Foreign Direct Investment Dynamics in the Face of the Informal Economy and Corruption – Theory and New Empirical Findings

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List of Abbreviations

BMD – Benchmark Definition

CEPII – Centre d'Etudes Prospectives et d'Informations Internationales

COC – Control of Corruption

CPI – Corruption Perception Index

DGE – Dynamic General Equilibrium

EBRD – European Bank for Reconstruction and Development

EFTA – European Free Trade Association

EU – European Union

FDI – Foreign Direct Investment

GDP – Gross Domestic Product

GMM – General Method of Moments

GNP – Gross National Product

H-O – Heckscher-Ohlin

ILO – International Labor Organization

IMF – International Monetary Fund

KC – Knowledge Capital

M&A – Mergers and Acquisitions

MIMIC – Multiple Indicators Multiple Causes

MNC – Multinational Company

MNE – Multinational Enterprise

MRT – Multilateral Resistance Term

OECD – Organisation for Economic Co-operation and Development

OLI – Ownership, Locational, Internalization

OLS – Ordinary Least Squares

PPML – Poisson Pseudo Maximum Likelihood

PPMLHDFE – Poisson Pseudo Maximum Likelihood with High Dimensional Fixed Effects

PWT – Penn World Table

R&D – Research and Development

SME – Small and Medium sized Enterprise

SPE – Special Purpose Entity

TI – Transparency International

UN – United Nations

UNCTAD – United Nations Conference on Trade and Development

UNODC – United Nations Office on Drug and Crime

WGI – Worldwide Governance Indicators

1. Introduction

1.1 Motivation

Foreign direct investment (FDI) has developed over the recent decades from a relatively small part to one of the pillars of the global economy. Global FDI flows increased from 1990 to 2021 from roughly $175 billion to $1.75 trillion, with a similar picture regarding global FDI stocks increasing from 1990 to 2021 from $2.2 trillion to $45 trillion (UNCTAD 2022b). Being a multinational company (MNC) is not reserved for only the biggest companies in the world anymore, with more and more small and medium-sized enterprises (SMEs) becoming multinational companies. Globalization has increased trade worldwide and led to global supply and value chains through the channel of FDI. On a macro level, this translates into the following benefits for target countries receiving FDI, like an increase in GDP, higher production potential through technology transfers, structural change, and an increase in competition, but also for countries where the investment originates, like an increase in GNP from income abroad and access to new markets (Alemu 2012).

Nevertheless, countries do not share the same business environment, and investing in a country abroad comes with various difficulties, some of which are the amount of corruption and the size of the informal economy. Despite significant efforts from non-governmental organizations like Transparency International and international institutions like the OECD and UN, corruption is still a prevalent and relevant part of today's global economy. The International Monetary Fund (2016) estimates the economic cost of corruption just from bribes in its 2016 report to be roughly 2% of global GDP or $1.5 to $2 trillion. The revelation of the Panama Papers in 2016 (ICIJ 2016) and Paradise Papers in 2017 (ICIJ 2017) has shown how organized and widespread it is. The revelation of Qatargate in late 2022 in the EU, where European parliament officials allegedly engaged in corruption, money laundering, and organized crime, having been influenced by the governments of Qatar, Morocco, and Mauritania, has shown that institutions of developed countries aren't as free of corruption as one might have thought (see, e.g. (POLITICO 2023)). The situation is similar when looking at the informal economy[1]. The placement of migrant minors in a Hyundai plant in Alabama (Reuters 2022), informal work in the garment industry in Turkey (Clean Clothes Campaign 2023), and Bangladesh, with ILO estimates of about 90% of workers being employed in the informal economy (International Labor Office 2023b) or the

[1] As is common in literature, informal economy and shadow economy are used interchangeably to avoid repetition

cobalt mines in the Democratic Republic of the Congo (Amnesty International 2016) are just some examples.

As shown above, many countries have a sizeable informal economy and corrupt governments. Nevertheless, these countries still are targets of FDI, and the question arises is how these variables affect FDI. Are MNCs investing in countries with largely corrupt governments or a sizeable informal economy as it allows companies to circumvent specific regulations or profit from low labor costs? Or do they invest despite these factors and not because of them? And what economic advice can be given to politicians? These are the key questions motivating the empirical research presented here.

This dissertation examines corruption and the informal economy, two variables outside the legal framework that might impact MNCs' decision to invest in a country. On the one hand, corruption, e.g., in the form of bribes, allows companies to circumvent parts of a country's legal framework, for better or worse, depending on who you ask. On the other hand, the informal economy is the result of the economic subjects of a country leaving the formal economy (willingly or unwillingly) for a multitude of reasons. Both are local characteristics of a country that affect the country itself and its business environment and therefore impact FDI. Reference is made to historical and political developments that motivated the empirical analyses herein with sound theory and econometric methodology that have developed over the past decades to the present day. The author intends to contribute to theoretical and empirical FDI research and economics by expanding existing knowledge, introducing new aspects and data, and discussing the results in the context of the studies reviewed.

1.2 Theory and Model

Foreign direct investment is the central theme of this dissertation; therefore, two of the main FDI theories are presented in this chapter. Additionally, a short paragraph regarding the model used for the empirical analysis is included, with the following chapters providing a more in-depth look into the theory.

The first theory starts with the dissertation of Hymer (1960). Here, Hymer presents an important finding: the traditional approach (the Heckscher-Ohlin model), where companies simply move capital around to exploit factor price differences resulting from relative factor endowment differences, was inconsistent with FDI data. He proposed the idea that firms possess special assets that result in an advantage in a foreign market over local firms (Antràs and Yeaple 2014). Ultimately, this idea resulted in Dunning’s (1977) eclectic

paradigm or OLI framework. OLI stands for ownership, location, and internalization and represents the advantages foreign companies have over local firms. Ownership advantages refer to a company's assets that allow it to overcome the information disadvantage of operating in a foreign market, thereby allowing it to compete with domestic firms. These assets can be patents, management, or technology. The important characteristic of these assets is that they are transferable and can be used in multiple locations, and competing firms can be excluded from using these assets. Location advantages describe characteristics of a potential location for production, and while various firms can take advantage of these locational characteristics, they are tied to the location. Should the locational advantages of the home country outweigh those of other countries, no FDI takes place. An example of such an advantage could be low labor costs. Lastly, the existence or non-existence of an internalization advantage determines if a company can use its ownership advantages through using exports or FDI or if it is more profitable to license production to another firm. Ownership advantages are necessary to become active in a foreign market while location and internalization advantages determine the form of activity in a foreign market, namely FDI, exports, or licensing (Dunning 1977).

The second "big" theory presented here is the Knowledge-Capital (KC) model, which is based on more complex FDI dynamics, such as horizontal and vertical forms of FDI. Horizontal FDI describes a firm's intention to access a foreign market to serve the local market through local production. Horizontal FDI is often associated with the motive of saving trade costs stemming from, for example, tariff barriers. There could also be locally specific customer preferences that make it necessary to produce locally. Vertical FDI refers primarily to the motive of seeking to exploit international factor price differentials through trade. The production process is hereby split depending on factor intensity, and suitable locations are then used to produce the different stages of the product. The labor-intensive stage of the process gets produced in a country with low labor costs, whereas the capital-intensive stage gets produced in a country where the cost of capital is low (Carr et al. 2001). Carr et al. (2001) create a 2x2x2 (two factors, two countries, two goods) model that includes vertical and horizontal FDI and Knowledge-Capital. The underlying assumptions that knowledge-generating activities can be separated from production and are skilled labor intensive, and have a joint input character generate two companies that act differently. The vertical company has its headquarters in a country with an abundance of skilled-labor and produces in countries with an abundance of low-skilled labor. The horizontal company is active in countries with similar sizes and similar relative factor endowments as its home country (Carr et al. 2001).

Regarding the methodology used in this dissertation, the gravity model, one has to start with a short history of the model. The gravity model is based on Newton's law of gravity[2] , stating that the attractive force between two objects is positively related to each object's mass and negatively related to the distance between the two objects. Tinbergen (1962) was the first to translate this into economic terms for trade between two countries: the GDP of each country represented the mass, with the distance between the countries representing the distance. The subsequent development of the gravity model of trade came with Anderson and van Wincoop's (2003) paper, in which they derived a microeconomic foundation for trade gravity by introducing multilateral resistance terms. Anderson et al. (2019) follow up with a paper deriving a structural gravity equation but this time for FDI stocks. The theoretical rationale for analyzing FDI flows comes from the extension of the KC-model by Bergstrand and Egger (2007) with physical capital. This model translates into a gravity-like equation, the extension of the KC model. Combining these advances, one has a strong case for using gravity models in FDI research.

All in all, these theories translate well into the methodology used in this dissertation. With a gravity model of FDI, one mainly looks at the locational factors of target and origin countries, one of the essential necessities for FDI. The extension of the KC model by Bergstrand and Egger (2007) introduces a theoretical rationale for FDI flows.

1.3 Data

A quick paragraph concerning the question of data mainly focused on what is the source of the data for corruption and the shadow economy and the reasons for the usage of this data. Data for FDI comes from the OECD and is preferred as it is less aggregated and compiled more uniformly when compared with UNCTAD data (see Welfens and Baier (2018) for a more extensive analysis of this).

The issue with corruption and the informal economy is that there is no direct way to measure it. Measuring a country's GDP can be done relatively easily through a country's statistical office. But how does one measure the size of an economy that does not officially exist or appear in the official statistics? How does one measure the "corruptness" of a country?

Answering the latter question first, the usual modus operandi is to use so-called perception indices. These are constructed by including various sources and show the level of perceived

[2] $F = G\frac{m_1 m_2}{r^2}$.

corruption. This is also one of the main points of critique: perceptions are subjective and not “hard” facts. While this is undoubtedly true, including various sources will help reduce an index's subjectivity. In addition, the MNC’s decision about where to invest is not entirely based on hard facts. Experience in doing business in a country and perception of the business environment also play a part. Therefore, using such an index is certainly viable. The control of corruption index of the World Bank’s Worldwide Governance Indicator (WGI) series is chosen for the corruption measure. *“Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.”* (Kaufmann and Kraay).

Here, petty and grand corruption refers to the value of the transaction, with the former being low value and the latter being high-value. While petty corruption only involves small amounts of money for a small favor, the public loss can still be considerable, like when a customs officer waves through a shipment of high-duty goods for a small bribe (United Nations 2004).

Regarding the definition of the shadow economy, this paper follows the definition of Medina and Schneider (2018) in that the informal economy includes all activities, which, if recorded, would contribute to GDP. These exclude household production or illegal activities like e.g. human trafficking. Other definitions like the ILO definition include household production: *“The term “informal economy” refers to all economic activities by workers and economic units that are – in law or in practice – not covered or insufficiently covered by formal arrangements.”* (International Labor Office 2012).

Criminal activities like e.g. drug trafficking or fencing stolen goods also represent a form of an underground economy that is not part of the formal economy but is excluded for obvious legal and moral reasons.

The definition by Medina and Schneider (2018) is preferred, because it translates well into a potential locational factor relevant for FDI. One can reasonably make an argument that informal companies and companies using informal employees can provide a low-cost alternative compared to formal companies which in turn could be attractive for FDI e.g. a manufacturing plant that can take advantage of the local informal forms through procuring goods and resources at a lower price compared to the formal economy. On the other hand, a sizable shadow economy can also be a negative, because it affects the availability of labor and capital in the local formal economy. This would lead to an inefficient and suboptimal formal economy, making the country less attractive for FDI. Lastly, it is highly

unlikely that activities like household production or criminal activities are a relevant economical factor for FDI.

The informal economy can also be described with different characteristics or by different approaches: Exit versus exclusion describes the situation where one the one hand workers are excluded from the formal economy due to burdensome entry regulations and on the other hand workers voluntarily exit the formal economy for the informal economy. Subsistence informality describes the situation, often in low-income countries, where workers need informal activities to not fall below subsistence levels. Lastly, there are evaders, avoiders, and outsiders: evaders are regulated firms that do not comply with their regulations, avoiders are companies that modify themselves to be outside of regulations, and outsiders are firms that are not covered by regulations at all (Elgin et al. 2021).

Since measuring the shadow economy is prone to difficulty, researchers have developed several methods to estimate the shadow economy. Here, a short overview of two of these methods that are used to estimate data used in this dissertation is presented: The Multiple Indicators Multiple Causes (MIMIC) model (used in Chapter 3) by Schneider et al. (2010) and the Dynamic General Equilibrium (DGE) model (used in Chapter 4) by Orsi et al. (2014), Elgin and Oztunali (2012), and Ihrig and Moe (2004). Both models are indirect measures of the informal economy[3] (Elgin et al. 2021).

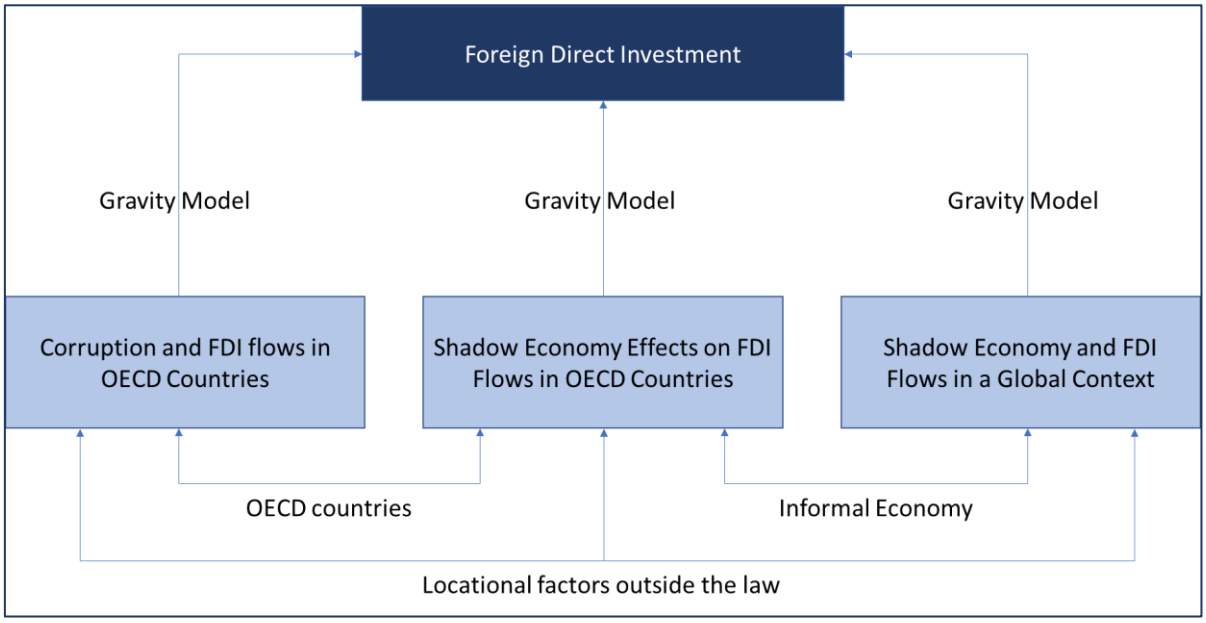
The MIMIC model is a structural equation model that allows for multiple possible causes of shadow economic activity and captures multiple outcome indicators of shadow economic activity. It uses mainly macroeconomic panel data, can be updated annually, and allows for broad coverage of countries over time. Of course, there are weaknesses with this model, like the use of GDP in both cause and indicator variables, the reliance on another independent study to calibrate, and the sensitivity of the model to changes in model specification and sample coverage. The DGE model works by having households optimize the allocation of labor between formal and informal economies in each period and then tracks how these allocation changes over time. The advantage of this model is the extensive country coverage and time series. Just like the MIMIC approach, the DGE model also comes with several limitations, like needing another independent study to calibrate and only being able to capture stylized facts of the informal sector. It relies on strong assumptions regarding the functional form of activity in the formal and informal sectors and how formal and informal production is related to each other (Elgin et al. 2021).

[3] Direct measures are e.g. a survey of informality in a country

1.4 Overview

This subchapter briefly summarizes the studies underlying this dissertation. Each chapter is an original paper that discusses several aspects of FDI. All articles are written by the author of this dissertation in sole authorship and use the gravity model as the methodology of choice. All chapters also deal with locational factors outside the law, namely corruption and the shadow economy. In a way, this helps approach the topic from two points of view: a private point of view (informal economy) and an institutional point of view (corruption). Of course, in reality, the borders between the informal economy and corruption are not as clear as the previous statement might give the impression. Chapter 2 discusses the effects of corruption on FDI flows for OECD countries, and Chapters 3 and 4 deal with the question of how the shadow economy affects FDI flows for OECD countries (Ch.3) and in a global context (Ch.4). Figure 1 illustrates the linkages between the chapters.

Figure 1.1: Framework of the Dissertation



Chapter 2: Corruption and Foreign Direct Investment Flows in OECD Countries

Chapter 2 is based on an original paper titled “Does corruption matter for FDI flows in the OECD? A gravity analysis” written solely by the author of this dissertation. The article was published in the *Springer* journal *International Economics and Economic Policy* (April 2021, Issue 18, p. 347–377)

The core of this paper is the analysis of the effect of corruption on FDI flows. The literature is thus far divided regarding the impact of corruption: One hypothesis argues that corruption greases the wheels of government by allowing, e.g., MNCs to circumvent excessive red tape, thereby speeding up the process of doing business which in turn leads to more economic growth and the benefits associated with that. The other hypothesis argues that it sands the wheels of government, resulting in a second-best solution for an economy (Bardhan 1997). While corruption might help alleviate problems concerning excessive red tape regulation, it can be argued that corruption is the reason for the existence of said red tape in the first place, creating a vicious circle whereby more and more regulation gets put into place solely to generate more bribes.

A dataset consisting of bilateral FDI data from the OECD and the control of corruption measure from the World Governance Indicators of the World Bank from 1996 to 2017 is compiled for the empirical analysis. To further analyze the effects of corruption, the Panama Papers revelation is used as a corruption-increasing event. The implementation into law of the OECD Anti-Bribery Convention is used as a corruption-decreasing event. Finally, the difference between corruption levels in the target and the origin country will be examined. The analysis uses a state-of-the-art gravity model with dyadic and time-fixed effects.

Findings show differing effects depending on whether one looks at target countries or origin countries. For target countries, a positive correlation between corruption and FDI flows is found, meaning that increased perceived corruption levels are associated with increased FDI inflows. For the origin countries, the effect is reversed. Lower levels of corruption are associated with higher levels of FDI flows, which could result from the origin countries usually being richer countries, and richer countries often have lower levels of corruption and a better rule of law. The event variable for the revelation of the Panama Papers shows precise results. The release of the Panama Papers resulted in a drop in FDI flows. This finding can be seen as in indication that, generally, corruption affects the business environment and FDI flows negatively, which is also corroborated by the results that the implementation into law of the OECD anti-bribery convention is associated with an increase in FDI inflows for target countries.

Nevertheless, the results show MNCs are willing to invest in corrupt countries. A reason for this could be that MNCs see a corrupt government as a reduction in their investment risk as they can influence regulation and policies directly and possibly quite effectively, albeit not through legal means. However, results from the event variables suggest a general negative effect of corruption on FDI and a positive effect of anti-corruption legislation on business.

Chapter 3: Shadow Economy Effects on Foreign Direct Investment flows in OECD Countries

Chapter 3 is based on an original paper titled “FDI Flows and the Effects of the Shadow Economy: Evidence from Gravity Modelling” written solely by the author of this dissertation. The article will be published in an upcoming issue of the *Athens Journal of Business & Economics* (available online 22 February 2023).

This paper analyzes the question if the size of the shadow economy FDI flows and what effects, if any, there are. Since about 1990, FDI has become the second crucial pillar of economic globalization in OECD countries and worldwide, with FDI inward and outward flows contributing to higher per capita income and accelerated international technology transfer. The shadow economy used to be seen as a remainder of some past, inefficient regime, which was expected to disappear over time (Williams and Lansky 2013; Williams 2013). This prediction is evidently wrong, as the shadow economy is still present in all countries of the world. Therefore, the informal economy represents something different with the neoliberal perspective arguing that it is due to the personal choice of economic subjects and mainly takes the form of self-employment. The motivation for this paper is to see if the shadow economy is something that MNCs see as a chance or if it is something that is seen as a problem, in the sense that engaging in business with enterprises active in the shadow economy is illegal (primarily due to tax reasons).

An OECD-only dataset for 1992-2018 is compiled to analyze this question. This dataset allows for the analysis of bilateral, bidirectional FDI flows. The shadow economy variable comes from the research of Medina and Schneider (2019) and is estimated using the MIMIC approach. The model of choice is a gravity model with both country and time-fixed effects and the use of dyadic and time-fixed effects in a separate gravity model. Additionally, three interaction terms are constructed to help shed light on potential interactions between the shadow economy and other control variables.

The empirical findings show differing effects for target and origin countries. The shadow economy is positively correlated with FDI inflows for target countries, suggesting that MNCs take advantage of characteristics of the shadow economy of a target country, e.g., lower labor costs though subcontracting to an enterprise active in the shadow economy. For origin countries, the shadow economy is negatively correlated with FDI flows, meaning the larger a country's shadow economy, the less FDI it sends. One possible explanation is that due to a large shadow economy, local companies are negatively impacted by the presence of the shadow economy, thereby not being able to generate the necessary profits and equity capital to invest abroad. Additional results show that the interaction term of the shadow economy and government size and the interaction term for the shadow economy and a financial banking crisis are positively correlated with FDI flows. For the former, it seems that an overreaching government increases the effect of the shadow economy on FDI flows for target countries, indicating that the shadow economy could be an alternative way of generating goods and profit in a hostile legal environment. For the latter, it shows that in times of a banking crisis, the effect of the shadow economy is increased, probably due to more people becoming active in the informal economy and increasing its size.

From a policy perspective, changes in the size of the shadow economy – typically taking place in periods of recession, in a high taxation environment, or in the context of a pandemic shock – should be carefully monitored by economic policymakers as well as by policy monitoring international organizations such as the IMF and the EBRD. Suppose a group of (OECD) countries decides to adopt anti-shadow economy economic policies. In that case, there will be pressure on other (OECD) countries to adopt similar policies since the difference between the size of the shadow economy in the source country and the host country negatively impacts FDI. Thus, FDI could indirectly be a catalyst for reforms.

Chapter 4: Shadow Economy and Foreign Direct Investment Flows in a Global Context

Chapter 4 is based on an original paper titled “The effects of the informal economy on Foreign Direct Investment Flows – Evidence from Gravity Modeling” written solely by the author of this dissertation. The paper is currently under review with the journal International Economics and Economic Policy (available as a preprint[4]:).

This paper explores the effect of the informal economy on FDI flows in a global setting. The neoliberal perspective on the shadow economy states that people choose to be active in the shadow economy due to, e.g., high tax burdens. Another perspective is the political economy perspective that describes the informal economy as an integral part of late-stage capitalism arising from downsizing, subcontracting, and outsourcing and, in general, as a result of maximizing production flexibility, violating labor laws to reduce cost and maximizing profits, or using subcontracting to businesses that use informal workers. The motivation for this analysis is to go beyond OECD-only countries when looking at the effects of the shadow economy. While the OECD countries make up almost 70% of global FDI flows, their shadow economy size is relatively small in comparison to other countries of the world. That is unsurprising, as a higher shadow economy is often found in poorer countries, with some countries having a shadow economy estimated at more than 50% of the official GDP. One of the points of interest is if effects differ from OECD countries compared to a global sample in order to gain a deeper understanding of FDI dynamics in general and of shadow economy dynamics in particular.

For this, a new dataset was compiled. It is based on bilateral OECD FDI data from the new Benchmark Definition (BMD) 4. The dataset contains 35 OECD origin countries and 145 countries worldwide as target countries of FDI. The years available are from 2005 to 2019. This time, the shadow economy variable is estimated using a DGE model[5] while still focusing on activities that, if recorded, would contribute to GDP. Another point of interest is to see if the results change when compared to the analysis in Chapter 4 and previous empirical papers. The methodology is again a gravity model approach using state-of-the-art estimation with dyadic fixed effects and PPMLHDFE[6] estimation.

Empirical findings demonstrate that a positive correlation between the shadow economy and FDI can be found for target countries. This is similar to previous results and provides

[4] https://www.researchgate.net/publication/369236643_The_effects_of_the_informal_economy_on_Foreign_Direct_Investment_Flows_-_Evidence_from_Gravity_Modeling

[5] See chapter 1.2. for more information

[6] Poisson Pseudo Maximal Likelihood with high dimensional fixed effects

additional evidence that MNCs seek profits not only in the formal but also in the informal economy. A second finding is that MNCs prefer to operate in a business environment similar to their “home” environment. This is also supported by the idea of institutional distance, which here is negatively correlated with FDI flows. Additional results from looking at Latin American and Asian countries seem to corroborate these global results. From a policy perspective, the shadow economy appears to be no inherent deterrent to FDI inflows. On a worldwide scale, it seems to actually be positively associated with it meaning that countries mainly focused on attracting FDI, reforming the informal economy does not need to be the top priority. On the other hand, for countries trying to push for more formalization, MNCs from countries with similar views could substitute for the potential loss of FDI flows from MNCs attempting to exploit the informal economy.

2. Corruption and Foreign Direct Investment Flows in OECD Countries

2.1 Introduction

"The more corrupt the state, the more numerous the laws."

Tacitus, The Annals of Imperial Rome (1959)

Foreign direct investment (FDI) has become increasingly relevant in past years. In 1995 FDI flows totalled $330 billion whereas in 2017 they had increased to $1.43 trillion (UNCTAD 2018). Many developing economies replace existing controls and restrictions over the entry of foreign multinational companies (MNCs) with new policies that are designed to attract and encourage FDI. Developing countries hope to benefit from FDI. Some of those benefits can be incoming capital, spillover effects associated with foreign technology as well as modern management skills and corporate governance (Alemu 2012).

But it is not just FDI that has gained in importance around the world. It is also corruption, or rather the fight against corruption, that has become more important over the last number of years. Recent corruption scandals show that corruption plays a big part in countries and economies around the world. For example, Volkswagens' manipulation of the software in their diesel cars, the release of the Panama Papers, Brazil's former presidents Dilma Rousseff and Luiz Inacio Lula da Silva corrupt dealings with the oil company Petrobras and South Korea's President Park Geun-hye abuse of power to pressure conglomerates into millions of dollars of "donations" to just name a few (BBC News 2018a, 2018b). Additionally, the abominable effects of corruption show especially in times of crisis. Regarding the Covid-19 pandemic, the United Nations Office on Crime and Drugs (UNODC) mentions for example the possibility of corrupt behaviour regarding the distribution of fiscal stimuli and rescue packages of governments around the world, especially who receives grants from these emergency funds (United Nations Office on Drugs and Crime 2020a). Another issue raised with regard to the Covid-19 pandemic are the corruption risks related to vaccine development, production and distribution. Due to fast tracked research and development processes, opportunities for corruption arise due to conflicts of interest. Another area at risk for corruption is vaccine deployment as well as vaccine procurement; basically, the whole supply chain is at risk due to these extraordinary circumstances and sped-up processes and controls (United Nations Office on Drugs and Crime 2020b).

Corruption was also a topic at the UN Security Council in 2018: Secretary-General António Guterres cited World Economic Forum estimates saying that the global cost of corruption is at least 5% of world GDP or $2.6 trillion (United Nations 2018). According to a World Bank estimate, businesses and individuals pay about 2% of global GDP or $1.5 trillion in bribes each year (World Bank 2017). Along these lines, Transparency International estimates that governments lose around $500 billion in tax revenues from businesses each year and further billions from individuals. These estimates should not be taken at face value as it is very hard to quantify the extent of damages caused by corrupt behavior. But it shows that corruption is treated as a very serious matter by major international organizations. Moreover, one cannot rule out that corruption in some countries facilitates a sometimes-useful expansion of the shadow economy during critical periods – e.g. during a major recession – so that more people find a job and the overall effective real income could be raised, and poverty problems could possibly be alleviated in relatively poor countries. Such paradoxical real income effects are, however, not a key aspect considered in the subsequent analysis.

Compared to the early corruption research on FDI in the first decade of this millennium the data coverage and quality of data have improved for FDI as well as the estimation methods for the gravity model like the Poisson Pseudo Maximum Likelihood (PPML) estimator by Santos Silva and Tenreyro (2006). Building on these advantages this paper contributes to the literature by investigating corruption in a homogenous country group, namely the OECD, using high-quality bilateral FDI data from the OECD. By employing state of the art econometric modeling, i.e. a gravity model using PPML estimation and dyadic fixed effects as well as time fixed effects, new insights into the dynamics of corruption and FDI will be gained. Furthermore, the use of an event variable to model a corruption shock, i.e. the use of the revelation of the Panama Papers scandal as a shock that increases perceived corruption levels within this country group, brings new insights into the afore mentioned dynamics. Lastly, with the use of the OECD anti-bribery convention, a corruption curbing mechanism will be researched. As regards an analysis of the latter, some research has been done by Blundell-Wignall and Roulet (2017).

The reason for using only the OECD group of countries is due to the quality of data available but also to see what happens when one looks at a relatively homogenous group of primarily developed economies. Does corruption matter? Are subtle differences in corruption enough to affect FDI flows? Or are corruption levels low enough that companies do not need to care too much about it? Maybe there is just enough corruption for MNCs to take the risk and abuse these opportunities to their advantage? These are some of the questions that this paper is trying to answer.

Following the introduction is chapter 2.2 in which the theoretical framework as well as empirical findings regarding the nexus of FDI and corruption will be discussed. At the end of this chapter, hypotheses will be formed. Chapter 2.3 concerns the gravity model and its historical development from Newton's law of gravity, to a model that explain trade flows and then to a model that explains FDI flows. Also, in chapter 2.3, there is a description of the data, control variables, model specification as wells as the estimation method used in the analysis while statistical challenges are also discussed. Chapter 2.4 presents the results of the estimation of the gravity model as well as a discussion of the empirical findings. Chapter 2.5 concludes with policy conclusion and an outlook on further research.

2.2 Literature Review and Theoretical Framework

2.2.1 Corruption Theory

The theoretical as well as the empirical literature on corruption shows a dichotomy when it comes to the effects of corruption. In the theoretical literature, there are two principle views on corruption, namely the 'sand the wheels' view and the 'grease the wheels' view. Sanding the wheels (of growth or FDI flows and so on) refers to the fact that corruption has a negative impact on the variable of interest (if the variable of interest is supposed to be "good" for an economy). Basically, corruption harms an economy and stops the economy from experiencing positive change over the years. Opposing this view is the grease the wheels view. Of course, the argument here is not that corruption suddenly is a positive for the economy. Rather, the idea is that corruption can be seen as a second-best case and can help under certain conditions to improve the status quo when compared with a case where corruption is not a possibility. Let us look at this view in more detail.

Méon and Sekkat (2005) summarize, that corruption could solve the issues arising from a malfunctioning administration. In particular, bribing corrupt officials might alleviate the problems of slowness of the public administration, rather poor skill levels on the part of civil servants, help to escape the consequences of some policies, and improve the quality of investment. Regarding slowness, Francis T. Lui (1985) showed in a queuing model that bribery could effectively speed up service, therefore, reducing the time spent in the queue. Bayley (1966) shows that corruption can improve the quality of civil servants in that it works as a kind of additional wage so that talented individuals are also attracted to possibly badly paying governmental jobs. Beck and Maher (1986) and Lien (1986) showed that, when comparing bribery to competitive bidding processes, there is no efficiency loss. In other words, the least cost firm will pay the highest bribe and therefore is awarded the price

resulting in the generation of a desirable outcome (Beck and Maher 1986; Lien 1986). Leff (1964) argues that in the case of bad entrepreneurship policies, entrepreneurs effectively could implement their own favorable policies using corrupt measures such as bribes to incentivize civil servants to not implement the government's policies. Leff (1964) continues that corruption may improve the quality of investment in that, for example, a bribe can be seen as a sort of insurance policy against the risk of expropriation or violence by the government.

Summarizing, corruption can, when faced with an inefficient and convoluted government and its policies and laws, lead to efficiency increases due to the possibility of circumventing the inefficacies produced by said government.

Switching now to the point of view of the sand the wheels hypothesis, Bardhan (1997) states:

"In the second-best case made above, it is usually presumed that a given set of distortions are mitigated or circumvented by the effects of corruption; but quite often these distortions and corruption are caused or at least preserved or aggravated by the same common factors. The distortions are not exogenous to the system and are instead often part of the built-in corrupt practices of a patron-client political system"

The grease the wheels hypothesis fails to recognize the enormous degree of discretion of many public officials regarding the regulatory burden (Kaufmann 1997). As Lambsdorff (2002) argues, corrupt public officials and politicians have a motivation of their own to create regulations. They do not need to be pushed to do so by private businessmen. Corruption gives public officials an incentive to create and impose regulations to maximize the bribes they get paid (Lambsdorff 2002). In the words of Kaufmann (1997):

"This is one mechanism whereby corruption feeds on itself."

Boycko et al. (1995) stress that a bribe does not constitute a legal right that a court would protect nor does a bribe establish a contract that is enforceable in court.

Moreover, along with these arguments, Kaufmann and Wei (1999) investigate the effect of 'speed-money' and find evidence that suggests that, instead of saving time through bribes, entrepreneurs waste more time dealing with corrupt administrations. One may argue that from this perspective, transaction costs in markets are raised and this has a negative welfare effect in the respective country.

However, it is not only the argument of using bribes to speed up an inefficient government process which is addressed by the sand the wheels approach, the other arguments brought

up above are addressed as well. When it comes to the quality of civil servants, Méon and Sekkat (2005) argue that officials also have an incentive to preserve their income from bribes by limiting the appointment of new and able officials to key positions. Regarding the efficiency argument in the bidding process, Kaufmann (1997) argues that corruption stands for a theft of public resources resulting in a decreased revenue stream for the treasury which can potentially impact macroeconomic stability as well as there being no guarantee that the winner is the most cost-efficient firm. Rose-Ackerman (1997) as well as Méon and Sekkat (2005) pick up this thought and argue that productive efficiency is not a requirement to win in a bidding process. Corruption favors those with no scruples and good connections (Rose-Ackerman 1997) and there is also the winner´s curse (Méon and Sekkat 2005). A related analytical approach with respect to markets points out that in the case of corruption with theft (meaning the public official does not turn over anything to the government and simply hides, for example the sale of a permit), competition between buyers helps spread corruption (Shleifer and Vishny 1993).

Moving on to escaping the consequences of some policies, here the grease the wheels view assumes that only “bad” policies are targeted and thereby overall efficiency could be improved. But “bad” policies for an entrepreneur or a company do not constitute inefficiencies or welfare loss for an economy. As Kaufmann (1997) mentions, some policies should not be escaped using bribes, for example, policies that prevent illegal logging of the rainforest or policies designed to protect the environment or air and water quality.

Regarding the argument that corruption may improve the quality of investment, it can be argued that corruption results in more public investment in unproductive sectors (Méon and Sekkat 2005). Corrupt officials favor projects that are one-of-a-kind, complex, and capital-intensive because corrupt payments are easier to conceal in these projects (Kaufmann 1997; Rose-Ackerman 1997). Therefore, defense projects or large infrastructure projects are preferred. Even more damaging are many unproductive projects that only enrich public officials and suppliers (Kaufmann 1997). Lastly, as corruption is illegal, the bribed officials have little incentive to truly commit to an agreement. Therefore, one can argue that bribes are not a safeguard against bad policies. On the contrary, corruption may as well lead to an increase in risks resulting from a weak rule of law (Méon and Sekkat 2005).

To sum up the theoretical views on corruption, there is an ongoing argument between seeing corruption as a second-best case that can, in some situations, lead to an efficiency gain on one hand and, on the other hand, seeing corruption as a condition that always results in a worse or unfavorable outcome. This ambiguity can also be seen in the findings

of the empirical literature. Research has shown results that support both the sand the wheels as well as the grease the wheels view of corruption.

Some of the early empirical studies came from Wei (2000a, 2000b). He finds evidence that corruption in a capital importing country distorts the composition of capital inflows towards foreign bank loans and away from FDI (Wei 2000b). Additionally, Wei (2000a) finds evidence that corruption reduces inward FDI stocks, acting comparably to an increase in taxation. Habib and Zurawicki (2002) find evidence that corruption as well as the difference in corruption between the host and source countries have a negative influence on FDI. Voyer and Beamish (2004) also find evidence in Japanese FDI supporting these earlier findings. Egger and Winner (2006) produce three results: 1) corruption, as measured via the Corruption Perception Index (CPI), has a negative impact on FDI, 2) corruption is an important factor for intra-OECD FDI but not for extra-OECD FDI, and 3) the impact of corruption for FDI, in general, has declined over the years. The authors argue that for horizontal intra-OECD FDI, trade impediments and factor cost differences are relatively low and that a change in perceived corruption could result in MNCs deciding to engage in trade rather than horizontal FDI.

Al-Sadig (2009) finds evidence that the corruption level has negative effects on FDI inflows but this effect loses significance once institutional quality is introduced in the regression. The author concludes that sound institutions are more important for attracting FDI than corruption levels. Alemu´s (2012) findings also support earlier studies. Belgibayeva and Plekhanov (2019) hypothesize that FDI is not homogenous and depends on the level of corruption in the host country. They use Eurostat data from 1992 to 2011 for EU countries, Turkey and FYR Macedonia. Their evidence suggests that, overall, corruption deters foreign direct investment. They also find that the level of corruption affects the composition of FDI meaning that reducing corruption then attracts more FDI from less corrupt countries.

Most of these earlier studies found support for the sand the wheels hypothesis. In contrast, more recent studies often find evidence that corruption is indeed a facilitator for FDI. Bellos and Subasat (2012) , for example, and the follow-up study of Subasat and Bellos (2013) employ a gravity model to investigate the connection between FDI and corruption. Their results point towards the grease the wheels hypothesis, meaning that a decrease in corruption levels would lead to a decrease in FDI inflows. Barassi and Zhou (2012) employ both parametric and non-parametric analyses and find that, after controlling for the location selection process of MNCs, corruption has a positive impact on FDI stocks. They also find that, in their non-parametric analysis, the effect of corruption is heterogeneous and depends on the level of FDI stock. Finally, Blundell-Wignall and Roulet (2017), using dyadic fixed

ordinary least squares (OLS) estimation and generalized method of moments (GMM) estimators, find that corruption, in general, has either an insignificant or a positive effect on FDI.

There are also studies from behavioral economics focusing on exploring the question on why there even is corrupt behavior.

As Lambsdorff (2012) puts it: *"Homo economicus is either horribly corrupt, because he feels no moral impediments, regards all temptations to be legitimate and takes advantage of risks of punishment being commonly low. Or Homo economicus is averse to corruption, because corruption is arduous to enforce. Homo reciprocans provides a better approach to understanding corruption. As now widely evidenced in experimental research, humans are sometimes willing to reciprocate a bribe but they also devote resources to an altruistic punishment of bribe-takers and like to serve their principals."*

Behavioral economics also helps to gain an understanding regarding the efficacy of anti-corruption measures. Lambsdorff explores this in another paper where he studies six anti-corruption measures and illustrates why these measures, even though they are seen as best practice, show mediocre results at best and are often counterproductive and inefficient (Lambsdorff 2015). Although this strand of literature is very interesting and delivers many answers this study will not further pick up on this.

Although all these studies vary in their scope, country selection, model, and estimation method, one can say that, overall, there is more empirical support for the sand the wheels hypothesis. Considering theory as well as empirical findings over the years, one can argue that corruption could have an ambiguous effect dependent on the prevalent characteristics of the countries included in the dataset. Nevertheless, we will adopt the view that higher levels of corruption are detrimental for attracting FDI.

2.2.2 FDI Theory and Main FDI Determinants

Regarding why companies engage in FDI, there have been several theories over the years (for an extensive review, see e.g. Faeth (2009)). One of the earliest theories was the approach of Dunning. He first introduced the concept of the eclectic paradigm of international production in 1976. Dunning wanted to create a holistic framework that is able to identify and evaluate the factors that influence the initial decision and act of foreign production and the growth of such production. He chose to label his theory eclectic as several strands of economic theory are needed to explain the transnational activities of enterprises (Dunning 1988).

In short, the eclectic paradigm states that a combination of the following three advantages is necessary for an MNC to enter into a foreign market: Ownership-specific advantages (O-advantages), location-specific advantages (L-advantages), and internalization-specific advantages (I-advantages) (Hermannsdottir 2008; Dunning 1988). FDI gravity analysis often focuses on the location-specific advantages of the target and host country.

As Faeth (2009) puts it: *"Empirical studies testing the OLI framework have found FDI to be determined by a combination of ownership advantages, market size and characteristics, factor costs transport costs, protection and other factors including regime type, infrastructure, property rights and industrial disputes."*

In an early study of the empirical literature regarding FDI determinants, Blonigen (2005) identifies exchange rate effects, taxes, institutions, trade protection and trade effects as main determinants of FDI. He also points out the difficulty in developing a general equilibrium model for FDI, since FDI patterns appear to be more complex than trade patterns, since there seems to be two general motivations for FDI: horizontal FDI, which aims to access markets in the face of trade frictions and vertical FDI which is to access low wages for part of the production process. Building on these, in papers by Carr et al. (2001) as well as Bergstrand and Egger (2007), theoretical models have been developed that suggest additional possible factors for determining FDI patterns. As Blonigen and Piger (2014) point out, standard gravity variables capture horizontal FDI patterns, but for explaining vertical FDI patterns these additional control variables are needed (see e.g. Baltagi et al. (2007)).

Both Blonigen and Piger (2014) as well as Eicher et al. (2012) study robust determinants of FDI. Key gravity variables according to Blonigen and Piger (2014) are real GDP, distance, a common language and colonial relationships, trade openness of the host country, customs union, regional trade agreements as well as endowment differences across host and source countries. Eicher et al. (2012) find that a lack of corruption, ethnic tension, as well as the corporate tax rate are additional robust determinants of FDI flows. The authors also study robust determinants for only OECD countries. Here they find that for OECD country-pairs a common language, membership of EFTA, and military influence in governance lose relevance as determinants, whereas higher levels of development, government instability, financial risk, and bureaucratic efficiency gain in relevance. Key gravity equation parameters are not affected and remain robust determinants (Eicher et al. 2012).

2.2.3 Hypotheses

As previously stated, we will follow the sand the wheels arguments in that corruption is seen to be detrimental to FDI. Therefore, the main hypothesis of this paper is as follows:

1) Corruption has a significant and negative effect on FDI flows.

We will employ multiple methods to try to capture these corruption effects. Therefore, the main hypothesis has to be specified and adjusted accordingly:

A. The higher the corruption levels are, the smaller the FDI flows. Corruption levels will be measured by the Control of Corruption (COC) Index of the World Bank´s Worldwide Governance Indicators. This index is used over the corruption index of Transparency International (TI) because the TI index is only comparable over time from 2011 onwards (Transparency International 2012).

B. The higher the difference between corruption levels (see e.g. Qian and Sandoval-Hernandez (2016)) or Habib and Zurawicki (2002)) of the target and origin country, the smaller the overall FDI flows for this country-pair.

As regards B., one may argue that a similar level of corruption in the host country and the home country represents a similarity in the respective economic systems which, in turn, reduces investors' information costs abroad and therefore a similar level of corruption should stimulate FDI flows.

According to Kaufmann et al. (2010) the COC index is: *"capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests."*

The index ranges from -2.5 to 2.5 with 2.5 meaning no perceived corruption at all and -2.5 being the highest amount of perceived corruption. As this is unintuitive, the index will be rescaled to that it ranges from 0 to 5 with 0 being the lowest corruption levels and 5 being the highest. One can also note that the COC Index does not have values for the years 1997, 1999, and 2001. We approximate these values by using the average of the years before and after.

The revelation of the Panama Papers scandal as an event of increasing overall corruption and also an increased overall perception of corruption will be used to study the effects of such an event on FDI. This leads to the following hypothesis:

C. The reveal of the Panama Papers is expected to have a negative effect thereby decreasing overall FDI flows.

Finally, the implementation into law of the OECD Anti-Bribery Convention as a way of researching the effect of an anti-corruption measures will be analyzed: According to the OECD, “The OECD Anti-Bribery Convention establishes legally binding standards to criminalize bribery of foreign public officials in international business transactions and provides for a host of related measures that make this effective” (OECD 2020).

Thus, the OECD Anti-Bribery Convention – if implemented - is regarded as a corruption reducing action as it makes bribery, a significant element of corrupt behavior, punishable by law thereby increasing the ramifications for those caught engaging in such corrupt behavior (see Blundell-Wignall and Roulet (2017) for extensive research regarding the effects of the OECD Anti Bribery Convention):

D. The implementation into law of the OECD Anti-Bribery Convention in the target country, as a corruption reducing event, will have a positive effect on FDI inflows.

2.3 Methodology

2.3.1 The Gravity Model

The first time the concept of a gravity model appeared in economics was in 1889 when Ravenstein used it to model migration patterns in the United Kingdom. Then, in 1962 Tinbergen used it the first time to model trade flows and in its most basic form it can be written as follows:

$$\log X_{ij} = c + b_1 \log GDP_i + b_2 \log GDP_j + b_3 \log(distance_{ij}) + e_i \quad (1)$$

Where X_{ij} indicates imports from country i to country j, GDP represents each country's respective GDP, the distance between them, $distance_{ij}$, is an observable proxy for trade costs, e_{ij} is the error term, c is a regression constant, and b_1 to b_3 are coefficients to be estimated. From here the reason why it is called a gravity model becomes clearer as equation (1) resembles Newton's law of gravity[7] which states that every object attracts every other object in the universe with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers. In economic terms the force becomes exports, the mass becomes GDP and the squared distance becomes distance. In other words, bigger countries trade more and countries that are further apart from each other trade less (Shepherd 2016).

The next step in the evolution of the gravity model occurred when Anderson and van Wincoop published their famous 'gravity with gravitas' paper in 2003. Essentially, this model is a demand function where consumers have 'love of variety' preferences meaning that their utility increases both from consuming a wider range of varieties or from consuming more of a given product variety (Shepherd 2016). Anderson and van Wincoop's theoretical results show that bilateral trade is determined by so-called multilateral trade-resistance terms, in other words, bilateral trade is determined by relative trade costs. This means that exports from country j to country i depend on all export markets and that imports from country i to country j depend on trade costs across all possible suppliers. To give an example, Belgium and the Netherlands, which are bordered by two large trading economies, namely France and Germany, and by each other, will trade less between themselves than if they were

[7] $F = G\frac{m_1 * m_2}{r^2}$, where m = mass, r = distance, and G = gravitational constant

surrounded by vast mountains or by oceans. This leads to the theoretically-funded gravity equation:

$$X_{ij} = \frac{Y_i Y_j}{Y} * \left(\frac{t_{ij}}{\Pi_i \mathrm{P}_j} \right)^{1-\sigma} \quad (2)$$

where Y represents world GDP, Y_i and Y_j the GDP of country i and j respectively, t_{ij} represents the cost in j of importing the good from i, $\sigma > 1$ denotes the elasticity of substitution and Π_i and P_j denote country i's outward and country j's inward multilateral resistance terms (Bacchetta et al. 2012).

In log-linearized form, one thus gets the following equation (3):

$$\ln X_{ij} = c + b_1 \ln Y_i + b_2 \ln Y_j + (1-\sigma) \ln \tau_{ij} + b_3 \ln \Pi_i + b_4 \ln \mathrm{P}_j + e_{ij} \quad (3)$$

The difficulty with equation (3) is that the multilateral resistance terms are not directly observable. To solve this problem a commonly used option is the use of country fixed-effects for importers and exporters (Bacchetta et al. 2012).

The next step in the evolution of the gravity model came from Larch et al. (2017). In their paper, the authors laid the theoretical foundation for the use of the gravity model not just for trade analysis but also for FDI analysis. The authors get the following FDI gravity system for the steady-state with (4) being the function for the FDI stock and (5) and (6) representing multilateral resistance terms. The detailed derivation of this system can be found in Larch et al. (2017).

$$FDI_{ij}^{stock,value} = \frac{\beta\phi^2\eta_i^2\delta_M}{1-\beta+\beta\delta_M}\omega_{ij}^{\xi}\frac{E_i}{P_i}\frac{Y_j}{M_i} \quad (4)$$

$$P_i = \left[\sum_{j=1}^{N}\left(\frac{t_{ji}}{\Pi_j}\right)^{1-\sigma}\frac{Y_j}{Y}\right]^{\frac{1}{1-\sigma}} \quad (5)$$

$$\Pi_j = \left[\sum_{i=1}^{N}\left(\frac{t_{ji}}{P_i}\right)^{1-\sigma}\frac{E_i}{Y}\right]^{\frac{1}{1-\sigma}} \quad (6)$$

(4), (5) and (6) from Larch et al. (2017)

E_i = the size of the country of origin

Y_j = the size of host country

W_{ijt} = FDI barriers

P_i = inward multilateral resistance terms

Π_j = outward multilateral resistance terms

Equation (5) and (6) represent the inward and outward multilateral resistance terms for FDI, respectively (the phrase multilateral resistance terms come from Anderson and van Wincoop in their 2003 paper; also used in equation (2) but with a different definition). Our main interest lies with equation (4) as it reveals several interesting relationships. Firstly, it shows that FDI is directly linked to the size of the country of origin, as measured by expenditure E_i. Secondly, it shows the positive connection between FDI and the size of the host country, measured by nominal output Y_j (this fits with the intuitive gravity model whereby the "mass" of the countries is a significant influence on the "attractive force"). Thirdly, ω_{ij} captures FDI barriers and thereby reveals the negative relationship between FDI and said FDI barriers. Additionally, equation (4) shows the link between FDI and trade via the multilateral resistance terms (MRTs). In detail, higher inward MRTs of the origin country should lead to less FDI abroad in general and at the destination country in particular. Interestingly, there is no outward multilateral resistance term in equation (4). Larch et al. (2017) justify this with the fact that technology capital is non-rival, i.e. in contrast to goods that are sold from i to j and then cannot be used elsewhere, the technology of country i that

is used in country j can also be used elsewhere. And lastly, this equation also shows that the value of the FDI stock of country i in country j depends negatively on the amount of technology capital in country i (Larch et al. 2017).

Conveniently, this FDI gravity system can be estimated empirically using the standard fixed effects techniques of the trade gravity literature (Larch et al. 2017). To transform equation (4) into an econometric equation, the authors propose to first model the FDI frictions $\omega_{ij,t}$. To this end, they suggest decomposing the frictions into four categories:

1) Characteristics of the source country, such as corporate tax rate, corruption, red tape, etc.
2) Characteristics of the host country, such as corruption, corporate tax rate, internal tensions, etc.
3) Time-invariant bilateral characteristics for the two partners, such as distance, common official language, colonial relationships, etc.
4) Time-varying bilateral determinants of FDI, such as regional trade agreements, customs union, etc.

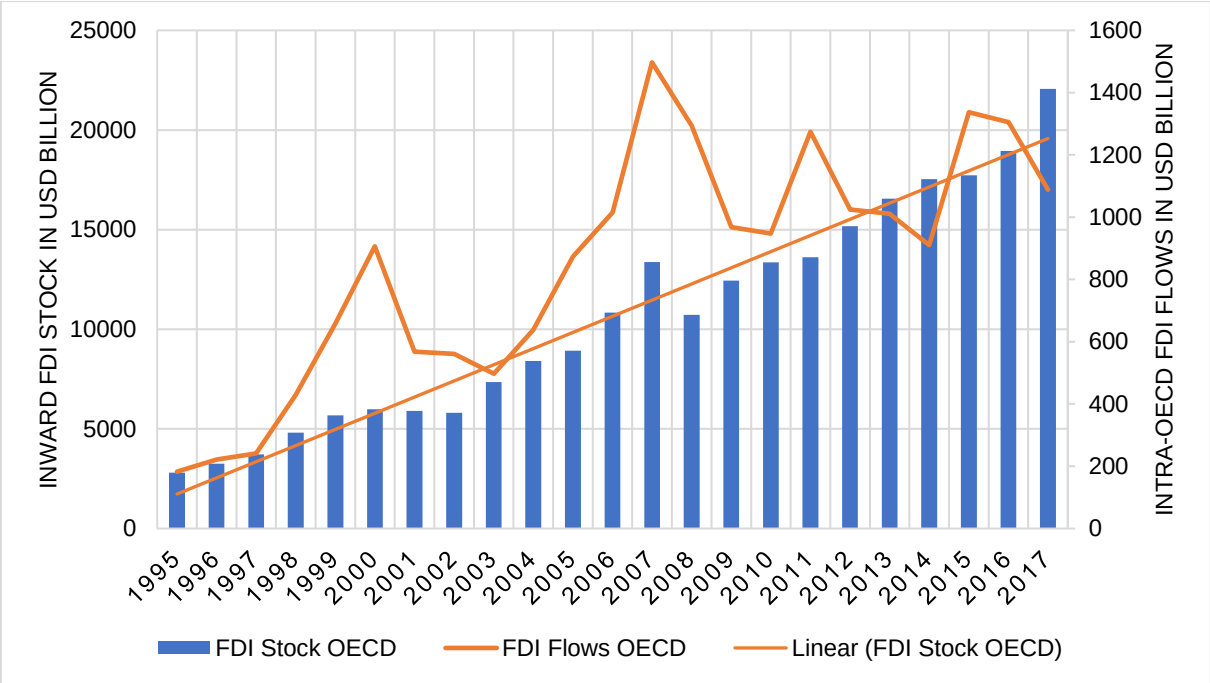
These determinants are based on the studies of Blonigen and Piger (2014) and Eicher et al. (2012), which have been discussed in a previous chapter. It is worth noting that for a dataset with only OECD countries, different determinants are relevant, e.g. EFTA membership loses its relevance when looking at only OECD countries. This is due to very little variation in these variables across OECD countries (Eicher et al. 2012). Therefore, we only use the Eurozone as a time-varying bilateral determinant of FDI (point 4).

In sum, the gravity model of trade has been proven to be a useful tool in analyzing international trade. Larch et al. (2017) also showed that it can be used to analyze FDI flows. Recent studies (see, e.g., Bruno et al. (2016), Blundell-Wignall and Roulet (2017), and Baier (2020)) have successfully used the gravity model to explain foreign investment flows and for this and the reasons above, it is used in this paper as well.

2.3.2 Data and Control Variables

In this study, bilateral FDI flow data from the OECD is used for the years 1996 to 2017. The bilateral data is available from 1985 but, due to data limitation, mainly resulting from the COC Index only starting in 1996, the timespan for the dataset is shortened.

Figure 2.1: FDI Developments in the OECD, from 1995 – 2017



Source: OECD.Stat (https://stats.oecd.org/, 04.09.2020) and own calculations

Figure 2.1 shows the development of the total OECD inward FDI stock in billions of US Dollars and the total yearly FDI flows in billions of US Dollars. In 1995, the total FDI Stock is roughly at about $4 trillion whereas in 2018 it is almost at $22 trillion. That is more than a five-fold increase over 23 years. Total intra-OECD FDI flows follow a similar trend but are of course more volatile than the stock. In 1995, there were roughly $200 billion in FDI flows increasing to roughly $1.1 trillion in 2017. Needless to say, that FDI does indeed play a very big role in OECD economies. The figure also shows a very clear, linear, upward trend for both stock and flows. This is in line with the trend mentioned in the introduction of FDI flows increasing worldwide from $330 billion in 1995 to $1.43 trillion in 2017 (United Nations 2018).

The OECD has a total of 36 member countries. This when combined with the timespan of 22 years results in a total possible number of 27,720 observations. Due to missing values, this number drops to 15,408. Table 2.1 shows the summary statistics concerning the dependent as well as the independent variables.

Table 2.1: Summary Statistics with Mean, Standard Deviation (sd), Minimum and Maximum value

	count	mean	sd	Min	max
inflow	15408	1152.338	5341.779	0	172740
ln_target_gdp	15408	12.89243	1.585268	8.935393	16.79051
ln_origin_gdpp	15408	12.92831	1.583329	8.645722	16.79051
ln_pop_target	15408	2.726963	1.54765	-1.305157	5.784278
ln_pop_origin	15408	2.673425	1.527832	-1.305157	5.784278
ln_agglo_l1	15408	11.67986	1.527454	5.295098	15.70052
ln_patents_target	15408	7.546825	2.248416	2.70805	12.85892
ln_patents_origin	15408	7.607631	2.176204	2.564949	12.85892
target_tax	15408	27.81796	7.492964	9	56.8
origin_tax	15408	28.10505	7.260312	9	56.8
openness	15408	0.8679761	0.4753944	0.1865374	3.166917
ea_dummy	15408	0.1516745	0.3587167	0	1
coc_l1_target	15408	1.221463	0.8031797	0.030009	3.021816
coc_l1_origin	15408	1.126718	0.7776764	0.030009	3.265936
panama_event	15408	0.1102025	0.3131521	0	1
oecd_ab_target	15408	0.9000519	0.2999405	0	1
coc_diff_l1	15408	0.9062835	0.6617513	0.0003068	3.041567

Source: Own calculations

The control variables used are based on the previous studies by Faeth (2009), Blonigen and Piger (2014) as well as Eicher, Helfman, and Lenkoski (2012). The reason for not using GDP per capita but instead using the total population is because GDP per capita and the corruption variables show a very high correlation[8]. Therefore, to avoid potential multicollinearity issues, GDP per capita is not used in this analysis. In the Appendix, there are two models, based on model (4) and (8), that use GDP per capita as a form of robustness check. The effect on the estimated value of the COC variable is, however, fairly small. Table 2.2 shows the correlation of the dependent variable inflow and the independent variables.

Table 2.2: Correlation Table of the Dependent and the Independent Variables

	inflow
inflow	1
ln_target_gdp	0.174***
ln_origin_gdp	0.155***
ln_pop_target	0.114***
ln_pop_origin	0.0956***
ln_agglo_l1	0.226***
ln_patents_target	0.132***
ln_patents_origin	0.126***
target_tax	0.115***
origin_tax	0.0941***
openness	0.0218**
ea_dummy	0.0445***
coc_l1_target	-0.0830***
coc_l1_origin	-0.0990***
panama_event	0.0163*
oecd_ab_target	0.0371***
coc_diff_l1	-0.120***

* p<0.05, ** p<0.01, *** p<0.001"

Source: Own calculations, full table in appendix.

[8] For target country > -0.7 for the host country ~ -0.7

Every independent variable is significantly correlated with the dependent variable without having a high correlation, introducing potential issues of multicollinearity.

Table 2.3 provides an overview of the dependent and independent variables that will be used.

Table 2.3:Description of Dependent and Independent Variables

Variable	Definition	Source
Inflow	*Bilateral FDI intra-OECD flows*	*OECD FDI database; BMD3 data 1985-2012, BMD4 data 2013-2017*
ln_target_gdp	GDP of FDI Target Country, in current USD	World Bank
ln_origin_gdp	GDP of FDI Origin Country, in current USD	World Bank
ln_pop_target	Total Population of the Target Country, in millions	OECD
ln_pop_origin	Total Population of the Origin Country, in millions	OECD
openness	Total import plus total export of FDI target country, divided by its GDP	World Bank
target_tax	General FDI target country corporate tax rates, including average/typical local taxes	Mintz/Weichenrieder (2010); KPMG (2020)
origin_tax	General FDI origin country corporate tax rates, including average/typical local taxes	Mintz/Weichenrieder (2010); KPMG (2020)
ln_patents_target	Patent applications by residents of the target country	World Bank
ln_patents_origin	Patent applications by residents of the origin country	World Bank
ln_agglo_l1	Agglomeration effects (inward FDI stock) in the	OECD

	target country lagged by 1 year	
ea_dummy	Dummy variable that takes the value 1 if both countries are part of the eurozone	European Commission
coc_l1_target	The level of corruption in the target country, lagged by 1 year. Rescaled to 0 – 5 (5 being maximum corruption)	World Bank WGI Project by Kaufmann, Kray and Mastruzzi
coc_l1_origin	The level of corruption in the origin country, lagged by 1 year. Rescaled to 0 – 5 (5 being maximum corruption)	World Bank WGI Project by Kaufmann, Kray and Mastruzzi
Coc_diff_l1	Difference between host and source country level of corruption	World Bank WGI Project by Kaufmann, Kray and Mastruzzi
panama_event	Event dummy that takes the value 1 when the Panama Papers were revealed (2016)	
oecd_ab_target	Dummy variable for the target country, that takes the value 1, once the OECD Anti Bribery Convention was implemented into law	OECD

The effects that are to be expected for these control variables based on the theoretical and empirical literature previously discussed, are as follows:

1) Market size, measured by GDP and the population, has a positive and significant effect on FDI flows.
2) Corporate taxes have a negative impact on FDI flows**.**
3) Trade openness, representing a measure for the ease of trade, will have a positive effect on FDI flows. In other words, a country open for trade will attract more FDI flows.
4) Agglomeration effects are significant and positive contributors to FDI flows, meaning that countries with an already high FDI stock will attract more FDI flows than countries with a smaller FDI stock.
5) The innovative capacity of an economy is expected to have a positive effect on FDI flows. The number of patent applications in a country is used to measure this.
6) Eurozone dummy: it is expected that when both countries are in the Eurozone they have more FDI flows (see e.g. Huiyan Zhang (2004) for an early study on the effects of the European Monetary System on intra-EU FDI; for another related study, but with an EU dummy instead of Eurozone dummy, see Bruno et al. (2016))

Combining theory, the variables of interest and control variables then results in the following specification of the gravity model:

$$FDIflows_{odt} = c + b_1 \ln X_{ot} + b_2 X_{dt} + b_3 X_{o(t-1)} + b_4 X_{d(t-1)} + \delta_{od} + \tau_t + \varepsilon_{odt} \quad (7)$$

- c = regression constant
- X_{ot} = origin country time variant characteristics
- $X_{o(t-1)}$ = lagged origin country time variant characteristics
- X_{dt} = destination/target country time variant characteristics
- $X_{d(t-1)}$ = lagged destination/target country time variant characteristics
- δ_{od} = time invariant dyadic fixed effects
- τ_t = time fixed effects
- ε_{odt} = error term

Lastly, several statistical challenges have to be addressed.

- Zero values in the data: 5,865 of 15,408 observations (thus, circa 38% of observations are zeroes). Some of the 15,408 observations are dropped in the later analysis to ensure the existence of estimates.
- Heteroskedasticity: Breusch Pagan / Cook Weisberg testing reveals the presence of heteroskedasticity.
- Endogeneity: to avoid potential endogeneity problems regarding the dependent variable the corruption variables, corruption variables are lagged by 1 year.
- Missing values are dealt with by listwise deletion.
- Negative values are set to zero.
- Stationarity is not an issue here as our N (15,408) is much larger than our T (21).

The solution to the statistical challenges presented here is the Poisson Pseudo Maximum Likelihood estimator (PPML) by Santos Silva and Tenreyro (2006).

2.3.3 Estimation Method

There are many ways to estimate the gravity model. For a detailed discussion see Kareem et al. (2016). For the analysis, we will use the Poisson Pseudo-Maximum Likelihood (PPML) estimator Santos Silva and Tenreyro (2006). The PPML estimator is an analysis often-used estimator in modern trade and FDI gravity analysis due to its superior performance over the OLS estimator. Shepherd (2016) points out that in the case of a multiplicative error term in the theoretical gravity model, log-linearization in the presence of a heteroscedastic error term violates the first OLS assumptions and leads to inconsistent estimates. Santos Silva and Tenreyro (2006) provide a solution to this problem. They show that that the PPML estimator is robust to different patterns of heteroskedasticity and produces consistent estimates of the non-linear model. Basically, PPML estimates the gravity equation in levels instead of taking logarithms (Kareem et al. 2016).

For FDI analysis, the OLS estimator has been the most used estimator (Larch et al. 2017). When using OLS, standard procedure would be either to delete zero trade flows or one would simply give zero values the place holder value of $1 (in comparison to the usual millions of dollars of FDI flows, an insignificant value) as the OLS model is estimated using the logarithm of the FDI flows and the logarithm of 0 is not defined. Of course, deletion as well as assigning a nominal $1 value introduces some bias into the dataset (Welfens and

Baier 2018). However, more recently PPML has seen increased usage. Biro et al. (2019) decided to test the performance of PPML vs OLS with regards to FDI. They find that the PPML estimator gives a better fit to the data, yielding unbiased, consistent, and efficient results when compared to the OLS estimator.

Shepherd (2016) points out several advantages of the PPML estimator. Firstly, the PPML estimator includes observations for which the observed value is zero. Secondly, it is consistent in the presence of fixed effects. And thirdly, like Kareem et al. (2016) mention, the PPML estimator takes account of observed heterogeneity.

As the analysis uses fixed effects, the dataset has a large number of zeroes and we observe heteroskedasticity (Breusch pagan / Cook Weisberg test), the logical conclusion is to use the PPML estimator as it is best equipped to deal with these issues and is proven to be consistent and performs better when compared to OLS. These findings in combination with the arguments by Shepherd (2016) and Kareem et al. (2016) as well the use of PPML in recent studies (e.g. Biro et al. (2019) and Baier (2020)) is enough evidence for us to use the PPML estimator as our main estimation method (OLS estimation will be used for robustness checks).

2.4 Results

As mentioned in previous chapters, the models will be estimated using the PPML estimator as well as country pair and time fixed effects. Two different ways of using the COC Index were implemented for this analysis, the first one is to simply use the value of the index for the target and source country lagged by 1 year to avoid possible endogeneity. The second way is to use the difference in corruption levels of the target and source country, also lagged by 1 year for the same reasons. In models (1) to (4), the COC Index will be used, in models (5) to (8) the difference in corruption index will be used. The event variable for the Panama Papers scandal, panama_event, will be introduced in models (2) and (4) for the COC analysis, and models (6) and (8) for the corruption difference analysis. The OECD Anti-Bribery Convention dummy, OECD_ab, will be introduced in models (3) and (4), as well as (7) and (8). Model (1) is the baseline model with the usual gravity variables and the COC measure. Model (2) then introduces the Panama Papers event dummy. In model (3) the Panama event dummy is switched for the OECD Anti-Bribery event dummy. Then in model (4), both dummy variables are added. Models (5) to (8) follow the same logical structure only that here, the corruption measure is the corruption distance.

Table 2.4: PPML Estimation with COC Variable

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
ln_target_gdp	**1.082*** **	**1.082*** **	**1.032*** **	**1.032*** **
	(0.352)	(0.352)	(0.354)	(0.354)
ln_origin_gdp	0.322	0.322	0.318	0.318
	(0.342)	(0.342)	(0.344)	(0.344)
ln_pop_target	**3.921** **	**3.921** **	**4.119** **	**4.119** **
	(1.883)	(1.883)	(1.918)	(1.918)
ln_pop_origin	1.889	1.889	1.883	1.883
	(1.753)	(1.753)	(1.751)	(1.751)
ln_agglo_l1	**0.233***	**0.233***	0.208	0.208
	(0.128)	(0.128)	(0.131)	(0.131)
ln_patents_target	0.216	0.216	0.215	0.215
	(0.139)	(0.139)	(0.141)	(0.141)
ln_patents_origin	0.0231	0.0231	0.0215	0.0215
	(0.124)	(0.124)	(0.124)	(0.124)
target_tax	-0.0056	-0.0056	-0.004	-0.004
	(0.0100)	(0.0100)	(0.0098)	(0.0098)
origin_tax	0.0003	0.0003	0.0003	0.0003
	(0.0105)	(0.0105)	(0.0104)	(0.0104)
openness	**2.035*** **	**2.035*** **	**1.970*** **	**1.970*** **
	(0.375)	(0.375)	(0.369)	(0.369)
ea_dummy	**0.273** **	**0.273** **	**0.234** **	**0.234** **
	(0.120)	(0.120)	(0.119)	(0.119)
coc_l1_target	***0.511*** **	***0.511*** **	***0.489*** **	***0.489*** **
	(0.201)	*(0.201)*	*(0.204)*	*(0.204)*
coc_l1_origin	***-0.542*** **	***-0.542*** **	***-0.544*** **	***-0.544*** **
	(0.258)	*(0.258)*	*(0.258)*	*(0.258)*
panama_event		***-0.439*** *		***-0.435*** *
		(0.226)		*(0.226)*
oecd_ab_target			*0.305*	*0.305*
			(0.195)	*(0.195)*
Observations	14,626	14,626	14,626	14,626
R-squared	0.562	0.562	0.562	0.562

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

NOTE: All models are estimated using dyadic and time fixed effects. They have been omitted for brevity. Corruption variables in italic, statistically significant variables in bold.

Table 2.4 shows the result of the PPML estimation with dyadic and time fixed effects. Models (1) – (4) employ the COC index as the corruption measure. The standard gravity variables are significant and have the expected sign, thereby validating our model. Specifically, the GDP of the target country (1% significance level) and the population (5% significance level in model (1) and (2), 10% significance level in models (3) and (4)), as well as agglomeration effects (10% significance in models (1) and (2)) and trade openness[9] (1% significance level), show statistical significance and the expected positive sign. Surprisingly, the results for the tax rates of the target country as well as the country of origin show no significance. The patent variable is also not significantly different from zero in any of the models. The dummy for the Eurozone, on the other hand, shows significance at the 5% level in all four estimated models. It also has the expected positive sign, indicating that when both countries are part of the Eurozone, FDI flows between them increases[10]. Moving on to our variables of interest, the corruption variables, both COC variables for the target and origin country are significant at the 5% level in all four models, the Panama event dummy is also significant (10% level) in the models it was estimated (i.e. models (2) and (4)). The OECD Anti-Bribery dummy is not significant. The COC variables have interesting signs, deviating from our expectations. It seems that for target countries of FDI, the COC is positively correlated (semi-elasticities between 0.67% and 0.63%), whereas for host countries it is negatively correlated (semi-elasticities of -0.42%). The Panama event dummy has the expected negative sign and a semi-elasticity of -36% on FDI flows between country pairs.

[9] Semi elasticities between 6.1% and 6.7%
[10] Semi elasticities between 26% and 31%

Table 2.5: PPML Estimation with Corruption Difference Variable

VARIABLES	(5) Model 5	(6) Model 6	(7) Model 7	(8) Model 8
ln_target_gdp	**0.897*** **	**0.897*** **	**0.852*** **	**0.852*** **
	(0.328)	(0.328)	(0.329)	(0.329)
ln_origin_gdp	0.421	0.421	0.416	0.416
	(0.372)	(0.372)	(0.374)	(0.374)
ln_pop_target	**3.555***	**3.555***	**3.777** **	**3.777** **
	(1.879)	(1.879)	(1.911)	(1.911)
ln_pop_origin	1.405	1.405	1.397	1.397
	(1.779)	(1.779)	(1.776)	(1.776)
ln_agglo_l1	**0.224***	**0.224***	0.197	0.197
	(0.130)	(0.130)	(0.134)	(0.134)
ln_patents_target	0.157	0.157	0.158	0.158
	(0.141)	(0.141)	(0.142)	(0.142)
ln_patents_origin	0.0911	0.0911	0.0903	0.0903
	(0.125)	(0.125)	(0.125)	(0.125)
target_tax	-0.0001	-0.0001	0.0014	0.0014
	(0.0108)	(0.0108)	(0.0105)	(0.0105)
origin_tax	-0.0021	-0.0021	-0.0021	-0.0021
	(0.0110)	(0.0110)	(0.0108)	(0.0108)
openness	**1.847*** **	**1.847*** **	**1.786*** **	**1.786*** **
	(0.370)	(0.370)	(0.363)	(0.363)
ea_dummy	**0.259** **	**0.259** **	**0.217***	**0.217***
	(0.128)	(0.128)	(0.127)	(0.127)
coc_diff_l1	*0.233*	*0.233*	*0.227*	*0.227*
	(0.148)	*(0.148)*	*(0.148)*	*(0.148)*
panama_event		***-0.409****		***-0.406****
		(0.227)		*(0.227)*
oecd_ab_target			***0.329****	***0.329****
			(0.193)	*(0.193)*
Observations	14,626	14,626	14,626	14,626
R-squared	0.560	0.560	0.561	0.561

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: All models are estimated using dyadic and time fixed effects. They have been omitted for brevity. Corruption variables in italic and statistically significant variables in bold.

Models (5) to (8) follow the same principle as models (1) to (4) except for the corruption variable and results are shown in Table 2.5. Here, we now use the corruption difference of the host and the target country as the corruption measure. The use of this variable produces additional findings. Our gravity variables for the target country, GDP, population (significance level of 10% for models (5) and (6), 5% for models (7) and (8)), openness, agglomeration effects and the eurozone dummy (5% significance level in models (5) and (6), 10% significance level in models (7) and (8)) remain roughly the same[11] (openness coefficient slightly less). The same when it comes to the coefficients of these variables. The newly introduced corruption distance variable shows no significance in any of the models, the Panama event dummy remains statistically significant at the 10% level and negative (roughly the same coefficient as well). In models (7) and (8), we introduce the OECD Anti-Bribery dummy and here it is significant at the 10% level. The coefficient is positive (semi elasticity of 39%) indicating a positive effect on FDI inflows for the target country, once the OECD Anti Bribery Convention was implemented into law. One will not necessarily expect the impact of a lagged variable here since political debate will have an early signaling effect on investors – prior to legal changes being fully implemented.

2.4.1 Empirical Findings

As regards the first hypothesis A, that higher corruption levels result in lower FDI flows, has two results and key results, respectively. The analysis shows that the effect of corruption here is different for source and target countries of FDI. For target countries, a positive correlation was found in models (1) to (4) (semi-elasticities between 0.63% and 0.67% dependent on model specification) whereas for the source country a negative correlation (semi-elasticities of -0.42%) was found. The results are therefore ambiguous and hypothesis A cannot be corroborated – the finding that corruption in target countries shows a positive correlation could be interpreted as follows: corruption-inclination in target countries effectively allows to reduce foreign investors' risk premium because corruption can be used to influence the bureaucracy and investor-related regulations in a favorable way; note that one cannot rule out that a more FDI friendly "effective business climate" also stimulates more investment and higher R&D expenditure ratios by domestic firms in the respective home countries which, in turn, will stimulate more FDI inflows from abroad. Hence a direct and indirect FDI link could be relevant – only further research could shed more light on these two channels.

[11] Changes in significance levels compared to models (1) to (4) in brackets.

The finding that source countries' corruption levels have a negative effect on FDI could potentially point to the problem that corruption is associated with the risk of an ad-hoc intervention of government and bureaucratic agencies vis-à-vis all or most multinational companies which therefore will aim to reduce overall investor risk – and this could include reduced R&D expenditures on the part of firms: with a lower R&D expenditure ratio the ability of firms to generate a critical minimum level of owner-specific technological advantage could be restricted and the consequence is a reduction of FDI.

For hypothesis B there is no evidence since we do not get statistically significant results thereby are not able to state with confidence that the point estimate for the corruption distance is different from zero.

The results for hypothesis C on the other hand are clear. In all models where the panama event dummy was used (Models (2), (4), (6) and (8)) we find a statistically significant and negative effect (semi-elasticities between, -33% and -36%). This strong evidence leads to the adoption of hypothesis C that the revelation of the Panama Papers scandal as a global corruption increasing event leads to fewer FDI flows. This supports the sand the wheels hypothesis, that in general, corruption is seen as a negative and business harming process.

Hypothesis D, regarding the OECD Anti Bribery Convention, is again not so clear. In the specification with the COC, the results show no statistical significance for the dummy variable, but in the models with the corruption distance, we find statistical significance. Due to these non-robust findings, hypothesis D can neither be accepted nor rejected, as it seems this effect is highly dependent on model specification. On the other hand, one could argue, that this shows weak evidence again in favor of the sand the wheels hypothesis.

Regarding the effects of our control variables, most were as expected. GDP and the population of the target country are statistically significant and positively correlated in FDI inflows, confirming the theory, that market size is an attractor of FDI. In models without the OECD anti-bribery dummy, agglomeration effects are also statistically significant and positively correlated, showing some evidence that, target countries with higher FDI stocks attract more FDI.

The trade openness of the target country is statistically significant in all models and shows the expected positive sign. This is again in line with theoretical expectations that, countries with higher trade openness attract more FDI. This is especially the case with regards to vertical FDI, which is the main type of FDI within the OECD.

The dummy for the Eurozone is also statistically significant and positively correlated with FDI flows in all models, indicating that when both countries are members of the Eurozone,

they engage in more bilateral FDI with each other. Finally, our results show no significance when it comes to the variables for patents and corporate tax. Therefore, no clear statement can be made for these variables.

2.4.2 Robustness Checks

Robustness checks are done using GDP per capita instead of population. Although this might introduce some problems concerning multicollinearity the results stay robust. Estimated were models (4) and (8). Our variables of interest stay roughly the same and are also significant. We also estimated model (4) using GDP per capita and OLS but the results are questionable (with an r-squared of circa 34% even with dyadic fixed effects). We do, however, find significance for our corruption variables (except COC of the host country) and the signs are also the same. One has to keep in mind, however, that we are estimating in the presence of heteroskedasticity and fixed effects. All these estimations can be found in the appendix.

2.5 Policy Conclusions and Further Research

This analysis set out to answer the question of whether corruption matters for FDI flows in OECD economies or if subtle differences are not enough, and, if it matters, in which way does it matter. We began by discussing the theoretical foundation underlying corruption research, namely the two differing views of the grease the wheels and the sand the wheels hypotheses. We presented arguments for both sides and presented the relevant empirical literature and its findings. Here, we discovered that in the empirical literature too, the ambiguity of the theoretical arguments can be found. Evidence was presented for both theoretical views. In the next step, the FDI literature was shortly discussed and robust determinants for FDI were identified (based on Faeth (2009), Blonigen and Piger (2014) as well as Eicher et al. (2012)). After stating the hypotheses based on the sand the wheels view, the gravity model was discussed and the theoretical foundation supporting the use of the gravity model (Larch et al. 2017) in FDI research. A description of the data, the control variables, and the estimation method followed and resulted in a specification of the model. Subsequently, the results were presented. We find evidence that corruption does have complex effects on FDI flows. For target countries of FDI, corruption seems to be positively correlated, whereas for source countries of FDI, we find a negative correlation. Furthermore, one finds strong evidence that the revelation of the Panama Papers scandal resulted in an

overall drop in FDI flows. Evidence regarding the OECD Anti-Bribery convention was not as strong and only showed significance in two out of four models, but the expected positive correlation with FDI flows was shown. The concept of corruption distance showed no significance in this dataset.

Arguing that target countries should increase their perceived levels of corruption to attract more FDI goes against common sense. There are more effects of corruption than just increasing FDI inflows. An argument that can be made, however, is that target countries of FDI should focus on other projects, as their corruption levels do not seem to deter FDI. Therefore, focusing on improving infrastructure or generating a business-friendly environment (possibly through reducing corporate taxation, for evidence see Baier and Welfens (2019)) seems to be the way to move forward for these countries. It is also worth noting that FDI is usually associated with positive spill-over effects not just in the technological plane but also in the cultural plane. Therefore, assuming that FDI mainly runs from richer, less corrupt countries to poorer, more corrupt countries, one can argue that by having these FDI inflows some of the company cultures of the MNCs in less corrupt countries might merge with the company culture of the more corrupt countries. Of course, the other side to this argument is simply that in these more corrupt countries, MNCs can more easily engage in corrupt behavior with less fear of getting caught or facing the ramifications of the corruption and therefore there would be no positive cultural spillover effects.

Source countries of FDI on the other hand should indeed look for ways to reduce the corruption prevalent in their countries, as here a reduction in perceived corruption levels correlates with an increase in FDI inflows. A possible explanation for this could be that source countries are generally richer and richer countries tend to have lower corruption levels. Moreover, in these countries the ramifications for corrupt behavior are usually bigger than in corrupt countries, especially regarding media attention, be it traditional media or social media. Another reason might be stronger institutions and a stronger rule of law in these countries.

The results of the revelation of the Panama Papers scandal were very clear. This indicates that, generally, corruption is not seen as something positive for business. An increase in overall perceived corruption, especially in conjunction with an increased focus on the part of the media, society, and politics on the problem of corruption, resulted in a drop in total FDI flows. One argument could be that, the revelation of the Panama Papers scandal showed MNCs that, corrupt activities are not as secret as they might have assumed and the pressure from the public and policymakers resulted in them engaging in less FDI that

involved corrupt behavior. The argument for the other side might be that, MNCs were not aware of these widespread levels of corruption in countries with very low perceived corruption levels, resulting in MNCs adjusting their behavior and reevaluating their FDI decisions in the face of these newly uncovered events.

This study is of course not all-embracing. Some topics which can be expanded in future research are for example the country group considered. The OECD is a relatively homogenous group of mostly rich and well-developed countries. Some of the characteristics of these countries are strong institutions and relatively moderate to low corruption levels. It would certainly be of interest to see how FDI flows both into and from lesser developed countries react to corruption. Another consideration is that different measures of corruption could be used. Generally, it would be of interest for future research to use alternative corruption measures such as Transparency International's Corruption Perception Index.

There could also be special problems in sectors with international industry interdependency, e.g. sectors with a "follow the leader" investment pattern. Such a parallel FDI pattern has not been analyzed here – mainly because of a lack of available sectoral bilateral FDI stock data (and also some problems with the availability of FDI flow data). However, to the extent that the databases of the OECD and the World Bank should improve in relevant fields, future research could look into this issue.

As regards US FDI, a special role in 2018-2019 could come from specific aspects of the Trump Administration's tax reform in 2017 which has reduced incentives to keep profits made in foreign subsidiaries offshore. It is, for example, unclear whether high profits retained abroad have an impact on effective outward FDI flows of US multinational companies. These aspects could also be covered in future research.

At the bottom line, one clearly can state that the empirical analysis gives crucial new insights into FDI dynamics in the context of an augmented FDI gravity equation. Some of the standard gravity variables were confirmed and new insights into the dynamics of corruption and FDI have been developed. These insights could also be useful for policymakers eager to stimulate FDI inflows as part of a broader supply-side based strategy for overcoming the corona shocks of 2020.

Appendix A

Table 2.6: PPML Dyadic Fixed Estimation with GDP per Capita Variables

VARIABLES	(1) Model 1	(2) Model 2
ln_target_gdp	4.892***	4.364**
	(1.848)	(1.846)
ln_origin_gdp	2.506	2.123
	(1.718)	(1.781)
ln_target_gdppc	-3.831*	-3.486*
	(1.968)	(1.957)
ln_origin_gdppc	-2.224	-1.745
	(1.760)	(1.781)
ln_agglo_l1	0.208	0.197
	(0.132)	(0.135)
ln_patents_target	0.216	0.158
	(0.143)	(0.144)
ln_patents_origin	0.0151	0.0814
	(0.120)	(0.123)
target_tax	-0.0037	0.0018
	(0.0099)	(0.0106)
origin_tax	-0.0003	-0.0027
	(0.0104)	(0.0108)
openness	1.981***	1.791***
	(0.372)	(0.364)
ea_dummy	0.235**	0.218*
	(0.119)	(0.126)
coc_l1_target	0.496**	
	(0.204)	
coc_l1_origin	-0.543**	
	(0.256)	
panama_event	-0.416*	-0.390*
	(0.225)	(0.227)
oecd_ab_target	0.304	0.328*
	(0.196)	(0.194)
coc_diff_l1		0.228
		(0.148)
Constant	-55.40***	-50.53***
	(9.591)	(10.21)
Observations	14,626	14,626
R-squared	0.562	0.561

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.7: OLS Dyadic Fixed Effect Regression, Zero Flows set to 1$

VARIABLES	(1) Model 1
ln_target_gdp	19.35***
	(3.528)
ln_origin_gdp	-2.645
	(3.152)
ln_target_gdppc	-18.48***
	(3.466)
ln_origin_gdppc	6.480**
	(3.231)
ln_agglo_l1	-0.221
	(0.317)
ln_patents_target	0.682**
	(0.276)
ln_patents_origin	0.346
	(0.250)
target_tax	-0.0821***
	(0.0278)
origin_tax	-0.0521*
	(0.0287)
openness	1.400
	(0.884)
ea_dummy	-0.313
	(0.490)
coc_l1_target	1.680***
	(0.626)
coc_l1_origin	-0.581
	(0.595)
panama_event	-8.513***
	(1.255)
oecd_ab_target	1.044**
	(0.453)
Observations	15,408
R-squared	0.349

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.8: Correlation Table (1/3)

	inflow	ln_target_gdp	ln_origin_gdp	ln_target_gdppc	ln_origin_gdppc
inflow	1				
ln_target_gdp	0.174***	1			
ln_origin_gdp	0.155***	-0.00366	1		
ln_target_gdppc	0.142***	0.273***	0.0725***	1	
ln_origin_gdppc	0.141***	0.0255**	0.297***	0.133***	1
ln_pop_target	0.114***	0.901***	-0.0365***	-0.173***	-0.0337***
ln_pop_origin	0.0956***	-0.0155	0.900***	0.0145	-0.149***
ln_agglo_l1	0.226***	0.849***	0.0258**	0.399***	0.0936***
ln_patents_target	0.132***	0.899***	-0.0145	0.252***	-0.00469
ln_patents_origin	0.126***	-0.0112	0.895***	0.0173*	0.235***
target_tax	0.115***	0.558***	-0.0785***	0.127***	-0.188***
origin_tax	0.0941***	-0.0235**	0.513***	-0.138***	0.135***
openness	0.0218**	-0.528***	0.0442***	0.116***	0.0874***
ea_dummy	0.0445***	-0.0985***	-0.0955***	0.174***	0.183***
coc_l1_target	-0.0830***	-0.0581***	-0.0121	-0.724***	0.0248**
coc_l1_origin	-0.0990***	-0.00697	-0.0561***	0.0295***	-0.700***
panama_event	0.0163*	0.0137	0.0223**	0.0991***	0.0900***
oecd_ab_target	0.0371***	0.0517***	0.0491***	0.238***	0.196***
coc_diff_l1	-0.120***	-0.0626***	-0.0615***	-0.233***	-0.129***

*** p<0.01, ** p<0.05, * p<0.1

Table 2.9: Correlation Table (2/3)

	ln_pop_target	ln_pop_origin	ln_agglo_l1	ln_patents_target	ln_patents_origin
inflow					
ln_target_gdp					
ln_origin_gdp					
ln_target_gdppc					
ln_origin_gdppc					
ln_pop_target	1				
ln_pop_origin	-0.0224**	1			
ln_agglo_l1	0.689***	-0.0160*	1		
ln_patents_target	0.807***	-0.0129	0.663***	1	
ln_patents_origin	-0.0192*	0.820***	-0.0129	-0.0115	1
target_tax	0.514***	0.00475	0.314***	0.524***	-0.00365
origin_tax	0.0383***	0.469***	-0.124***	0.0110	0.522***
openness	-0.594***	0.00588	-0.169***	-0.538***	0.00151
ea_dummy	-0.180***	-0.183***	-0.0302***	-0.147***	-0.147***
coc_l1_target	0.268***	-0.0239**	-0.181***	-0.137***	-0.0193*
coc_l1_origin	-0.0205*	0.261***	0.0287***	-0.0156	-0.118***
panama_event	-0.0302***	-0.0175*	0.0939***	-0.0197*	-0.0263**
oecd_ab_target	-0.0547***	-0.0386***	0.241***	0.0216**	-0.0327***
coc_diff_l1	0.0409***	-0.00533	-0.106***	-0.0948***	-0.0890***

*** p<0.01, ** p<0.05, * p<0.1

Table 2.10: Correlation Table (3/3)

	target_tax	origin_tax	openness	ea_dummy	coc_l1_target	coc_l1_origin	panama_event	oecd_ab_target	coc_diff_l1
inflow									
ln_target_gdp									
ln_origin_gdp									
ln_target_gdppc									
ln_origin_gdppc									
ln_pop_target									
ln_pop_origin									
ln_agglo_l1									
ln_patents_target									
ln_patents_origin									
target_tax	1								
origin_tax	0.225***	1							
openness	-0.454***	-0.121***	1						
ea_dummy	-0.0628***	-0.0627***	0.137***	1					
coc_l1_target	-0.170***	-0.0544***	-0.0128	-0.0660***	1				
coc_l1_origin	-0.0508***	-0.148***	0.0403***	-0.0657***	-0.000370	1			
panama_event	-0.191***	-0.188***	0.0777***	0.0390***	0.00602	0.0405***	1		
oecd_ab_target	-0.359***	-0.312***	0.187***	0.0993***	0.0188*	0.0517***	0.117***	1	
coc_diff_l1	-0.0724***	-0.0608***	-0.0220**	-0.0565***	0.282***	0.155***	-0.0127	0.0122	1

*** p<0.01, ** p<0.05, * p<0.1

3. Shadow Economy Effects on Foreign Direct Investment Flows in OECD Countries

3.1 Introduction

Total foreign direct investment (FDI) flows in 2021 amounted to $1.65 trillion, thus showing a recovery from their exceptionally low level in 2020 due to the Covid-19 pandemic with an increase of $718 billion, with developed economies accounting for more than $500 billion, or more than three-quarters of total FDI flows (UNCTAD 2022b, 2022a). Compared to total FDI flows in 1990 of around $220 billion and it becomes obvious that FDI has grown very rapidly into a sizeable and important part of the world economy, particularly important in member countries of the Organisation for Economic Co-operation and Development (OECD), some Newly Industrialized Countries, and China. It is noteworthy that FDI is also associated with many benefits for the target economy (the recipient of the FDI flow so to say):

- FDI inflows contribute to capital accumulation (greenfield investment) and international technology transfer (via both greenfield FDI and international mergers & acquisitions (M&A)). Thus, FDI inflows can result in job creation and access to new technologies, thus promoting labor productivity and possibly also economic growth in the respective host country.
- The introduction of new technologies also encourages the enhancement of human capital and skill upgrading where both effects also in turn raise domestic real income.
- FDI can also bring advantageous spillover effects resulting from horizontal and vertical linkages in the host economy (OECD 2002).

Therefore, unsurprisingly, FDI has been and still is a popular and relevant topic in the research community (see, e.g., Zander (2021), Baier (2020), van Cuong et al. (2021), Huynh et al. (2020), Roeger and Welfens (2021)). A lot of research is done concerning the locational factors of countries that affect FDI flows using gravity models, and this paper follows this established approach.

The topic of the shadow - or underground - economy has also been a topic for quite some time in the economic literature. In the late 1970s, this topic started to first appear within a broader economic debate. Another thing observed at that time was the growth in the size

of government and rising levels of taxation and higher tax rates; higher unemployment rates also increased the incentive for certain workers to seek additional income in the shadow economy in many OECD countries in the 1970s. This, combined with more regulation, led to growing incentives for individuals and corporations to enter the shadow economic sector in order to avoid taxes and regulations. Thus, at that time, a good case could be made for the shadow economy to be a growing concern (Tanzi 1999).

The Corona (Covid-19) pandemic which induced a recession in many countries in 2020 and the following years and considering the concerns related to the Russian invasion of Ukraine in early 2022, coupled with inflationary pressure due to a global temporary shipping crisis – partly related to the Corona lockdowns in Shanghai and other Chinese ports in 2022 - and general distortions in sectoral global value chains, as well as the increasingly evident effects of climate change on the economy, has resulted in higher pressure on governments to step in and actively fight these crises. This, of course, usually means increased government spending which could, in turn, lead to an increase in taxes (Nikopour et al. 2009). Therefore, the case can be made that the incentive to avoid taxes and regulations is growing once again. This also means that it is important to research the effects of tax evasion opportunities, such as the extent of the shadow economy, empirically since the shadow economy is an important part of the overall economic system and can affect every aspect of the economy (van Cuong et al. 2021). The costs associated with the shadow economy can include labor market distortions, the suboptimal provision of public goods, revenue losses due to the under-reporting of wages and production, and the reduced provision of and access to finance (Kelmanson et al. 2019). The Corona shocks in OECD countries have been found to contribute to the growth of the shadow economy (Schneider 2022).

Therefore, it is important to explore the linkages between FDI and the shadow economy as well as other drivers of FDI. Conducting such research can provide policymakers with the necessary empirical evidence and knowledge as both FDI and the shadow economy are important aspects of a country. If the goal is to attract FDI, does the shadow economy work against achieving that goal? It may be that the size of the shadow economy is considered by foreign investors as a signal of a rather poor institutional framework or inconsistent economic policy strategies. Is it important to reduce the shadow economy to be more attractive for multinational companies (MNCs)? Or is it the case that maybe the shadow economy – with its size signaling excess labor supply - offers opportunities for MNCs and therefore acts as a factor that may indeed attract FDI? This paper provides evidence to answer these questions by researching the effects of the shadow economy on FDI inflows through the use of a gravity model. There are relatively few empirical studies when it comes to the nexus of FDI flows and the shadow economy. Thus, this paper adds to the literature

by making several contributions to the existing empirical frontier, namely by creating a new dataset for the gravity model analysis of shadow economy effects on FDI flows for OECD countries for the years 1992 to 2018, by giving new insights from state-of-the-art gravity modeling into the nexus of FDI and the shadow economy; and by including three interaction terms, which attempt to capture potential interactions between independent variables and the shadow economy.

The remainder of the chapter is structured as follows: section 3.2 provides a brief review of the theoretical literature regarding the shadow economy, and FDI as well as empirical studies regarding the nexus of the shadow economy and FDI. Section 3.3 reviews the literature regarding the gravity model as well as the data, FDI determinants, and the specification of the model. Section 3.4 presents the results and additional considerations while section 3.5 concludes with economic policy implications.

3.2 Literature Review

In this section, the relevant theoretical and empirical literature will be reviewed. The goal is to build a theoretical basis and use empirical evidence in conjunction with the theoretical literature to build hypotheses concerning the links between the shadow economy and FDI flows which can be tested in the present analysis.

3.2.1 Theoretical Literature

One of the early theories in International Economics stems from the neoclassical trade theory´s Heckscher-Ohlin model. The idea behind the theory is that countries differ in relative factor endowment which leads to international factor price differences and thus a clear specialization pattern in production and exports as well as imports. Following this logic, a capital-abundant country would specialize in capital-intensive goods production if it is highly endowed with capital (relative to labor) so that economic opening up leads to more production of the capital-intensive good and indeed also to exports of the capital-intensive goods produced; and if the capital intensity is rather low, a country will specialize in labor-intensive production and exports after economic opening up; moreover, there could also be international capital movements to a country where returns on capital are higher until factor price equalization is achieved (Faeth 2009).

The traditional theory though made little distinction between FDI and international portfolio flows. Hymer (1960) was the first to find inconsistency between this approach and FDI data.

In short, *"Hymer envisioned a world in which real (not financial) factors shape the location of multinational activity and financial flows are a mere consequence of the financial structure decisions of multinational firms."*(Antràs and Yeaple 2014).

After refinement by multiple authors (see (Antràs and Yeaple 2014) for more), the result was Dunning´s eclectic paradigm (Dunning 1977). Dunning looked more at the idea of what factors influence a firm's decision to invest abroad. He identified three broad advantages in his eclectic paradigm: Ownership (e.g., a firm's production processes), Location (e.g., market access), and Internationalization (e.g. lowering transaction costs) advantages. This became known as the OLI framework. These advantages can vary and depend on the characteristics of the country, industry, market, and the MNC itself (Faeth 2009).

Other models try to explain FDI dynamics using the concepts of horizontal FDI, vertical FDI, and the Knowledge-Capital (KC) Model. *"Vertical MNEs [Multinational Enterprises] engage in trade and seek to exploit international factor price differentials whereas horizontal MNEs seek to save trade costs by serving markets locally"* (Baltagi et al. 2007).

Based on earlier work (see (Markusen et al. 1996) and (Markusen 1997)) Carr et al. (2001) develop the so-called "Knowledge-Capital model" which combines vertical and horizontal modes of MNC entry. The authors create a 2x2x2 (two factors, two countries, two goods) model with three basic assumptions: firstly, knowledge-generating activities can be separated from production; secondly, these activities are skilled-labor-intensive, and - thirdly - knowledge-based activities have a joint-input character. The first and second assumptions lead to the motivation for vertical FDI (access low wages), whereas the third assumption delivers a motivation for horizontal FDI (access markets). This results in the horizontal firm being active in countries of a similar size and with similar relative factor endowments whereas vertical firms have an incentive to headquarter in countries with an abundance of skilled labor and have production in a country where skilled labor is relatively scarce.

Bergstrand and Egger (2007) extend the KC model into a three-factor, three-country, two-good model allowing now for physical capital as a third factor of production in addition to knowledge capital (skilled and unskilled labor). The assumption that physical capital is mobile leads to MNCs endogenously choosing *"the optimal allocation of domestic physical capital between home and foreign locations to maximize profits"* (Bergstrand and Egger 2010).

This means that their “Knowledge-and-Physical-Capital model” actually has FDI. In their 2010 paper, Bergstrand and Egger create a more general version of their 2007 model, by constructing a three-factor, three-country, three-good model thereby providing a theoretical rationale for estimating gravity equations for bilateral FDI flows (as well as bilateral final goods trade flows and bilateral intermediate goods trade flows) (Bergstrand and Egger 2010).

Regarding the definition of the shadow economy, this paper follows the definition of Medina and Schneider (2018, p. 4): *“Shadow economic activities may be defined as those economic activities and income earned that circumvent government regulation, taxation or observation. More narrowly, the shadow economy includes monetary and non-monetary transactions of a legal nature; hence all productive economic activities that would generally be taxable were they reported to the state (tax) authorities.”*

Generally, the literature on the shadow economy identifies four overarching reasons when it comes to why one would be active in the shadow economy. The first is to avoid paying taxes (e.g., income or value-added taxes), the second is to avoid paying social security contributions, the third is to avoid compliance with certain labor market standards (e.g., minimum wages, maximum working hours, workplace safety regulation), and the fourth and last is to avoid certain administrative procedures. This also means that while these activities could be part of the national accounts, they do not show up due to their illicitness (Medina and Schneider 2018; Schneider and Buehn 2018; Schneider and Williams 2013).

Based on the reasons why one would be active in the shadow economy, Schneider (2008) identifies the main causes for an increase in the shadow economy as follows:

- Increase of the Tax and Social Security Contribution Burdens
- Intensity of Regulations
- Social Transfers
- Labor Market Standards
- Public Sector Services

Another relevant topic when talking about the shadow economy is the links with corruption. Regarding corruption, there are two strands in the literature the “grease the wheels” view and the “sand the wheels” view. Proponents of the former argue that corruption can lead to second-best solutions (Bardhan 1997) and can, for example, help circumvent business-hindering government policies or a badly working government in general (see, e.g., (Leff 1964), (Bayley 1966), (Lui 1985), (Beck and Maher 1986), (Lien 1986)). Supporters of the

“sand the wheels” view, on the other hand, argue that no matter the situation, corruption is always the worst choice. For example, while bribes might at times be used to circumvent bad policies, they might also be used to do so for sound policies and a government that accepts bribes also has a considerable incentive to create legislation in order to maximize the amounts of bribes they can receive (see, e.g., (Kaufmann 1997), (Rose-Ackerman 1997), (Kaufmann and Wei 1999), (Lambsdorff 2002)).

As one can see, the effect of corruption on the official economy is in theory still somewhat unsettled, therefore the relationship between corruption and the shadow economy is not clear either. Should corruption help economic growth and wealth, this in turn should ultimately lead to a decline in corruption and also a decline in shadow economy activity. Should corruption on the other hand harm the economy, this then would ultimately lead to more corruption and more incentive to do business in the shadow economy (Schneider 2008; Schneider and Williams 2013). Although important, the main focus of this paper will be on the linkage between the shadow economy and FDI.

3.2.2 Empirical Literature

The empirical literature examining the relationship between FDI and the shadow economy is relatively limited. The following papers represent, to the best of the author's knowledge, all empirical studies examining FDI and the shadow economy.

Nikopour et al. (2009) examine the relationship between the shadow economy and FDI using Granger causality analysis. For this, they first estimate a panel and then look for causality. The authors use data for 145 countries and 5 data points (1999/2000, 2001/2002, 2002/2003, 2003/2004, 2004/2005). Using a system generalized methods of moment (GMM) estimation, they find in all specifications in their panel data model, a positive and significant effect of the shadow economy on FDI inflows. They then use Granger causality tests and find that the shadow economy Granger causes FDI inflows in all models finding support for one of their hypothesis that a higher shadow economy causes higher FDI inflows (Nikopour et al. 2009). Davidescu and Strat (2015) examine the relationship between the shadow economy and FDI for Romania using two different causality analysis methods (Granger and Toda-Yamamoto) over the period 2000-2010. Their findings reveal a short-run causality from FDI to the shadow economy. The authors argue that, due to FDI stimulating economic activity, tax reforms may be possible and lower taxes would lead to less incentive for individuals to engage in the shadow economy.

Ali and Bohara (2017) use a gravity model to explore the effects of the shadow economy on FDI inflows for 34 OECD countries from 1999 to 2007. Their results show a positive relationship between the shadow economy and FDI inflows indicating that MNCs are motivated to take advantage of the shadow economy. Huynh et al. (2020) investigate the relationship between FDI, shadow economy, and institutional quality for 19 developing Asian countries between 2002 and 2015. Focusing on their findings regarding the FDI-shadow economy nexus, the authors find that FDI has a negative impact on the size of the shadow economy. Additionally, an improvement in institutional quality from FDI increases the negative impact of FDI on the shadow economy. In the most recent study, van Cuong et al. (2021) investigate the effect of the shadow economy on FDI for 158 countries for the period from 2003-2018. Therefore, they investigate total FDI as well as greenfield investments and cross-border M&As. Their findings show no clear effect on total FDI inflows, but a positive effect on greenfield investments and a negative effect on cross-border M&As.

3.2.3 Hypotheses

Based on the theoretical and empirical literature presented in this chapter, the following hypotheses are stated here:

1) The shadow economy is expected to attract FDI, therefore a positive sign for FDI inflows can be expected.

2) The difference in the size of the shadow economy between two countries is expected to have a negative sign, as countries with similar levels of the shadow economy are expected to engage in more FDI with each other; MNCs from, for example, country 1 – with a large shadow economy – will find investing abroad in other countries with a relatively high level of shadow economic activity as representing economic conditions in a crucial field which are not very different from the conditions in the source country so that established business models can be transplanted to subsidiaries abroad in a rather easy way; moreover, international transaction costs for intra-company trade should be relatively small which would make vertical FDI particularly attractive in some sectors.

3) Inflation typically leads to government intervention, including anti-inflation measures which, following the logic of the Phillips curve, will temporarily raise unemployment rates (e.g., in the case of reduced government spending); hence inflation interacts with the shadow economy in a way that the effective labor supply from unemployed workers will increase. As inflation reduces real income in many countries with no wage indexation or weak trade unions, there is also an incentive for workers from the official economy to seek additional hours of work in the shadow economy in order to restore the previous real income growth.

4) The size of the government, proxied by government consumption as a percentage of GDP, is expected to interact with the shadow economy as a larger government can lead to a larger shadow economy (Zhanabekov 2022). Therefore, a positive sign is expected.

5) Finally, a crisis dummy for the transatlantic banking crisis (as a proxy for the Global Financial Crisis of 2007/08) is interacted with the shadow economy in that a significant international crisis affects both FDI and the shadow economy. Therefore, a positive sign is expected.

3.3 Gravity Model of FDI and Specification

The broader theoretical foundation has been discussed in section 2. Here we will focus more on the specification of the gravity model and best practices.

3.3.1 Gravity Model and Model Specification

The gravity model has a long history in science apart from the field of physics[12]. Ravenstein (1885) and Zipf (1946) were the earliest adopters of a gravity model followed by Tinbergen's (1962) adoption with regard to trade between countries[13]. The next big innovation concerning the gravity model of trade came in 2003 with the famous "gravity with gravitas" paper by Anderson and van Wincoop (2003). Building on the early intuition of the gravity model that the size of the country correlates positively with trade while the distance between countries correlates negatively with trade, Anderson and Van Wincoop introduced two new additional variables: outward and inward multilateral resistance (Benedictis and Taglioni

[12] The gravity model is based on Newton's Law of Gravity
[13] A detailed history of the gravity model can be found in Benedictis and Taglioni 2011.

2011). The former captures the fact that exports from country i to country j depend on trade costs across all possible export markets while the latter captures the dependence of imports into country i from country j on trade costs across all possible suppliers.

In the words of Shepard (2016): *"… this model picks up the fact that changes in trade cost on one bilateral route can affect trade flows on all other routes because of relative price effects."*

Based on the aforementioned "gravity with gravitas" paper, Anderson et al. (2019) derive a structural gravity system for FDI, in particular for FDI stocks. Their model includes an equation for FDI and two multilateral resistance terms (one for the origin country and one for the target country). The main properties of the system are that FDI is related to the size of the host and origin countries' respective GDPs, is inversely related to FDI barriers, it links FDI to trade via a multilateral resistance term, and lastly, there is a relationship between the FDI stock and technology capital.[14]

The resulting gravity equation looks like this:

$$FDIflows_{odt} = \alpha_0 + \alpha_1 X_{ot-1} + \alpha_2 X_{dt-1} + \alpha_3 X_{dt-1} Z_{dt} + \gamma Z_{odt} + \delta_{od} + \delta_d + \delta_d + \tau_t + \varepsilon_{odt}$$

Where

- α_0 = regression constant
- $X_{o(t-1)}$ = lagged origin country shadow economy
- $X_{d(t-1)}$ = lagged destination/target country shadow economy
- $X_{d(t-1)}Z_{dt}$ = interaction terms for the target country
- Z_{odt} = set of control variables for both origin/destination countries (set includes time-invariant characteristics of country-pairs from the CEPII database for the country fixed effects regressions)
- δ_{od}, δ_{od}, δ_{od} = time-invariant country and country-pair fixed effects[15]
- τ_t = time-fixed effects
- ε_{odt} = error term

[14] For a more detailed explanation see Anderson et al. 2019.

[15] Of course, if country-pair fixed effects are used, country fixed effects are not included and vice versa. Also, the equation for the model with shadow economic distance is not presented. For the model without interaction terms simply drop $X_{d(t-1)}Z_{dt}$

3.3.2 Estimator and Best Practices

There have been additional advances regarding FDI gravity, namely dyadic fixed-effects, and the Poisson-Pseudo-Maximum-Likelihood (PPML) estimation methods. Baldwin and Taglioni (2006) argue for the use of time-invariant pair dummies (dyadic fixed effects) when it comes to estimating gravity equations. They caution though that this means that the coefficients of interest will only be identified on their time variation, meaning that there needs to be a significant enough time variation in the policy variable one is trying to estimate (one also cannot include time-invariant parameters, e.g., distance). Egger and Pfaffermayr (2003) also advocate for using bilateral fixed effects (dyadic fixed effects) and time fixed effects (two-way model) rather than country (importer and exporter) fixed effects and time fixed effects (three-way model). Head and Ries (2008) also use dyadic fixed effects in their gravity equation for FDI.

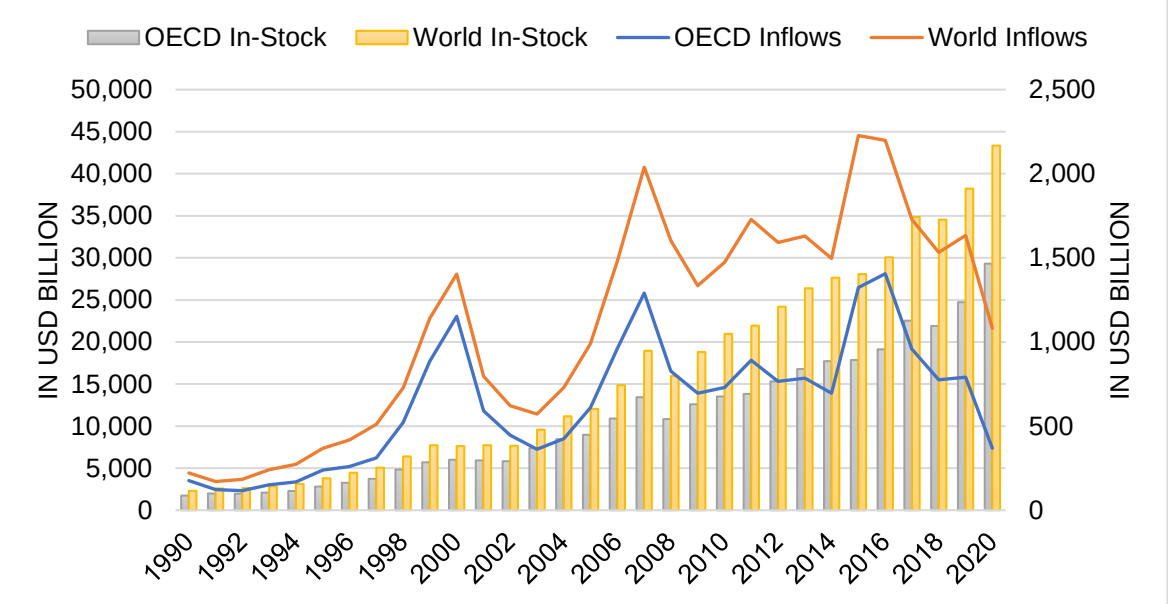
PPML is an estimator developed by Santos Silva and Tenreyro (2006) to deal with heteroskedasticity in gravity equations. It does so by estimating the equation in levels and not, as with Ordinary Least Squares (OLS) estimation, in log-linearized form, which, according to the authors, is inconsistent in the presence of heteroscedasticity. Additionally, it allows for the inclusion of zero FDI (or trade) flows and it takes account of observed heterogeneity (Santos Silva and Tenreyro (2006); Head and Mayer (2014); Kareem et al. (2016)). Based on the original paper of Correia et al. (2019) the STATA command “ppmlhdfe” allows for a fast estimation of Poisson models with multiple high-dimensional fixed effects (HDFE). As Santos Silva and Tenreyro (2022) put it in their “The Log of Gravity at 15” paper*:* ”PPML is efficient in the class of pseudo maximum likelihood estimators that are valid in models with fixed effects and are compatible with structural gravity models.”

As Breusch-Pagan/Cook-Weisberg testing for heteroskedasticity confirms heteroskedasticity in the sample, PPML is chosen as the estimator for all models. Additionally, there are no serious correlation issues, see the correlation matrix in Table 6 in the Appendix. Potential endogeneity between the independent variable and the variable of interest, the shadow economy, is avoided by lagging the shadow economy variable by one year.

3.3.3 The Determinants of FDI and a Description of the Data

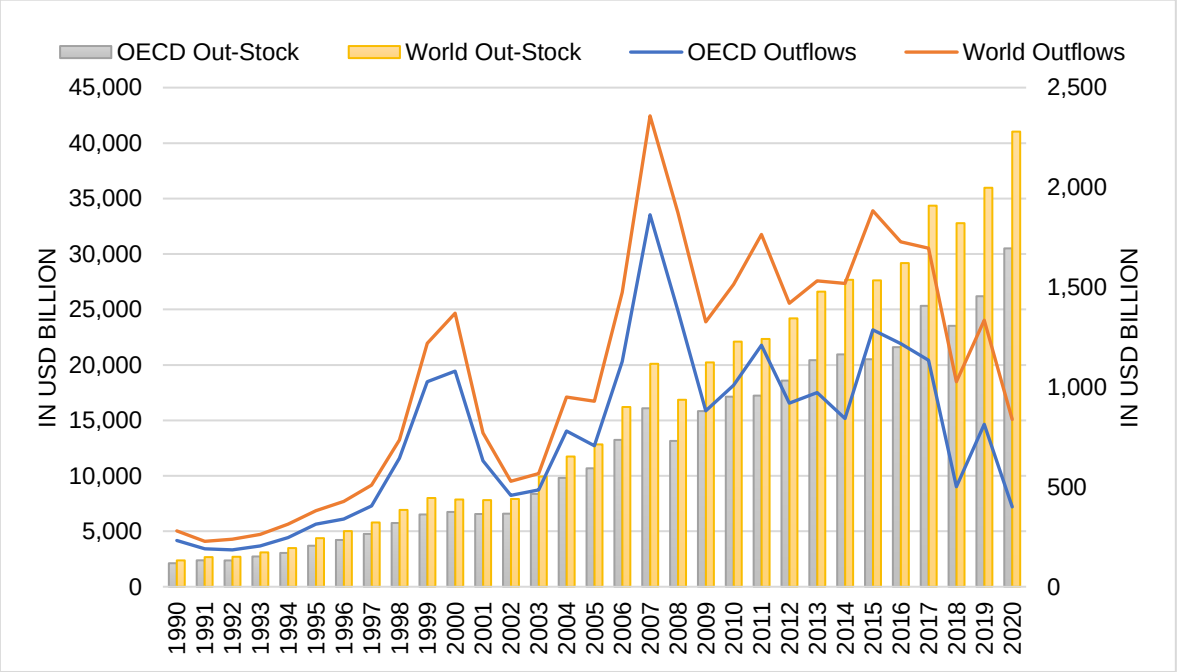
Figures 3.1 and 3.2 show the development of inward and outward flows and stocks, respectively, for OECD countries in comparison with the world total. The overall trend is that FDI stocks are growing for both the OECD group of countries and the world economy. FDI flows in comparison are more volatile and in the late 2010s are exhibiting more of a decline compared to the early and mid-2000s. Also, OECD countries stand for the majority of FDI flows and FDI stock in the world, albeit the proportion of OECD-related FDI is declining as other non-OECD countries increase investment.

Figure 3.1: FDI Inflows and Inward Stock for OECD Countries and the World from 1990-2020



Source: Own representation based on data available from UNCTAD (https://unctadstat.unctad.org/EN/Index.html)

Figure 3.2: FDI Outflows and Outward Stock for OECD Countries and the World from 1990-2020



Source: Own representation based on data available from UNCTAD (https://unctadstat.unctad.org/EN/Index.html)

In the following empirical analysis, bilateral FDI flow data from the OECD is used due to it being compiled more uniformly and it being less aggregated as compared to UNCTAD data, resulting in more data points. Moreover, looking at Figures 1 and 2 and especially the world inflows and outflows, one can see that in these graphs, which are made with UNCTAD data, there is a difference but there should not be a difference in terms of world inflows and outflows and this is most likely a problem with data quality. Therefore, data from the OECD is preferred (Baier 2020).

The selection of the data and variables for the gravity model is based on empirical and theoretical literature. As Faeth (2009) puts it: *"FDI should not be explained by single theories but more broadly by a combination of ownership advantages or agglomeration economics, market size and characteristics, cost factors, transport costs and protection and risk factors and policy variables."*

Therefore, following research from Faeth (2009), Blonigen (2005), Blonigen and Piger (2014), and Eicher et al. (2012) regarding FDI determinants as well as previous empirical literature, real GDP, distance, cultural variables, agglomeration effects, inflation, a transatlantic banking crisis dummy, and openness are included, furthermore government consumption as a proxy for government size, following Zhanabekov (2022), is also included.

Data for real GDP, inflation, and openness comes from the World Bank, time-invariant country-pair characteristics come were taken from CEPII, and data on the shadow economy comes from Medina and Schneider (2019) and is estimated using the MIMIC approach (see their paper for more details on this), agglomeration effects data is from the OECD database, government consumption data was taken from the Penn World Tables 10, and data on the financial crisis dummy comes from Laeven (2018). Details regarding the definition and source of the variables can be found in the following table 3.1.

Table 3.1: List of Variables

Variable	**Definition**	**Source**
inflow	FDI inflow, from origin to target in current USD; Negative values to zero, excluding missing values	OECD FDI database; BMD3 data 1992-2012, BMD4 data 2013-2018
ln_target_gdp	Real GDP of FDI target country in mln. USD	World Bank
ln_origin_gdp	Real GDP of FDI origin country in mln. USD	World Bank
ln_dist	Simple geodesic distance between two countries	CEPII GeoDist Database by Mayer and Zignago (2011)
contig	dummy variable indicating whether the two countries are contiguous	CEPII GeoDist Database by Mayer and Zignago (2011)
comlang_off	dummy variable indicating whether the two countries share a common language	CEPII GeoDist Database by Mayer and Zignago (2011)
colony	dummy variable indicating whether the two countries have ever had a colonial link	CEPII GeoDist Database by Mayer and Zignago (2011)
openness	Total import plus total export of FDI target country, divided by its GDP	World Bank
ln_agglo_target	Agglomeration effects (inward FDI stock) in the target country lagged by 1 year	OECD
target_gov_100	Share of government consumption at current PPPs multiplied by 100[16]	PWT 10.0 by Feenstra et al. (2015)

[16] The original values are between 0 and 1. Multiplying by 100 makes the interpretation of the estimates easier.

target_inflation	Annual inflation based on Consumer Price Indices	OECD
target_fin_cri	Dummy describing whether a country was experiencing a systemic banking crisis as an effect of the transatlantic banking crisis	Laeven (2018)
shadow_target	Size of the shadow economy of the target country, in % of GDP	Medina and Schneider (2019)
shadow_origin	Size of the shadow economy of the origin country, in % of GDP	Medina and Schneider (2019)
shadow_diff	Absolute difference between size of the shadow economy of the target and origin country	Medina and Schneider (2019)
S_inf	Interaction term for the target country between inflation and shadow economy	Medina and Schneider (2019) and OECD
S_gov_100	Interaction term for the target country between government consumption and shadow economy	Medina and Schneider (2019) and Feenstra et al. (2015)
s_cri	Interaction term for the target country between financial crisis dummy and shadow economy	Medina and Schneider (2019) and Laeven (2018)
Eurozone	Dummy variable for when the target and origin country are both part of the eurozone	European Union

Source: Own representation

In total, the resulting dataset has 19,921 observations for the years 1992-2018 for 35 OECD countries excluding Luxembourg[17]. Missing values get treated by deletion and negative values are set to zero following the methodology in Welfens and Baier (2018). Summary statistics can be found in Table 3.2.

[17] Luxembourg is excluded due to it being a major outlier in the dataset.

Table 3.2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
inflow	19,921	870.851	4160.598	0.0	116455.9
ln_target_GDp	19,921	12.916	1.550	8.735	16.841
ln_origin_GDp	19,921	12.949	1.546	8.412	16.841
ln_dist	19,921	7.946	1.171	4.088	9.883
contig	19,921	0.077	0.266	0	1
comlang_off	19,921	0.071	0.257	0	1
colony	19,921	0.043	0.202	0	1
openness	19,921	0.828	0.410	0.158	2.274
ln_agglo_target	19,921	11.561	1.567	4.761	15.875
t_gov_100	19,921	18.326	4.850	6.701	33.758
target_fin_cri	19,921	0.097	0.297	0.0	1.0
target_inflation	19,921	3.391	7.335	-4.478	105.215
shadow_target	19,921	16.359	6.597	5.1	35.8
shadow_origin	19,921	15.661	6.431	5.1	35.8
S_inf	19,921	75.935	241.228	-52.842	3661.482
S_cri	19,921	1.428	4.623	0	23.1
s_gov_100	19,921	304.123	146.887	36.634	757.133
eurozone	19,921	0.137	0.344	0	1

Source: Own representation

3.4 Results

In this section, the results from the gravity model regressions are presented. The regressions are done using the PPML estimator (Stata command: ppmlhdfe) with country- and time-fixed effects as well as another regression with country-pair and time-fixed effects. The reason for estimating both types of fixed effects is that dyadic-fixed effects do not allow for time-invariant dyadic variables such as distance. It also helps to show the differences in estimation results between the three-way and the two-way model.

Table 3.3 shows the results for the country and time-fixed effects PPML regressions. Model 1 is simply a baseline model. It confirms the gravity intuition that market size (GDP) is positively correlated with FDI and distance is negatively correlated with FDI, with ln_target_gdp being significant at the 1% level in all models and ln_origin_gdp being significant at 1% level in Model 1 and 3 and the 5% level in model 2 and 4. This can also be seen as confirmation that the model behaves as expected. Other variables of interest are trade openness which shows a positive effect and is significant at the 1% level, government size (proxied by government consumption) which expresses a negative sign and also significance at the 1% level and agglomeration effects which are positive and significant at the 5% level in Model 1 to 4. The eurozone dummy is also positive and significant at the 1% level in Model 1 to 4. In Model 2, the variables for the shadow economy are introduced and both are statistically significant, with shadow_target being significant at the 1% level and shadow_origin being significant at the 5% level. For the target countries, a positive effect is found and for the origin countries, a negative effect is found. The other control variables remain roughly unchanged. In Model 3, the variable for the difference between the target and origin shadow economy is introduced, which shows a negative sign and is statistically significant at the 1% level. Interpreting the results for the shadow economy variables in Models 2 and 3, we get a 17.3% increase in FDI inflows for target countries when the shadow economy in the target country increases by 1% and a -11.75% decrease in FDI outflows from host countries when their shadow economy increases by 1%. For Model 3 and the shadow economy difference variable, we get a -3.9% decrease in FDI flows between countries when the difference in their respective shadow economies increases by 1%.

Table 3.3: PPML Country- and Time-Fixed Effects Results

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
ln_target_gdp	**0.842*** **	**1.313*** **	**0.805*** **	**1.337*** **
	(0.304)	(0.324)	(0.305)	(0.326)
ln_origin_gdp	**1.135*** **	**0.840** **	**1.109*** **	**0.840** **
	(0.369)	(0.415)	(0.375)	(0.413)
ln_dist	**-0.427*** **	**-0.426*** **	**-0.441*** **	**-0.427*** **
	(0.0810)	(0.0812)	(0.0808)	(0.0812)
contig	-0.127	-0.128	-0.110	-0.126
	(0.187)	(0.187)	(0.188)	(0.187)
comlang_off	**0.267** **	**0.264** **	**0.268** **	**0.263** **
	(0.132)	(0.133)	(0.127)	(0.132)
colony	**0.263***	**0.263***	**0.272***	**0.265***
	(0.144)	(0.144)	(0.141)	(0.144)
openness	**1.540*** **	**1.775*** **	**1.496*** **	**1.920*** **
	(0.407)	(0.419)	(0.410)	(0.431)
ln_agglo_target	**0.257** **	**0.296** **	**0.257** **	**0.248** **
	(0.129)	(0.126)	(0.129)	(0.126)
t_gov_100	**-0.0583** **	**-0.068*** **	**-0.0564** **	**-0.128*** **
	(0.0258)	(0.026)	(0.0258)	(0.0399)
target_fin_cri	0.125	0.127	0.115	-0.237
	(0.0903)	(0.0904)	(0.0907)	(0.193)
target_inflation	0.0005	-0.0044	0.0028	0.0635
	(0.0054)	(0.0054)	(0.0054)	(0.0489)
eurozone	**0.366*** **	**0.378*** **	**0.335*** **	**0.375*** **
	(0.127)	(0.126)	(0.121)	(0.126)
shadow_target		**0.171*** **		**0.161*** **
		(0.0391)		(0.0544)
shadow_origin		**-0.115** **		**-0.117** **
		(0.0574)		(0.057)
S_inf				-0.0022
				(0.0015)
S_gov				**0.331***
				(0.184)
S_cri				**0.0348** **
				(0.0162)
shadow_diff			**-0.0379*** **	
			(0.0086)	
Constant	-20.67***	-24.51***	-19.44**	-23.98***
	(7.735)	(9.074)	(7.870)	(9.162)
Observations	19,921	19,921	19,921	19,921

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Model 4 introduces interaction terms for the three variables that potentially interact with the shadow economy variable. These are inflation, the banking crisis dummy, and the government size variable all for the target country. Two interaction terms show statistical significance, with the shadow*gov term being significant at 10% and the shadow*crisis term at 5%. Both show a positive sign for their effect. This would mean that the effect of the shadow economy on FDI increases by **0.338%** for every 1% increase in gov consumption. In other words, the greater government consumption, the larger the effect of the shadow economy on FDI inflows. The shadow*crisis interaction term follows the same interpretation in that for target countries that are experiencing a financial crisis, the effect of the shadow economy on FDI increases by **3.7%.** The interaction term for shadow*inflation is negative but not statistically significant.

Table 3.4 shows the results for the country-pair and time-fixed effect PPML regressions. Models 5 to 8 repeat models 1 to 4 but with dyadic fixed effects instead of country fixed effects. As is the norm when using dyadic fixed effects, time-invariant variables get dropped (such as distance, etc.). Moreover, the number of observations falls because ppmlhdfe drops 841 observations due to them being singletons. This is done to guarantee that the PPML estimator converges. Generally, most control variables remain the same when it comes to significance and sign and only vary slightly in their point estimate (usually slightly lower) except for origin_GDP which loses statistical significance in models 6 and 8, when the shadow economy variables get introduced. Also, the variable shadow_diff in model 7 is no longer statistically significant (while the sign stays the same), which means that the time-variant part of the variable (since it is dyadic) is not statistically significant. The variables shadow_target and shadow_origin exhibit the same signs and significance levels as in the previous estimations, findings for the two interaction terms, s_cri, and s_gov are also basically the same, except that s_cri drops from significance at the 5% level to the 10% level. Overall, the results point to robust and good findings coming from the gravity model which is corroborated by the constant, e.g. in model 2 the constant is slightly lower than in model 1 but model 2 exhibits higher GDP effects meaning that model 1 and 2 are of similar fit. Similar behavior can be observed in the other models as well.

Table 3.4: PPML Country-pair- and Time-Fixed Effects Results

VARIABLES	(1) Model 5	(2) Model 6	(3) Model 7	(4) Model 8
ln_target_gdp	**0.812*** **	**1.312*** **	**0.791** **	**1.337*** **
	(0.307)	(0.327)	(0.315)	(0.329)
ln_origin_gdp	**0.926*** **	0.634	**0.911** **	0.630
	(0.355)	(0.402)	(0.354)	(0.398)
openness	**1.452*** **	**1.685*** **	**1.425*** **	**1.825*** **
	(0.399)	(0.410)	(0.405)	(0.421)
ln_agglo_target	**0.248***	**0.292** **	**0.250***	**0.247***
	(0.129)	(0.127)	(0.130)	(0.127)
t_gov_100	**-0.0589** **	**-0.0698*** **	**-0.0582** **	**-0.129*** **
	(0.0257)	(0.0259)	(0.0259)	(0.0392)
target_fin_cri	0.136	0.139	0.130	-0.179
	(0.0889)	(0.0887)	(0.0881)	(0.194)
target_inflation	9.37e-05	-0.0049	0.0008	0.0663
	(0.0053)	(0.0053)	(0.0053)	(0.0489)
eurozone	**0.407*** **	**0.502*** **	**0.401*** **	**0.482*** **
	(0.139)	(0.153)	(0.138)	(0.155)
shadow_target		**0.183*** **		**0.170*** **
		(0.0400)		(0.0554)
shadow_origin		**-0.114** **		**-0.115** **
		(0.0582)		(0.0579)
S_inf				-0.0023
				(0.0015)
S_gov				**0.333***
				(0.178)
S_cri				**0.0306***
				(0.0164)
shadow_diff			-0.0184	
			(0.0347)	
Constant	-20.02***	-24.54***	-19.44***	-24.00***
	(7.299)	(8.730)	(7.326)	(8.824)
Observations	19,214	19,214	19,214	19,214

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.4.1 Discussion

Regarding the hypotheses from section 2:

1) The shadow economy is expected to attract FDI, therefore a positive sign for FDI inflows is expected.

    - This hypothesis is accepted, as the shadow economy target country variable in both models is positive and significant and confirms the results of Ali and Bohara (2017). This also means that economies with a larger shadow economy receive more FDI.

    - Regarding the results for the origin country, here the sign of shadow_origin is negative which means that countries with a larger shadow economy send less FDI abroad. This might reflect the negative impact of the shadow economy on the profits of MNCs in the respective country – a lack of equity capital then becomes a problem for leveraged potential international M&A projects (assuming imperfect international capital markets so that the relative size of equity capital is relevant).

2) The difference in the size of the shadow economies between two countries is expected to have a negative sign, as countries with similar levels of shadow economy are expected to engage in more FDI with each other.

    - In the three-way model, this hypothesis is accepted as the variable is significant and the sign is negative but in the dyadic fixed-effects model this finding cannot be replicated. Therefore, the hypothesis can neither be accepted nor rejected.[18]

3) Inflation interacts with the shadow economy as inflation can be seen as a decline in real income and therefore increases the incentive to engage in shadow economy activities.

    - This hypothesis can neither be accepted nor rejected as both estimations have failed to produce statistically significant results that allow for a conclusive statement.

[18] One could argue for a tentative accept, but we will not do so here on the basis of the empirical evidence at hand.

4) The size of the government, proxied by government consumption as a percentage of GDP, is expected to interact with the shadow economy as a larger government can lead to a larger shadow economy (Zhanabekov 2022). Therefore, a positive sign is expected.

    - The hypothesis is accepted. In both models 4 and 8, the interaction term between the shadow economy and government consumption is positive, indicating that a larger government strengthens the effect of the shadow economy on FDI inflows. This could mean that the shadow economy allows for opportunities for MNCs in countries with big governments (and presumably high taxes or distorting policies). Vice-versa, the shadow economy lessens the effect (negative sign of t_gov_100) of an increase in government consumption on FDI inflows

5) Lastly, a crisis dummy for the transatlantic banking crisis (as a proxy for the Global Financial Crisis) is interacted with the shadow economy in that a crisis affects both FDI and the shadow economy.

    - The hypothesis is accepted. Indeed, for countries that are experiencing a banking crisis, the effect of the shadow economy on FDI inflows is increased, indicating that the shadow economy might offer opportunities even in a crisis struck country.

The findings here are in line with the previous empirical literature on the topics of FDI and the shadow economy in that there seems to be a positive correlation between FDI inflows and the size of the shadow economy. The motif of low labor costs comes to mind, in the sense that MNCs might interpret a bigger shadow economy as a locational advantage because it allows for the possibility of low labor costs. The findings of the negative sign of the shadow distance variable support this because MNCs invest in countries with a similar shadow economy size as their home country relying on the experience from doing business at home. The interaction terms support the findings from the theoretical literature in that government size as well as a banking crisis affect the size of the shadow economy positively. Of course, it is hard to say if the positives of attracting foreign investment outweigh the negatives of having people be part of the shadow economy and not paying taxes and social security contributions.

3.4.2 Additional Considerations

In this paragraph, the paper discusses certain additional considerations that are not part of the main analysis, namely institutional distance and corruption.

For institutional distance, the absolute difference between the origin and target countries' economic freedom index scores from the Heritage Foundation is used (Kostova et al. 2020). For the corruption measure, the control of corruption index from the World Bank's World Governance Indicator series is used[19]. See the results of models with these variables in the Appendix. Both variables are tested only with dyadic-fixed effects and, in the case of corruption, for target countries. Institutional distance is not significant in the models, corruption is significant and negative, and the shadow_target variable loses significance once the shadow_corruption interaction term gets introduced. The interaction term is not significant aside from model A4 and only at the 10% significance level. Shadow_origin stays significant (albeit at 10%). Signs are the same for both shadow economy variables. What is notable is that in models 1 to 3, the inflation_shadow interaction term becomes significant and negative, meaning that more inflation leads to a lower shadow economy effect on FDI but again this is only significant at the 10% level. One can see a positive sign at the 10% level for the corruption_shadow interaction term. This means that an increase in the corruption variable (which indicates lower levels of corruption) increases the shadow economy effect on FDI inflows and vice versa. This can be seen as an indicator that the shadow economy and corruption are substitutes, as suggested by Schneider (2008) for rich countries since lower corruption levels increase the shadow economy effect and higher levels of corruption decrease it. Overall, the inclusion of the corruption variable and institutional distance variable did not result in robust findings and certainly more in-depth research is required here.

[19] It is transformed so as to have an index that goes from 0 (high corruption) to 5 (no corruption). Missing years are interpolated.

3.5 Conclusion and Economic Policy Implications

This paper explores the subject of the effect of the shadow economy on FDI flows. For this analysis, a dataset for 35 OECD countries from the years 1992 – 2018 was compiled and used in a state-of-the-art gravity model setting. For policymakers aiming to attract FDI, a sizeable shadow economy might not be a serious hindrance as the existence of the shadow economy does not deter FDI as the results of the gravity models have shown. The shadow economy seems to be recognized as an opportunity by MNCs rather than a risk. However, as the difference between the size of the shadow economy in the origin country i and destination country j has a negative impact on FDI, it is also clear that once a large group of (OECD) countries decides in favor of fighting the shadow economy – and the respective countries are successful in this policy – there will be a growing pressure on the other (OECD) countries to follow suit with a similar anti-shadow economy policy since those other countries will be afraid of losing out on potential FDI flows. From this perspective, FDI can be a transmission channel for similar policy strategies in a broad group of countries. To the extent that such anti-shadow economy policies, in the end, raise total factor productivity and bring significant efficiency gains, the broader picture and the relevant implications suggest that FDI and anti-shadow economic policies in some countries could contribute to major international welfare gains.

Moreover, an increase in government size seems to increase the shadow economy effect on FDI even further, the same is true in the case of a country experiencing a systemic banking crisis. A possible interpretation here is that a larger government is associated with a higher need for government financing which could mean higher taxes. As higher taxes lead to lower FDI inflows (see, e.g., (Baier 2020)) the shadow economy and its potential for tax evasion might present an opportunity for MNCs to avoid these higher taxes. Regarding the systemic banking crisis effect, one could say that in uncertain markets and a struggling economy, the shadow economy presents MNCs with some kind of opportunity, possibly due to being able to employ people without having to pay labor taxes. This might even allow people to earn an income and two-thirds of income made in the shadow economy is immediately spent in the real economy (Schneider 2008).

As mentioned in the introduction, FDI comes with several benefits but, on the other hand, the shadow economy also comes with certain drawbacks. Thus, for policymakers aiming to combat the shadow economy efficiently, a fair and equitable tax regime seems necessary[20].

[20] For example, in Greece, the unique geography of the country makes it very costly to administer and collect all taxes (see Papanikos 2015)

Moreover, the government needs to be able to collect taxes to maximize its tax revenue. Additionally, to reduce incentives for corporations to engage in the shadow economy and tax evasion, a country could impose heavy sentences for accountants engaged in facilitating tax evasion. Over time though, the shadow economy in OECD countries has reduced while FDI has grown. So, countries can reap the benefits of FDI while slowly working on improving the welfare situation for people thereby reducing the incentive to be active in the shadow economy. It is beyond the scope of this paper to assess if the FDI positives outweigh the shadow economy negatives or vice versa.

Overall, there are both positive and negative effects and it is up to policymakers to decide, which effects outweigh the other. The shadow economy is not necessarily a bad thing for a country, so focusing on policies that reduce regulation, make doing business easier, and a social security and tax burden that leaves people with more than just a livable income, as well as robust and trustworthy institutions, seems to be the best way to move forward, which ultimately will result in fewer incentives to engage in the shadow economy and a better economic climate overall for all economic actors.

Appendix B

Table 3.5: Regressions for the Additional Considerations Section, PPML Dyadic Time Fixed Effects

VARIABLES	(1A) Model 1	(2A) Model 2	(3A) Model 3	(4A) Model 4
ln_target_gdp	**1.353*** **	**1.466*** **	**1.537*** **	**1.506*** **
	(0.354)	(0.352)	(0.354)	(0.349)
ln_origin_gdp	0.673	0.708	**0.708***	0.679
	(0.442)	(0.436)	(0.428)	(0.427)
openness	**1.864*** **	**1.948*** **	**2.021*** **	**2.008*** **
	(0.435)	(0.433)	(0.434)	(0.435)
ln_agglo_target	**0.234***	0.209	0.219	**0.224***
	(0.136)	(0.134)	(0.133)	(0.133)
t_gov_100	**-0.131*** **	**-0.122*** **	**-0.122*** **	**-0.120*** **
	(0.0407)	(0.0417)	(0.0422)	(0.0421)
target_fin_cri	-0.216	-0.288	-0.284	-0.293
	(0.199)	(0.206)	(0.205)	(0.208)
target_inflation	0.0784	0.0836	0.0804	0.0790
	(0.0517)	(0.0514)	(0.0514)	(0.0515)
shadow_target	**0.167*** **	**0.165*** **	0.0411	0.0311
	(0.0618)	(0.0616)	(0.0854)	(0.088)
shadow_origin	**-0.123** **	**-0.117***	**-0.116***	**-0.118***
	(0.0613)	(0.0607)	(0.0610)	(0.061)
S_inf	**-0.0029***	**-0.0031***	**-0.0027***	-0.0027
	(0.0016)	(0.0016)	(0.0016)	(0.0016)
S_cri	**0.0332** **	**0.0363** **	**0.0348** **	**0.0353** **
	(0.0168)	(0.0171)	(0.0168)	(0.017)
s_gov_100	**0.0034***	0.0028	**0.0035***	**0.0034***
	(0.0018)	(0.0019)	(0.002)	(0.002)
inst_distance	0.0122			0.0128
	(0.011)			(0.0112)
target_coc		**-0.409** **	**-0.839** **	**-0.863*** **
		(0.202)	(0.330)	(0.335)
s_corr			0.0326	**0.0355***
			(0.0207)	(0.0213)
Constant	-24.53***	-24.74***	-24.38***	-23.55**
	(9.467)	(9.468)	(9.385)	(9.307)
Observations	17,412	17,412	17,412	17,412

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

Table 3.6: Correlation Matrix

	inflow	gdp_t	Gdo_o	ln_dist	contig	comlan~f	colony	openness	Agglo_t	t_go~100	Fin_cri	Inflation	Shadow_t	Shadow_	S_inf	S_cri	s_go~100
inflow	1																
ln_target_gdp	0.2024	1															
ln_origin_gdp	0.1912	-0.0174	1														
ln_dist	-0.0708	0.1128	0.1349	1													
Contig	0.1096	0.0605	0.0308	-0.4402	1												
comlang_off	0.1774	0.1168	0.1017	-0.0026	0.2858	1											
colony	0.1175	0.0682	0.0526	-0.0525	0.2131	0.3462	1										
openness	-0.0372	-0.5222	0.069	-0.2803	0.026	-0.0446	-0.0689	1									
ln_agglo_targ	0.2418	0.8209	0.0333	0.0249	0.0662	0.1693	0.0581	-0.127	1								
t_gov_100	-0.1213	-0.5046	0.0282	-0.1968	-0.0275	-0.1896	-0.0274	0.4201	-0.3499	1							
target_fin	0.0444	0.0225	0.0581	-0.0268	-0.0074	0.0251	0.0069	0.0957	0.1201	0.0744	1						
target_inf	-0.0362	-0.1029	-0.0184	0.0204	-0.0209	-0.048	0.0015	-0.1304	-0.2057	-0.0258	-0.0237	1					
shadow_targ	-0.1452	-0.2315	-0.0598	0.0618	-0.0704	-0.1712	-0.0478	-0.0769	-0.3761	0.135	-0.0851	0.4229	1				
shadow_orig	-0.1527	0.0063	-0.298	0.0229	-0.0464	-0.1268	-0.0224	-0.0469	-0.0305	-0.041	-0.0588	0.0179	0.0345	1			
S_inf	-0.0395	-0.0797	-0.02	0.0239	-0.0215	-0.0498	-0.0019	-0.1355	-0.1922	-0.0407	-0.0447	0.9902	0.4525	0.0168	1		
S_cri	0.0141	-0.0367	0.0536	-0.038	-0.0088	-0.0031	-0.0033	0.118	0.0478	0.1285	0.9401	-0.0188	0.0014	-0.053	-0.0345	1	
s_gov_100	-0.1587	-0.4587	-0.0213	-0.0823	-0.0558	-0.2115	-0.0512	0.1944	-0.4695	0.6451	-0.0136	0.2903	0.8147	0.0001	0.3022	0.0854	1

Source: own representation

Table 3.7: List of Countries

Australia	Korea, Republic of
Austria	Latvia
Belgium	Lithuania
Canada	Mexico
Chile	Netherlands
Czech Republic	New Zealand
Denmark	Norway
Estonia	Poland
Finland	Portugal
France	Slovakia
Germany	Slovenia
Greece	Spain
Hungary	Sweden
Iceland	Switzerland
Ireland	Turkey
Israel	United Kingdom
Italy	United States
Japan	

Source: own representation

4. Shadow Economy and Foreign Direct Investment Flows in a Global Context

4.1 Introduction

Since the 1990s, foreign direct investment (FDI) has evolved into a vital pillar of economic globalization in countries that are members of the Organization for Economic Co-operation and Development (OECD) and worldwide. Global FDI flows increased from 1990 to 2021 from roughly 175 billion USD to 1.75 trillion USD, with a similar picture regarding global FDI stocks increasing from 1990 to 2021 from 2.2 trillion USD to 45 trillion USD. The benefits of FDI are well documented in the literature and go beyond a simple influx of capital for the target country. FDI can lead to technology spillovers, help in human capital formation, increase competition, and lead to international trade integration. Additionally, FDI may help improve environmental and social conditions by, e.g., bringing in environmentally friendly technologies or more socially responsible corporate policies (OECD 2002).

Another trend is that, in recent decades, the informal economy[21] has become more of a focus for researchers. This paper follows the definition of informality as presented by Elgin et al. (2021, p. 5): *"Informality is typically defined as market-based and legal production of goods and services that is hidden from public authorities for monetary, regulatory, or institutional reasons. Monetary reasons include the avoidance of taxes and social security contributions, regulatory reasons include the avoidance of government bureaucracy or regulatory burdens, and institutional reasons include corruption, related often to the poor quality of political institutions and weak rule of law. These factors affect firms and workers' decisions to participate in the formal sector. For the purposes of this paper, the informal economy involves activities that, if recorded, would contribute to GDP, and does not cover illegal activities or household production."*

According to the International Labor Office (ILO) in 2019 nearly 2 billion workers were in some form of informal employment representing 60% of global workers and 50% when agriculture in excluded. The major share, 47%, of informal workers is represented by own-account workers follows by employees with 37% and contributing family workers with 16%. Workers informally employed by formal enterprises make up roughly 33% of informal

[21] As is common practice, shadow economy and informal economy are used interchangeably to avoid repetition. Both follow the same definition.

employees in low-income countries whereas in high-income countries they make up roughly 50% of informal employees (International Labor Office 2023a).

Putting these two developments together creates an interesting question of how the informal economy's size affects FDI flows. This paper sheds some light on this question by taking FDI flow data from the OECD for 35 OECD source countries and 147 target countries from 2005 to 2019. This paper adds to the existing literature by using a new dataset based on the OECD Benchmark Definition 4 of Foreign Direct Investment (BMD4) and analyzing it with a state-of-the-art gravity model for a global sample and Latin America and Asia as regional samples. The findings are that the size of the informal economy in the target country is linked to higher FDI inflows from OECD countries. Additionally, countries with similar levels of informal economy tend to have more FDI activity between them. Natural resource rents and government expenditure seem to decrease the informal economy's effect on the target countries' FDI. Lastly, the findings for Latin America and Asia are similar to the global results.

The remainder of the chapter is organized as follows: in Chapter 4.2, the relevant theoretical and empirical literature is discussed, and hypotheses are formed. In Chapter 4.3, the gravity model of FDI is introduced and specified. Moreover, a description of the data and a short discussion on the estimator are included. In Chapter 4.4, the results of the empirical analysis are presented and discussed. Chapter 4.5 concludes with economic policy implications.

4.2 Literature Review

In this chapter, the theoretical and empirical literature regarding FDI as well as the informal economy, will be discussed. Afterward, the hypothesis for the empirical analysis will be formed based on the literature presented here.

4.2.1 Theoretical Literature

One of the early theories in explaining FDI is based on the neoclassical trade theory’s Heckscher-Ohlin (H-O) model. In the H-O model, trade is explained via the idea of a difference in a country’s relative factor endowment (capital abundance vs. labor abundance). This difference leads to a difference in international factor prices, resulting in a clear specialization pattern in production, exports, and imports. Following this logic, a labor-abundant country would specialize in labor-intensive goods production so that economic opening up leads to more production of the labor-intensive good and, indeed,

also to exports of the labor-intensive goods produced. A country with a high capital intensity, or a capital-abundant country, would therefore specialize in producing and exporting capital-intensive goods after economic opening up. Moreover, this would also allow for the possibility of international capital movements to a country where returns on capital are higher until factor prices equalize (Faeth 2009).

This traditional approach, though, makes little distinction between FDI and international portfolio flows. The first one to find discrepancies between this approach and FDI was Hymer (1960). The idea was that *"… financial flows are a mere consequence of the financial structure decisions of multinational firms" and that "… real (not financial) factors shape the location of multinational activity …"* (Antràs and Yeaple 2014).

Several authors picked up on this idea, and after a period of refinement, Dunning's eclectic paradigm came to fruition[22]. Dunning (1977) elaborated on the factors that could influence a firm's decision to invest abroad. He identified three broad advantages: Ownership (e.g., a firm's production processes), Location (e.g., market access), and Internationalization (e.g., lowering transaction costs), hence also the name OLI framework. These advantages can vary depending on the country's characteristics, industry, market, and the MNE itself(Faeth 2009).

Other explanations of FDI dynamics use the concepts of horizontal FDI, vertical FDI, and Knowledge-Capital (KC). Based on previous work (see (Markusen et al. 1996) and (Markusen 1997)) Carr et al. (2001) developed the so-called "Knowledge-Capital model," which combines vertical and horizontal modes of MNCs. *"Vertical MNEs engage in trade and seek to exploit international factor price differentials whereas horizontal MNEs seek to save trade costs by serving markets locally"* (Baltagi et al. 2007).

Carr et al. (2001) create a 2x2x2 model (two factors, two countries, two goods) with three underlying assumptions: firstly, knowledge-generating activities can be separated from production; secondly, these activities are skilled-labor-intensive; and – thirdly – knowledge-based activities have a joint-input character. The motivation to engage in vertical FDI (access to low wages) can be derived from the first and second assumptions of the model. The rationale for horizontal FDI (access markets) can be derived from the third assumption. This leads to two differently acting companies: the vertical company that headquarters in a country with an abundance of skilled labor and has production facilities in countries with an abundance of low-skilled labor, and the horizontal firm which is active in countries of a similar size and with similar relative factor endowments as its home country.

[22] See Antràs and Yeaple 2014 for a in-depth description

An extension of the KC model comes from Bergstrand and Egger (2007). The authors present a three-factor, three-country, two-good model that now allows for physical capital as a third factor of production in addition to knowledge capital (skilled and unskilled labor). Because of the introduction of physical capital and the assumption that physical capital is mobile, MNCs can now endogenously choose *"… the optimal allocation of domestic physical capital between home and foreign locations to maximize profits …"* (Bergstrand and Egger 2010).

The implication is that the three-factor, three-country, two-good model ("Knowledge-and-Physical-Capital model") now depicts FDI. Following this, Bergstrand and Egger (2010) extend their Knowledge-and-Physical-Capital model into a three-factor, three-country, three-good model, thereby creating a theoretical rationale for estimating gravity equations for bilateral FDI flows, as well as bilateral final goods trade flows and bilateral intermediate goods trade flows.

During most of the twentieth century, the belief in literature was that the formal economy would slowly but surely replace the informal economy, which was seen as a residual of some past regime. However, as recent studies have shown, the informal economy is not receding and is a persistent global phenomenon. In some countries, the informal economy is even growing compared to the formal economy (Williams and Lansky 2013; Williams 2013). These observations then demand a different explanation.

The political economy perspective argues that the informal economy is not a relic of the previous economic system but an integral part of late capitalism arising from downsizing, subcontracting, and outsourcing and, in general, as a result of maximizing production flexibility, violating labor laws to reduce cost and maximize profits or using subcontracting to businesses that use informal workers. Furthermore, deregulation, liberalization, privatization, and the shift away from the welfare state leave people with little to no choice but to seek work in the informal economy in order to make ends meet (Williams et al. 2015). *"In short, participants in informal employment are unwilling and unfortunate pawns in an exploitative global economy which has made work more precarious and poorly paid"* (Williams and Lansky 2013, p. 364).

However, not all forms of informal economy employment can be characterized that way.

The neoliberal perspective recognizes that most work in the informal economy comes in the form of self-employment and due to personal choice. There are several motivating factors for someone to be active in the informal economy: an increase in tax and social security burdens, the intensity of regulations, social transfers, labor market standards, and public sector services. Analog to the aforementioned factors, the literature identifies four main

reasons for shadow economy activity. Just like a tax increase can be a reason to engage in the informal economy, simply the motivation to avoid paying taxes, like income or value-added taxes, in the first place can be a reason too. Similarly, trying to avoid paying social security contributions can be a second reason. A third reason could be the attempt to evade specific labor market standards, like minimum wages or maximum working hours, or workplace safety regulations. Lastly, the fourth reason refers to the effort to avoid specific administrative purposes (Schneider and Williams 2013; Schneider and Buehn 2018; Medina and Schneider 2018; Williams 2013; Medina and Schneider 2019). All these reasons describe some motivation or factor to exit the formal economy and enter the informal economy due to overregulation, high taxes, or corruption. The implication is that the economic agents view the job decision as a utility maximization problem by comparing formal and informal economies and making a rational decision and *"workers making a rational economic decision to voluntarily exit the formal economy in order to avoid the costs, time and effort of formal registration"* (Williams and Lansky 2013, p. 364).

4.2.2 Empirical Literature

In this subchapter, a discussion of the empirical literature examining the nexus of FDI and the informal economy will take place. Overall, the empirical literature on this topic is relatively limited, and the following papers presented are the most relevant empirical studies examining FDI and the informal economy.

Nikopour et al. (2009) use a panel approach with a following Granger causality analysis to examine FDI and the shadow economy. The authors use data for 145 countries and 5 data points (1999/2000, 2001/2002, 2002/2003, 2003/2004, 2004/2005) and estimate in the first step using GMM. Their findings show the shadow economy's positive and significant effect on FDI inflows in all models. The following Granger causality analysis reveals that the shadow economy Granger causes FDI inflows in all models. This supports one of their hypotheses that a higher shadow economy causes higher FDI inflows. Davidescu and Strat (2015) focus their analysis on the causal relationship between the shadow economy and FDI for Romania over the period 2000-2010. They use two different causality analysis models, Granger and Toda-Yamamoto. Their results reveal a short-run causality running from FDI to the shadow economy, which, according to the authors, is due to FDI stimulating economic activity leading to the possibility of tax reforms, and the resulting lower taxes would then lead to less incentive for individuals to be active in the shadow economy.

Ali and Bohara (2017) examine the relationship between FDI inflows and the shadow economy using a panel for 34 OECD countries from 1999 to 2007. Using a gravity model

approach, they find a positive and significant relationship between the shadow economy and FDI inflows revealing that MNCs have the incentive to take advantage of the shadow economy. Huynh et al. (2020) use a panel for 19 developing Asian countries from 2002 to 2015 to investigate the relationships between FDI, shadow economy, and institutional quality. For the nexus of FDI and the shadow economy, they find that FDI negatively impacts the size of the shadow economy and that an improvement in institutional quality resulting from FDI inflows increases the negative effect FDI has on the shadow economy. van Cuong et al. (2021) investigate the impact of the shadow economy on total FDI inflows, greenfield investment, and cross-border M&As using a panel of 158 countries from 2003-2018. Their results show no clear effect on total FDI inflows, a negative impact on cross-border M&As, and a positive effect on greenfield investments. Zander (2023) analyzes the question if the size of the shadow economy affects foreign direct investment (FDI) flows using an OECD-only dataset that allows for data on bilateral, bidirectional FDI flows from 1992-2018. The empirical results suggest a positive effect of the shadow economy for FDI target countries and an adverse effect for FDI origin countries and that the difference between the size of the shadow economy in the source country and the host country has a negative impact on FDI inflows.

4.2.3 Hypotheses

Based on the theoretical and empirical literature presented in this chapter, the following hypotheses are stated here:

1) The informal economy is expected to attract FDI based on previous empirical studies. Therefore, a positive sign for the informal economy is expected.

2) The difference in the size of the informal economy between the two countries is expected to have a negative sign, as countries with similar levels of the informal economy are expected to engage in more FDI with each other due to similar business environments.

3) Natural resource rents are expected to interact with the informal economy because natural resources tend to undermine the formal economy, as seen in the Dutch Disease phenomenon, thereby increasing motivation or need for individuals and companies to engage in the informal economy (Blanton and Peksen 2021). A positive sign for the interaction term is expected.

4) The size of the government, proxied by government consumption as a percentage of GDP, is expected to interact with the informal economy as a larger government can lead to a larger informal economy (Zhanabekov 2022). Therefore, a positive sign for the interaction term is expected.

5) The effect of the informal economy differs depending on the region/or level of development of a country/region. This is explained by Schneider and Williams (2013), who argue that in many parts of the world, informal economic activity is more a result of the lack of infrastructure or institutions than a choice. Therefore, this could lead to differing effects with regard to FDI. To explore this hypothesis, the full sample will be divided into a sample of 19 developing Asian economies and 20 Latin American economies. The sign of the effect would be expected to differ between the two samples.

4.3 Model and Data

This chapter presents and explains the gravity used in the analysis and how it is specified. Additionally, the estimator, the current state of empirical analysis with gravity models, and a short description of the data and the variables are discussed.

4.3.1 Gravity Model of FDI

The gravity model originates from Newton's law of gravity: $F = G\frac{m_1 m_2}{r^2}$. It states that every particle in the universe attracts every other particle in the universe with a force proportional to the product of their masses and inversely proportional to the square of the distance between their centers. Ravenstein (1885) and Zipf (1946) were the earliest adopters of the gravity model with respect to migration patterns of people, and Tinbergen (1962) was the first with respect to trade between countries[23]. The next significant innovation of the gravity model came from Anderson and van Wincoop (2003), which builds on the intuition that trade positively correlates with the size of a country's economy and negatively with the distance between countries. The authors introduced two new terms: outward and inward multilateral resistance (Benedictis and Taglioni 2011). Outward multilateral resistance captures the fact that exports from country i to country j depend on trade costs across all possible export markets. In contrast, inward multilateral resistance captures the dependence of imports into

[23] A detailed history of the gravity model can be found in Benedictis and Taglioni 2011.

country i from country j on trade costs across all possible suppliers. This means that *"… this model picks up the fact that changes in trade cost on one bilateral route can affect trade flows on all other routes because of relative price effects."* (Shepherd 2016).

Following up on the Anderson and van Wincoop (2003) paper, Anderson et al. (2019) present a structural gravity model for FDI, particularly for FDI stocks. The model includes an equation for FDI and a multilateral resistance term for the origin country and one for the target country. The model's main characteristics are that FDI is positively related to the size of the host and origins countries' GDP, negatively related to FDI barriers, has a multilateral resistance term that links FDI to trade, and connects FDI stock and technology capital[24]. The rationale for the gravity equation for FDI flows follows from Bergstrand and Egger (2007) and Bergstrand and Egger (2010), which have been reviewed in chapter 2.

Regarding the specification of the model, several papers argue for the inclusion of dyadic and time-fixed effects. Baldwin and Taglioni (2006) support the inclusion of time-invariant pair dummies. Still, they also mention a drawback: by including these dummies, the coefficients of interest will only be identified on their time variation. This means that policy variables need to have a significant time variation. Furthermore, one cannot include time-invariant bilateral parameters, e.g., a distance parameter. Egger and Pfaffermayr (2003) and Head and Ries (2008) also use bilateral fixed effects. For the estimation in this paper, both the three-way model with country and time-fixed effects and the two-way model with bilateral and time-fixed effects will be used. The estimator will be the Poisson-Pseudo-Maximum-Likelihood (PPML) estimator developed by Santos Silva and Tenreyro (2006). This estimator is able to deal with heteroskedasticity in gravity equations by estimating in levels and not, as with OLS, in log-linearized form, which is inconsistent in the presence of heteroscedasticity. It also allows for the inclusion of zero FDI lows and takes into account observed heterogeneity (Santos Silva and Tenreyro 2006; Head and Mayer 2014; Kareem et al. 2016). Correia et al. (2019) developed the Stata command "PPMLHDFE," which uses the PPML estimator with a faster computation in the presence of high dimensional fixed effects (HDFE). It also corrects for singletons when clustering with country pairs, which helps with reducing inference bias. As Santos Silva and Tenreyro (2022) state: *"… PPML is efficient in the class of pseudo maximum likelihood estimators that are valid in models with fixed effects and are compatible with structural gravity models."*

[24] For a more detailed explanation see Anderson et al. 2019.

As Breusch-Pagan/Cook-Weisberg testing for heteroskedasticity confirms heteroskedasticity in the sample, PPML is chosen as the estimator for all models. Additionally, there are no severe correlation issues; see the correlation matrix in table 9A in the Appendix. Potential endogeneity between the independent variable and the variable of interest is avoided by lagging the informal economy variable by one year.

Only the specification, including interaction terms, is presented here; the others can be found in the Appendix.: Of course, if country-pair fixed effects are used, country-fixed effects are not included, and vice versa[25]. This results in the following gravity equation:

$$FDIflows_{odt} = \alpha_0 + \alpha_1 X_{ot-1} + \alpha_2 X_{dt-1} + \alpha_3 X_{dt-1} Z_{dt} + \gamma Z_{odt} + \delta_{od} + \delta_d + \delta_d + \tau_t + \varepsilon_{odt}$$

Where

- α_0 = regression constant
- $X_{o(t-1)}$ = lagged origin country informal economy
- $X_{d(t-1)}$ = lagged destination/target country informal economy
- $X_{d(t-1)}Z_{dt}$ = interaction terms for the target country
- Z_{odt} = set of control variables for both origin/destination countries (set includes time-invariant characteristics of country-pairs from the CEPII database for the country fixed effects regressions)
- δ_{od}, δ_{od}, δ_{od} = time-invariant country and country-pair fixed effects[26]
- τ_t = time-fixed effects
- ε_{odt} = error term

[25] These are only included in the same equation for brevity

4.3.2 The Determinants of FDI and a Description of the Data

The selection of control variables is based on theoretical literature and empirical research by Blonigen (2005), Faeth (2009), Eicher et al. (2012), and Blonigen and Piger (2014), as well as previous empirical literature as *"… FDI should not be explained by single theories but more broadly by a combination of ownership advantages or agglomeration economics, market size and characteristics, cost factors, transport costs and protection and risk factors and policy variables."* (Faeth 2009).

This results in the following control variables: real GDP, distance, cultural variables like common official language, agglomeration effects, natural resource rents, urban population, openness, and government consumption as a proxy for government size following Zhanabekov (2022). The data is for FDI flows and consists of 35 OECD source countries and 147 target counties from 2005 to 2019[27]. The dataset has been treated by setting negative values to zeroes and listwise deletion of missing values leaving in the end 33,205 observations. Additional information can be found in the summary statistics in table 4.1.

Table 4.1: Summary Statistics

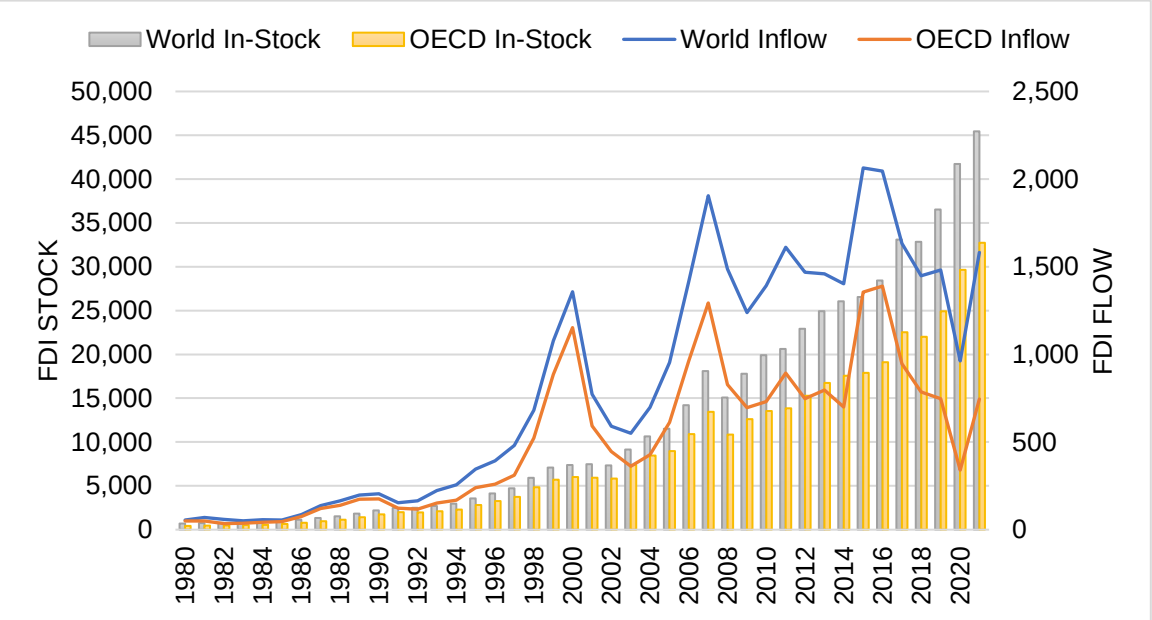
Variable	Obs	Mean	Std. Dev.	Min	Max
flows	33,205	353.08	3145.82	0.00	217855.80
ln_target_gdp	33,205	11.88	1.91	7.45	16.84
ln_origin_gdp	33,205	12.96	1.65	9.55	16.84
ln_dist	33,205	8.48	0.91	4.09	9.89
contig	33,205	0.03	0.16	0.00	1.00
comlang_off	33,205	0.06	0.24	0.00	1.00
colony	33,205	0.03	0.17	0.00	1.00
target_openness	33,205	0.86	0.47	0.00	4.37
ln_agglo_target	33,205	10.12	2.23	0.28	15.86
t_gov_100	33,205	18.03	5.99	4.70	45.42
inst_dist	33,205	11.56	8.12	0.00	60.40
target_up	33,205	60.30	21.94	9.62	100.00
target_rents	33,205	6.49	9.43	0.00	59.58
origin_shadow	33,205	20.51	6.70	7.97	34.27
target_shadow	33,205	29.13	11.58	7.97	65.14
gov_shadowe	33,205	517.17	255.76	56.77	1700.71
shadow_rent	33,205	199.95	297.99	0.00	2728.82

Source: Own calculations

[27] With the coverage from 2005 to 2012 only having data for 7 to 16 OECD counties, for 2013 29 countries and from 2014 onward 33 up to 36 in 2019

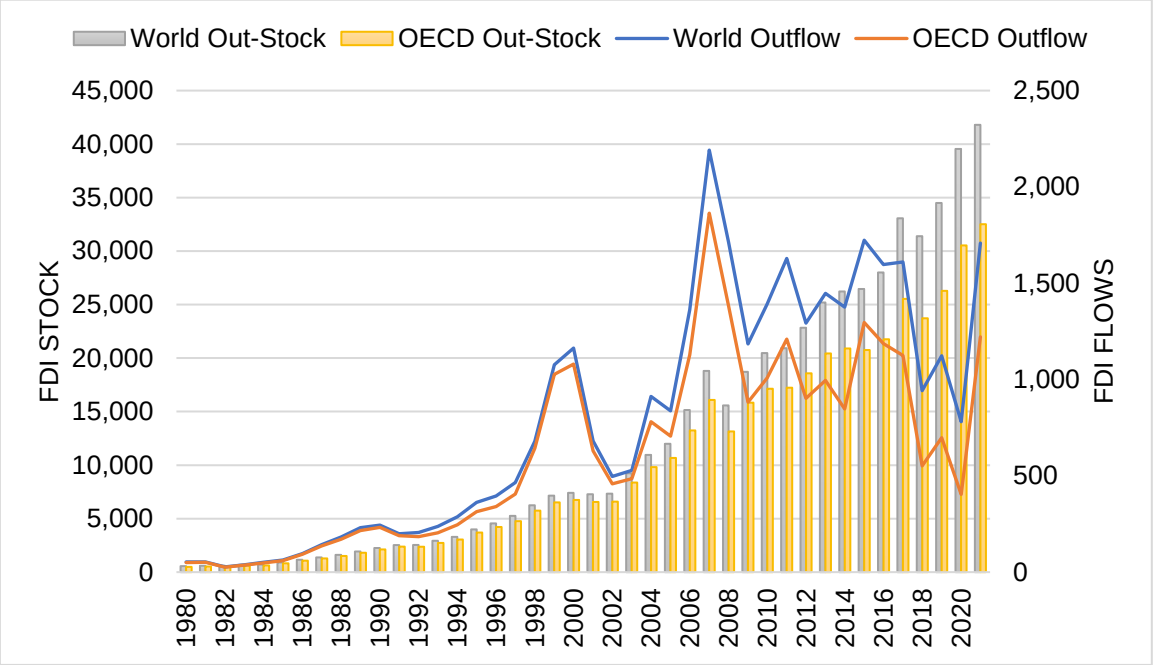
Figure 4.2 shows FDI outflows and outward stock for OECD countries and globally. One can also see that the OECD countries account for most of those FDI flows and stock, although the gap between OECD and global flows is widening from 2010 onwards. Compared to UNCTAD data, the OECD data is less aggregated and compiled more uniformly. This results in more data points and a better-quality dataset. In Figures 4.1 and 4.2, which are based on UNCTAD data, one can see that there is a difference in world outflows and world inflow which in theory should not exist and most likely points to a problem with data quality. For these reasons, the OECD data is preferred over UNCTAD data (Baier 2020).

Figure 4.1: FDI Inflows and Inward Stock for OECD Countries and the World from 1980-2021 in Billion USD



Source: Own representation based on data available from UNCTAD (https://unctadstat.unctad.org/EN/Index.html)

Figure 4.2: FDI Outflows and Outward Stock for OECD Countries and the World from 1980-2021 in Billion USD



Source: Own representation based on data available from UNCTAD (https://unctadstat.unctad.org/EN/Index.html)

Data for real GDP, inflation, and openness comes from the World Bank, time-invariant country-pair characteristics come were taken from the CEPII geodist database, and data on the informal economy comes from Elgin et al. (2021) and is estimated using a dynamic general equilibrium model (see their paper for more details on this), agglomeration effects data is from the OECD database, government consumption data was taken from the Penn World Tables 10. Details regarding the definition and source of the variables can be found in the following table 4.2.

Table 4.2 List of Variables

Variable	Definition	Source
flows	FDI flow, from origin to target, in current USD mln.; Negative values to zero, excluding missing values	OECD FDI database; BMD3 data 1992-2012, BMD4 data 2013-2018
ln_target_gdp	Natural Logarithm of Real GDP of FDI target country in mln. USD	World Bank
ln_origin_gdp	Natural Logarithm of Real GDP of FDI origin country in mln. USD	World Bank
ln_dist	Simple geodesic distance between two countries	CEPII GeoDist Database by Mayer and Zignago (2011)
contig	dummy variable indicating whether the two countries are contiguous	CEPII GeoDist Database by Mayer and Zignago (2011)
comlang_off	dummy variable indicating whether the two countries share a common language	CEPII GeoDist Database by Mayer and Zignago (2011)
colony	dummy variable indicating whether the two countries have ever had a colonial link	CEPII GeoDist Database by Mayer and Zignago (2011)
openness	Total import plus total export of FDI target country, divided by its GDP	World Bank
ln_agglo_target	Natural Logarithm of inward FDI stock (agglomeration effects) in the target country lagged by 1 year	OECD
target_gov_100	Share of government consumption at current PPPs multiplied by 100[28]	PWT 10.0 by Feenstra et al. (2015)
target_up	Urban population (% of total population). Urban population refers to people living in urban areas as defined by national statistical offices. The data are collected and smoothed by United Nations Population Division.	World Bank, United Nations
Target_rents	Total natural resources rents (% of GDP). Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	World Bank

[28] The original values are between 0 and 1. Multiplying by 100 makes the interpretation of the estimates easier.

shadow_target	Size of the informal economy of the target country, in % of GDP	Elgin et al. (2021)
shadow_origin	Size of the informal economy of the origin country, in % of GDP	Elgin et al. (2021)
shadow_diff	Absolute difference between size of the informal economy of the target and origin country	Elgin et al. (2021)
Shadow_rent	Interaction term for the target country between inflation and informal economy	Elgin et al. (2021) and OECD
Gov_shadow	Interaction term for the target country between government consumption and informal economy	Elgin et al. (2021) and Feenstra et al. (2015)

Source: Own representation

4.4 Results

In this chapter, the results from the regression analysis will be discussed. First, the empirical results for the entire sample are presented. Country-fixed effects with time-fixed effects and country-pair-fixed effects with time-fixed effects models are presented. Following are the results for the two country groups, namely Latin America and Asia. Only the country-pair-fixed effects with time-fixed effects regression results are presented here. The country and time-fixed effects tables can be found in the appendix, tables 4.7 and 4.8A.

4.4.1 Results for the Global Sample

Table 4.3 shows the results for the full sample with country and time-fixed effects. The general gravity model results are that Target_gdp is positive and significant at 5% to 10% level in all models, the distance variable is negative and significant at 1% in all models, and comlang_off is positive and significant at 1% in all models. Institutional distance shows a negative sign and significance at the 1% level in all models. This means that a country with high GDP receives more FDI, that closer countries invest more in each other that countries that share the same official language engage in more FDI, and that countries with similar institutions or business conditions invest more in each other.

Regarding the variables of interest Target_shadow is positive and significant in model 1 at 5% and in model 3 at 1%, and shadow_diff is significant at 5% and negative in model 2. Additionally, in model 3, the two interaction terms are significant with a negative sign at the 5% to 10% significance level, and the variables t_gov_100 and target_rents show a positive and significant effect at the 10% and 5% level, respectively. This means that countries with a bigger informal economy relative to GDP receive more FDI from OECD countries. The negative sign for the shadow_diff variable implies that countries with similar levels of informal economy engage in more FDI. This interpretation is similar to the institutional distance variable in that MNCs can use knowledge and experience from operating in the home country's business environment abroad and prefer environments similar to their home environment. For the interpretation of the interaction terms, the negative signs mean that the government consumption variable and the resource rent variable reduce the effect of the informal economy variable on FDI and vice versa.

Table 4.3: Full Sample, Country- and Time-Fixed Effects

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
ln_target_gdp	**1.827****	**1.417***	**1.953****
	(0.791)	(0.789)	(0.786)
ln_origin_gdp	0.897	1.039	0.848
	(1.034)	(0.854)	(1.030)
ln_dist	**-0.341*****	**-0.333*****	**-0.343*****
	(0.0651)	(0.0660)	(0.0647)
contig	0.0286	0.0558	0.0302
	(0.168)	(0.172)	(0.167)
comlang_off	**0.537*****	**0.544*****	**0.541*****
	(0.152)	(0.150)	(0.153)
colony	0.111	0.0898	0.110
	(0.144)	(0.148)	(0.145)
target_openness	0.059	0.150	0.088
	(0.293)	(0.296)	(0.287)
ln_agglo_target	0.123	0.126	0.186
	(0.225)	(0.227)	(0.223)
t_gov_100	0.0346	0.0263	**0.121***
	(0.0362)	(0.0375)	(0.0653)
inst_dist	**-0.0412*****	**-0.0371*****	**-0.0409*****
	(0.0084)	(0.0087)	(0.0083)
target_up	0.0099	0.0015	0.0189
	(0.0325)	(0.0326)	(0.0311)
target_rents	0.0115	0.0151	**0.0573****
	(0.0108)	(0.0109)	(0.0237)
origin_shadow	-0.0872		-0.0965
	(0.200)		(0.201)
target_shadow	**0.111****		**0.158*****
	(0.0522)		(0.0546)
gov_shadowe			**-0.0036***
			(0.0019)
shadow_rent			**-0.0017****
			(0.0009)
shadow_diff		**-0.0214****	
		(0.0096)	
Constant	-31.71	-26.61	-35.41*
	(20.46)	(16.56)	(20.60)
Observations	33,026	33,026	33,026

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.4 shows the results for the full sample with dyadic and time-fixed effects. For the general gravity results, target_gdp is positive and significant at the 5% to 1% level in all models. Target_rents is positive and significant at the 10% to 5% level in all models. This means that countries with higher GDP and higher natural resource rents receive more FDI from OECD countries. For the variables of interest, the informal economy variable for the target country is also positive and significant in models 4 and 6 at the 10% and 5% levels, respectively. This confirms the previous results that countries with bigger informal economies relative to GDP receive more FDI from OECD countries. Interestingly, the shadow_diff sign changes to positive when compared with model 2 and is significant at the 10% level, indicating some time-invariant characteristics in this variable that have a negative effect. Since variables in this model are only identified by their time variation, it is unsurprising that some of the variables that showed significance in the previous model are no longer significant.

Table 4.4: Full Sample, Dyadic- and Time-Fixed Effects

	(4)	(5)	(6)
VARIABLES	Model 4	Model 5	Model 6
ln_target_gdp	**2.182*** **	**1.963** **	**2.247*** **
	(0.845)	(0.825)	(0.846)
ln_origin_gdp	0.721	0.994	0.703
	(1.049)	(0.887)	(1.042)
target_openness	-0.0668	-0.0155	-0.0527
	(0.342)	(0.342)	(0.341)
ln_agglo_target	-0.0553	-0.0358	-0.0148
	(0.216)	(0.219)	(0.214)
t_gov_100	0.0471	0.0474	0.0991
	(0.0370)	(0.0375)	(0.0666)
inst_dist	-0.0117	-0.0130	-0.0106
	(0.0209)	(0.0205)	(0.0207)
target_up	0.0409	0.0195	0.0476
	(0.0307)	(0.0359)	(0.0306)
target_rents	**0.0217***	**0.0234** **	**0.0549** **
	(0.0116)	(0.0113)	(0.0268)
origin_shadow	-0.125		-0.131
	(0.216)		(0.216)
target_shadow	**0.111***		**0.140** **
	(0.0626)		(0.0654)
gov_shadowe			-0.0022
			(0.0018)
shadow_rent			-0.0013
			(0.001)
shadow_diff		**0.106***	
		(0.0608)	
Constant	-36.26*	-36.42**	-38.64*
Observations	19,317	19,317	19,317

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

4.4.2 Results for the Latin American and Asian Sample

To evaluate hypothesis 5, two country groups are formed and then estimated with the same model specification as for the full sample. As mentioned in the introduction of this chapter, only the dyadic fixed effects models are presented; the country fixed effect models can be found in the appendix.

Table 4.5: Latin American Sample, Dyadic- and Time-Fixed Effects

VARIABLES	(7) Model 7	(8) Model 8	(9) Model 9
ln_target_gdp	**7.104*** **	**6.657*** **	**8.718*** **
	(2.230)	(2.177)	(2.510)
ln_origin_gdp	-3.344	-2.548	-3.273
	(2.075)	(1.576)	(2.012)
target_openness	0.0876	0.392	-1.779
	(1.216)	(1.210)	(1.456)
ln_agglo_target	**-0.884***	-0.818	**-1.365** **
	(0.492)	(0.499)	(0.536)
t_gov_100	0.0408	0.0380	-0.156
	(0.0405)	(0.0384)	(0.179)
inst_dist	**-0.0767***	**-0.0769***	**-0.0821** **
	(0.0425)	(0.0424)	(0.0414)
target_up	-0.137	-0.125	-0.157
	(0.151)	(0.153)	(0.155)
target_rents	0.0772	0.0742	**0.254***
	(0.0494)	(0.0489)	(0.136)
origin_shadow	-0.224		-0.192
	(0.196)		(0.181)
target_shadow	0.161		**0.333** **
	(0.112)		(0.167)
gov_shadowe			0.0058
			(0.0059)
shadow_rent			-0.0058
			(0.0036)
shadow_diff		0.109	
		(0.130)	
Constant	-21.78	-29.11	-42.22
	(34.90)	(24.84)	(36.37)
Observations	2,453	2,453	2,453

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4.5 shows the result of the regression analysis with dyadic and time-fixed effects for the Latin American sample. For the control variables, the GDP of the target country shows a positive effect and significance at the 1% level in all models. Agglomeration effects show a negative sign and significance in models 7 and 9 at the 10% level and 5% level, respectively. This can mean MNCs seek countries with less MNC presence and, therefore, less competition. The variable for institutional distance is significant in all models between 5% and 10%. It shows a negative correlation meaning that MNCs from the origin country look for countries with similar institutional environments. Target_rents is only significant in model 9 at the 10% level. Only target_shadow shows a positive effect in model 9 at 5% significance level for the variables of interest. Informal economy variables in other models show no significance.

Table 4.6: Asian Sample, Dyadic- and Time-Fixed Effects

VARIABLES	(10) Model 10	(11) Model 11	(12) Model 12
ln_target_gdp	**3.372****	**3.715****	**4.413*****
	(1.495)	(1.614)	(1.589)
ln_origin_gdp	2.382	2.339	2.271
	(3.550)	(2.556)	(3.675)
target_openness	-0.208	0.0421	-0.0765
	(0.933)	(0.975)	(0.912)
ln_agglo_target	0.0533	0.0525	0.160
	(0.435)	(0.424)	(0.447)
t_gov_100	0.0480	0.0459	0.126
	(0.0367)	(0.0395)	(0.0842)
inst_dist	-0.0006	0.0102	-0.0011
	(0.0236)	(0.0224)	(0.0237)
target_up	0.0514	**0.171****	**0.105*****
	(0.0356)	(0.0813)	(0.0344)
target_rents	**-0.0725***	**-0.0896****	0.0471
	(0.0388)	(0.0398)	(0.0889)
origin_shadow	-0.229		-0.224
	(0.324)		(0.326)
target_shadow	0.0210		0.122
	(0.119)		(0.142)
gov_shadowe			-0.0025
			(0.0027)
shadow_rent			-0.0035
			(0.0027)
shadow_diff		**-0.190***	
		(0.101)	
Constant	-81.25	-93.10*	-102.3
	(65.39)	(50.24)	(65.66)
Observations	2,235	2,235	2,235

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

Table 4.6 shows the results of the dyadic and time-fixed effects regressions of the Asian economies. Starting with the control variables, target_GDP is positive and significant at 1% to 5% levels in all models. The urban population shows a positive effect in models 11 and 12 with 5% and 1% significance levels, respectively, indicating that countries with a higher urban population receive more FDI. This could be because a higher urban population means better access to workers and goods for MNCs that want to invest in a country. Target_rents are negative and significant in models 10 and 11, with 10% and 5% significance levels, respectively. A possible reason for the negative correlation of resource rents with FDI is that both China and India are big countries that receive lots of FDI inflows from the OECD but have very low resource rents as they are not rich in natural resources. Only the shadow_diff variable is significant at 10% in model 11 with a negative sign. The other informal economy variables show no statistical significance, albeit having similar signs as in previous regressions.

Overall, the two sub-samples show some parallel evidence with the full sample and help support previously found evidence. Regarding the results for the five hypotheses from chapter 2:

1) The informal economy is expected to attract FDI based on previous empirical studies. Therefore, a positive sign for the informal economy is expected.

→The hypothesis is accepted based on the evidence from the full sample.

2) The difference in the size of the informal economy between the two countries is expected to have a negative sign, as countries with similar levels of the informal economy are expected to engage in more FDI with each other.

→Mixed evidence; therefore, the hypothesis is neither accepted nor rejected.

3) Natural resource rents are expected to interact with the informal economy. A positive sign is expected.

→Some evidence shows a negative sign, so it is tentatively rejected.

4) The size of the government, proxied by government consumption as a percentage of GDP, is expected to interact with the informal economy as a larger government can lead to a larger informal economy (Zhanabekov 2022). Therefore, a positive sign is expected.

→Some evidence shows a negative sign, so it is tentatively rejected.

5) The effect of the informal economy differs depending on the region/or level of development of a country/region.

→Looking at the evidence from the two regional analyses, there seems to be no difference in the sign of the effects of the informal economy on FDI. So, the hypothesis is rejected.

4.4.3 Discussion

Regarding hypothesis 1, a positive effect of the informal economy could mean two things: MNCs see an opportunity in the informal economy to reduce costs and maximize profits by not having to comply with labor laws when employing or subcontracting people from the informal economy. Secondly, it could mean that the self-employed or micro-entrepreneurs active in the informal economy possess certain qualities or traits, like increased flexibility and innovativeness, that otherwise cannot be found in the formal economy of these countries, thereby creating a locational advantage and a reason for MNCs to invest in these countries.

Regarding hypothesis 2, MNCs from, for example, country 1 – with a large informal economy – will find investing abroad in other countries with a relatively high level of informal economic activity as representing economic conditions in a crucial field that are not very different from the conditions in the source country. Therefore, established business models can be transplanted to subsidiaries abroad relatively easily. This would make vertical FDI particularly attractive in some sectors and explain the negative signs in some of the results. This could also be seen as an incentive to improve institutions and reduce the informal economy through reforms if a country wants to attract FDI. The negative sign of the institutional distance variable further supports this.

Regarding hypotheses 3 and 4, the empirical analysis shows different results than expected, leading to a tentative rejection of both hypotheses. It seems that for both interaction terms, a negative effect is found. This would mean that the effect of natural resource rents, or government consumption, reduces the informal economy's effect on attracting FDI. This is an interesting finding in that previous literature has shown that both these variables tend to increase the size of the informal economy, and therefore a bigger informal economy should lead to more FDI (Zhanabekov 2022; Blanton and Peksen 2021). But here, it seems that these variables compete with each other. It would seem that an increase in resource rents or government expenditure would substitute the attractive effect of the informal economy on FDI towards the impact linked with resources and government expenditure.

Regarding hypothesis 5, there seems to be no effect difference depending on the region. For Latin American and Asian countries, the effect of the informal economy is positive, albeit not significant in all the models. This would mean that informal economy activity relevant for FDI is in sectors that exhibit similar structures around the world with similar effects.

4.5 Policy Conclusions and Economic Policy Implications

This paper researched the effect of the informal economy on FDI flows by compiling a new dataset for 35 OECD source countries and 147 target counties from 2005 to 2019 and analyzing it with state-of-the-art gravity models. Several findings that are also relevant to policymakers have been found. Firstly, a positive correlation between FDI and the size of the informal economy has been found. This would indicate that countries with a bigger shadow economy are receiving more FDI. For policymakers, this means that a sizeable shadow economy is not necessarily a problem for foreign MNCs. One explanation for this phenomenon could be that MNCs can reduce labor costs and circumvent labor laws by directly employing people informally or by subcontracting to local informally operating companies, thereby reducing the cost of their abroad operation and increasing profit margins in return. This raises the question of moral accountability and corporate social responsibility. If foreign MNCs actually take advantage of the informal economy like that, this, in turn, could result in policymakers delaying efforts to transition the informal economy towards the formal economy in order not to push away foreign capital.

A second finding is that MNCs prefer to interact in a business environment similar to their home country, as shown by the negative sign of the shadow economy difference variable and the institutional distance variable. This could be seen as FDI becoming a transmission channel for similar policy strategies, which would, in turn, support countries and policymakers that want to transition towards more formality as these countries would then receive more FDI from (OECD) countries with similar views. Thirdly, evidence suggests that natural resource rents and government expenditure reduce the shadow economy's attractive effect on FDI. This contradicts previous findings that show that an increase in government expenditure or a high natural resource rent lead to a rise in the shadow economy, seemingly complementing each other. A possible explanation is that the opportunities provided by a government contract or access to natural resources are more profitable when compared to what the informal economy offers. Therefore, natural resources and government expenditure seem to compete with the informal economy. For policymakers, it would seem that these are questions that are not necessarily answered by

correlations between FDI and the informal economy. Lastly, the results for the two country groups show no major differences compared to the global sample. While the informal economy might have different characteristics depending on the country and/or region for FDI, it seems to be of no further significance. This would make sense as the shadow economy is a locational factor in Dunning's OLI framework, and an MNC would look for similar locational advantages around the world regarding their investment decision.

Regarding the reasons for formalization, the ILO writes: *"Formalization is not an objective in itself but a necessary condition to reach very important objectives. Without formalization, access to decent work remains an illusion. Formalization reduces poverty and leads to greater equality among people. The formalization of enterprises, including through increased productivity and better market access, contributes to their sustainability and fosters fair competition in national and international markets. The formalization of enterprises is also a condition for an adequate labor and social protection of the workers they employ. More broadly, formalization benefits society as a whole because it enhances the government scope of action, notably by allowing increased public revenues and strengthening the rule of law."* (International Labor Office 2021).

Some evidence has shown that FDI can be a facilitator of this change by "importing" more socially responsible business practices. This paper has also demonstrated that policymakers do not need to be afraid that they would lose out on FDI by pushing for more formality, as foreign MNCs from countries with similar views would then invest more in these countries. Ultimately, this decision cannot be made by simply looking at FDI. FDI is only one of many factors playing a role, and increasing public revenue and giving workers rights should not be seen as a negative factor for business.

Appendix C

Table 4.7: Latin American Sample with Country- and Time-Fixed Effects

VARIABLES	(1) Model 13	(2) Model 14	(3) Model 15
ln_target_gdp	0.322	-0.0409	2.141
	(1.560)	(1.431)	(1.553)
ln_origin_gdp	1.073	2.611	1.071
	(3.487)	(2.912)	(3.577)
ln_dist	**-0.447****	**-0.356**	**-0.444****
	(0.222)	(0.238)	(0.221)
comlang_off	0.245	0.118	0.252
	(0.239)	(0.238)	(0.239)
colony	0.153	0.183	0.159
	(0.273)	(0.271)	(0.271)
target_openness	1.027	1.019	1.226
	(0.787)	(0.798)	(0.781)
ln_agglo_target	-0.214	-0.213	-0.104
	(0.466)	(0.464)	(0.468)
t_gov_100	0.0420	0.0369	**0.205****
	(0.0403)	(0.0377)	(0.0888)
inst_dist	-0.00476	0.00280	-0.00714
	(0.0225)	(0.0245)	(0.0225)
target_up	-0.0530	-0.0527	0.0315
	(0.0426)	(0.0428)	(0.0477)
target_rents	-0.0405	-0.0447	0.121
	(0.0431)	(0.0416)	(0.0934)
origin_shadow	-0.372		-0.378
	(0.355)		(0.354)
target_shadow	0.0874		**0.226****
	(0.0871)		(0.0938)
gov_shadowe			**-0.00537***
			(0.00285)
shadow_rent			-0.00469
			(0.00310)
shadow_diff		**0.0329****	
		(0.0156)	
Constant	-1.948	-24.10	-39.30
	(66.86)	(55.08)	(63.81)
Observations	4,371	4,371	4,371

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

Table 4.8: Asian Sample with Country and Time-Fixed Effects

VARIABLES	(1) Model 16	(2) Model 17	(3) Model 18
ln_target_gdp	**8.510*** **	**6.836*** **	**9.624*** **
	(2.816)	(2.488)	(2.963)
ln_origin_gdp	-0.512	-0.133	-0.531
	(4.050)	(2.505)	(4.218)
ln_dist	**-0.851*** **	**-0.840*** **	**-0.841*** **
	(0.298)	(0.298)	(0.298)
contig	**0.850*** **	**1.047*** **	**0.870*** **
	(0.246)	(0.251)	(0.251)
comlang_off	**0.960** **	**0.788** **	**0.989*** **
	(0.380)	(0.348)	(0.381)
colony	-0.231	-0.0562	-0.249
	(0.403)	(0.358)	(0.401)
target_openness	0.143	0.873	-1.324
	(1.354)	(1.006)	(1.475)
ln_agglo_target	**-1.105** **	**-0.931* **	**-1.396** **
	(0.555)	(0.558)	(0.557)
t_gov_100	0.0521	0.0386	-0.102
	(0.0532)	(0.0477)	(0.218)
inst_dist	0.0117	-0.0196	0.0103
	(0.0243)	(0.0212)	(0.0245)
target_up	**-0.312** **	**-0.261* **	**-0.335** **
	(0.156)	(0.148)	(0.159)
target_rents	**0.114** **	**0.0978* **	0.240
	(0.0575)	(0.0590)	(0.153)
origin_shadow	-0.154		-0.142
	(0.360)		(0.370)
target_shadow	0.195		**0.342* **
	(0.125)		(0.179)
gov_shadowe			0.00475
			(0.00748)
shadow_rent			-0.00413
			(0.00427)
shadow_diff		**0.0915*** **	
		(0.0327)	
Constant	-61.45	-47.58	-75.25
	(67.26)	(42.07)	(70.06)
Observations	3,941	3,941	3,941

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

Table 4.9: Correlation Table

	inflow	ln_target_gdp	ln_origin_gdp	ln_dist	contig	comlan_off	colony	target_openness	ln_agglo_target	t_gov_100	inst_dist	target_up	target_rents	origin_shadow	target_shadow	gov_shadowe	shadow_rents
inflow	1.00																
ln_target_gdp	0.14	1.00															
ln_origin_gdp	0.11	0.05	1.00														
ln_dist	-0.08	-0.13	0.08	1.00													
contig	0.11	0.11	0.02	-0.42	1.00												
comlang_off	0.08	0.01	0.16	-0.03	0.15	1.00											
colony	0.04	0.04	0.11	-0.06	0.14	0.38	1.00										
target_openness	0.02	-0.17	0.01	-0.20	0.04	-0.02	-0.03	1.00									
ln_agglo_target	0.17	0.84	0.07	-0.22	0.13	0.04	0.04	0.13	1.00								
t_gov_100	-0.04	-0.15	0.03	-0.27	0.06	-0.08	0.00	0.22	-0.03	1.00							
inst_dist	-0.06	-0.16	-0.01	0.23	-0.08	0.02	-0.04	-0.14	-0.27	-0.07	1.00						
target_up	0.09	0.41	0.04	-0.21	0.09	0.02	0.01	0.24	0.61	0.22	-0.33	1.00					
target_rents	-0.05	-0.15	-0.04	0.14	-0.07	-0.03	0.00	-0.05	-0.23	-0.01	0.23	0.01	1.00				
origin_shadow	-0.12	-0.05	-0.50	-0.04	0.02	-0.15	-0.09	0.00	-0.09	-0.04	-0.15	-0.03	0.05	1.00			
target_shadow	-0.12	-0.44	-0.04	0.19	-0.07	-0.02	-0.02	-0.21	-0.55	-0.11	0.25	-0.45	0.10	0.05	1.00		
gov_shadowe	-0.11	-0.42	-0.01	-0.05	0.00	-0.07	-0.01	0.02	-0.42	0.62	0.17	-0.19	0.07	0.01	0.67	1.00	
shadow_rent	-0.06	-0.24	-0.05	0.15	-0.06	-0.02	0.01	-0.09	-0.31	-0.04	0.30	-0.12	0.89	0.07	0.34	0.23	1

Further Model Specifications[29]

$$FDIflows_{odt} = \alpha_0 + \alpha_1 X_{ot-1} + \alpha_2 X_{dt-1} + \gamma Z_{odt} + \delta_{od} + \delta_d + \delta_d + \tau_t + \varepsilon_{odt}$$

$$FDIflows_{odt} = \alpha_0 + \alpha_1 \left| X_{ot-1} - X_{dt-1} \right| + \gamma Z_{odt} + \delta_{od} + \delta_d + \delta_d + \tau_t + \varepsilon_{odt}$$

[29] Same caveat regarding fixed effects presentation as before applies

5. Concluding Remarks

The papers presented in this dissertation give new insights into FDI dynamics in the face of corruption and the shadow economy for OECD countries and globally.

Chapter 2 presented evidence regarding the effects of corruption on FDI flows in OECD countries. The research showed that corruption is positively correlated with FDI inflows for target countries, indicating that countries with higher levels of corruption receive more FDI. As mentioned in Chapter 2, these findings align with more recent studies on FDI flows and corruption and contradict results from earlier studies. A possible reason could be that earlier studies were often cross-country focused and had to work with limited data availability for FDI and corruption. As data increased and became more readily available, as well as the continuous development of the gravity model (dyadic fixed effects and PPML estimator), researchers were able to decrease the bias that might be present in earlier studies, e.g., due to not controlling for country fixed effects or country pair fixed effects (as illustrated in Baldwin and Taglioni (2006)). Another possible reason is that the impact of corruption has changed from a sand-the-wheels effect to a grease-the-wheels effect over time. Nevertheless, the findings in this paper add relevant and new insights into the dynamic between FDI and corruption, albeit only with a focus on OECD countries.

Chapter 3 analyzed how the shadow economy affects FDI flows within OECD countries. The findings showed that countries with a higher shadow economy receive more FDI and that countries with a higher shadow economy send less FDI. This confirms earlier findings from Ali and Bohara (2017) in that the informal economy positively affects FDI inflows in OECD countries. Chapter 4, while looking at the effects of the shadow economy on a global scale, also finds evidence that the shadow economy is positively correlated with FDI inflows for target countries. This means that countries with a bigger informal economy tend to receive more FDI from and within OECD countries showing that MNCs are willing to take advantage of the informal economy, be it through the possibility of reducing their tax burden, dodging specific labor laws and standards, or generally being able to profit from lower labor costs. As the empirical literature regarding FDI and shadow economy effects is relatively sparse, chapters 3 and 4 provide valuable new key insights and add to the empirical literature and the scientific discourse by employing state-of-the-art empirical methodology and sound theory.

5.1 Policy Implications

While the empirical findings are valid and meaningful on their own, it is essential for an economic dissertation to place the results in the political context and formulate policy recommendations. While both the level of corruption and the size of the shadow economy are positively correlated with FDI inflows for target countries, it is more than questionable to recommend a policy that focuses on increasing corruption levels or the size of the shadow economy. Nevertheless, several important policy conclusions can be drawn here. Focusing on corruption, it is important to view these results in the context of the whole empirical findings. While corruption is positively associated with FDI inflows, so is GDP, trade openness, the population, and the implementation of the OECD anti-bribery convention into law. Therefore, corruption is one of several FDI-attracting locational factors. One interpretation is that in countries with higher levels of corruption, it can help deal with excessive red tape regulation and, in combination with other locational factors, results in an attractive target for MNCs.

Here corruption is more a means to an end than the primary goal. With regards to policy, this would mean that instead of focusing on lowering corruption, other policy changes and improvements can take priority while still maintaining a country's status as an attractive FDI target. One such improvement could be to strengthen and develop institutions in a country. Better schools, for example, can improve human capital formation, better police and fire departments, and access to health care can improve health and safety for the population. At the same time, social security programs can help alleviate poverty. All of this can result in even more FDI inflows which come with positive spillover effects like technology transfer, job creation, and economic growth country (see e.g. (Buchanan et al. 2012)).

Additionally, a better institutional environment and a more stable and secure country would, in turn, reduce corruption levels (Dreher et al. 2009). While the reduction in corruption levels on its own might lead to decreases in FDI, combined with the improvements mentioned above, the total effect could well be an overall increase in FDI inflows. Also, better institutions can lead to more competition and more competition is associated with less corruption (Djankov et al. 2002) and a more efficient market outcome. Furthermore, corruption not only has economic effects but also effects on the society and people of a country. Usually, people with low income or living in poverty suffer the most from corrupt practices (Gupta 1998).

Another angle here is that FDI, besides bringing more capital to the target country, also brings some of the origin country's culture. While the results were not significant in the

empirical analysis, the difference between the origin and target country's level of corruption was positively correlated with FDI flows. Therefore, countries with differing levels of corruption would invest more in each other. Assuming that countries with low levels of corruption would invest in countries with high levels of corruption, one can argue that there will be not only technology but also cultural spillover effects. This could potentially lead to a decrease in corruption as more and more incumbent firms and government officials adopt business practices that are free of corruption. Lastly, these effects might be transient[30] meaning that the increase in FDI flows associated with higher corruption levels also brings more economic growth and ultimately increases wealth. This, plus additional tax revenue, could enable a government to implement policies to reduce corruption effectively.

While writing this dissertation, several impactful developments happened that affected economies worldwide, namely the 2020 Corona pandemic resulting in a recession in many countries that year and the high inflation pressure in 2022 due to several factors like the aforementioned Corona pandemic, a global shipping crisis, and the Russian invasion of Ukraine. The shadow economy is affected by these developments.

Firstly, high inflation is often associated with having negative effects on FDI for both industrialized and developing economies (see, e.g., Agudze and Ibhagui (2021)), especially regarding the widespread inflation observed throughout 2022. Inflation raises the cost of doing business and the cost of talent, which in turn affects the decision of a company to invest abroad. When overall costs increase, potential projects in a foreign market might be put on hold, especially since an increase in inflation is often associated with increased central bank interest rates, increasing the cost of capital. Inflation is also seen as a driver for the shadow economy, as the real wage declines and the cost of living becomes more expensive. This increases the pressure on workers in the formal economy, potentially leading to them leaving it for the shadow economy. The shadow economy being positively correlated with FDI inflows could then potentially provide a channel for alleviating the effects of inflation pressure. Of course, this does not mean policymakers should see the shadow economy as the solution to inflation.

On the other side, when a country experiences inflation, it can lead to the depreciation of the currency compared to foreign currency, which in turn can lead to an increase in FDI flows as assets in the target country have become cheaper for foreign investors to buy (Froot and Stein 1991). In conjunction with the positive effect of the shadow economy on FDI, this could lead to more capital inflows for a country experiencing inflation which might

[30] This refers to the findings of earlier empirical studies where corruption often had negative effect on FDI flows

help mitigate some of the recession pressure coming from inflation. This does not mean policy should not focus on curbing inflation pressure because the shadow economy exists. It is more of a recommendation to focus policy priorities elsewhere in these times and not on the shadow economy developments, as an increase in the shadow economy must not always be a bad sign. It can help people endure difficult times and keep consumption alive, as two-thirds of the money made in the informal economy is immediately spent in the formal economy (Schneider 2008). However, there is one thing policy-makers should keep in mind: the issue with government packages and the shadow economy, especially when it comes to monetary support in times of high inflation. The usual channels of tax relief or wage subsidies do not reach the people working in the shadow economy. As such, a different approach has to be taken, like easier access to finance for informal firms (Ohnsorge and Yu). The same is true for any help packages during the Corona pandemic. The Corona pandemic, though, is a particular case, as it had not just economic effects but severe health effects as well, and though it is not the scope of this dissertation to discuss these effects of the pandemic, some remarks will still be made. For many people working in the informal economy, it is often true that they have limited access to health care or that informal firms have limited health and safety procedures. This, of course, exacerbates the effects of a quickly spreading virus like Covid-19, which leads to informal workers getting not only sick but also often leads to them losing their source of income during their time of sickness as informal workers often do not have access to social security nets (World Bank 2021).

Additionally, these crises, and the ongoing climate crisis, put pressure on governments to do something which could increase government spending, which for OECD countries is negatively linked to FDI flows (Chapter 3). It can also lead to tax increases to fund the additional spending, which deters FDI (Baier 2020) and increases the shadow economy. While the shadow economy can alleviate the negative effects of an increase in government size, people and companies active in the informal economy do not pay taxes, which could mean that an increase in taxes does not have the desired additional tax income for the government. This leads back to the neoliberal approach that the shadow economy is due to individual choice based on utility maximization. A tax increase reduces an individual's income and increases the attractiveness of informal work. The same can be said for an increase in social security contributions, the intensity of regulations, and labor market standards. Following this train of thought, policy recommendations become obvious: decrease the tax and social security burden, create a market environment that is not stifled through excessive regulation, and improve labor market flexibility. Additionally, reduce the cost for start-ups, increase access to finance, and increase tax morale and governance in general. While these policies would be aimed at reducing the shadow economy, they are

also linked with an increase in FDI inflows (see, e.g., Baier (2020) or Buchanan et al. (2012)). Also, as shown in Chapter 3, firms tend to prefer similar institutional environments to their home environment, meaning that while the reduction of the shadow economy through these policies might lose FDI from firms seeking to exploit informality, other firms from countries with a smaller shadow economy could substitute. Of course, all of this is a balancing act, as a government needs enough tax income to do all these reforms and improvements in the first place. Therefore, while these recommendations seem straightforward, implementing them is a challenging endeavor. Finally, some ideas from the political economy perspective that argues that the shadow economy is a result of the current form of capitalism due to downsizing, subcontracting, and in general trying to reduce labor cost as much as possible in order to increase profit margins. In this context, deregulation and a reduction in the social security net would lead to even more informal work, especially during a crisis, as workers would simply be faced with minimal choice. Moreover, while this might lead to more FDI inflows, it is, at the very least, morally questionable. A more sensible approach would probably be to try to decrease taxes to attract more FDI while closing tax loopholes, thereby increasing tax revenue which could then be used to facilitate better social security nets without increasing the burden on the working class. Of course, one could also argue that changing from a shareholder-value-based to a stakeholder-value-based economy could also lead to a better societal outcome. Additionally, looking at increasing social inequality and increasing lower income strata, good income redistribution and effective support of the lower income strata could result in a double dividend. On the one hand, reducing the attractiveness of the informal economy and on the other hand alleviating poverty pressure. This would result in an increase in GDP and overall wealth.

Ultimately, policy should never solely focus on only one thing, like a determinant in an FDI gravity equation. While one can learn a lot from that, it should not be seen as a certain and definitive way to control FDI inflows in a country. Instead, policymakers should focus on the bigger picture: there is more to the shadow economy and corruption than just the potential of attracting FDI. In addition, while an argument can be made that the informal economy and corruption can facilitate economic growth and increases in wealth by attracting FDI, there is the side of them creating an especially bad environment for poor people, which heavily favors the rich and powerful.

5.2 Limitations and Future Research

As mentioned earlier, data on corruption or the shadow economy is always done through estimations based on several indicators and surveys. This is simply due to the nature of these variables being outside the legal framework, which somewhat impacts the viability of the results. Nevertheless, as FDI comes from a company's decision to invest abroad and these decisions are, at least for the foreseeable future, made by human beings, their perceptions about these topics affect their decision. Another point can be made regarding special purpose entities (SPEs). SPEs are often set up to benefit from low taxes or easy access to capital markets and have little to no effect on the economy but are used to move capital, meaning they contribute to FDI flows. In the FDI data used for the analysis in this dissertation, no differentiation between flows from SPEs and non-SPEs is made. This is also a topic of future research, with some of the OECD FDI flow data allowing for that differentiation. Also, a new IMF database allows for that differentiation for 26 economies (International Monetary Fund 2022). Another argument regarding sectoral FDI data can be made: for specific sectors, like the garment industry, a factor like the shadow economy is probably more relevant than the service industry. Of course, this is just a hypothesis that future researchers would have to investigate. And while this dissertation does not establish causation, there is still a lot to learn from identifying and researching these effects of locational factors in a gravity model setting.

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