated to be faster for inflows FDI (Camarero et al., 2018). The trends for inward and outward FDI for the EU countries were found to be quite similar to one another, with a difference of outflows FDI being slightly higher than inflows FDI. A possible explanation for this is suspected to be the euro, that is expected to have contributed to attracting foreign capital from the rest of the EU countries (Camarero et al., 2018). Camarero et al. (2018) also point out that estimating the impact of crisis is a challenging research topic due to the scarcity of data and the complexity of the financial crisis as a phenomenon.

5. Empirical Strategy

This section will introduce the gravity model and estimation strategy for this study. It will begin with an introduction to the gravity model followed by the estimation strategy that defines the methods that we use to estimate our model. We will then define the variables we have included in our model and the impact we expect them to have on FDI flows. We will end the chapter with our hypotheses for the outcome of our estimations.

5.1. Gravity Model

The gravity model was initially criticized for its lack of theoretical underpinnings but today it has a solid theoretical background (Camarero et al., 2018). Nowadays, it is commonly used within the field of international economics. Initially it was established to estimate bilateral trade flows between countries. Similarly to the theory of gravitation in physics where particles are attracted to each other by proportion to the size of their masses and proximity, bilateral trade flows have been approximated by the sizes of countries in terms of their GDP and by the distance between two countries (Bacchetta et al., 2012). This model has been further applied to FDI flows, also as a function of the sizes of countries in terms of their economy and as their proximity, measured by distances between countries in kilometres. It has become popular among scholars who research FDI flows, for example Schiavo (2007) used it to estimate the effect of a common currency on FDI flows. The the general definition of the gravity model for trade looks as follows:

$$X_{ij} = GS_iM_j\phi_{ij}$$

in which *X* denotes the value of exports from country *i* to country *j* in monetary value. Exports, in turn, depend on *G*, the variables that are not country specific, *S*, the exporter (*i*) specific variables, and *M*, the importer (*j*) specific variables. Lastly, stands for trade costs, which commonly are represented by variables such as whether a country is an island or landlocked and if so, with whom they share borders. Trade costs also include information cost variables such as language, culture and colonial history. It is hypothesised that countries closer together trade more because transport costs are lower. Common language or a shared colonial history are more likely to increase trade because of a more similar business environment.

The research on the theoretical foundations of the gravity model has brought up the importance of deriving the specifications of the gravity model from economic theory (Bacchetta et al.,

2012). One of these findings is the importance of including relative trade costs, or the so-called Multilateral Trade Resistance (MTR) terms in the gravity model (Bacchetta et al., 2012). According to Anderson and van Wincoop (2003) the MTR are important determinants of bilateral trade. They represent the inclination of country j to import from country i and depends on country j's trade costs stemming from trading with country i relative to country j's weighted average trade costs and to the resistance that the importing country i faces (Bacchetta et al., 2012). We will further explain how we have controlled for MTR in the Other gravity modelling issues- section.

5.2. Estimation Strategy

OLS has been the most widely used estimation method for gravity models (Yotov et al., 2016). However, the recent economic theory has identified several issues with gravity model estimation with OLS. If there is heteroscedasticity in the data, as is common for trade data, Santos Silva and Tenreyro (2006) showed that the coefficients of trade costs become biased and inconsistent when the regression is transformed into log-linear form (Yotov et al., 2016). Another downside of estimating the gravity model with OLS is that when the regression is transformed into log-linear form, all zero values in the data are lost (Yotov et al., 2016). In addition, as our data do have several levels or panel units, the theory-based multiplicative form of gravity equation does not support the use of OLS estimation on levels (Bacchetta et al., 2012). For those reasons, another estimation method that we have decided to utilise is Poisson Pseudo Maximum-Likelihood (PPML)- estimation method, which has several advantages for gravity model estimation. PPML can estimate regressions in non-linear form and thus enables us to include all zero values in the data (Yotov et al., 2016) which ameliorates the credibility of the obtained estimation results. Moreover, PPML controls for heteroscedasticity in the traditional gravity model in multiplicative form (Yotov et al., 2016). One more benefit is that PPML can be used to estimate data with levels of trade (Bacchetta et al., 2012).

The accessibility to large micro-level datasets has created an interest for new types of estimation methods (Guimaraes & Portugal, 2010). One of these models, suitable for estimating large datasets with a high number of levels, is High Dimensional Fixed Effects linear regression (Guimaraes & Portugal, 2010). The benefits of using HDFE estimation method is that it takes into account heterogeneity between levels of panel units (Cornelissen, 2008), i.e. in our case between the host and partner country and time. Without including fixed

effects, heterogeneity between the panel units may otherwise be correlated with the variables that we have included in our gravity model and that we are interested in estimating. As mentioned above, employing HDFE regressions are further relevant when working with a dataset with a high number of observations (P. Guimaraes and P. Portugal, 2010).

We will thus begin by estimating our model with OLS with fixed effects. Since this estimation method has several disadvantages, we will run our model with PPML method with fixed effects. After that, since our data meet the criteria for the high-dimensional estimation method - we have a high number of observations - and in order to account for all the possible heterogeneity, we have decided to use HDFE as a robustness check. Lastly, in order to account for all the zero values in the data while simultaneously accounting for the high-dimensional fixed effects, we will employ PPML HDFE - estimation method, which is PPML-reassessment with high-dimensional fixed effects. For all the methods, we run the regressions with the same country and time fixed effects, and with robust standard errors.

5.2.1. Model

We have decided to estimate the regressions for inward and outward FDI data separately since we anticipate that the financial crisis might have impacted these differently. Moreover estimating FDI inflows and outflows separately for each specific year is recommended by the gravity model theory since by averaging trade flows between countries we might lose important information (Bacchetta et al., 2012). The results will be analysed from the perspective of the host country, this means that in the FDI inflows model, the host (i) is the country that receives the FDI flows and the partner (j) is the country who invests in the host country. On the contrary, for FDI outflows, we refer to the host (i) as the investing country and the partner (j) country is the recipient of the investments. Year is represented with the t-index. We have included dummy variables for both the EU and the EMU membership as well as the financial crisis in addition to the traditional variables included in the gravity model, namely GDP and distance. To specifically capture how the eurozone maintained FDI inflows and outflows during the financial crisis and in its aftermath we created an interaction between the EMU and the financial crisis dummies. Our models for FDI inflows and outflows as dependent variables are specified as follows:

$$LnFDIInflows_{ijt} = \beta1 + \beta2\,ln(GDPHost_{it}) + \beta3\,ln\big(GDPPartner_{jt}\big) +$$

$$\beta4\,ln(GDPperCapitaHost_{it}) + \beta5\,ln\big(GDPperCapitaPartner_{jt}\big) + \beta6\,ln\big(Distance_{ij}\big) +$$

$$\beta7EU_{ij} + \beta8\,EMU_{ijt} * Crisis_t + \beta9EMU_{ijt} + \beta10Crisis + \alpha_i + \alpha_j + \alpha_t + \varepsilon_{ijt}$$

$$LnFDIOutflows_{ijt} = \beta1 + \beta2\,ln(GDPHost_{it}) + \beta3\,ln\big(GDPPartner_{jt}\big) +$$

$$\beta4\,ln(GDPperCapitaHost_{it}) + \beta5\,ln\big(GDPperCapitaPartner_{jt}\big) + \beta6\,ln\big(Distance_{ij}\big) +$$

$$\beta7EU_{ij} + \beta8\,EMU_{ijt} * Crisis_t + \beta9EMU_{ijt} + \beta10Crisis + \alpha_i + \alpha_j + \alpha_t + \varepsilon_{ijt}$$

The model is estimated using the natural logarithm of the quantitative variables FDI inflows and outflows, GDP and GDP per capita for both the host and the partner country and the distance variable to have a model that can be estimated using linear regressions. The coefficients of the logarithmic values should be interpreted as the percentage variation of FDI inflows or outflows that follows from a one percent increase in one of the independent variables. The coefficients of the dummy variables show the percentage variation of FDI inflows and outflows as a result of a one percent increase in one of the dummy variables when transformed into elasticities as follows, $(exp^\beta - 1)*100$ (Bacchetta et al., 2012). As we are interested in bilateral variables that are time-varying, such as the EMU variable, we have controlled for the country fixed effects in our model, i.e. dummy variables for host and partner country that will either take values one or zero. These will capture all the country-specific characteristics, as well as control for each country's overall level of FDI flows (Bacchetta et al., 2012), so that the bilateral time-varying variables will not capture these effects. We have also included a year dummy for time varying fixed effects, in order to control for global economic effects, such as recessions and booms (Bacchetta et al., 2012).

5.2.2. Variables

All the variables used in our estimated gravity model will be introduced below. We will define in which measurements the data is collected and how the variables are defined. The descriptions will also include the impact we expect the variables to have on FDI inflows and outflows. These will later be the foundation for our hypotheses.

5.2.2.1. Logarithmic Variables

The dependent variables in the model are the logarithmic values of FDI in- and outflows. The inflow variable represents the inflow of FDI from the partner country (*j*) to the host country (*i*)

at time (*t*) and correspondingly, the outflow variable represents the outflow of FDI from the host country (*i*) to the partner country (*j*) at time (*t*). The FDI inflows and outflows are measured in thousands of US-dollars. Secondly, both the receiving and investing countries' GDP are crucial components of the gravity model. They are included in the model to account for the sizes of the countries in terms of their economy. The higher GDP a country has, the more it is expected to trade, or in our case invest, in other countries. Similarly, the higher GDP, the more investments a country is expected to attract. As the values for GDP are transformed into logarithmic values in our model, the obtained coefficients are interpreted as elasticities; they stand for the percentage variation in the dependent variable as a result of one percent increase in GDP. GDP per capita on the other hand stands for both receiving and investing countries' GDP divided by the population in a country. In addition to regular GDP, GDP per capita is included in the model to include a better measure of the average standard of living and economic well-being in a country, which we assume will also positively affect investment flows to and from a country. The coefficients for GDP per capita are interpreted in a similar manner as the coefficients for GDP. Another central component of the gravity model, distance, is included in the gravity model in order to capture trade costs between a pair of countries. It is expected to negatively affect FDI flows between a country pair and reversely, the closer two countries are located, the higher investment flows between the two countries are expected. Distance is calculated as the distance between the two countries' capital cities in kilometres without regard to transport roads or waters (Bacchetta et al., 2012). In order to estimate the effect of distance on FDI flows, we have transformed the values into logarithmic values. Hence, the distance's coefficient denotes the variation of FDI in- or outflows as a result of a one percent increase in distance.

5.2.2.2. Dummy Variables

We have incorporated three dummy variables in our regression that aim to capture the effects of being an EU member, an EMU member and the effects of the global financial crisis. The EU member dummy is denoted by one if both the host and the partner country in a country pair belong to the EU and by zero if only one or neither are a member state. The EU membership is assumed to positively affect FDI flows as being part of the EU gives better market access in the form of the Single Market and offers deeper forms of economic integration. 23 of the OECD countries in our sample belong to the EU, including the UK, as it still was part of the EU during the covered period of time. Similarly, the EMU member dummy is denoted by one if both countries in a country-pair are members of the currency union and by zero otherwise. This

variable has a central role in the model since it captures the effect of EMU membership on FDI flows. According to previous theories, being a member of a currency union should have a positive effect on FDI flows considering that it reduces exchange rate volatility, among other things, and should thereby increase the willingness to invest. The last dummy variable in our model represents the global financial crisis. This variable is denoted by one from 2008 and onward. 2008 was chosen as the starting point since it is argued that the financial crisis, although it began in 2007, affected the world in 2008 after the crash of the Lehman Brothers. Considering that this was a global crisis, we assume that all the OECD-countries' economic status were affected. Since the aim of this thesis is to analyse how the euro impacts FDI flows with a specific focus on the financial crisis, this variable has an important role in the model. The financial crisis is expected to have a negative impact on FDI flows.

5.2.2.3 Interaction Variable

We incorporated an interaction between the financial crisis and the EMU dummy to estimate how the euro members specifically were affected by the financial crisis. Given the theoretical framework and previous studies, we foresee two potential outcomes for how the financial crisis impacted FDI to and from the eurozone compared to the non-euro countries in our dataset. More specifically, this interaction variable is to have a positive impact on FDI flows for the EMU members if the eurozone managed to attract more FDI due to reduced exchange rate volatility despite the crisis. On the contrary, if the consequences of the financial crisis and its aftermath's severe effects were too costly for the eurozone compared to the other countries, then this coefficient is to take a negative value.

5.2.3. Hypothesis

Based on the theoretical framework, the previous studies and the anticipated signs of the variables coefficients, we hypothesize that the model will estimate the following:

H1a: The financial crisis did not negatively affect FDI flows.

H1b: The financial crisis did negatively affect FDI flows.

H2a: The global financial crisis effect on the EMU countries' FDI in- and outflows did not differ from the other countries.

H2b: The global financial crisis effect on the EMU countries' FDI in- and outflows differ from the other countries.

6. Data

This part of the thesis is dedicated to the descriptive statistics of our sample. We will also discuss limitations regarding zero values, heteroskedasticity, as well as other modelling issues typical to gravity models. These are issues that exist in our sample that need to be managed for the credibility of the analysis.

6.1. Sample

It is generally recommended to use panel data in order to estimate gravity models, since it enhances the efficiency of the estimation (Yotov et al., 2016). In total, our panel data consists of 1,296 country-pairs and a total of 17,626 and 17,640 observations for inflows and outflows, respectively. It contains bilateral FDI flows in thousands of US-dollars - inflows and outflows kept separate - between the 36 OECD countries. These countries were selected based on their position as the world's largest traders. The thesis concentrates on the impact of the financial crisis but in order to capture its effect on FDI flows we include a few years prior to the financial crisis together with the acute stage and the aftermath. Hence, the data is collected for the years 2005 to 2018. The data on bilateral FDI flows between the OECD countries were collected from the OECD statistical database (OECD, 2020). However, as recognized by previous studies, access to data on FDI flows and especially bilateral data is limited and consequently our sample has 3,405 and 3,878 missing values for inflows and outflows which makes the panel unbalanced. For both inflows and outflows, we noticed that Norway has missing values for the years 2011-2018 and Canada has few observed values, Mexico does not have any data on outflows and for inflows data, we lack observations for Spain between the years 2005-2012. The data also contains zero values - 1,405 for inflows and 1,923 for outflows - which becomes a limitation when using the logarithmic values of the quantitative variables. Another limitation is the potential discrepancy between different countries reported FDI flows meaning that the reported outflow from the sender country might deviate compared to the reported inflow of the receiver country. The time varying data on GDP and GDP per capita for each OECD country is collected from the World Bank's database (The World Bank, 2021). Our gravity model also consists of the time invariant variable distance, obtained from CEPII's (2011) database.

6.2. Zero values

As mentioned above, FDI flow data does commonly include zero values which may affect the estimation of gravity models. The problem arises when in order to use OLS- and HDFE-methods of estimation, the data is transformed into a log-linear model by taking logarithms of the values for FDI inflow and outflow (Bacchetta et al., 2012). Although containing important information, taking the logarithmic values will automatically drop the zero values from the data, due to which some of the values will be excluded from the estimations. Another issue with FDI data is that it includes negative values, which must also be dropped when the model is transformed into log-linear form, as it is not possible to take the logarithmic values of negative numbers. Since the zero and negative values also hold relevant information for our analysis, we cannot remove data from our analysis without losing some of the relevant information for our estimation. In order to account for the zero values in our study, we will estimate our model with PPML- and PPML HDFE- estimation methods, which enable us to include zeros in the estimation.

6.3. Heteroscedasticity

To capture heteroscedasticity in the data, i.e. to capture if the variance of the residuals is not constant, we have conducted the Breuch-Pagan test for both FDI inflow and outflow data. The null hypothesis is that the data is homoscedastic, meaning that the variance of the residuals is constant, whereas rejecting the null hypothesis implies that the data is heteroscedastic. The null hypothesis is rejected at five percent level of significance. For both samples we reject the null hypothesis as the results of the tests were significant and therefore we can conclude that both of our samples are heteroscedastic. To account for heteroscedasticity in the data, we will run our regressions with robust standard errors.

6.4. Other gravity modelling issues

Economic theory has in addition identified three typical mistakes in the traditional gravity model theory, named gold, silver and bronze medal mistakes (Bacchetta et al., 2012). According to the gold medal mistake, the traditional gravity equation uses logs of GDP as lnSi and lnMj, the exporter and importer specific variables in order to account for the MTR mentioned in the Gravity Model- section. These are correlated with trade costs and therefore the estimates become biased (Bacchetta et al., 2012). We therefore control for MTR instead by

estimating our regressions with country fixed effects, i.e. directional exporter- and importer-dummies. To control for MTR in panel data, Olivero and Yotov (2012) showed that these should be accounted for by exporter-time and importer-time fixed effects. However, since time-varying country dummies would capture the effects of the size variables (Yotov et al., 2016) - in our model GDP and GDP per capita - we have decided to include country fixed effects instead, which will provide unbiased estimates and control for the MTR as the country-time effects do (Bacchetta et al., 2012).

The silver medal mistake regards averaging trade flows between countries, whereas the economic theory recommends that trade and FDI in- and outflows should be treated separately to each direction, from (i) to (j) and from (j) to (i), at each specific time (t) (Bacchetta et al., 2012). To avert the silver medal mistake, we have estimated both the inflows and outflows of FDI separately from one another, for each specific year. Lastly, the bronze medal mistake considers deflation of trade flows. Inappropriate deflation may create spurious correlations and therefore biases in the estimation. We have not deflated the FDI inflows or outflows variables that we have included in our estimations, and even if we had, covering for the gold medal mistake covers simultaneously for the third medal mistake as well (Bacchetta et al., 2012). The downside of including country effects in the estimation is that it would prevent us from obtaining estimations for the effects of country-specific variables. This will not however be an issue for our analysis, as we are interested in bilateral time-varying variables.

7. Empirical Results & Analysis

In this section we will present the results separately from running our regressions for FDI inflows and outflows with OLS with fixed effects, PPML with fixed effects, HDFE as well as PPML HDFE estimation methods, after which we will summarize the results for both inflows and outflows together. For clarification, in terms of FDI inflows, the host country (i) is the country attracting investments and the partner country (j) is the investing country, whereas for FDI outflows, the host country (i) represents the investing country and the partner country (j) is the country receiving the investments. The host countries are those whose perspective we found the analysis on.

7.1. Inflows

Variables	OLS & FE	PPML&FE	HDFE	HDFEPPML
GDPHost	2.478***	3.051**	2.155***	2.833**
	(0.000)	(0.027)	(0.001)	(0.038)
GDPPartner	0.224	2.744***	-0.072*	0.135***
	(0.572)	(0.004)	(0.057)	(0.000)
GDPperCapHost	-1.978***	-1.994	-1.784**	-1.303
	(0.001)	(0.216)	(0.010)	(0.379)
GDPperCapPartner	0.666	-1.873*	0.702***	1.098***
	(0.103)	(0.094)	(0.001)	(0.004)
Distance	0.574***	1.930***	-0.972***	-0.239***
	(0.000)	(0.000)	(0.000)	(0.000)
EU			0.347***	0.647***
			(0.001)	(0.000)
Euro	0.398***	0.039	0.347***	0.199
	(0.008)	(0.809)	(0.003)	(0.188)
Crisis	0.029	-0.298**		
	(0.635)	(0.017)		
Euro##Crisis	-0.259***	-0.074	-0.236**	-0.120
	(0.009)	(0.657)	(0.035)	(0.400)
R-squared	0.027		0.674	0.764

Robust p-value in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7.1.

The results for the regressions estimated for FDI inflows as the dependent variable, are presented in Table 7.1. Overall, the coefficients for the traditional variables in the gravity model estimated by the four estimation methods - both the GDP measures as well as the distance measure - have the expected signs according to the theory. We will begin with the results obtained from estimating our model for FDI inflows with OLS with fixed effects. The coefficient for GDP of the host country is significant and positive, implying that the larger the host country's GDP the more FDI it attracts. The coefficient of GDP for the partner country is however insignificant. A possible reason for the insignificant coefficient is the fact that OLS does not include zero value observations in the estimations, and thus important information is lost which render this specific estimate insignificant. The coefficient for GDP per capita of the host country is significant yet negative, which would imply that GDP per capita has a negative effect on FDI inflows. A plausible explanation for the negative effect of GDP per capita for the host country can be explained by the rationale behind vertical FDI decisions; parts of the production process might be moved abroad to countries with cheaper factors of production in order to save production costs. Thus, it is not necessarily the economic prosperity in the host country that is the attracting factor of vertical FDI inflows but rather the cheaper factors of production. Typically, cheaper factors of production are found in countries with lower standards of living and therefore with a lower GDP per capita, hence the negative sign of the coefficient. GDP per capita of the partner country estimated by OLS was negative, although significant on ten percent-level, and since our more robust models estimated the effect to be positive and in line with the theory, we find these results more reliable. Lastly, the coefficient of the distance variable is significant, yet it has a positive coefficient, implying that the further away two countries are located the more they would invest in one another. This is implausible and in conflict with the theory, according to which the distance is expected to decrease FDI inflows. However, since the R-squared for OLS regression is 2.7 percent, which implies that our model to a very low degree explains the relationship between our chosen variables and FDI inflows. We therefore suspect that these estimates might not be reliable.

To move on to the variables that we included in the model, the variable for EU membership was omitted from the model. The variable for the EMU membership on the other hand is significant and has a positive coefficient as expected. Counterintuitively, the coefficient for the financial crisis is positive, although not significant. The interaction variable's coefficient is negative and significant, implying that the eurozone countries were negatively affected by the crisis. We are thus able to obtain results for the variables that we included in the model,

however, as the theory points out and as already mentioned before, OLS is not a suitable estimation method for gravity model for several reasons and since the R-Squared is very low for our model, we have estimated our model with other methods.

We estimated our model with PPML with fixed effects in order to include the 1,405 zero value observations that were not included in our OLS estimation. Including the zeros is expected to improve the reliability of our model. Both the coefficients for GDP of host and partner country are positive and significant as expected. GDP per capita of the host country is however insignificant and the impact of GDP per capita of the partner country is estimated to be negative and significant on a ten percent-level, unlike the coefficients obtained from the other estimation methods. In addition, the last traditional gravity model variable distance is positive and significant, entailing similar results to those estimated with OLS, which are in conflict with the gravity model theory. As for OLS, the EU variable got omitted. Contrary to the results we obtained from running OLS, the EMU and interaction variable are insignificant, whereas the variable for the financial crisis is negative and significant. Based on this we can conclude that the financial crisis had a negative effect on FDI flows for the OECD countries. However, even though it is recommended to run the gravity model with PPML-method, since the coefficients obtained for the traditional gravity model variables are not in line with the theory, we suspect that the model may not be able to detect all the heterogeneity between the levels of panel units, and therefore we have estimated the model with HDFE.

Thus, in order to add robustness to our estimations, we estimated our model with HDFE linear regression. However, as it is recommended to use PPML-method when estimating the gravity model, we also estimated our regression by PPML HDFE estimation method that includes both the high-dimensional fixed effects as well as PPML. When we estimated our regression with HDFE PPML, we obtained the highest R-squared for our model, namely 76.4 percent and 67.4 percent from estimating it with HDFE.

For the model estimated with HDFE linear regression, most of the fundamental variables of the gravity model show results as expected according to the theory. For both HDFE and PPML HDFE, the coefficients of GDP and GDP per capita measures are positive and significant except for GDP per capita of the host country estimated by PPML HDFE, however it still has a similar sign to the other estimates. According to these methods, one percentage change in GDP of the host country is expected to increase FDI inflows by 2.16 percent and 2.83 percent, according to HDFE and PPML HDFE respectively. GDP for the partner country is estimated

to be negative when the regression is estimated with HDFE but positive and significant when estimated by PPML HDFE. Since PPML HDFE method estimates the model by including the zero value observations as well as accounts for high-dimensional fixed effects, we consider the estimates PPML HDFE to be the most reliable. Therefore, a one percentage change in GDP of the partner country is expected to increase FDI inflows by 0.14 percent according to PPML HDFE. In contrast to the theory, the coefficient of the GDP per capita for the host country is negative and significant when estimated by HDFE, yet insignificant according to PPML HDFE. Even though the results were insignificant when the zeros were included, the coefficient was still estimated to be negative by all the methods and significant by OLS and HDFE. According to HDFE, this entails a negative effect of GDP per capita of the host country on attracting FDI inflows. As discussed above, we suspect that this might be due to the rationale behind vertical FDI. According to HDFE, higher GDP per capita for the host country is expected to attract 1.78 percent less FDI inflows. The effect of GDP per capita for the partner country is on the other hand expected to be positive and significant according to both HDFE and PPML HDFE, in accordance with the gravity model theory. One percentage change in GDP per capita for the partner country is thus estimated to increase FDI inflows by 0.7 percent and 1.1 percent, estimated by HDFE and PPML HDFE. As expected based on the theory, the coefficient of the distance variable is negative and significant, thus implying that distance between a country pair has a negative effect on FDI inflows. For one percentage change in distance, inflows are estimated to be negatively affected by a decrease of 0.24 percent and 0.97 percent, estimated by PPML HDFE and HDFE respectively.

To move on to the variables that we included in the model, as we expected, according to both HDFE and PPML HDFE the EU membership is estimated to have a positive impact on FDI inflows. The increase is expected to be $(exp^{0.347} - 1)*100 = 41.48$ percent and $(exp^{0.647} - 1)*100 = 90.98$ percent, according to HDFE and PPML HDFE respectively. Since the effect of the EU membership is higher estimated by the most robust model PPML HDFE, we suspect the true effect to be closer to 90.98 percent. The coefficient for the EMU membership on the other hand shows a positive and significant effect according to the estimate from HDFE, although positive yet insignificant effect estimated by PPML HDFE. According to the estimate obtained from HDFE, EMU membership is expected to increase FDI inflows by $(exp^{0.347} - 1)*100 = 41.48$ percent. The EU membership is thus expected to increase FDI inflows more than the EMU membership. The coefficient for the estimate of the financial crisis on the other hand has a negative, although insignificant sign estimated with both HDFE and PPML HDFE.

Since the coefficients of the financial crisis are insignificant, we cannot conclude that the financial crisis did negatively affect FDI inflows to the OECD countries.

The coefficient of the interactive dummy between financial crisis and euro however shows a negative, significant effect obtained by estimating it with HDFE. The financial crisis is thus estimated to decrease FDI inflows to the EMU countries by $(exp^{-0.236} - 1)*100 = -21.02$ percent according to results from HDFE. What this entails is that for FDI inflows estimated by HDFE, we can conclude that the effect of the financial crisis on FDI inflows differed between EMU and the OECD countries; EMU countries were negatively affected by the crisis despite the positive effects of the EMU membership, whereas we cannot conclude that the OECD countries were negatively affected at all. Even though the EMU dummy became significant by estimating it with HDFE and OLS, we did not obtain significance by estimating it with neither PPML with fixed effects, nor with PPML HDFE. We are thus not able to conclude based on our most robust results that the financial crisis had a negative impact on FDI inflows for all OECD countries, nor whether the EMU countries' FDI inflows were more or less affected by the financial crisis, than the OECD countries.

7.2. Outflows

Variables	OLS & FE	PPML& FE	HDFE	HDFE PPML
GDPHost	1.286	5.862***	1.061	6.152***
	(0.144)	(0.001)	(0.176)	(0.000)
GDPPartner	2.803***	2.578**	3.238***	4.446***
	(0.000)	(0.019)	(0.000)	(0.000)
GDPperCapHost	-0.362	-5.680***	-0.586	-6.064***
	(0.687)	(0.003)	(0.490)	(0.000)
GDPperCapPartner	-2.330***	-0.890	-3.046***	-2.843***
	(0.003)	(0.431)	(0.000)	(0.008)
Distance	-0.352	0.366	-0.969***	-0.291***
	(0.158)	(0.362)	(0.000)	(0.000)
EU			0.039	0.204
			(0.710)	(0.180)
Euro	0.294*	-0.085	0.653***	0.270
	(0.083)	(0.699)	(0.000)	(0.101)
Crisis	-0.110	-0.909***		
	(0.343)	(0.001)		
Euro##Crisis	-0.300***	-0.031	-0.435***	-0.104
	(0.006)	(0.852)	(0.000)	(0.486)
R-squared	0.049		0.671	0.7652

Robust p-value in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7.2.

The results for the FDI outflows regressions can be found in Table 7.2. For all the regressions, GDP for the partner country was significant with a positive sign. We can therefore conclude that the host countries are more likely to invest in countries with a higher GDP, similarly to FDI inflows data. This result corresponds with the convention that FDI often are foreign investments between developed countries as a result of more well-developed institutions in these countries. Correspondingly with FDI inflows data, GDP per capita was also found significant - with the exception of PPML fixed effects regression - yet with a negative sign. This suggests that host countries - between the years 2005 and 2018 - invested in countries with lower GDP per capita. Given that the sample only consists of OECD countries that all have relatively high GDP, this measurement is interesting since this means that there is more

room for foreign investors to invest. It is possible to acquire both talent and resources at a lower cost as a lower GDP per capita implies lower economic prosperity and economic well-being and thus factors of production, for example wages, are also expected to be cheaper than in the host country. The rest of the results varied depending on the estimation method and consequently they will be presented separately.

Identically to the estimation of inflows and as mentioned in the estimation strategy, we began with OLS fixed effects regression. The results were, as anticipated, poor. The R-squared value is 4.89 percent, meaning that the independent variables in the model do not explain FDI outflows from the OECD countries. Furthermore, several variables, such as both GDP and GDP per capita for the host country, distance, financial crisis as well as EMU and EU membership were insignificant. In fact, only GDP and GDP per capita for the partner countries and the interaction between the EMU membership and the financial crisis were significant. More specifically, the financial crisis had a significant and negative impact on the eurozone, and on the contrary the financial crisis impact was insignificant for the OECD countries. Considering the amount of zero values in the sample we estimated the same regression but this time using PPML fixed effects. The results change when accounting for the measured zero FDI outflows; GDP and GDP per capita for the host country were significant and so were GDP for the partner country and the financial crisis, the rest were found insignificant. The most distinctive result is the significant negative value for the financial crisis, thus indicating that the financial crisis had a negative impact on all the OECD countries. Although, we cannot draw any conclusions regarding how the eurozone was affected by the financial crisis since the interaction coefficient was insignificant.

The initial tests show that when including the zero FDI outflows in the estimation, we can say that the financial crisis negatively impacted the OECD countries although we cannot draw any conclusions regarding if the crisis impacted the EMU members differently. As a result, we can reject the first null hypothesis in favor of its alternative hypothesis, that the crisis had a negative impact on FDI outflows, but we cannot reject the second null hypothesis that there is a difference between the EMU and the OECD countries. Since these tests are not the most appropriate for the gravity model, we used more robust tests - HDFE and PPML HDFE - to examine the validity of the initial results.

HDFE regression with fixed effects reported the following results; the adjusted R-squared value is 66.78 percent, hence the model can explain FDI outflows from one of the OECD countries to another to a much higher extent compared to the initial regressions. As mentioned above, GDP for the partner country had a positive effect for outflows and GDP per capita was found to have a negative coefficient. In fact, an increase in GDP for the partner country by one percent generates an increase in outflows by 3.24 percent, this suggests that the richer a partner country is in terms of total GDP the more likely the host country is to invest in that country. The coefficient for GDP per capita should be interpreted as follows, a 3.05 percent decrease in FDI outflows originates from a one percent increase in GDP per capita. On the contrary, we found that both GDP and GDP per capita for the host country were insignificant. The coefficient for distance is as expected, it has a negative impact on FDI outflows and thus indicates that within a country-pair the host country is less likely to invest in the partner country the further the distance is between them. An increase of the distance by one percent results in a decrease of the outflows by 0.97 percent, this was found significant and corresponds to the reasoning behind the gravity model. The further away a potential partner country is located the more do the costs for the investing host country increase. Hence, the investments are reduced.

For the variables we have added to the gravity model we found that both the global financial crisis and the EU dummy were insignificant for outflows according to HDFE. However, we got significant results for both the euro and the interaction between the euro and the financial crisis. The euro had a positive coefficient, which means that in general the euro generates a positive impact for FDI outflows. Although the interaction between the financial crisis and the euro on the other hand shows that, even though we could not estimate the impact of the financial crisis for all the OECD countries, we can conclude that the EMU members were negatively affected by the financial crisis. This corresponds with the result we got for FDI inflows. As mentioned we expect that this is related to the negative impact the financial crisis had on the EMU members as they were asymmetrically shocked by the financial crisis and as the debt crisis developed as a consequence. Therefore, we can notice a reduction in outflows from the euro countries. The estimates from HDFE suggest that the euro increased FDI outflows by $(exp^{0.653} - 1)*100 = 92.13$ percent but during the financial crisis outflows from EMU host countries were reduced by $(exp^{-0.435} - 1)*100 = -35.27$ percent.

The results from HDFE regression were further compared to the equivalent PPML HDFE regression, although the latter also includes zero trade flows. This regression generated the best R-squared value, 76.52 percent of FDI outflows can be explained with this model. Furthermore, we got similar signs for the coefficients; GDP for the partner country were positive and GDP per capita for the partner country were negative. This strengthens the conclusion that countries with lower economic prosperity attract more FDI. Yet, the FDI outflows increased slightly more - compared to HDFE regression - since a one percent increase in GDP is estimated to increase FDI outflows by 4.45 percent and are more reduced since an increase in GDP per capita decreases the outflows from a host country with 2.84 percent. Notable is also that both GDP and GDP per capita for the host country now are significant, and follow the same pattern as GDP and GDP per capita for the partner country. Distance is also significant and negative, but this time, an increase in distance by one percent only causes an decrease of FDI flows by 0.29 percent.

The estimated coefficients for the variables added for the purpose of the thesis - the EU and EMU membership, the financial crisis and the EMU and crisis interaction - were found insignificant estimated by PPML HDFE. In fact, despite reporting the same signs as previous regressions they were far from significant. Hence, according to PPML HDFE we cannot reject any of the null hypotheses, we cannot conclude that there is a trend regarding how the financial crisis has impacted FDI flows. Neither can we determine how FDI outflows from the EMU countries have been affected by the crisis when including zero values with PPML HDFE, which we could with HDFE estimation. Considering that PPML HDFE estimation is the most robust results, we cannot conclude that the financial crisis did have a negative impact on the EMU countries nor on the OECD countries.

7.3. Summary

This section aims to summarise the main findings from the analysis and present similarities and differences for FDI inflows and outflows. Since the first two regressions are less suitable for gravity model estimations, we will focus on the regressions that are more robust for our gravity model estimations, i.e. HDFE and PPML HDFE. These regressions reported mostly similar results for the GDP and the GDP per capita variables. Furthermore we noticed that, as anticipated, the distance has a negative impact on FDI flows. The financial crisis was only significant for PPML fixed effects inflows and outflows regressions and thus we do not

conclude that it has a negative impact on FDI flows. The EMU membership variables also reported similar estimations, it was significant with a positive sign when estimated with HDFE regressions, hence indicating that the euro both attracts and increases FDI. HDFE regressions also estimated negative signs for the interaction coefficient, thus suggesting that the financial crisis had a negative impact for the eurozone. However, these findings were insignificant for the PPML HDFE regressions which weakens our results since PPML HDFE regressions present the best R-squared value, suggesting that this regression best explains FDI flows, independently of estimating inflows or outflows. A difference between inflows and outflows that we noticed is that the EU variable was significant for FDI inflows but not for outflows. Consequently we conclude that the EU membership has a positive effect for attracting foreign investments but we cannot estimate a trend for how it impacts investment decisions from EU countries. Related to the research question and the hypotheses, the conclusion for both FDI in- and outflows is as follows; we cannot determine what impact the financial crisis had for FDI flows for the OECD countries. Yet, there is significant evidence that the euro suffered more compared to the non-euro countries when estimating both FDI inflows and outflows with the HDFE regression. This conclusion is not supported by the HDFE PPML regressions.

8. Discussion

Since we did not obtain robust estimates for the effect of the financial crisis on FDI inflows and outflows, we cannot draw any conclusions regarding its effects on FDI flows. Reasons for why the impact of the financial crisis became insignificant, despite previous literature concluding that the global financial crisis did negatively impact FDI inflows (Poulsen & Hufbauer, 2011), could be related to the fact that the FDI are long term commitments and cannot be easily revoked. According to Lipsey's (2001) findings, FDI are considered less volatile than other foreing investments. He concludes that despite an economic crisis, FDI firms are more likely to continue production and investments compared to other investments (Lipsey, 2001). Therefore, the financial crisis might have stopped the planned foreign investments for some countries but for those who already engaged in foreign investments, the engagement continued. Hence, we are not able to establish a trend. The insignificant results can possibly also be explained by the fact that countries outside of the EMU such as Sweden, Denmark and UK were able to perform relatively well in terms of their GDP growth after the crisis, as they were able to conduct an independent monetary policy tailored to these countries' own needs and enabled them to recover faster from the financial crisis (Ferreiro et al., 2016). Thus the negative effects that the EMU-countries experienced during the financial crisis may have been balanced out by the positive effects non-euro countries in the sample.

However, when estimated with HDFE regression we found that the euro has a positive impact for both FDI inflows and outflows. This corresponds with previous literature that estimated similar results (Dinga & Dingova, 2011). The EU membership also turned out to have a significant positive impact on inflows, in fact the EU had a more positive relationship for attracting FDI than the euro. This result sustained when estimating inflows with HDFE PPML, the EU memberships impact for inflows was still significant but the euro was found insignificant. That the EU membership has a larger positive effect for attracting FDI is consistent with Dingá and Dingova's (2011) conclusions. We can then assume that the Single market advantages of the EU, with its free movement of production factors - including capital and labour - within the preferential trade agreement, is more advantageous than a currency union for attracting inflows of FDI. A possible explanation is perhaps that the eurozone did not turn out to be an OCA and consequently cannot benefit from the advantages of an OCA. We further noticed an increase in the EU membership's impact on attracting FDI, more specifically the PPML HDFE method showed that inflows increased by 64.7 percent compared to

insignificant impact of the EMU membership. As Dinga and Dingová (2011) suggested this result can be related to including the EU membership variable, because it is a more dominant factor in attracting FDIs than the euro over time, thus absorbing the effects of the euro. This result differs from what Camarero et al. (2018) concluded, that in fact the eurozone attracted FDI from other EU countries. On the contrary, the EU membership was never significant for FDI outflows.

In line with our findings, as was discovered by Poulsen & Hufbauer (2011) the financial crisis in 2008 had a greater impact on FDI flows compared to the magnitude of the impact that previous crises had had on FDI flows. As their results indicated, the developed countries FDI outflows were found to be recovering more slowly from the global financial crisis compared to past crises. Despite these developments, we were interested to find out whether the effects of the currency union would have led to positive effects on FDI flows despite the financial crisis, given that the EMU was expected to be an OCA. As we wrote previously in our theoretical framework, we foresaw two potential outcomes for our second hypothesis in which we tested whether the effect of our interaction variable will have a negative or positive effect on FDI flows. From our results estimated by HDFE, the interaction's coefficient was negative and significant for both the FDI inflows and outflows data. Thus, we were able to conclude that the countries sharing a common currency experienced a larger negative impact of the financial crisis than the rest of the OECD countries. The financial crisis' effects were thus severe enough for the advantages of the currency union, such as the increased exchange rate stability that are expected to positively affect FDI, to dominate the impact of the crisis although our results lacked robustness. We expect our results to be related to how hard the financial crisis impacted the eurozone compared to countries outside of the currency union, as well as to the increased lack of trust for the currency union among foreign investors.

Referring back to the theory of OCA, we discussed how problems with the inflexibility in monetary policy arise, when a currency union is hit by an asymmetric shock. As the effects of the global financial crisis reached Europe, the euro area experienced an asymmetric shock where the imbalances within the currency union grew as some countries were forced to run budget deficits for a long time, as well as in the lack of an external adjustment mechanism. In 2009, as a consequence of the financial crisis and the underlying imbalances within the eurozone, it was hit by another shock, when the true size of Greece's debt was discovered. The European Sovereign Debt Crisis affected the PIIGS countries the hardest, which faced large

sovereign debts and had to go through austerity measures and bailouts. Even though the impacts of the crisis started to mitigate, the recovery phase was slowed down in the eurozone by the inflexibility to conduct only one type of monetary policy within the currency union, as well as due to the disorderly political response to the crisis and the lack of plans to handle a crisis. We expect that these events have prolonged the effects of the financial crisis in the eurozone and thus have had a negative effect on the FDI flows to and from the EMU. Moreover, as we mentioned in the theoretical framework, Poulsen & Hufbauer (2011) had found out, that the greater effects of the financial crisis on FDI flows were due to three reasons; the liquidity constraints for the firms which adversely affected their capacity to invest, the overall slowdown in the economy which negatively affected firms ability to invest abroad, as well as a more cautious attitude among investors which is expected to have led to favouring safer investments over more risky ones. We expect these developments to have further contributed to the negative effect the financial crisis had on EMU countries.

We thus ask whether the eurozone constitutes an optimum currency union. The criteria for constituting an optimum currency union are the mobility of factors of production, as well as the absence of frequent asymmetrical shocks (Mundell, 1961). Burda & Wyplotz (2017) wrote that a region constitutes an optimum currency union if it creates no loss of welfare for its member states (Burda & Wyplotz, 2017). These factors cannot however be concluded about the EMU. Despite the several advantages of the currency union, as discussed, since the financial crisis reached Europe the inflexibility of the monetary policy as well as the lack of an external adjustment mechanism resulted in growing imbalances within the EMU, which prevented the EMU countries to recover faster from the crisis. According to Mundell (1961) the stabilization between the members of a currency union should instead take place through capital and labour mobility from the suffering sectors or countries to those with surplus demand, but this has not been the case. The four freedoms of movement, the fundamentals of the Single Market have not been efficient enough in order for the balance in prices and employment to have been stabilized internally within the EMU. It is also unlikely that the eurozone would not face shocks of similar extent in the future. As the crisis affected the PIIGS countries more negatively than the rest of the EMU and as it resulted in welfare losses for its member countries, we therefore conclude that the EMU does not constitute an OCA.

9. Conclusion

Our selection consisted of the OECD countries and their bilateral FDI inflows and outflows between the years 2005 and 2018. The aim of this thesis was to estimate *what is the impact the financial crisis has had on FDI flows and to compare the impact the crisis has had on the euro member countries to non-euro member countries.* Previous researchers had seen a decline in FDI during the financial crisis yet - to our knowledge - no one had estimated the difference between the euro countries and non-euro countries for retaining FDI when the world experienced the worst financial crisis since the Great recession. This particular comparison is relevant considering the ongoing debate of whether the EMU is an OCA and the implications the financial crisis had on the eurozone. Despite the crisis, the EMU members have the advantage of a shared currency, a determinant believed to increase FDI.

The robust regressions generated the more reliable results, and these results further differed depending on whether we used a PPML HDFE method that included zero FDI flows or the HDFE method that is similar to an OLS regression but with more levels of fixed effects, i.e. country- and time- dummies that control for host, partner and time- specific fixed effects. The regressions were unable to conclude that the financial crisis impacted FDI flows, this differs from previous studies, which found that the financial crisis had a negative impact for FDI flows. We can explain this result with the notion that FDI are long-term investments and not easily revoked, even during times of crises. Through HDFE regressions we could establish that the euro increased both inflows and outflows, which corresponds with what previous literature have concluded. Our HDFE regressions also showed that the financial crisis had more negative effects for the EMU members than the OECD countries. These results however, were insignificant when we estimated the regression with PPML HDFE methods since we recognized the limitations to the results if we would not include zero FDI flows. Still, the indication based on HDFE is that the euro did not fully meet the requirements of an OCA. We could further conclude that the EU membership had a significant positive effect on inflows of FDI, for both the HDFE and the PPML HDFE regressions. It appears that the advantages of a Single market are more important than the advantages of a currency union for attracting FDI.

A limitation with this thesis is that we only focused on FDI flows between the OECD countries. This decision was made based on available data but we are aware that the results can change when including bilateral FDI inflows and outflows between the OECD countries and all the

countries in the world. A reason for the insignificant results is perhaps that the countries in our sample are too similar in terms of economic development, and consequently we cannot identify a true pattern of how the financial crisis might have impacted the eurozone. Furthermore, we identified many missing values that also affected the results, which is a common phenomenon when using data measured in times of a crisis. Overall, we conclude that our regressions potentially are affected by the challenges of estimating the impact of a crisis because of its complexity.

To know how the eurozone responds to a financial crisis compared to other countries, more specifically to compare how the responses of a currency union differs from other forms of economic integration, is relevant considering that countries regularly experience shocks. The aim for any country is to have the tools to quickly recover, whether it is from a currency union or free trade agreements, without suffering too severe economic consequences. As the crisis in fact had more negative impacts for the eurozone, the institutional design of the euro needs to be reviewed. Since we could not draw any ultimate robust conclusions from our estimations, we suggest including FDI flows between an increased number of country pairs for future research. It would also be relevant to study the impact the COVID-19 pandemic has had for FDI flows considering that it both caused country lock downs and paused production in some countries. As many researchers have argued, insecurities negatively impact FDI and therefore it would be interesting to estimate to what extent these extreme consequences have impacted FDI flows. Another relevant subject of further research is how the FDI inflows and outflows will be affected by the exit of the UK from the EU. Since the UK will not have access to the Single Market to a similar extent after Brexit, and since several companies that have been based in the UK previously had an easier access to the EU market when the UK was a part of the EU as a result of the free movement of services, it would be interesting to estimate in the future the effect that Brexit will have on FDI flows.

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